

The First 12.5 Years of Parenthood: A Latent Trait-State Occasion Model of the Longitudinal Association Between Maternal Distress and Child Internalizing and Externalizing Problems

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Maternal anxiety and depression symptomatology are risk factors for the development of children's internalizing and externalizing behavior problems. However, it is still unclear whether chronic and transient symptoms relate differently to child behavior. The aim of this prospective longitudinal study ($N = 193$) was to investigate the associations between anxiety and depression symptomatology in a community sample across the first 12.5 years of parenthood, and children's internalizing and externalizing problems. Maternal anxiety and depression were measured at the child's age of 3, 6, and 12 months, and 2.5, 4, 6, 8, 10 and 12.5 years. At 12.5 years of age, both mothers and children reported on children's internalizing and externalizing problems. Trait-state occasion modeling was used to disentangle the chronic (trait) part of maternal symptomatology from the transient (occasion-specific) part. On average, 66.6% of the variance in maternal anxiety and depression symptomatology could be explained by the chronic trait factor. For both anxiety and depression, the chronic variance in maternal symptomatology was related to mother-reported internalizing, but not externalizing, problems of the child. Also, for child-reported internalizing problems, a significant association with maternal anxiety and depression symptomatology emerged. Only the occasion-specific part of maternal depression symptomatology at the child's age of 12.5 years was marginally related to mother-reported internalizing problems. Given that chronic subclinical symptomatology seems to be associated with child internalizing problems, prevention and treatment of maternal anxiety and depression symptomatology might be worthwhile regardless of the degree of severity.

Keywords: maternal depression, maternal anxiety, internalizing problems, externalizing problems, trait-state occasion modeling

The period following childbirth often brings joy and happiness, but it is also known for its challenges (Missler et al., 2018). In addition to challenges to well-being (e.g., reduced self-esteem and relationship satisfaction; Van Scheppingen et al., 2018), the period can be characterized by symptoms of psychopathology. In community samples, between 8% to 40% of all mothers experience at least some symptoms of postnatal depression, whereas the prevalence of maternal anxiety symptoms postnatally ranges from 13%

to 40% (Dennis et al., 2017; Glasheen et al., 2010; Heron et al., 2004; McCoy et al., 2006; Morris-Rush et al., 2003). Moreover, a considerable proportion of affected women experiences symptoms of both depression and anxiety (Yelland et al., 2010). Maternal postpartum depressive and anxiety symptomatology has been associated with more internalizing problems (such as anxiety and depression), as well as externalizing problems (such as inattentiveness and disruptiveness) in their children (e.g., Barker et al., 2011; Brennan et al., 2000; for reviews, see Field, 2018; Glasheen et al., 2010; Goodman et al., 2011; Murray et al., 2015; Rees et al., 2019). In addition to shared genetic vulnerability, an often proposed mechanism behind these findings is that parents suffering from mental health problems show lower quality of parenting, compromising the development of the child (for a review, see Stein et al., 2014). As the psychosocial functioning of mothers with subclinical depressive symptoms seems to be affected in ways comparable to that of mothers with major depressive

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disorder (Weinberg et al., 2001), maternal caregiving quality and subsequent child development might also be impacted by subclinical symptomatology. Indeed, a study following children of mothers with depressive symptomatology longitudinally for the first 11 years of the child's life found that, at age 16, children of mothers with subclinical symptomatology indicated heightened suicidal ideation compared to children of mothers with minimal to no symptoms (Hammerton et al., 2015). However, much remains unclear regarding how transient periods versus chronic maternal symptomatology affect child behavior. The aim of this study was to investigate the associations between subclinical depressive and anxiety symptoms across the first decade of parenthood, and children's internalizing and externalizing problems at 12.5 years of age.

There are indications that children of chronically depressed mothers have more internalizing and externalizing problems than children whose mother had a shorter depressive episode (e.g., Brennan et al., 2000; Hentges et al., 2020; Kingston et al., 2018; Netsi et al., 2018). However, in these studies, chronicity is measured by using the frequency of high symptomatology across a given number of measurement moments (e.g., Brennan et al., 2000; Hentges et al., 2020; see also Prenoveau et al., 2017), or by examining continuous trajectories of maternal symptomatology (Kingston et al., 2018; Netsi et al., 2018). In these cases, chronicity of symptoms is determined based on variation compared to population levels of depression (e.g., by using cut-off scores or categories of severity), rather than on the participants' own history of depression. This way of conceptualizing chronicity does not take into account that many psychopathological constructs (such as anxiety and depression) are relatively stable over time (Prenoveau, 2016).

