Emerging parenthood: Parental sensitivity from infancy to toddlerhood

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CHAPTER 4

Maternal and Paternal Sensitivity from Infancy to Toddlerhood: A Longitudinal Study in Three Countries

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Abstract

To date, research results are mixed on whether and how mothers' as well as fathers' levels of sensitivity change over time in the first two years of the child's life, reflecting the need for more studies to discern robust patterns. Therefore, the aim of the current study was to longitudinally examine trajectories of parental sensitivity in mothers and fathers, using Ainsworth's definition of sensitivity observed in similar settings across infancy and toddlerhood, in three countries: the UK, the USA, and the Netherlands. Participants included 428 families, consisting of primiparous mothers and fathers and their child. Parental sensitivity was observed at three time points (4 months, 14 months, 24 months) and coded using the Ainsworth sensitivity scale. Using a three-level multilevel modeling (MLM) approach, results demonstrated that parental sensitivity increased from infancy to toddlerhood. Furthermore, whereas mothers and fathers did not differ in their overall levels of sensitivity during this period, their trajectories did differ: mothers showed a slightly steeper increase in sensitivity than fathers. Lastly, no overall country differences were found, but trajectories did differ: parental sensitivity improved more over time in the Netherlands than in the UK. In conclusion, the robust results of the current study gave valuable insight in trajectories of maternal as well as paternal sensitivity from infancy to toddlerhood.

Keywords: parental sensitivity, infancy, toddlerhood, longitudinal, family socioeconomic status, parental age.

Introduction

Sensitive parenting refers to parents' ability to notice and accurately interpret their child's signals and appropriately respond to them (Ainsworth et al., 1974). It is an important predictor of positive child outcomes across several developmental domains, such as cognitive and language development (e.g., Tamis-LeMonda et al., 2004). During infancy as well as toddlerhood, children's developmental levels change rapidly, with two major milestones leading to a large increase in their range of signals and behaviors: children learn to speak, which makes them increasingly able to communicate with others (Iverson, 2010), and children learn how to crawl and eventually walk, which makes them increasingly able to explore their environment independently (Malina, 2004). To be sensitive, parents need to adjust their responses to their children's changing behaviors. Being sensitive may become easier over time as children are more able to communicate their needs, but their signals could also be perceived as more complex, making it more difficult for parents to respond in a sensitive way. To date however, research results are mixed on whether and how parents' levels of sensitivity change over time in the first two years of the child's life, reflecting the need for more studies to discern robust patterns. Therefore, the aim of the current study is to longitudinally examine trajectories of parental sensitivity from infancy to toddlerhood in both mothers and fathers.

As described by Hallers-Haalboom et al. (2017), three hypotheses can be put forward regarding change in parental sensitivity across this time period. First, parents may generally be able to adjust their responses to their child's changing signals, which would result in an absence of change in their level of sensitivity over time. Several studies provide evidence for this continuity in parental sensitivity across the first two years of the child's life, both in mothers and fathers (e.g., Bornstein et al., 2008; Kochanska & Aksan, 2004; Lovas, 2005). Second, it may also become easier for parents to respond sensitively to their child over time, as children become more active partners in communication which makes them increasingly able to signal their needs explicitly. In addition, parents gradually build up experience with their child's unique characteristics, which could also make it easier for them to respond sensitively to their child. Indeed, multiple studies have shown that parental sensitivity increases in the first two years in mothers as well as fathers (e.g., Hallers-Haalboom et al., 2017; Kemppinen et al., 2006). In contrast, one international study found a small overall decrease in maternal sensitivity (Bornstein et al., 2010), which points to evidence for the third hypothesis that sensitive parenting may also become more challenging over time in the first two years of the child's life. This could be explained by the so-called 'terrible twos', a phase generally starting in the second year of life, during which children show an increase in externalizing behaviors such as physical aggression (Alink et al., 2006). During this time parental discipline becomes more important to teach the child practical and social rules, which could make it more challenging for a parent to also sensitively attend to the child's needs and signals. Overall, these mixed results indicate that more research is needed to determine how trajectories of maternal and paternal sensitivity develop in the first two years of the child's life.

One reason for the varying results regarding these trajectories could be the way parental sensitivity was measured in each of the aforementioned studies. First, different coding

systems and conceptualizations of parental sensitivity were used. These include a combination of multiple scales regarding maternal responsiveness by Ainsworth et al. (1974), the Emotional Availability Scales by Biringen et al. (1998), the CARE-Index by Crittenden (2001), and an event based coding system by Bornstein et al. (2008). Even though all of these measures include important aspects of Ainsworth's original definition of sensitivity, both the EAS and CARE-index also include positive affect whereas Ainsworth's original conceptualization as well as the event-based coding system by Bornstein et al. (2008) does not. Because there is evidence that positive affect and sensitivity are different constructs (Mesman & Emmen, 2013), this could be a reason for the mixed results regarding the trajectories of parental sensitivity. Indeed, the two longitudinal studies with a conceptualization of sensitivity that was more closely related to Ainsworth's original conceptualization found evidence for continuity, whereas the four studies that included positive affect in their conceptualization of sensitivity demonstrated mixed results regarding sensitivity trajectories (i.e., increase, decrease, and continuity).

