Early Childcare and Developmental Delay Risk at 3.5 Years: Insights from the French ELFE Cohort

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Abstract

Purpose

We tested the association between early childcare attendance in the first three years of life and child development at age 3.5 years in the French context, where early childcare is subsidized.

Methods

In the ELFE (*Étude Longitudinale Français depuis l'Enfance)* birth cohort study set in metropolitan France, children's development was reported by parents at age 3.5 years (n = 11,033) via the Child Development Inventory (CDI) questionnaire. CDI scores were transformed into a development quotient (DQ), with a DQ <90 corresponding to possible and a DQ <85 corresponding to a probable developmental delay. Inverse probability weighted multivariable regression models were used to analyse whether early childcare in the first three years of life (centre-based, childminder, informal or parental care) was associated to development delay.

Results

Compared to children in exclusive parental care, those in centre-based childcare (CBC) or with a childminder prior to school entry were significantly less likely to experience possible (OR = 0.56, [95% CI = 0.51-0.61] for CBC and OR = 0.77, [95% CI = 0.72-0.83] for childminder attendance) and probable developmental delay (OR = 0.62, [0.58-0.67] for CBC and OR = 0.80 [0.76-0.83] for childminder). Informal childcare attendance was not significantly associated with children's possible nor probable developmental delay ((OR = 0.97, [0.84-1.12]) and (OR = 0.97, [0.82-1.15]), respectively).

Conclusions

Overall, our findings add to the existing scientific literature, showing that in the French context, where childcare can start as early as 3 months of age, early childcare attendance can contribute to child's development.

Word count: 249 words

Key Words

Early childcare; child development, developmental delay; cohort study, France

Abbreviations:

CBC: Centre-Based childcare

CDI: Child Development Inventory

DQ: Development Quotient

ELFE : *Étude Longitudinale Français depuis l'Enfance* (birth cohort)

IPW: Inverse Probability Weight

OR: Odds Ratio

SD: Standard Deviation

What's Known on This Subject

Studies on early childcare attendance and child development have shown mixed results, associations with better psychomotor development mainly being observed in Nordic countries, while some studies in other countries such as the USA showed no or negative associations.

What This Study Adds

In a country with broad and subsidized access to childcare such as France, access to early childhood education can positively contribute to children's psychomotor development. However, we found that access to childcare does not appear to reduce social inequalities in children's psychomotor development.

1. Introduction

Research on childcare prior to school entry and effects on later child development has yielded sometimes discrepant results [1–6]. Many studies showed positive effects, particularly of centre-based childcare [2] on children's cognitive skills, language development and behaviour [1,5,7–9]. However other studies suggested that early childcare has no [2,6] or negative impacts on outcomes, such as motor and social skills [10], and aggression [2–4,11]. These contradictory results might be due to international differences in early childhood policies, resulting in variations in quality, quantity, accessibility and age of entry [5,12–14].

The nature of the environment children grow up in - including childcare quality - play pivotal roles in shaping developmental trajectories [1,5,15–17]. High-quality early childcare includes structured learning activities and diverse experiences that stimulate children's cognitive growth, enhance language skills and foster problem-solving abilities [1,15,16]. The ratio of children per carer, one of the criteria of childcare quality, is critical [5], as are small group activities which can yield special benefits in terms of language, reading and literacy skills [18].

In addition, positive effects of early childcare can extend into adolescence and adulthood [19–21] and predict higher educational attainment, and improved career prospects and overall well-being [22,23], although these long-term benefits have been debated [24].

The impact of childcare attendance might differ depending on the child's sex [25–27] and sibship [27]. For example, boys and girls differ in terms of behavioural outcomes[1,25,26], while first born children have especially improved communication skills [1,27]. Parents' educational level [28] as well as their mental health [29] may also play a moderating role: some studies show that children from socially disadvantaged backgrounds or whose mother suffers from depression, can particularly benefit from attending high quality childcare[1,24,29,30].

In this context, France offers an interesting framework to study early childcare attendance and child development. Since 2019, preschool attendance is mandatory from the age of 3 years (until 6 years) [31]. However even before 2019, more than 97% of children aged 3 years were enrolled [32]. It is hence possible to examine the effects of early childhood education specifically prior to age 3 years on later child outcomes. Moreover, in France access to early childcare is subsidised and families pay according to their income level [33], the two main types being: childminders (government-licensed and trained childcare providers that care for of up to five children in their home) and centre-based childcare (most are public, high quality, and heavily monitored) [34] (see **Supplementary Materials** for more details). Maternity leave being 10-18 weeks after a child's birth, most children enter childcare around age 3 months. Nevertheless, some children are cared for by their parents prior to preschool entry, and a small proportion are in informal – mostly familial care [33].

While several studies have focused on the impact of childcare on child's health, none have studied it in the unique French context, especially at population level. We tested whether the type of childcare attended prior to preschool entry predicts children's development using data from the French ELFE mother-child cohort. Additionally, we tested effect modification by characteristics of the child (sex, sibship) or his/her family (maternal educational level, parental mental health).

2. Methods

2.1. Population selection

Data for this study comes from the ongoing ELFE (*Étude Longitudinale Français depuis l'Enfance)* mother-child cohort, which recruited 18,289 babies born in 2011 in 320 maternity wards across all of France [35].

Follow-up questionnaires were administered at ages 2 months, 1 and 2 years (telephone interviews of both parents) and 3.5 years (home visit, and interview with one parent) [35]. The ELFE cohort is nationally representative and survey weights are available for each study wave.

Twins (n = 570), who have specific development dynamics [36–38], children with chromosomic disorders (n = 335), those placed in foster families [39] (n = 3), as well as children with data neither on the study exposure nor the outcome were excluded (n = 6,445).

2.2. Exposure

Parents reported the type of childcare attended by their child and the age of initiation at 1, 2 and 3.5 years of age:

- Centre-based childcare, CBC (2,592; 23.5%);
- Childminder (4,997; 45.3%);
- Parental care (2,611; 23.7%);
- Informal care, IC (733; 7.6%).

2,032 children (18.4%) changed childcare between ages 3 months, 1, 2 and 3,5 years, mostly from parental or informal care to formal childcare, a minority switching from a childminder to CBC. Nevertheless, 62% of participating children were already in their final childcare type at age 3 months, 86% at 6 months and a large majority at age 1 year. In case of a switch in childcare type, the final one which was generally longer than the 1st one, thus we retained the latter. Similarly, when children attended different types of childcare, we prioritized first CBC, next a childminder.

2.3. Outcome

Child development was measured via the parent-reported General Development scale of the Child Development Inventory (CDI) [40–42], a short questionnaire [42] assessing children's language development (expression and comprehension), gross and fine motor skills, self-help, socialisation, and letter and number skills, through 70 specific questions. The CDI has previously been used to identify developmental delay between ages 15 months and 5 years [40,42].

In the ELFE cohort, parents completed the CDI questionnaire when their child was 3.5 years, exact age varying between 38.7 to 52.8 months (42.4 months on average, SD = 1.8 months). As child development is strongly linked to child age [40,42], we converted each CDI score into a Development Quotient (DQ) taking into account age at time of assessment [40,43] (see **Supplementary Materials** for details). The French version of the CDI, as well as norms, curves and thresholds were validated in representative samples of children aged between 9 months to 6 years and 3 months [43,44]. In this study we used two DQ thresholds [43]:

- Possible developmental delay: DQ < 90;
- Probable developmental delay: DQ < 85.