As such, it remains unclear whether a score at a specific time point can be attributed to chronic, trait-like factors, or transient, occasion-specific fluctuations in symptomatology. This distinction is important because trait and occasion symptoms can relate differently to child outcomes (Kingston et al., 2018). Furthermore, this distinction also provides important insights for prevention and intervention studies, as trait and state maternal symptomatology probably warrant different approaches, for example with regard to involving the child in the intervention (Yap et al., 2016).

Differentiation between trait and state symptomatology can be done using latent trait–state occasion (TSO) modeling (Cole et al., 2005), which distinguishes between chronic (trait) and transient (state occasion) parts of maternal depressive and anxiety symptomatology at various time points. Thus, the method differentiates between chronic anxiety and depression symptomatology (level of symptomatology that can be expected based on the stability in previous scores), and transient deviations from the score that would be expected based on this stable history. This way, it is possible to detect whether chronic variance in symptomatology is related to child factors, independent of transient fluctuations in symptoms (i.e., a temporarily heightened level of anxiety symptoms). Importantly, the assumption of the TSO model is that stability in symptomatology decreases with increasing time lapsed between measurements, but never reaches zero. Thus, using the TSO model it is possible to account for the pattern of relative stability of anxiety and depression symptomatology (e.g., Cole et al., 1998; Struijs et al., 2020; see also Prenoveau, 2016).

To our knowledge, only one study focused on both state and trait anxiety and depression using the TSO model (Prenoveau et

al., 2017). This study focused on child outcomes at two years and showed that not so much the transient periods of elevated depression and anxiety, but especially the chronic part of maternal postpartum symptomatology seemed to be associated with child outcomes. More specifically, only the chronic variance in maternal major depressive disorder and generalized anxiety disorder, as assessed with a diagnostic interview, was related to more mother-reported behavioral problems of the child at two years of age. Chronic depression was furthermore related to observed emotional negativity at two years. As this study from Prenoveau and colleagues (2017) focused on clinical-level anxiety and depression, and child outcomes at 2 years after birth, it is unclear whether the same relations would emerge in a low-risk sample over longer periods of time.

The Current Study

This study aimed to investigate the relation between depression and anxiety symptoms in a community sample of mothers throughout the first 12.5 years of parenthood and their children's internalizing and externalizing problems at the age of 12.5 years. Through latent modeling, the differential associations between chronic (trait) versus transient (occasion) depression and anxiety symptomatology and children's emotional and behavioural development were disentangled. Based on previous research (Brennan et al., 2000; Hentges et al., 2020; Kingston et al., 2018; Netsi et al., 2018; Prenoveau et al., 2017), we hypothesized that chronic maternal depression and anxiety symptomatology would be most strongly associated with children's internalizing and externalizing problems, as compared to transient maternal symptoms.

Method

Participants

Participants were part of an ongoing longitudinal study on psychobiological development in children (BIBO project; Dutch acronym for Basal Influences on Child Development) which started in 2006 and in which mothers and their children are followed from pregnancy onward (see also Beijers et al., 2011). Pregnant women were recruited through midwife practices in the Dutch city of Nijmegen (a mid-sized city in the east of the country) and surrounding areas. Only mothers with healthy, singleton pregnancies, no severe physical diseases or problems with potential risks for the pregnancy or unborn child, no severe mental health problems (i.e., no current treatment or medication use for mental health problems), no drug use, and a clear understanding of the Dutch language were included. The ethical committee from the Faculty of Social Sciences of Radboud University Nijmegen approved the 'Basal Influences on Child Development' study (#ECG300107; ECG211111; ECG300107; ECG1303498), and all mothers provided informed consent. Baseline measures took place during the 37th week of pregnancy. Of the 220 mother-infant dyads that enrolled in the study, eight were excluded for medical reasons (e.g., prematurity, low birth weight), and another 19 discontinued their participation during the infant's first three months of life for personal reasons. This resulted in a final sample of 193 mothers and their infants. There were no statistically significant differences in demographic factors between the 193 families that took part in the study and the

19 that dropped out. Table 1 displays sample descriptives. The majority of mothers had received higher education (75.80%), lived with their partner (97.90%), and were born in the Netherlands (95.80%). All pregnancies were uncomplicated, and children were born at term (>37 weeks of pregnancy) and healthy (Infant Apgar scores ranging from 7 to 10; $M = 9.6$; $SD = .6$).