A second reason for the mixed results could be that both within and across these studies, different settings were used to observe parental sensitivity. In Kemppinen et al. (2006), for example, an increase in sensitivity was found, but sensitivity was measured in a less naturalistic outpatient clinic setting at the first time point (6-8 weeks) whereas the second assessment (24 months) took place in a more naturalistic home setting. Because both mothers and fathers are more sensitive in more naturalistic settings (Branger et al., 2019), this methodological factor may have unduly influenced the results. Similarly, the only study that found a decrease in parental sensitivity over time, also measured sensitivity in two different settings. At the first assessment (5 months), a natural interaction was observed during which parents could do what they would normally do, while at the second assessment (20 months) parental sensitivity was observed during a free play session with a standardized toy set (Bornstein et al., 2010). Thus, to fully understand whether parents' level of sensitivity changes over time in the first two years of the child's life, research on the trajectories of parental sensitivity is needed, using a narrow conceptualization of parental sensitivity that excludes positive affect (preferably Ainsworth's original definition) as well as using the same type of setting across time points.

In addition, it is important to examine potential differences between mothers and fathers more closely. To date, the few longitudinal studies that have been done on maternal versus paternal sensitivity during the first years of the child's life point to evidence that mothers are overall slightly more sensitive than fathers (Hallers-Haalboom et al., 2017; Kochanska & Aksan, 2004; Lovas, 2005). However, cross-sectional studies that examined differences between maternal and paternal sensitivity at various time points in infancy found mixed results. Studies that included infants aged six months and older more often found that mothers were more sensitive than fathers (e.g., Fuertes et al., 2016), compared to studies that included infants younger than six months (e.g., Braungart-Rieker et al., 1998). Thus, at least during infancy it seems that differences between mothers and fathers vary over time. This would suggest that the trajectories of maternal and paternal sensitivity would also differ. However, very little is known about potential differences in these pathways. To our knowledge only Kochanska and Aksan (2004), who examined parental sensitivity towards children from 7 to 15 months old, and Hallers-Haalboom et al. (2017), who examined

parental sensitivity to children from 12 to 36 months old, explicitly reported on mother-father differences in sensitivity pathways. Both studies found no difference between the pathways of mothers and fathers.

Lastly, out of the six previously mentioned longitudinal studies on trajectories of parental sensitivity in the first two years of the child's life, the three studies that found evidence for continuity were all done in the USA, whereas the two studies that found an increase were executed in Northern-European countries (Finland and the Netherlands), and the study that found a decrease was done in multiple countries (Argentina, Italy, USA; Bornstein et al., 2010). Even though the last study found similar sensitivity pathways over time across countries, the differences between the other studies raise the question whether there could be country differences in trajectories of parental sensitivity – especially since Northern-European countries generally have more generous family policies than the USA. Research demonstrated that more generous country-level family policies – in particular paid parental leave and financial aid for childcare – play a positive role in parents' wellbeing, for instance by reducing their (financial) stress (Glass, Simon, & Andersson, 2016). As it is widely known that parents' wellbeing is positively related to parental sensitivity (e.g., Bernard et al., 2018), these family policies probably also (indirectly) impact parenting. Additionally, paid parental leave in particular gives parents more opportunities to spend time with their infant, which in turn may aid them in learning how to accurately recognize and attune to their child's signals. As there is great diversity in family policies between countries, trajectories of parental sensitivity may also differ between countries especially in the first years of the child's life, depending on how generous these policies are. To our knowledge however, to date only one study examined trajectories of parental sensitivity in countries with diverse country-level family policies, and found no differences (Bornstein et al., 2010).

Addressing gaps and inconsistencies in the literature, the current study aims to examine trajectories of parental sensitivity in mothers and fathers, using Ainsworth's definition of sensitivity observed in similar settings across infancy and toddlerhood. The current study is part of a larger, international study in the Netherlands, the United Kingdom, and the United States. This provides a unique opportunity to explore possible differences in (trajectories of) both maternal and paternal sensitivity between these countries as their family policies are not equal, especially regarding paid parental leave (OECD, 2019): the UK offers partially paid maternity leave for 39 weeks and fathers receive up to two weeks paid leave, the Netherlands offers 16 weeks of fully paid maternity leave and fathers receive one week fully paid leave (starting July 1st 2020 Dutch fathers receive an additional five weeks for 70% of their income; Rijksoverheid, 2020), whereas in the USA it depends on the employer whether a mother or father receives paid leave.