2.4. Covariates

In the ELFE cohort, multiple parental, family and child characteristics were recorded at the time of the child's birth, at 2 months, 1, 2, and 3.5 years of age and we considered as potential covariates all variables that may be linked to childcare attendance or child development, based on existing scientific literature. Covariates were included in statistical analyses if they were associated with the study exposure and outcome ($p < 0.01$).

Child characteristics assessed at baseline included child sex (boy vs. girl), birthweight for gestational age (low vs. normal), season of birth, prematurity (yes vs. no), sibship yes vs. no), as well as duration of breastfeeding, the types of toys played with, exposure to TV and other screens ascertained at age 2 years.

Parental and family characteristics ascertained included the mother's age (<30 vs. >=30 years), nationality (French vs other), marital status (couple vs. single), educational level (<high school certificate, up to Bachelor degree, Master's degree or higher), area of residence (Paris and suburbs vs. other), smoking status (smoker, former smoker, non-smoker), alcohol consumption (never, rarely, often), psychological difficulties and other medical issues during pregnancy, the father's age, nationality, educational level, psychological difficulties, household income (1^{st} and 2^{nd} deciles, 3^{rd} to 8^{th} deciles, 9^{th} and 10^{th} deciles), and household financial difficulties recorded at study baseline. Several characteristics were ascertained at other time points such as parental smoking status, health conditions, post-partum depression, family conflicts, employment status, division of household chores, activities with the child and parental - including father's - involvement in the child's care [45].

In statistical analyses, we mainly included maternal characteristics, but when measures of both parents were available we combined them (e.g. mental health).

Statistical methods

To test associations between childcare attendance and children's development, we implemented logistic regression models, accounting for covariates with propensity scores. Children who were cared for by their parents prior to entering preschool served as the reference group. To ensure that the sample was representative of French children and to account for attrition over time, all analyses included survey weights.

Missing data on study covariates were imputed using multiple imputation with Fully Conditional Specification (FCS), creating 10 imputed datasets. In case of missing items on the CDI, subscales were imputed and the total CDI score calculated for each imputed dataset. The imputation model contains all variables used in our analyses, as well as variables predicting missingness. The results of the analyses on the imputed datasets were combined using the SAS proc mi procedure.

A Generalized Boosting Model (GBM) implemented in R was used to estimate propensity score weights with Kolmogorov-Smirnov (KS) means [46], and inverse probability weights (IPW) method was used to balance differences in characteristics across the different childcare groups.

GBM outperforms a more classic covariate balancing propensity score method when the relationships between the exposure, outcome and covariates are complex.[47] All covariates measured at study baseline linked to the outcome were included in the models[48]. The GBM model can perform variable selection and a larger number of covariates tends to improve its performance [48,49]. Survey weights were added in the model to predict propensity scores associated with childcare attendance and calculate the IPW[50,51].

Balance across groups was evaluated by two criteria: an Absolute Standard Mean Difference of < 0.2 and a Kolmogorov-Smirnov (KS) tests ($p>0.05$) [52].

In case of incomplete balance across groups, in sensitivity analyses we added the unbalanced variables as covariates in the weighted models.

We also tested the association between childcare attendance and children's psychomotor development excluding children who changed childcare types between study waves (18.4% of the sample).

Finally, we tested interactions between childcare attendance and a) the child's sex, b) sibship (first born in the family vs having an older sibling), c) maternal educational level (tertiary education vs high school certificate or lower), and d) parental mental health problems in the first three years of the child's life.

All analyses were performed using SAS version 9.4 or R (version R-4.3.0).

3. Results

3.1. Descriptive analysis

Our study sample consisted of 11,033 children. 7,042 had complete CDI data. On average, less than 10% of covariate data were missing (3.6%), with a maximum of 12.7% for father's post-partum depression.

In our study, 8.3% of children experienced probable developmental delay and 16.2% possible developmental delay. Possible or probable developmental delay was more likely among boys than among girls (respectively 20.8 vs. 11.4%, $p < 0.0001$ and 11.2 vs. 5.3%, $p < 0.0001$), among children with older siblings than among first-born (respectively 17.5 vs. 14.6%, $p < 0.0001$ and 9.3 vs. 7.1%, $p < 0.0001$), among those whose mother had a low compared to intermediate or high educational level (respectively 22.0, 15.4 and 12.3%, $p < 0.0001$, and 12.9, 7.7 and 5.3%, $p < 0.0001$), and among children with parental history of psychological problems in the first three years compared to those whose parents had no psychological problems (respectively 19.0 vs. 15.1%, $p < 0.0001$ and 9.8 vs. 7.7%, $p < 0.0001$).

Table 1 and **Table 2** show sample characteristics across the four types of childcare studied. Our results show decreasing CDI scores across the three categories of childcare with mean scores ranging from 54.1 (SD = 4.8) among children attending CBC, 53.6 (SD = 5.0) among

those staying with a childminder, 52.7 (SD = 6.0) among those in informal childcare, and 52.5 (SD = 6.5) among those staying with parents only ($p < 0.0001$). We observed the same pattern for the Development Quotient ranging from 102.4 (SD = 12.4), 101.3 (SD = 12.7), 100.4 (SD = 14.2) to 99.9 (SD = 14.8) across the four groups, respectively. Consequently, the proportion of children with possible or probable developmental delay (DQ <85) was 14.5 and 7.1%, 16.5 and 8.2%, 23.5 and 13.4% and 24.3 and 14.8% respectively.

3.2. Main results – IPW analyses

Table 3 shows unadjusted and adjusted results of inverse probability weighted (IPW) statistical analyses. Even after adjusting on covariates, compared to children who were in exclusive parental care, those who attended CBC or a childminder were significantly less likely to experience possible or probable developmental delay (CBC: OR = 0.56, [95% CI = 0.51-0.61] and 0.62, [0.58-0.67]; childminder: OR = 0.77, [95% CI = 0.72-0.83] and OR = 0.80 [0.76-0.83], respectively). We found no statistical difference between children in informal childcare and those in exclusive parental care (ORs = 0.97, [0.84-1.12] and OR = 0.97, [(0.82-1.15] for possible and probable developmental delay).

These results were stable after accounting for additional covariates (**Supplementary Table 4**) as well as among children with complete CDI data (**Supplementary Table 6**).

Our results were also stable when children who were in multiple types of childcare were excluded (results not shown).

3.3. Effect modification of the effect of childcare

The only statistical interaction we found to be significant was between childcare attendance and child sex ($p = 0.0228$) (**Supplementary Table 3**). While among boys probable developmental delay was less frequent among those who attended either CBC or a childminder, among girls this association was only statistically significant among those who

were in CBC. On the other hand, informal childcare attendance was associated with a lower probability of probable delay in girls but a higher probability of probable delay in boys.

4. Discussion

4.1. Main findings

In the ELFE child cohort study conducted in France, we found that 8.3 % of children had probable developmental delay. Controlling for multiple characteristics of children and their parents, those who attended CBC or were looked after by a childminder were less likely to experience probable developmental delay compared to those who were in exclusive parental care. Attending CBC or being cared for by a childminder had a positive influence on boys only, while informal childcare had a positive influence on girls but a negative one on boys.