Procedure

Mothers filled out questionnaires on their depressive and anxiety symptoms at the child's age of 3 months, 6 months, 12 months, 2.5 years, 4 years, 6 years, 8 years, 10 years and 12.5 years (by paper-and-pencil in the first stage of the study, and online from 6 years onward). At 12.5 years of age, both mothers and children independently filled out questionnaires on the child's internalizing and externalizing problems during a home visit.

Measures

Maternal Distress

Edinburgh Postnatal Depression Scale. Maternal depressive symptoms were measured with the Dutch translation (Pop et al., 1992) of the self-report 10 item Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987). The items were measured on a 4-point scale. Items are scored from 0 to 3 and total scores range from 0 (no depressed feelings) to 30 (severe depressed feelings). Cronbach's alpha in the current study ranged from .71 (12 months postpartum) to .91 (10 years postpartum). To describe the percentage of mothers at risk for (minor) depression, a cut-off score of 10 or more was used, as is recommended for screening purposes in the general population (Cox et al., 1987; Bergink et al., 2011).

State-Trait Anxiety Inventory. Maternal postnatal anxiety symptoms were measured with the Dutch translation (Van der Ploeg et al., 1981) of the 20-item state anxiety subscale of the State-Trait Anxiety Inventory (STAI; Spielberger, 1983). Items were measured

on a 4-point scale. Higher scores indicate more anxiety. Total scores range from 20 to 80. Cronbach's alpha in the current study ranged from .82 (4 years postpartum) to .94 (10 years postpartum). A cut-off score of > 40 was used to describe the percentage of mothers at risk for postpartum anxiety (Dennis et al., 2013).

Child Social-Emotional Functioning

Child Strength and Difficulties. Mothers and children reported on child emotional and behavioral problems with the Dutch translation (van Widenfelt et al., 2003) of the Child Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The items refer to both strong points as well as difficulties of the child. The questionnaire contains 25 items, each measured on a 3-point scale (scored 0, 1, or, 2), measuring emotional symptoms, conduct problems, hyperactivity-inattention, peer problems, and prosocial behavior. In this study, the Internalizing (consisting of the Emotional Symptoms and Peer Problems subscales) and Externalizing (consisting of the subscales Conduct problems and Hyperactivity) scales were used (Goodman et al., 2010). For maternal report, Cronbach's alpha in the current study was .72 for the Internalizing and .75 for the Externalizing subscales. Cronbach's alpha for the children's report was .70 for the Internalizing and .71 for the Externalizing subscales.

Control Variables

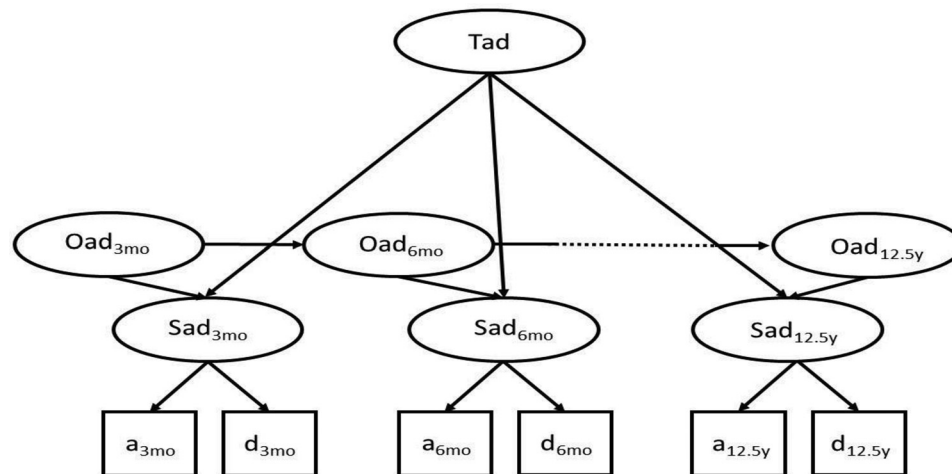
We included the following control variables in our analyses: child sex, maternal educational level, and pubertal status. Pubertal status was measured in terms of the Tanner stages questionnaire (Marshall & Tanner, 1969), which tracks the physical development of primary and secondary sex characteristics. Both mothers and children indicated for each sex characteristic which Tanner stage most closely resembled their own physical development, as depicted on a drawing and described by text. We used mother-rated pubertal status for the mother-reported child developmental

Table 1
Descriptive Statistics of the Study Variables (N = 193)