We used a multilevel modeling approach to account for the fact that the mothers and fathers in our study were nested in families. First, we explored whether parental sensitivity shows and increase, decrease, or absence of change across three observed time points: when the child was 4-, 14-, and 24-months old. Second, we tested the hypothesis that mothers are overall more sensitive than fathers, and we explored whether this effect differs across the three time points. Third, we tested the hypothesis that overall levels of

parental sensitivity differ between the three countries, with the UK and the Netherlands as countries with more generous family policies showing higher parental sensitivity than the USA, and explored whether trajectories of sensitivity do differ between these countries.

Method

Participants

This study is part of the international, longitudinal New Fathers and Mothers Study examining the relations between parental wellbeing, parenting behavior, and children's self-regulation in the first two years of life (see also Woudstra et al.). The current paper reports on data from all four waves and all three countries: the UK, the USA, and the Netherlands. In the UK (Cambridge) and the USA (New York State), expecting parents were recruited at antenatal clinics and ultrasound scans. In the Netherlands, recruitment took place throughout the country at pregnancy fairs and prenatal exercise classes, and through flyers and posters distributed at pregnancy stores and midwife clinics. Interested couples filled out a screening questionnaire to check eligibility to participate. Primiparous expecting parents had to (1) be at least 21 years of age, (2) expect delivery of a healthy, singleton baby, (3) be living together at the time of birth, (4) be planning on raising their baby together, (5) be planning to speak English in the UK and USA or Dutch in the Netherlands as a main language to their child, and (6) have no self-reported history of severe mental illness or substance misuse.

Power analysis indicated that, allowing for 10% overall attrition, a sample of 325 participants was required to detect small effects ($f^2 = 0.10$) at the 0.01 level of significance with 95% power in regression analyses with up to 10 predictors (Faul et al., 2007). For a flowchart of the participants at each wave, see Appendix A. A total of 484 couples participated in the first assessment, which took place around 36-weeks pregnancy. Ten families were not eligible to participate at the 4-month wave due to either birth complications or emigration, 23 families withdrew from the whole study mostly due to lack of time, and 6 families declined participation only at this time point (also mostly due to lack of time). Thus, a total of 445 families participated in the 4-month assessment. At the 14-month wave, 13 families became ineligible to participate due to emigration, 6 families withdrew from the study, while 10 families declined participation only at this time point and the 6 families who declined participation at the previous wave took part again. Thus, a total of 422 families participated in the 14-month assessment. Lastly, at the 24-month wave, 12 families became ineligible due to emigration, while 16 families declined to take part in this final assessment and the 10 families who declined at the previous wave took part again. Thus, a total of 404 families participated in the final 24-month assessment.

For the current study, eligibility for inclusion in data analysis was based on the remaining families at the final assessment ($n = 432$). Furthermore, when both parents had missing data on parental sensitivity for two out of three time points, the family was excluded from data analysis ($n = 4$ families), resulting in a final sample of 428 families (UK $n = 195$, USA $n = 110$, NL $n = 123$). The sample consisted of 218 boys and 210 girls. At the time of birth, mothers were between 21 and 43 years old ($M = 32.22$, $SD = 3.92$) and fathers between

23 and 50 years (M = 33.95, SD = 4.50). Children's age ranged from 2 to 6 months (M = 4.25, SD = 0.46) at the 4-month assessment, from 9 to 18 months (M = 14.42, SD = 0.57) at the 14-month assessment, and from 19 to 26 months (M = 24.47, SD = 0.79) at the 24-month assessment. Regarding educational level, 84.2% of the mothers and 77.3% of the fathers were highly educated, meaning they had at least a Bachelor's degree, while, 4.8% of the mothers and 9.1% of the fathers had a low educational level (i.e., obtained upper secondary education or less).

Procedure

Mothers and fathers filled out questionnaires at every time point. At the 36-weeks assessment, both expectant parents were visited at home in one appointment, during which they were interviewed and performed several computer tasks. The order in which they were interviewed and performed the tasks was counterbalanced. At the 4-, 14-, and 24-month assessments, mother and child as well as father and child were visited separately with a period of approximately one week in between the visits. The order in which they were visited was counterbalanced. To avoid disruption of the assessment with the target parent, the other parent was either not present or in another room. During these postnatal home visits the parent was interviewed and performed several computer tasks again, child executive functioning was examined with multiple tasks, and parent-child interaction was videotaped which is the focus of this study.

At all three postnatal time points, parental sensitivity was videotaped for observation during free play. At the 4-month assessment, parents were instructed to play for 5 minutes with their child as they would normally do, on their lap or on the floor without toys or a pacifier. At the 14- and 24-month assessments, parents were instructed to play with their child for 5 minutes with a set of toys given to them by the researcher. There were two different, but comparable sets of toys at each of these two time points, suitable for the child's age, to prevent a learning effect for the child at the home visit with the other parent.

All visits were conducted by either trained graduate and undergraduate students or by researchers of the study team. Informed consent was obtained at every assessment from both parents. After each home visit, the child received a small present and the parent received (a gift voucher of) 30 British Pounds (UK), 50 US Dollars (USA), or 20 Euros (NL). The study was approved by the National Health Service Research Ethics Committee (UK), the University Committee on Activities Involving Human Subjects at New York University (USA), and the Ethics Review Board of the Institute of Education and Child Studies of Leiden University (NL).