4.2. Strengths and limitations of this study

Our study has several strengths which need to be highlighted. First, it is based on data from the ELFE cohort, a nationally representative sample of children born in France. To ensure representativeness, we applied survey weights. Second, childcare attendance was measured several times during follow-up, making it possible to obtain a precise measure prior to preschool entry at the age of 3 years. Most children did not change childcare once they entered one, usually between 3 and 6 months, and the few who switched childcare did so mainly in the 1st year of life. Third, we accounted for multiple sources of confounding bias using propensity scores, which made it possible to balance study groups and make them comparable.

Nevertheless, our study also has limitations which need to be acknowledged. First, our results cannot be directly generalized to other countries with different socio-economic, cultural and political contexts, as France has some specificities such as mandatory preschool entry at age 3

years. Second, as all birth cohorts, ELFE includes participants who accepted to take part and be followed over time. To address this issue, all analyses were conducted including study weights to render the sample representative of children born in France in 2011, which attenuated possible selection bias. However, exclusion of some children without data on outcome or exposure, might have lead to some censoring bias. Fourth, children's switching between different types of childcare could have caused classification bias. Since our analyses focused on children who did not switch childcare were consistent with our main findings, this source of bias is likely to be limited.

4.3. Interpretation of study findings

This study adds to existing literature that found that early CBC is linked to better child development [7,16]. Even in countries where research results on this topic are mixed, such as the USA, high quality childcare has been consistently linked to better child outcomes [16]. This is the first study based on a nationally representative sample to suggest that attending childcare, such as offered to children living in France, can in some contexts be protective of developmental difficulties that can have lasting consequences on children's health and well-being.

Early childcare settings can provide opportunities for children to interact with peers and adults outside their immediate family. Positive interactions in these environments contribute to the development of social skills, emotional regulation, and a sense of empathy, while at the same time they help enhance children's language and communication skills. Consequently, children who attend high-quality early childcare programs tend to have better psychomotor and emotional development, exhibit more positive behaviours and have a reduced likelihood of behavioural problems later in life [1,2,5,7–9]. Furthermore, the quality of caregiver-child relationships in early childcare settings can significantly influence a child's socio-emotional well-being over the long-term [53,54].

On the other hand, we found individual, non-professional informal childcare to be linked to a higher probability of developmental delay, specifically in boys. Previous studies showed that boys are more sensitive to childcare quality, especially as far as behaviour is concerned, with higher levels of behavioural problems in case of low quality childcare [55–57]. This suggests that to thrive boys may require well-organized, high-quality childcare settings, with caregivers who are especially sensitive and responsive. Several studies have shown that first born children fare better than later born children in several developmental domains [27,58], possibly because of a focus of familial resources on them [58,59].

Past research also suggested that children from disadvantaged family backgrounds may be more likely to benefit from high quality CBC[1,5,24]. In our study, this hypothesis was not confirmed, indicating that CBC attendance can help improve outcomes in children growing up in disadvantaged families, but it cannot help to close the gap with those from more advantaged families. It can be argued that even high-quality childcare systems, such as the one existing in France, need to specifically address the needs of children from disadvantaged families to promote equitable development.

5. Conclusion

In the French context, whereby childcare attendance is subsidised and can start as early as 3 months of age, offering access to high quality formal childcare, specifically CBC, might help promote children's favourable development. However, this universal access may not suffice to reduce social inequalities in child development or compensate difficulties related to parental mental health issues, which require specific approaches.

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Statements and Declarations

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Ethics Approval

The ELFE study was performed in line with the principles of the Declaration of Helsinki. Mothers provided written consent for their own and their child's participation. Fathers provided written consent for the child's participation when present at inclusion or were informed about their rights to oppose it. The Elfe study was approved by the Advisory Committee for Treatment of Health Research Information (Comité Consultatif sur le Traitement des Informations pour la Recherche en Santé) under approval numbers 10.623 (10/26/2010) and 13.004 (01/24/2013), the National Data Protection Authority (CNIL) (approval numbers 2011–081, 03/17/2011, and 2013–113, 04/25/2013) and the National Statistics Council.

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Authors contributions

All authors helped in drafting and critically reviewing the final manuscript, and brainstorming the methods, analysis and interpretations of results. ARG and MM were responsible for data acquisition and the concept and design of the study. ARG and KMB were responsible for data analysis. ARG and

MM had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. EC, MND and FBZ contributed for important intellectual content, critically reviewed and criticized the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Tables and Figures

Table 1. **Baseline family and child characteristics and childcare type, ELFE mother-child cohort, survey-weighted sample (N = 11,033), percentage.**

Table 2. **Other population characteristics across the 4 childcare types, ELFE mother-child cohort, survey-weighted sample (N = 11,033), percentage or mean (std deviation).**

Table 3. **Association between early childcare type and (1) potential developmental delay (Development Quotient <90), and (2) developmental delay (Development Quotient <85); unadjusted analysis and inverse probability weighted based on propensity scores analysis, ELFE cohort, survey-weighted sample (N = 11,033).**

Table 1. **Baseline family and child characteristics and childcare type, ELFE mother-child cohort, survey-weighted sample (N = 11,033), Number (%), *p-value* for bivariable analysis.**

Baseline Characteristics	Centre-based 2,592 (23.5%)	Childminder 4,997 (45.3%)	Informal 733 (7.6%)	Parents 2,611 (23.7%)	*p*
Mothers' characteristics					
French nationality	2,037 (78.6)	4,642 (92.9)	592 (80.8)	2,003 (76.7)	*<0.0001*
Resides in Greater Paris region	801 (30.9)	766 (15.4)	232 (31.6)	478 (18.3)	*<0.0001*
Mother is more than 30 years	1,467 (56.6)	2,484 (49.7)	337 (46.0)	1,259 (48.2)	*<0.0001*
Mother's educational level					*<0.0001*
<= Bac	892 (34.4)	1,734 (34.7)	369 (50.4)	1,849 (70.8)	
Up to Bac + 2	534 (20.6)	1,204 (24.1)	118 (16.1)	332 (12.7)	
Bachelor's degree or higher	1,166 (45.0)	2,059 (41.2)	93 (12.7)	401 (16.5)	
Mother’s employment status					*<0.0001*
Employed	2,110 (81.4)	4,367 (87.4)	584 (79.7)	1,420 (54.4)	
Unemployed, housewife, student, retired	482 (18.6)	630 (12.6)	149 (20.3)	1,191 (45.6)	
Smoking status during pregnancy					*<0.0001*
Non-smoker	1,553 (59.9)	2,893 (57.9)	426 (58.2)	1,483 (56.8)	
Quit smoking	632 (24.4)	1,249 (25.0)	144 (19.6)	483 (18.5)	
Smoked >=1 cigarette/day	407 (15.7)	854 (17.1)	163 (22.3)	645 (24.7)	
Alcohol consumption during pregnancy					*0.0015*
Never	1,962 (75.7)	3,643 (72.9)	562 (76.7)	2,052 (78.6)	
Rarely (< once per month)	456 (17.6)	919 (18.4)	124 (16.9)	399 (15.3)	
Often	174 (6.7)	435 (8.7)	47 (6.5)	159 (6.1)	
Psychological difficulties during pregnancy	355 (13.7)	595 (11.9)	94 (12.8)	418 (16.0)	*<0.0001*
Other medical complications during pregnancy	373 (14.4)	640 (12.8)	101 (13.8)	452 (17.3)	*<0.0001*
Father's characteristics					
Father has French nationality	2,154 (83.1)	4,667 (93.4)	612 (83.5)	2,039 (78.1)	*<0.0001*
Father's educational level					*<0.0001*