Demographics characteristics	<i>M (SD)</i>	Range
Maternal age (years)	32.46 (3.79)	21.10–42.90
Maternal educational level (%)		
Primary education	3.80%	
Secondary education	20.40%	
College or university	75.80%	
Maternal marital status (living with partner)	97.90%	
Birth weight (grams)	3,616.97 (465.32)	2,645.00–4,730.00
Infant sex ^a (%)		
Girl	47.20%	
Birth order (%)		
First	41.60%	
Second	43.70%	
Third or fourth born	14.70%	
Pubertal status		
Mother-reported	5.34 (1.92)	2–10
Child-reported	5.53 (1.70)	2–10
Strengths and Difficulties Questionnaire scores (12.5 years)		
Internalizing—mother ($n = 151$)	2.26 (2.48)	0–12
Internalizing—child ($n = 145$)	3.39 (2.87)	0–15
Externalizing—mother ($n = 151$)	3.46 (2.84)	0–14
Externalizing—child ($n = 145$)	5.25 (2.96)	0–13

^a The infant's sex was based on maternal report at baseline.

Figure 1
Trait-State-Occasion (TSO) Model of Child Outcomes at 12.5 Years Postpartum as Predicted by Maternal Symptomatology Across Measurements



Note. Measurements took place at the child's age of 3, 6, and 12 months, and at 2.5, 4, 6, 8, 10, and 12.5 years. For reasons of clarity, only the first two (3 and 6 months) and the final point in time (12.5 years) are shown. T = trait factor; O = occasion factor; S = state factor; a = anxiety; d = depression; 3m = 3 months after birth; 6mo = 6 months after birth; 12.5y = 12.5 years after birth. The latent variables are indicated by Sad_{3mo}, Sad_{6mo}, and Sad_{12.5y} (i.e., state anxiety/depression at the child's age of 3 months, 6 months, and 12.5 years) and a_{3m}/d_{3m} to a_{12.5y}/d_{12.5y} refer to their manifest indicators (i.e., the two anxiety and two depression parcels). For reasons of clarity, only the first two and the final point in time are shown.

outcomes, and child-reported pubertal status for the child-reported developmental outcomes.

Statistical Analyses

First, we inspected mean maternal depression and anxiety scores over time and correlations between all study variables, including the percentage of mothers scoring above cut-off for depression (EPDS: >9) and anxiety (STAI: >40) at each point in time. Also, we examined how often the mothers scored above cut-off for anxiety and depression (range of time points between 0 and 8).

Next, we performed the latent TSO modeling analysis using R 4.1 (R Core Team, 2020) and the R lavaan package for structural equation modeling (Rosseel, 2012). Missing data were handled by using full information maximum likelihood estimation under the assumption of missing at random. Accidentally, one question was omitted from the 6 year EPDS questionnaire. We have imputed this question with the mean of the participant on the remaining nine questions. Model fit was determined based on the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). A RMSEA of less than .08 and a CFI greater than .95 indicates a good fit of the model to the data. Raw data was used as input and maximum likelihood estimates were obtained.

First, a trait-state-occasion (TSO) model without the child outcomes at 12.5 years was estimated (Cole et al., 2005). The TSO model includes a series of latent state factors at specific occasions in time (St), which are measured by multiple indicators. St is in turn determined by the chronic trait factor (T), as well as by occasion-specific factors (Oadt; representing situational influences) (see Figure 1). The occasion factors refer to transient circumstances that determine St, up and above the influence of the chronic

trait factor (T). In case of good model fit, the model provides information about which part of the variance in state anxiety/depression can be explained by chronicity in symptomatology (the trait factor) and which part of symptomatology can be attributed to the prior occasion (through an autoregressive pathway that allows correlations between adjacent measurements) and thus refers to transient fluctuations in symptomatology.

The application of the model in this study is based on the TSO model as proposed by Loncke et al. (2017). Anxiety and depression scores were combined to reach one latent distress construct for each point in time. Both the anxiety (a) and depression (d) scales functioned as indicators of this latent construct. We created two parcels of five EPDS items for depressive symptomatology (i.e., EPDS items 1–5 as indicator 1, and EPDS items 6–10 as indicator 2). For anxiety symptomatology (as measured by the STAI), we applied the same procedure, thus two parcels of 10 items each were created (items 1–10 and 11–20, respectively). This method has been used before by Loncke et al. (2017) and resembles the approach of Prenoveau et al. (2017). Thus, the severity of maternal symptomatology was indicated by the Sadt latent state variable (combined state anxiety and depression at a given point in time), indicated by the scores on the four parcels of items on the STAI and EPDS scales. In the model, following Loncke et al. (2017), regression coefficients of anxiety/depression with Sad at a given point in time were set at 1 (see Figure 1). However, in contrast to Loncke et al. (2017), we did not assume homogeneity of the autoregressive pathways because the measurement moments in this study were not equidistant (i.e., time between measurements increased during the 12.5 years).