Measures

Parental sensitivity. Parental sensitivity at all three postnatal assessments was coded using the Ainsworth Sensitivity Scale (Ainsworth et al., 1974). One single global rating was given per assessment for each parent, based on a 9-point Likert scale ranging from 1 = highly insensitive to 9 = highly sensitive. Dutch coders were trained to reliability by the third and last author, and they only coded videotapes of families they did not visit. To guarantee independency among scores, mothers and fathers of the same family were coded by separate coders, and none of the coders who were trained to code multiple

assessments coded the same parent more than once. To prevent coder drift, during the coding process 25-30% of the 14-month as well as the 24-month videotapes were double coded; if coders' scores differed two or more points, the videotape was discussed and a consensus score was determined.

In total, 17 coders coded the videotapes of the 4-month assessment and 8 coders the videotapes of the 14-month assessment. Both reliability sets consisted of 30 videotapes (10 mothers and 10 fathers per country). Intraclass correlation coefficients (absolute agreement) for the different pairs of coders ranged from .70 to .94 (M = .82) for the 4-month assessment, and from .70 to .87 (M = .79) for the 14-month assessment. No separate reliability set was made specifically for the 24-month assessment, because the 14- and 24-month assessment were highly similar with regard to the task. Instead, 11 coders were either trained to reliability based on the 14-month reliability set or were already reliable, with intraclass correlation coefficients (absolute agreement) for the different pairs of coders ranging from .70 to .91 (M = .79). After receiving an extra training session on the coding of 24-month videotapes, they coded the videotapes of the 24-month assessment.

Analyses

Descriptive statistics of all relevant variables are shown in Table 1, Pearson correlations between time points and between mothers and fathers are shown in Table 2. Missing data in the final sample occurred because one or both parents did not participate in one of the home visits or a questionnaire was not filled out. These missing data were completely at random, indicating that there was no pattern to be found, Little's MCAR test $\chi^2(183) = 202.10$, $p = .159$. Multiple imputations were performed to handle these missing data, using both the mice and mitml package in R version 3.6.1 (R Core Team, 2019; Van Buuren & Groothuis-Oudshoorn, 2011) and accounting for the nested data. Based on all the other variables in the data set, missing data were imputed 20 times using 20 iterations. The summary function from mitml and RandEffStats from merTools were used for pooling and yielded the same results. The anova function from mitml was used to compare nested models.

Table 1. Descriptive Statistics for Family SES, Mothers' and Fathers' Age, and Parental Sensitivity at 4, 14, and 24 Months in Three Countries.

		UK			USA			NL		
		M	***SD***	**Range**	***M***	***SD***	**Range**	***M***	***SD***	***Range***
At birth	Family SES	-0.11	0.61	-2.33-1.58	0.36	0.74	-1.00-4.47	-0.16	0.76	-1.75-1.26
	Mothers' age	32.59	3.61	25-43	34.06	3.47	26-43	30.04	3.76	21-41
	Fathers' age	34.03	4.37	23-49	35.63	4.37	28-50	32.41	4.31	23-48
4-months	Maternal sensitivity	5.25	1.65	2-9	5.39	1.98	1-9	5.13	1.94	1-9
	Paternal sensitivity	5.60	1.68	1-9	5.19	1.90	1-9	5.62	1.89	1-9
14-months	Maternal sensitivity	6.07	1.53	2-9	5.82	1.68	2-9	6.59	1.27	3-9
	Paternal sensitivity	5.57	1.61	2-9	5.91	1.65	2-9	5.96	1.53	2-9
24-months	Maternal sensitivity	6.44	1.40	3-9	6.07	1.58	1-9	6.98	1.30	3-9
	Paternal sensitivity	6.22	1.40	2-9	6.19	1.47	2-9	6.38	1.35	3-9

Table 2. Pooled Correlations for Parents' Age and Family SES at the Birth of Their Child and Their Sensitivity at 4, 14, and 24 Months.

1. Family SES	-	.16**	.09	.12*	.09
2. Parental age	.24**	-	-.03	-.05	-.05
3. 4-month sensitivity	.12*	.08	**.19****	.19**	.14**
4. 14-month sensitivity	.05	-.10*	.15**	**.15****	.27**
5. 24-month sensitivity	.10	-.15**	.12*	.29**	**.20****

Note. Numbers below the diagonal refer to correlations for mothers, numbers above the diagonal refer to correlations for fathers, and the bold numbers on the diagonal refer to correlations between maternal and paternal sensitivity.
* $p < .05$. ** $p < .01$. *** $p < .001$.