High school certificate or lower	1,153 (44.5)	2,379 (47.6)	425 (58.0)	1,754 (67.2)	
Tertiary education, lower than Bachelor	428 (16.5)	1,029 (20.6)	106 (14.5)	345 (13.2)	
Bachelor's degree or higher degree	1,011 (39.0)	1,589 (31.8)	202 (27.6)	512 (19.6)	
Father's employment status					*<0.0001*
Employed	2,366 (91.3)	4,712 (94.3)	675 (92.1)	2,285 (87.5)	
Unemployed, student, retired	226 (8.7)	285 (5.7)	58 (7.9)	326 (12.5)	
Post-partum depression	220 (8.5)	325 (6.5)	67 (9.4)	285 (10.9)	*<0.0001*
Family characteristics					
Household income					*<0.0001*
Poorest quintile	487 (18.8)	515 (10.3)	210 (28.6)	1,240 (47.5)	
Middleclass (2nd to 4th quintiles)	1,467 (56.6)	3,438 (68.8)	373 (50.9)	1,206 (46.2)	
Richest quintile	638 (24.6)	1,044 (20.9)	150 (20.5)	164 (6.3)	
Financial difficulties	417 (16.1)	495 (9.9)	144 (19.7)	598 (22.9)	*<0.0001*
Child's characteristics					
Season of birth					*0.0775*
Spring	699 (27.0)	1,148 (23.0)	171 (23.3)	589 (22.6)	
Summer	629 (24.3)	1,358 (27.2)	207 (28.3)	728 (27.9)	
Autumn	658 (25.4)	1,303 (26.1)	171 (23.3)	637 (24.4)	
Winter	606 (23.4)	1,188 (23.8)	184 (25.1)	657 (25.2)	
Gender (Female)	1,322 (51.0)	2,528 (50.6)	370 (50.5)	1,326 (50.8)	*0.6791*
First child	1,260 (48.6)	2,548 (51.0)	384 (52.4)	770 (29.5)	*<0.0001*
Premature (<37 weeks amenorrhea)	109 (4.2)	180 (3.6)	46 (6.3)	120 (4.6)	*0.0680*
Low birthweight for the term and sex	205 (7.9)	335 (6.7)	67 (9.4)	191 (7.3)	*0.5423*
Live in a house (vs apartment)	1,148 (44.3)	3,353 (67.1)	359 (49.0)	1,360 (52.1)	*<0.0001*

Table 2. **Follow-up child and family characteristics across childcare types, ELFE mother-child cohort, survey-weighted sample (N = 11,033), percentage or mean (std deviation), *p-value* for bivariable analyses.**

Characteristics	Centre-based 2,592 (23.5%)	Childminder 4,997 (45.3%)	Informal 733 (7.6%)	Parents 2,611 (23.7%)	*p*
Mothers' characteristics					
Mother's marital status at 2 months					*<0.0001*
Married or civil union	1,558 (60.1)	3,053 (61.1)	401 (54.7)	1,548 (59.3)	
In a couple but not married	884 (34.1)	1,789 (35.8)	278 (37.9)	922 (35.3)	
Single	150 (5.8)	155 (3.1)	55 (7.5)	141 (5.4)	
Mother back to work before 1st year	2,030 (78.3)	4397 (88.0)	558 (76.1)	977 (37.4)	*<0.0001*
Post-partum depression	360 (13.9)	550 (11.1)	92 (12.6)	386 (14.8)	*0.0014*
Father's characteristics					
Father is employed at 2 months	2,237 (86.3)	4,602 (92.1)	625 (85.2)	2,133 (81.7)	*<0.0001*
Post-partum depression	220 (8.5)	325 (6.5)	69 (9.4)	285 (10.9)	*<0.0001*
Family characteristics					
Activities with the child shared by both parents	1,477 (57.0)	3,078 (61.6)	441 (60.2)	1,473 (57.2)	*0.0003*
At least one parent smokes (1 year)	1,405 (40.3)	2,134 (42.7)	349 (47.6)	1,290 (49.4)	*<0.0001*
At least one parent in psychological distress (2 years) (K6 scale)	145 (5.6)	230 (4.6)	45 (6.2)	206 (7.9)	*0.0001*
At least one parent has chronic illness (2 years)	588 (22.7)	1,109 (22.2)	141 (19.2)	608 (23.3)	*0.0697*
At least one parent in bad health (2 years)	456 (17.6)	700 (14.0)	133 (18.2)	514 19.7)	*<0.0001*
Family conflicts (verbal or physical) (2 years)	1,210 (46.7)	2,123 (42.5)	296 (40.4)	1,117 (42.8)	*0.0024*
Child's characteristics					
Never breastfed during first 3 months	526 (20.3)	1,289 (25.8)	167 (23.0)	668 (25.6)	*<0.0001*
Entered preschool before age 3	824 (31.8)	1,634 (32.7)	242 (33.0)	911 (34.9)	*0.4089*
Child activities /play					
Possesses a doll (1year)	1,446 (55.8)	2,703 (54.1)	419 (57.1)	1,491 (57.1)	*0.3920*

Possesses stacking games (1 year)	1,547 (59.7)	2,813 (56.3)	406 (55.4)	1,407 (53.9)	*0.0013*
Possesses slotting games (1 year)	1,610 (62.1)	3,058 (61.2)	443 (60.4)	1,525 (58.4)	*0.0502*
Possesses cognitive stimulation games (1 y)	2,055 (79.3)	4,147 (83.0)	604 (82.4)	1,916 (73.4)	*<0.0001*
Plays with a teddy bear (1 year)	1,472 (56.8)	2,893 (57.9)	399 (54.4)	1,465 (56.1)	*0.0993*
Frequent stimulating activities with parents (reading, etc)	964 (37.2)	1,624 (32.5)	334 (45.6)	1,123 (43.0)	*<0.0001*
Screen exposure (tablets, TV, etc.) before age 2					*<0.0001*
Never or rarely	353 (13.6)	585 (11.7)	59 (8.0)	254 (9.7)	
Weekly or monthly	702 (27.1)	1,209 (24.2)	118 (16.1)	359 (13.7)	
Daily	1,537 (59.3)	3,203 (64.1)	556 (75.9)	1,998 (76.5)	
Plays with a doll (2 years)	1,223 (47.2)	2,543 (50.9)	345 (47.0)	1,251 (47.9)	*0.0005*
Plays with a car (2 years)	1,547 (59.7)	3,058 (61.2)	456 (62.2)	1,648 (63.1)	*0.1103*
Plays with a bath toy (2 years)	2,154 (83.1)	4,272 (85.5)	620 (84.6)	2,026 (77.6)	*<0.0001*
Goes on strolls with parents (2 years)	1,957 (75.5)	3,593 (71.9)	537 (73.2)	2,196 (84.1)	*<0.0001*
Does regular physical activities (2 years)	1,452 (56.0)	2,778 (55.6)	406 (55.6)	1,572 (60.2)	*0.0078*
Does puzzles (2 years)	964 (37.2)	1,639 (32.8)	187 (25.5)	608 (23.3)	*<0.0001*
Plays with a ball frequently (2y)	1,700 (65.6)	3,358 (67.2)	501 (68.3)	1,828 (70.0)	*0.2856*
Draws or paints frequently (2y)	1,848 (71.3)	3,263 (65.3)	457 (62.4)	1,501 (57.5)	*<0.0001*
Average daily TV exposure at 2 years					*<0.0001*
Never	511 (19.7)	800 (16.0)	97 (13.2)	321 (12.3)	
< 1h	1,553 (59.9)	3,063 (61.3)	352 (48.0)	1,159 (44.4)	
>= 1h	528 (20.4)	1,134 (22.7)	285 (38.9)	1,131 (43.3)	
Child development					
Total CDI score at age 3.5 years/70	54.1 (4.8)	53.6 (5.0)	52.7 (6.0)	52.5 (6.5)	*<0.0001*
Development quotient	102.4 (12.4)	101.3 (12.7)	100.4 (14.2)	99.9 (14.8)	*<0.0001*
Possible development delay (DQ <90)	376 (14.5)	825 (16.5)	172 (23.5)	634 (24.3)	*<0.0001*
Probable development delay (DQ <85)	184 (7.1)	410 (8.2)	98 (13.4)	386 (14.8)	*<0.0001*