A three-level multilevel modeling (MLM) approach was applied, because the data were hierarchically nested as well as repeatedly measured (Tasca et al., 2009). The lme4 package of R version 3.6.1 was used. MLM analyses were performed to examine across the three postnatal time points whether (1) mean levels of parental sensitivity change over time, (2) mothers are overall more sensitive than fathers, and trajectories of parental sensitivity are different for mothers versus fathers, and (3) country of residence predicts overall levels and/or trajectories of parental sensitivity. As both family socioeconomic status and parents' age have been shown to be related to parental sensitivity (e.g., Bornstein et al., 2006; Roubinov & Boyce, 2017), both variables were included as a covariate first in all models, with family SES based on the mean of the standardized scores of parents' averaged household income and educational level, and higher scores representing a higher family SES (for a more extensive description of this measure, see Woudstra et al., 2019). At Level 1, within-parent change in sensitivity over time was modeled (for a more elaborate explanation of three-level MLM, see Tasca et al., 2009). At Level 2, variability in between-parent change in sensitivity was modeled. At Level 3, between-family growth was modeled, to account for the fact that the parents were nested into families. After specifying each level, a conditional intraclass correlation (ICC) based on complete cases was calculated using the sjstats package in R (Lüdecke, 2020) to check the levels of clustering and confirm the need of MLM.

The three-step MLM approach by Singer and Willett (2003) was used by running three types of models. First, an unconditional means or intercept-only model (Model 1) was run to examine whether MLM was indeed the necessary approach to analyze these data, by calculating the aforementioned ICC.

Unconditional Means Model:
Level 1: $Y_{ij} = \pi_{0i} + \varepsilon_{ij}$

Level 2: $\pi_{0i} = \gamma_{00} + \zeta_{0i}$

Second, four unconditional growth models were run. The first two unconditional growth models were run to examine the effect of time on parental sensitivity: one model with a fixed slope (Model 2), indicating that all parents follow a similar pattern over time (e.g., all

increasing), and one model with a random slope (Model 3), allowing for parents' individual variability in pattern over time. Both models were compared, by calculating an F-value: a significant F-value would indicate that the latter model was a better fit. The next two unconditional growth models were run to control for dependency as the parents were nested into families (i.e., Level 3 was added). In the first model, the intercepts were varied on family level (Model 4). In the second model, slopes were varied on family level (Model 5). Again, an F-value was calculated to examine which of the two possible models fitted best.

Unconditional Growth Model with fixed slope for time:
Level 1: $Y_{ij} = \pi_{0i} + \chi(\mathrm{TIME}_{ij}) + \varepsilon_{ij}$

Level 2: $\pi_{0i} = \gamma_{00} + \zeta_{0i}$

Unconditional Growth Model with random slope for time:

Level 1: $Y_{ij} = \pi_{0i} + \pi_{1i}(\mathrm{TIME}_{ij}) + \varepsilon_{ij}$

Level 2: $\pi_{0i} = \gamma_{00} + \zeta_{0i}$
$\pi_{1i} = \gamma_{10} + \zeta_{1i}$

Unconditional Growth Model with random intercept and fixed slope on family level:
Level 1: $Y_{tij} = \pi_{0ij} + \pi_{1i}(\mathrm{TIME}_{tij}) + \varepsilon_{tij}$

Level 2: $\pi_{0ij} = \beta_{00j} + r_{0ij}$
$\pi_{1ij} = \beta_{10j} + r_{1ij}$

Level 3: $\beta_{00j} = \gamma_{000} + u_{00j}$

Unconditional Growth Model with random intercept and random slope on family level:
Level 1: $Y_{tij} = \pi_{0ij} + \pi_{1ij}(\mathrm{TIME}_{tij}) + \varepsilon_{tij}$

Level 2: $\pi_{0ij} = \beta_{00j} + r_{0ij}$
$\pi_{1ij} = \beta_{10j} + r_{1ij}$

Level 3: $\beta_{00j} = \gamma_{000} + u_{00j}$
$\beta_{10j} = \gamma_{100} + u_{10j}$

Third, four conditional growth models were run to control for family SES (Model 6) and parents' age (Model 7), and to examine the effects of parent gender and time*parent gender (Model 8), and country and time*country (Model 9) on parental sensitivity. In this order, each of these predictors was added to the previous model if the random effects demonstrated that there was still significant variance to be explained. F-values were calculated to compare each model to the previous best fitting model, to determine the best fitting final model.

Final Conditional Growth Model:

Level 1: $Y_{tij} = \pi_{0ij} + \pi_{1ij}(\text{TIME}_{tij}) + \varepsilon_{tij}$

Level 2: $\pi_{0ij} = \beta_{00j} + \beta_{10j}(\text{parental age}_{ij}) + \beta_{10j}(\text{parent gender}_{ij}) + r_{0ij}$

$\pi_{1ij} = \beta_{10j} + \beta_{12j}(\text{parent gender}_{ij}) + r_{1ij}$

Level 3: $\beta_{00j} = \gamma_{000} + \gamma_{001}(\text{family SES}_{j}) + \gamma_{001}(\text{country}_{j}) + u_{00j}$

$\beta_{01j} = \gamma_{010} + u_{01j}$

$\beta_{02j} = \gamma_{020} + u_{02j}$

$\beta_{10j} = \gamma_{100} + \gamma_{102}(\text{country}_{j}) + u_{10j}$

$\beta_{12j} = \gamma_{120} + u_{12j}$

Results

The conditional ICC for the unconditional means model was 16%. Because multilevel modeling is a necessary approach when the between-subject variance is at least 10% of the total variance in unconditional means models (Kreft & De Leeuw, 1998), we concluded that multilevel modeling was indeed necessary for the current study. Furthermore, the AIC lowered after adding each level (Model 2-4), indicating better model fit (see Table 3). Pseudo R^2 indicated that after adding Level 2, the main effect of time explains 11% of within subject variance in parental sensitivity.

As shown in Appendix B, the unconditional growth model with a fixed slope (Model 2) was a better fit than the unconditional means model (Model 1), with F (1, 3931.73) = 184.27, p = 0.000. However, the unconditional growth model with a random slope (Model 3) fitted the data even better, with F (2, 8286.32) = 13.04, p = 0.000, indicating that not all parents follow a similar pattern in their development of sensitivity over time. Regarding the next two unconditional growth models, the F-values demonstrated that Model 4 was a better fit than Model 3, with F (1, 6910.63) = 26.22, p = 0.000. Model 4 also fitted the data better than Model 5, with F (2, 2006.34) = 1.86, p = 0.155, indicating that a random intercept but not a random slope on family level was the best fit. Therefore, in the last step a three-level model with a random slope for time and a random intercept at the family level was used, to which covariates and predictors were added.

Table 3. Fixed and Random Effects of the First Four Models Predicting Parental Sensitivity.

	Model 1	Model 2	Model 3	Model 4
Fixed effects				
Intercept	5.92*** (0.04)	5.40*** (0.05)	5.40*** (0.06)	5.40*** (0.06)
Time		0.52*** (0.04)	0.52*** (0.04)	0.52*** (0.04)
Random effects				
Within parents (σ^2_e)	2.40	2.13	1.90	1.90
Between parents – intercept (σ^2_{r0})	0.38	0.48	1.10	0.81
Between parents – slope (σ^2_{r1})			0.22	0.22
Between parents - covariance (σ^2_{r01})				-0.61
Between families (σ^2_{u00})				0.29
Model fit stats				
AIC	9671.6	9480.3	9456.8	9430.9
Conditional ICC	.16	.19	.27	.27

Note. The numbers not in brackets represent model estimates, the numbers in brackets are the standard errors. Apart from the conditional ICC values, which are based on complete cases, all values are based on pooled results of the imputed datasets.
* $p < .05$. ** $p < .01$. *** $p < .001$.

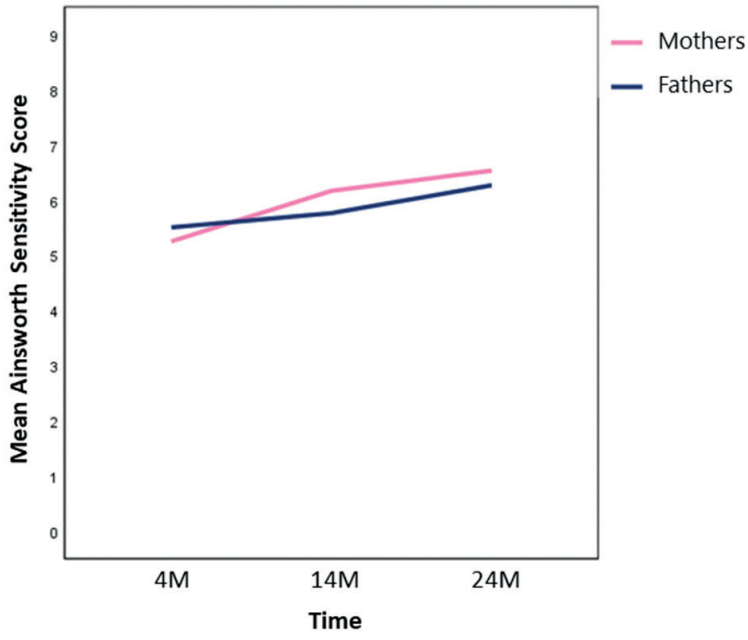

Figure 1. Maternal and paternal sensitivity at 4, 14, and 24 months.

As demonstrated in Table 4, the results of the final conditional growth model (Model 9) shows that both covariates added significantly to the model. We therefore, controlled for the effect of family SES and parents' age on parental sensitivity in the final results, in addition to controlling for the data dependency on family level. Overall, Model 9 showed that the fixed effects of time on parental sensitivity were significant: both the intercept (5.88; t = 16.26, p = 0.000) and the slope (1.01; t = 7.42, p = 0.000) of parental sensitivity were significantly different from zero. Above this main effect of time, there was a significant interaction effect of time*parent gender, which showed that mothers' sensitivity levels improved more over time from 4 to 24 months than fathers' sensitivity levels (see also Figure 1). Lastly, there was a significant interaction effect of time*country on parental sensitivity: trajectories of parental sensitivity differed significantly between the Netherlands and the United Kingdom, with more improvement over time in the Netherlands than in the UK.