Table 3. **Association between early childcare type and (1) possible developmental delay (Development Quotient, DQ <90), and (2) probable developmental delay (Development Quotient, DQ <85); inverse probability weighted based on propensity scores, ELFE cohort, survey-weighted sample (N = 11,033).**

	Bivariate analysis				IPW adjusted analysis			
	Possible developmental delay (Development Quotient < 90)							
Type of childcare	**OR**	**95% CI**		***p value***	**OR**	**95% CI**		***p value***
Centre-based (2,592; 23.5%)	**0.44**	0.41	0.47	*<.0001*	**0.56**	0.51	0.61	*<0.0001*
Childminder (4,997; 45.3%)	**0.52**	0.49	0.54	*<.0001*	**0.77**	0.72	0.83	*<0.0001*
Informal (733; 7.6%)	**0.89**	0.79	1.01	*0.0705*	**0.97**	0.84	1.12	*0.6598*
Parents only (2,611; 23.7%)	**1.00**			*reference*	**1.00**			*reference*
	Probable developmental delay (Development Quotient < 85)							
Type of childcare	**OR**	**95% CI**		***p value***	**OR**	**95% CI**		***p value***
Centre-based (2,592; 23.5%)	**0.53**	0.50	0.56	*<.0001*	**0.62**	0.58	0.67	*<0.0001*
Childminder (4,997; 45.3%)	**0.62**	0.59	0.65	*<.0001*	**0.80**	0.76	0.83	*<0.0001*
Informal (733; 7.6%)	**0.96**	0.87	1.06	*0.3399*	**0.97**	0.82	1.15	*0.6841*
Parents only (2,611; 23.7%)	**1.00**			*reference*	**1.00**			*reference*

Early Childcare and Developmental Delay Risk at 3.5 Years: Insights from the French ELFE Cohort.

Supplementary Materials

Childcare in France

In France, centre-based childcare (CBC) and childminder (assistante maternelle) care are considered to be formal childcare with trained professionals taking care of children. However, while childminders are professionals that can take care of up to 5 children in their home, in CBC there are several different professionals such as child care assistants who are responsible for feeding and cleaning the children, young child educators whose roles are animation, transmission and education, as well as nursery nurses. There is one carer for 5 non-walking children, and 1 for 8 walking children. There may also be other professionals like paediatrician and cooks amongst others. Informal care consists of any non-professional untrained person that may look after the child such as babysitters or grandparents, in their homes or the child's home.

In our study four main types of early childcare were identified based on parents' reports when the child was one, two and three and a half years of age:

- Centre-based childcare, CBC (2,592; 23.5%);
- Childminder, CM (4,997; 45.3%);
- Informal care, IC (733; 7.6%);
- Parental care (2,611; 23.7%).

In case of conflicting results across study questionnaires, meaning the child changed childcare type between waves (n = 2,032, 18.4%), children were classified in the group most different from parental care in the following priority order: CBC > childminder > informal > parents, i.e. if a child was reported to be in an informal and CBC over two time periods, he or she was put in the CBC group. However, most children transitioned from parental care to another type of childcare, with some of them experiencing informal care in between.

In the ELFE cohort, at each wave of data collection, parents reported the type of childcare(s) they had been using and the age at which the child entered this childcare. In France, there is a strong demand for formal childcare, especially centre-based. Because post-natal maternal leave is 10 weeks long (and 2 weeks for fathers at the time of ELFE cohort inception), most children enter childcare around age 3 months. Once children are in formal childcare they usually do not switch again. However, some parents take care of their child while their child is on a waiting list for formal care (mostly centre-based) or chose a transitory type childcare. So, 24% of children are always cared by their parents,

58% go directly to their final childcare type, and 18% transition through temporary childcare before going onto their final type of childcare. As these transitions occur mostly in the first year of life, we hypothesized that the influence of 2 years in the latest childcare would outweigh the influence of a few months in transitory childcare. Similarly, based on the scientific literature, and also on the fact that the environment in centre-based childcare is most different from the one in the child's home, we made the hypothesis that centre-based childcare would be the childcare type that would influence the child's development the most.

Child Development Inventory (CDI) and Development Quotient (DQ)

The Child Development Inventory (CDI) (Ireton, 1992) is for the assessment of children 15 months to 6 years old and consists of 300 questions. The description below is based on this detailed paper: https://static1.squarespace.com/static/562e8e0ae4b09db47d931eb9/t/565cd590e4b0c6e18e583427/1448924560903/cdi+manual.pdf

The first segment of the CDI consists of 270 developmental items of the CDI that are grouped to form scales including: Social, Self Help, Gross Motor, Fine Motor, Expressive Language, Language Comprehension, Letters, Numbers, and General Development. These scales assess aspects of growth and education outlined in child development literature, diverse psychological tests, and eligibility guidelines for early childhood and special education. It's important to note that these scales weren't formulated through factor analysis. They are designed to have significance for clinicians, teachers, and parents, and a detailed description of the scales follows:

Social (S) - 40 items: Includes interaction with parents, children and other adults — from individual interaction to group participation.

Self Help (SH) - 40 items: Includes eating, dressing, bathing, toileting, independence and responsibility.

Gross Motor (GM) - 30 items: Includes walking, running, climbing, jumping, riding, balance, and coordination.

Fine Motor (FM) - 30 items: Includes eye-hand coordination — from picking up objects to scribbling and drawing.

Expressive Language (EL) - 50 items: Expressive communication, from simple gestural, vocal, and verbal behavior to complex language expression.

Language Comprehension (LC) - 50 items: Language understanding, from simple comprehension to understanding of concepts.

Letters (L) - 15 items: Knowledge of letters and words, including printing and early reading.

Numbers (N) - 15 items: Knowledge of quantity and numbers from simple counting to solving simple arithmetic problems.