Table 4. Fixed and Random Effects of Final Conditional Growth Model Predicting Parental Sensitivity

	Estimate	***SE***	***t***	***df***	***p***
Fixed effects					
Intercept	5.88	0.36	16.26	1069.51	0.000
Time	1.01	0.14	7.42	2299.28	0.000
Family SES	0.24	0.10	2.47	36.47	0.018
Parental age	-0.02	0.01	-1.97	2578.92	0.049
Parent gender	0.15	0.11	1.30	4347.00	0.195
Time*Parent gender	-0.24	0.08	-3.02	1375.18	0.003
Country – NL vs. USA	-0.16	0.18	-0.85	506.43	0.397
Country – NL vs. UK	-0.01	0.15	-0.06	1523.49	0.953
Country – USA vs. UK	0.15	0.15	0.97	5245.25	0.335
Time*Country – NL vs. USA	-0.19	0.11	-1.77	3468.53	0.077
Time*Country – NL vs. UK	-0.20	0.09	-2.29	25200.53	0.022
Time*Country – USA vs. UK	-0.02	0.10	-0.20	3915.47	0.843
Random effects					
Within parents (σ^2_e)	1.90				
Between parents – intercept (σ^2_{r0})	0.83				
Between parents – slope (σ^2_{r1})	0.20				
Between parents - covariance (σ^2_{r01})	-0.62				
Between families (σ^2_{u00})	0.26				
Model fit stats					
AIC	8393.9				
Conditional ICC	.24				

Discussion

The aim of the current study was to examine (differences in) trajectories of maternal and paternal sensitivity from infancy to toddlerhood in both mothers and fathers in the UK, the USA, and the Netherlands. The results show that parental sensitivity increased over time from infancy to toddlerhood. Furthermore, mothers were overall not more sensitive than fathers, but mothers' sensitivity levels did improve more over time than fathers' sensitivity levels. Lastly, no differences in overall sensitivity levels were found between the three countries, though parental sensitivity levels in the Netherlands did improve more over time than in the UK.

First, we explored trajectories of parental sensitivity, and found an increase in parental sensitivity over time from infancy to toddlerhood. Overall, previous research on trajectories of parental sensitivity showed mixed results, possibly because of the diversity in conceptualizations of parental sensitivity in these studies, as well as the variety in settings used to observe parental sensitivity both within the same study and between the different studies. In the current study, we therefore used the original definition and coding system of sensitivity by Mary Ainsworth (1974), as well as the same measurement setting across the three measured time points (i.e., play setting). Consequently, the increase in parental sensitivity over time from infancy to toddlerhood cannot be explained by confounding factors such as broader definitions of sensitivity that include positive affect, or differences in measurement settings. It thus seems that responding in a sensitive manner to the child's signals actually gets easier over time for parents, at least from infancy to toddlerhood. As previously mentioned, this could be explained by the child becoming a more active partner in communication (Iverson, 2010), making it easier for the child to signal their needs, as well as the fact that new parents gradually build up experience over time with parenting in general and with their child's unique characteristics, needs, and signals.

Second, we examined differences in (trajectories of) parental sensitivity in mothers and fathers. In contrast to our hypothesis, we found no difference in overall levels of sensitivity between mothers and fathers, demonstrating that mothers are overall not more sensitive than fathers in the first two years of the child's life. However, we did find an interaction effect: mothers' sensitivity levels showed a steeper upwards slope, indicating that they increased more over time than fathers' sensitivity levels. It is likely that the amount of time that mothers and fathers can generally spend with their infant plays a role in this finding. Whereas fathers generally have to go back to work immediately after birth (USA) or after one or two weeks (UK and the Netherlands), mothers are often able to spend more time with their infant, at least in the first few months. This gives mothers a chance to get to know their infant's unique needs and signals faster, whereas fathers need a little more time to eventually get on the same level as mothers. These are important results, as previous research results have been mixed, and most of these studies only measured parental sensitivity at one time point. The current study demonstrates that it is important to examine parental sensitivity across time to truly understand the bigger picture regarding possible differences in sensitivity between mothers and fathers. Measuring sensitivity at one time point only could give a distorted view on whether mothers are overall 'better parents' than fathers, as is still widely believed by both the general public and biologists

(Gustafsson et al., 2013). The current study shows that mothers' and fathers' sensitivity levels in the first two years of their child's life are overall quite similar, but their trajectories do differ during these years.

Third, we examined differences in (trajectories of) parental sensitivity between three countries: the UK, the USA and the Netherlands. In contrast to our hypothesis, we found no difference in overall levels of sensitivity between the three countries. We did find an interaction effect, however: parental sensitivity improved more over time in the Netherlands than in the UK. Two explanations may underlie these results. First, in line with the Family Stress Model (Conger & Donnellan, 2007), research showed that a lack of or limited paid leave is related to less parental wellbeing (Glass,et al., 2016). As the UK families received partial but not fully paid leave, this may not necessarily caused financial stress in the first month, but it could have gotten more financially stressful for them as the time passed – explaining why their parental sensitivity improved less over time. Second, paid leave in the USA is not regulated by the government but depends on the employer. It is possible that a lot of the participating families from the USA received (fully) paid leave from their employer, just like all Dutch families, whereas all families from the UK only received partial paid leave. This could explain the absence of a significant slope difference between the Netherlands and the UK on the one hand, and the USA on the other hand.

Several limitations of this study should be mentioned. First, because of practical reasons it was not possible to train coders in each country. Therefore, the current study was only able to use Dutch coders. Even though all Dutch coders received extensive training and were fluent in English, coder bias could not be completely ruled out which could have played a role in the country slope differences found in this study. Future research on differences in trajectories between these countries, using coders from each country, is necessary to examine whether the found differences can be replicated. Second, even though this longitudinal collaboration between multiple countries offers a uniquely large observational dataset, the possible universality of parental sensitivity remains to be understood as the included countries are all WEIRD: Western, Educated, Industrialized, Rich, and Democratic (Henrich et al., 2010). Additionally, our sample was quite specific in background characteristics: parents' educational background, their parental age at birth and family SES were relatively high, which makes sense as higher education is related to delayed childbearing (Eriksson et al., 2013), and highly educated people tend to have a higher income. Future research with a more diverse sample is necessary to examine the generalizability of our findings. Third, our five-minute observations of parental sensitivity were relatively short, which is different from the length of Mary Ainsworth's observations. She originally started with the development of her maternal sensitivity coding instrument for her two-hour observations in Uganda, that she did twice a month for a period of nine months (Bretherton, 2013). It would therefore be interesting to replicate the current study using longer observations, to examine whether the same results are found.

In conclusion, the current study provides valuable insights in trajectories of maternal as well as paternal sensitivity from infancy to toddlerhood. The results of this study are highly robust, as the data were collected in such a way that the confounding factors of previous studies were eliminated. Furthermore, the analyses were carefully selected to

fit the complex multilevel data, and performed on a large dataset. All in all, this study demonstrates that primiparous mothers' and fathers' sensitivity generally improves over time from infancy to toddlerhood. Furthermore, even though mothers' and fathers' parenting styles have proven to be different in some ways, in the first two years of their child's life they are overall quite similar concerning the extent to which they respond sensitively to their child's signals.

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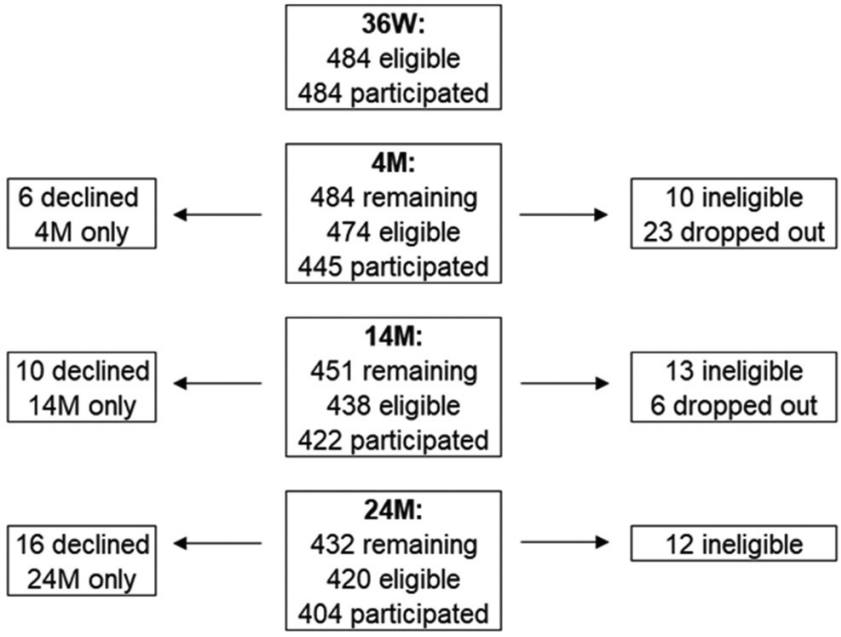
Appendix A:

Flow of participants through each wave.



Appendix B:

Comparison of Multilevel Models Predicting Trajectories of Parental Sensitivity.

Model comparison	*F*	*df1*	*df2*	*p*
1vs2	184.27	1	3931.73	0.000
2vs3	13.04	2	8286.32	0.000
3vs4	26.22	1	6910.63	0.000
4vs5	1.86	2	2006.34	0.155
4vs6	8.74	1	143.37	0.004
6vs7	11.54	1	2481.91	0.001
7vs8	5.73	2	1010.65	0.003
8vs9	3.09	4	285.50	0.016