The final segment of the CDI booklet comprises 30 items detailing diverse symptoms and behavioral issues that might manifest in young children. It's important to note that these items do not constitute a specific scale. Instead, they encompass a wide spectrum, addressing aspects ranging from vision and hearing to health and growth, as well as eating, sleeping, and toilet training

In between these 2 segments, there is the General Development scale consisting of 70 items which is a summary scale that provides an overall index of development. It includes 10 of the most age discriminating items from each of the developmental scales and five items each from the Letters and Numbers scales as shown in the table below.

Supplementary Table 1: General Development scale items by scale and age level

Scale/Age	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6+ years	Total
Social	3	5	2	0			10
Self Help	4	2	2	2			10
Gross Motor	5	3	2				10
Fine Motor	2	2	2	4			10
Expressive Language	2	4	4				10
Language Comprehension	2	3	3	2			10
Letters				2	1	2	5
Numbers			2	1	1	1	5
Total	18	19	17	11	2	3	70

These items are detailed below:

Social Scale - 10 items

Age 1-2

- Greets people with “Hi” or similar expression.
- Sometimes says “No” when interfered with.
- Shows sympathy to other children, tries to help and comfort them 21m

Age 2-3

- Asks for help in doing things.
- Helps a little with household tasks.
- Says “I can’t,” “I don’t know,” or “You do it.”
- Pays attention well — listens to others.
- Apologizes — says “I’m sorry” when he(she) does something wrong.

Age 3-4

- Tattles or tells on other children.
- Gives directions to other children.

Self Help Scale - 10 items

Age 1-2

- Lifts a cup to his(her) mouth and drinks.
- Feeds self with a spoon.
- Eats with a fork.
- Eats with a spoon with little spilling.

Age 2-3

- Opens door by turning knob and pulling.
- Washes and dries hands.

Age 3-4

- Toilet-trained for urine control and bowel movements.
- Dresses and undresses without help, except for tying shoelaces.

Age 4-5

- Buttons one or more buttons.
- Buttons a shirt, blouse, or coat, having all the buttons in the correct holes.

Gross Motor Scale - 10 items

Age 1-2

- Walks without help.
- Throws a ball while standing.
- Runs.
- Kicks a ball.
- Walks up and down stairs alone.

Age 2-3

- Runs smoothly, turning corners and making sudden stops.
- Jumps from steps with feet together. Or used to.
- Walks up and down stairs alone, one foot to a step, alternating feet.

Age 3-4

- Rides around on tricycle using pedals.
- Hops on one foot, at least two times, without support.

Fine Motor Scale - 10 items

Age 1-2

- Scribbles with crayon or pencil. Or used to.
- Builds a tower of five or more blocks.

Age 2-3

- Turns pages of children's book one page at a time.
- Attempts to cut with small scissors. Or cuts.

Age 3-4

- Draws or copies a complete circle.
- Cuts across paper with scissors from one side to the other.

Age 4-5

- Draws recognizable pictures.
- Draws or copies a square that has four good corners.
- Cuts with scissors, following a simple outline or pattern.
- Draws pictures of people that have at least three parts, such as head, eyes, nose, mouth, hair, body, arms, or legs.

Expressive Language Scale - 10 items

Age 1-2

- Uses at least five words as names of familiar objects.
- Refers to his(her) things as “my” or “mine.”

Age 2-3

- Uses at least one of the following words — “me,” “I,” “he,” “she,” “you,” “it.”
- Has a vocabulary of 20 or more words.
- Talks in sentences at least four words long.
- Speaks clearly; is understandable most of the time.

Age 3-4

- Gives reasons for things, using the word “because....”
- Asks questions beginning with “why,” “when,” or “how.”
- Talks about things that have happened in detail, describing a series of events, for example, “We went to..., and we.... Then we....”
- Talks in long, complex sentences, ten words or longer.

Language Comprehension Scale - 10 items

Age 1-2

- Follows simple instructions.
- Follows two-part instructions, for example, “Go to your room and bring me....”

Age 2-3

- Responds to simple questions appropriately with “yes” or “no.”
- Uses the words “big” and “little.”

- Answers questions like “What do you do with a...cracker?...a hat?...a glass?”

Age 3-4

- Answers “If..., then?” questions such as “If you get hurt, then what do you do?”
- Identifies at least four colours by name correctly.
- Answers the questions “What do you do with your...eyes?...ears?”

Age 4-5

- Uses -est words like biggest, strongest, greatest.
- When asked, “What is a...?” talks about the group it belongs to, for example, “A horse?”
- “Is an animal.” “An orange?” “Is a fruit.”

Letters Scale - 5 items

Age 4-5

- Prints a few letters or numbers.
- Prints first name (or at least four letters).

Age 5-6

- Prints two or more simple words from a copy.

Age 6

- Recognizes and names all the letters in the alphabet.
- Reads four or more words.

Numbers Scale- 5 items

Age 3-4

- Talks about things, comparing one to another, for example, says “This one is bigger, ...heavier, etc.”
- Tells when one object is longer or shorter than another object.

Age 4-5

- Counts ten or more objects.

Age 5-6

- Recites numbers in order from 1 to 30.

Age 6

- Answers arithmetic questions such as “How much is 2+2? 1+4? 3+6?”

In the ELFE cohort, General Development scale of the CDI was used to measure development at age 3.5 years. However, children’s exact age at the time of the questionnaire varied between 38.7 to 52.8 months, with a mean of 42.4 months (SD = 1.8 months). As child development is strongly linked to the child’s age, we converted each child’s CDI score into a Development Quotient (DQ) which takes into account age at the time of assessment, based on the M. Duyme manual for the French version of the CDI (Duyme, M., Capron, C. & Zorman, M. (2010). L'Inventaire du Développement de l'Enfant (IDE) : manuel d'utilisation. Devenir, 1(1), 27-50. https://doi.org/10.3917/dev.101.0027).

As seen in the table below, from Duyme’s work, each CDI score corresponds to a median development age (50th centile).

Supplementary Table 2: Child Development Inventory General Development scale score and corresponding median age.

CDI Scores	Corresponding Development age in months	CDI Scores	Corresponding Development age in months
70	>74	**37**	28.5
69	72 to 74	**36**	28
68	69	**35**	27.5
67	66	**34**	27
66	64	**33**	26
65	61.5	**32**	25.5
64	59	**31**	25
63	57	**30**	24.5
62	55	**29**	24.3
61	53	**28**	24
60	51.5	**27**	23
59	50	**26**	22.5
58	48.5	**25**	22
57	47	**24**	21.5
56	45.5	**23**	21
55	44	**22**	20
54	42.5	**21**	19.5
53	41	**20**	19.3

52	40	**19**	19
51	39.5	**18**	18.5
50	39	**17**	18.2
49	38	**16**	18
48	37	**15**	17
47	36	**14**	16.5
46	35.5	**13**	16.3
45	35	**12**	16
44	34	**11**	15.5
43	33	**10**	15
42	32	**9**	14.5
41	31	**8**	14
40	30	**7**	13
39	29.5	**6**	0
38	29		

The Development Quotient (DQ) is calculated as follows:

DQ = (theoretical age corresponding to the CDI score / child real age) x 100

In this study we used two DQ thresholds:

- Possible developmental delay: DQ <90 – this corresponds to a situation whereby a more the long form of the CDI questionnaire must be administered or a physician must be consulted for a more thorough examination.
- Probable developmental delay: DQ < 85.

For example, if a child has a score of 52, his theoretical age is 40 months. If his real age is 40, then his Development Quotient (DQ = (40/40) x 100)) is equal to 100, the child has no delay. On the other hand, if his real age is 50, then his Development Quotient (DQ = (40/50) x 100)) is equal to 80, the child has a developmental delay.

Our study sample consisted of 11,033 children and 7,042 had no missing items on the CDI questionnaire. The 3 items which parents most frequently did not reply to were: “the child can cut through a paper with scissors”, “the child can cut a figure on a page” and “the child can hop on one leg”. In case of incomplete questionnaire, subscale scores were imputed by fully conditional specification multiple imputation (FCS MI) method, and the total score was then calculated and subsequently the Development Quotient. Children who had complete questionnaire had some different characteristics to the ones who had at least one missing (***Supplementary Table 5***). To test whether our final results were robust, we conducted analyses on the unimputed sample (n = 7,042) and showed that our results are robust (***Supplementary table 6***).

Covariates

Financial difficulties

Financial difficulties were evaluated at 2 months through these questions:

Have you face financial difficulties in the last 12 months:

- To keep your home at the right temperature?
- To pay for a week's vacation away from home once a year?
- To replace out-of-use furniture?
- To buy new clothes (not second-hand)?
- To eat meat, chicken or fish every other day?
- To receive relatives or friends for a drink or a meal (at least once a month)?
- To give gifts to family or friends at least once a year?
- To have two pairs of good shoes (for each adult in the household)?
- And spent a day without meals due to lack of money?

Household revenue

Household income was the sum of each parent yearly income divided by number of shares (1 for an adult and 0.5 for each children). And then each household were classified in the corresponding quintile of household income.

Household chores

Parents reported who did several chores at home and a variable was created for household chores: mainly by the mother, shared, mainly by the father.

Activities with the child

Similarly, activities such as feeding, storytelling, changing nappies, playing with the child etc. was reported and a variable of activities with the child was created: mainly the mother, shared, mainly the father.

In case the mother was single, she was put in the category mainly by the mother.

Supplementary Table 3. Association between early childcare type and developmental delay (Development Quotient, DQ <85); inverse probability weighted based on propensity scores, ELFE cohort, survey-weighted sample (N = 11,033) – stratified analyses by gender, existence of sibling(s), mother's educational level and existence of any mental health problem in the parent from pregnancy to 3 years.

	Odds Ratio	**95% CI**	**Odds Ratio**	**95% CI**
Child's sex (*p* for interaction = 0.02)				
	Boys (50.7%)		***Girls (49.3%)***	
Centre-based childcare	**0.68**	0.60 - 0.77	**0.69**	0.59 - 0.82
Childminder	**0.81**	0.73 - 0.91	**0.94**	0.72 - 1.23
Informal childcare	**1.22**	1.03 -1.46	**0.76**	0.63 -0.92
Parents only (reference)	**1**		**1**	
Child's birth rank (*p* for interaction = 0.07)				
	First born child (56.6%)		***Have sibling(s) (43.4%)***	
Centre-based childcare	**0.6**	0.53 - 0.67	0.75	0.64 - 0.89
Childminder	**0.78**	0.64 -0.94	0.89	0.80 - 0.99
Informal childcare	**1.20**	1.00 - 1.45	0.90	0.76 -1.08
Parents only (reference)	**1**		1	
Mother's educational level (*p* for interaction = 0.14)				
	Low education (<= Bac) (48.0%)		***High education (> Bac) (52.0%)***	
Centre-based childcare	0.71	0.62 - 0.83	0.64	0.56 - 0.72
Childminder	0.91	0.83 -1.01	0.7	0.64 - 0.76
Informal childcare	1.03	0.79 - 1.35	0.96	0.86 - 1.07
Parents only (reference)	1		1	
Parents mental health (*p* for interaction = 0.09)				
	No mental health problem (66.8%)		***Mental health problems (32.2%)***	
Centre-based childcare	0.58	0.46 - 0.72	0.99	0.71 - 1.39
Childminder	0.73	0.63 - 0.85	1.14	0.91 - 1.42
Informal childcare	0.98	0.85 - 1.13	1.19	0.96 - 1.47
Parents only (reference)	1		1	

Supplementary Table 4. **Association between early childcare type and (1) possible developmental delay (Development Quotient, DQ <90), and (2) probable developmental delay (Development Quotient <85); inverse probability weighted based on propensity scores, ELFE cohort, survey-weighted sample (N = 11,033) – model adjusted for potential residual confounding after IPW (type of delivery at birth, child was cared by only the parents in the first two months, household income at 2 months, mothers' employment at age 1, child hearing disorder at age 2).**

	Possible developmental delay (DQ < 90)				**Probable developmental delay (DQ < 85)**			
Type of childcare	**OR**	**95% CI**		***p value***	**OR**	**95% CI**		***p value***
Centre-based (2,592; 23.5%)	**0.59**	0.53	0.65	*<0.0001*	**0.64**	0.59	0.70	*<0.0001*
Childminder (4,997; 45.3%)	**0.83**	0.76	0.90	*0.0008*	**0.83**	0.79	0.87	*<0.0001*
Informal (733; 7.6%)	**1.04**	0.90	1.20	*0.5541*	**1.01**	0.84	1.21	*0.9335*
Parents only (2,611; 23.7%)	**1.00**			*reference*	**1.00**			*reference*

Supplementary Table 5. **Comparison of some characteristics of children with complete CDI questionnaire (n =7,042) to children with imputed items of CDI questionnaire (n = 3,991)**

Characteristics (%)	**Complete CDI items 7,042 (63.8%)**	**CDI items missing 3,991 (36.2%)**	*p*
Mothers' characteristics			
French nationality at birth	91.2	89.5	**
Resides in Greater Paris region	17.9	20.9	**
Mother is more than 30 years	54.4	61.6	**
Mother's educational level			ns
<= Bac	32.5	32.7	
Up to Bac + 2	23.8	23.5	
Bachelor's degree or higher	43.7	43.8	
Mother's employment status			*
Employed	79.7	78.2	
Unemployed, housewife, student, retired	20.3	21.8	
Mother's marital status at 2 months			ns
Married or civil union	65.8	66.7	
In a couple but not married	32.1	30.8	
Single	2.1	2.5	
Mother back to work before 1st year	79.7	78.2	*
Smoking status during pregnancy			ns
Non-smoker	58.9	58.8	
Quit smoking	24.2	25.6	
Smoked >=1 cigarette/day	16.9	15.6	

Alcohol consumption during pregnancy			ns
Never	73.9	71.8	
Rarely (< once per month)	18.1	19.7	
Often	8.0	8.5	
Psychological difficulties during pregnancy	11.8	13.1	*
Other medical complications during pregnancy	14.3	14.0	ns
Post-partum depression	11.3	11.8	ns
Father's characteristics			
Father has French nationality	90.7	89.9	ns
Father's educational level			ns
High school certificate or lower	44.9	44.6	
Tertiary education, lower than Bachelor	19.0	18.6	
Bachelor's degree or higher degree	36.1	36.9	
Father's employment status			*
Employed	92.0	90.7	
Unemployed, student, retired	8.0	9.3	
Post-partum depression	6.9	7.2	ns
Family characteristics			
At least one parent smokes (1 year)	42.2	39.9	*
At least one parent in psychological distress (2 years) (K6 scale)	4.4	5.5	*
Household income			ns
Poorest quintile	14.5	15.4	
Middleclass (2nd to 4th quintiles)	62.5	60.0	
Richest quintile	23.0	26.6	
Financial difficulties	10.9	11.9	ns
Child's characteristics			
Season of birth			ns
Spring	16.2	16.4	
Summer	25.6	26.6	
Autumn	28.1	27.6	
Winter	30.1	29.4	
Gender (Female)	49.4	54.0	***
First child	47.1	43.1	***
Premature (<37 weeks amenorrhea)	4.0	4.2	ns
Low birthweight for the term and sex	7.0	6.9	ns
Never breastfed during first 3 months	24.3	21.1	***
Entered preschool before age 3	36.2	35.6	ns
Live in a house (vs apartment)	60.8	58.4	*
Child activities /play			
Activities with the child shared by both parents	60.5	61.3	ns
Possesses cognitive stimulation games (1 y)	82.6	80.3	*
Frequent stimulating activities with parents (reading, etc)	62.9	68.2	***
Screen exposure (tablets, TV, etc.) before age 2			ns

Never or rarely	12.5	12.7	
Weekly or monthly	23.9	24.0	
Daily	63.6	63.3	
Plays with a doll (2 years)	51.3	46.7	***
Plays with a car (2 years)	60.9	62.9	*
Plays with a bath toy (2 years)	85.3	85.5	ns
Goes on strolls with parents (2 years)	77.1	73.4	***
Does regular physical activities (2 years)	57.6	54.7	**
Does puzzles (2 years)	33.5	31.1	*
Plays with a ball frequently (2y)	67.3	65.3	*
Draws or paints frequently (2y)	67.2	64.3	**
Average daily TV exposure at 2 years			ns
Never	17.0	17.6	
< 1h	58.1	57.4	
>= 1h	24.1	25.0	
Child development			
Possible development delay (DQ <90)	15.1	18.0	***
Probable development delay (DQ <85)	7.2	10.4	***

- ns: non-significant difference; *: $p < 0.05$; **: $p < 0.001$; ***: $p < 0.001$

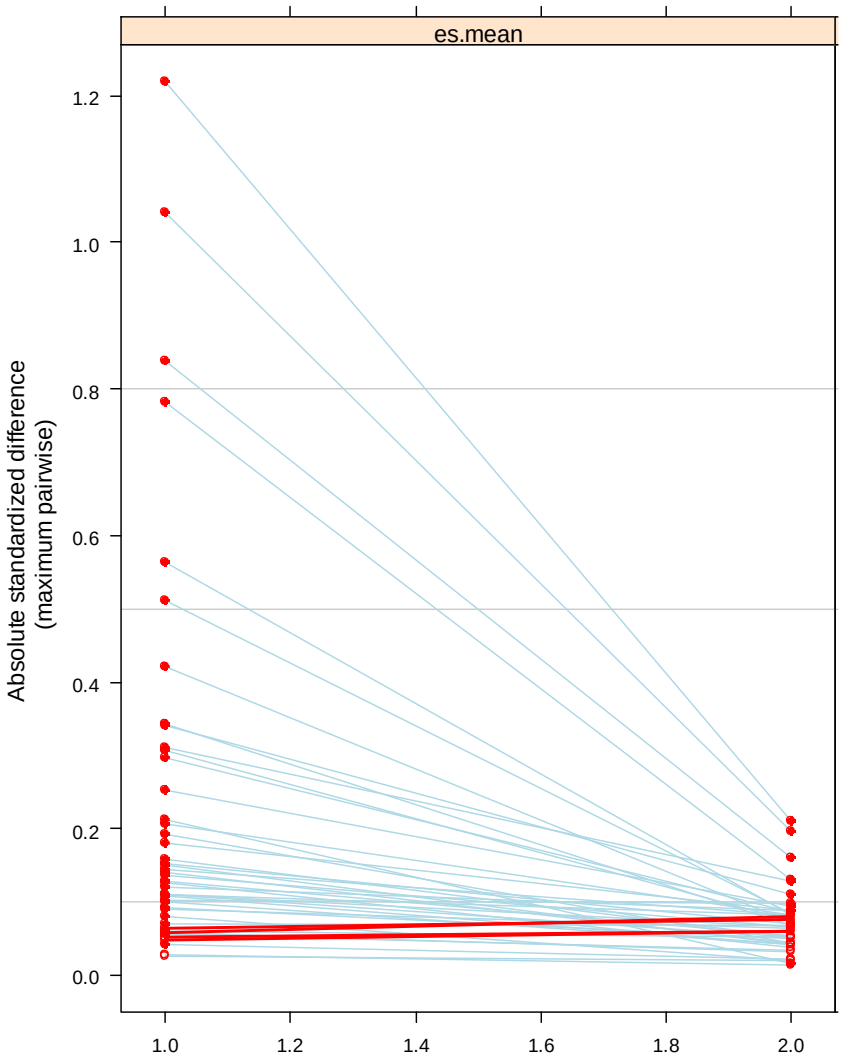
Supplementary Table 6. **Association between early childcare type and (1) possible developmental delay (Development Quotient, DQ <90), and (2) developmental delay (Development Quotient <85); inverse probability weighted based on propensity scores, ELFE cohort, survey-weighted, unimputed outcome sample (N = 7,042).**

	Potential delay (DQ < 90)				**Delay (DQ < 85)**			
Type of childcare	**OR**	**95% CI**		***p value***	**OR**	**95% CI**		***p value***
Centre-based (2,592; 23.5%)	**0.56**	0.49	0.64	*<0.0001*	**0.76**	0.70	0.83	*<.0001*
Childminder (4,997; 45.3%)	**0.70**	0.64	0.77	*<0.0001*	**0.90**	0.81	1.01	*0.0655*
Informal (733; 7.6%)	**1.05**	0.89	1.24	*0.5453*	**0.95**	0.82	1.09	*0.4104*
Parents only (2,611; 23.7%)	**1.00**			*reference*	**1.00**			*reference*

Supplementary Table 7. **Association between early childcare type and Development Quotient, DQ; linear regression adjusted with inverse probability weights based on propensity scores, ELFE cohort, survey-weighted sample (N = 11,033).**

IPW adjusted linear regression	**Development Quotient**			
Type of childcare	**Estimate**	**95% CI**		***p value***
Centre-based (2,592; 23.5%)	**102.0**	101.2	102.8	*<0.0001*
Childminder (4,997; 45.3%)	**100.8**	100.0	101.5	*0.0052*
Informal (733; 7.6%)	**99.8**	98.9	100.8	*0.7517*
Parents only (2,611; 23.7%)	**99.7**	99.2	100.3	*reference*

***Supplementary Figure 1*. Assessing balance of covariates, ELFE cohort, n = 11,033: Plots of the absolute standardized differences for baseline covariates before and after adjustment by inverse probability weighting based on propensity scores.**



Each red dot represents a covariate in the dataset. The dots on the left-hand side show the absolute standardized difference (ASMD) before the covariates are weighted and the right side shows the ASMD after the covariates are weighted. Following previous literature, an ASMD <0.2 informs the researcher that the exposure groups are well balanced on that particular covariate. The blue lines represent a decrease in the ASMD and the red lines report an increase in the ASMD