Then, with regression analyses within the structural equation modeling analyses, the relation between maternal symptomatology (the combined anxiety and depression factor) and child outcomes

(as reported by the mother and the child) were examined. The child's sex, pubertal status, and maternal educational level were added to the model as control variables. More specifically, to test the hypothesis that the chronic component of maternal symptomatology is related to child internalizing and externalizing problem behavior, both mother-reported as well as child-reported behavior were regressed onto the trait factor. Simultaneously, mother-reported and child-reported outcome variables were regressed on all state occasion factors (at the infant's age of 3, 6, and 12 months, and 2.5, 4, 6, 8, 10, and 12.5 years). This was done to test whether there are differences between time points regarding the effect of maternal symptomatology on child development (i.e., internalizing and externalizing problems at the child's age of 12.5 years). As a final step, to detect potential differential associations for anxiety and depression, all analyses were repeated for anxiety and depression separately (using the two indicator parcels for anxiety and the two indicator parcels for depression).

Results

Descriptives

Table 2 shows mean depression and anxiety scores over time. In Figure 2, the percentage of mothers scoring above validated cut-off scores for depression and anxiety at each point in time is displayed. As can be seen, at each wave, roughly 10% of mothers scored above cut-off on depression and/or anxiety. For depression, this percentage was higher at 3 months postpartum (13.90%) and at 2.5 years after birth (13.26%). For anxiety, a higher percentage emerged at 8 years after birth (12.71%), whereas at 6 months postpartum (4.37%) and at 4 years after birth (6.90%), this percentage was lower. Of the 123 mothers that completed the EPDS at all points in time, 74 never scored above cut-off (60.16%). The STAI was completed by 122 mothers at all waves: of these mothers, 82 (67.21%) never scored above cut-off.

In Table 1, mean scores for the Internalizing and Externalizing subscales as reported by mothers and children at 12.5 years after birth are shown. As can be seen, children's self-reported scores were consistently higher than maternal scores for both the Internalizing (difference in $M = 1.09$, $t = 5.54$, $p < .00$) as well as the Externalizing subscale (difference in $M = 1.78$, $t = 7.63$; $p < .00$).

Table 3 displays bivariate correlations between maternal symptoms of depression and anxiety over time, and children's behavior at child age 12.5 years, as reported by the mother and the child. Maternal depressive symptomatology scores and maternal report of child internalizing problems at 12.5 years significantly correlated at all points in time, except at child age 6 years. With regard to maternal anxiety scores, significant correlations with mother-reported internalizing behavior emerged at child age 3, 6 and 12 months, and at 10 and 12.5 years. For externalizing problems, no significant correlations emerged with maternal anxiety or depression symptomatology. When looking at child reports of internalizing and externalizing problems, there was only one significant correlation between maternal depression at 12.5 years and internalizing problem behavior. A higher level of maternal depression symptomatology at 12.5 years was associated with more child-reported internalizing behavior problems. Maternal anxiety was not associated with child-report of internalizing and externalizing problems.

Latent TSO Models

To estimate the relative contribution of trait and situational (occasion-specific) influences on maternal state symptomatology at a given point in time, first a model without the child outcomes at 12.5 years was estimated. Corresponding percentages can be computed using the completely standardized regression coefficients between trait and state; occasion and state; and between adjacent measurement moments (Prenoveau, 2016). Figure 3 shows the percentage of variance in maternal anxiety/depression symptomatology at a given point in time that can be attributed to the chronic trait factor, as well as the percentage of variance that can be explained by transient influences (the occasion factors). The occasion-specific variance can be decomposed into variance explained through the autoregressive pathway (thus occasion-specific variance determined by symptomatology at the previous time point) and 'unique' or residual occasion-specific variance. As the figure shows, the majority of the variance in maternal anxiety/depression symptomatology at each point in time could be explained by the trait factor, ranging between 52.0% (8 years) and 76.4% (6 months). On average, the trait factor explained 66.6% in maternal anxiety/depression symptomatology. The variance explained by the prior occasion factors ranged from .1% (2.5 years)

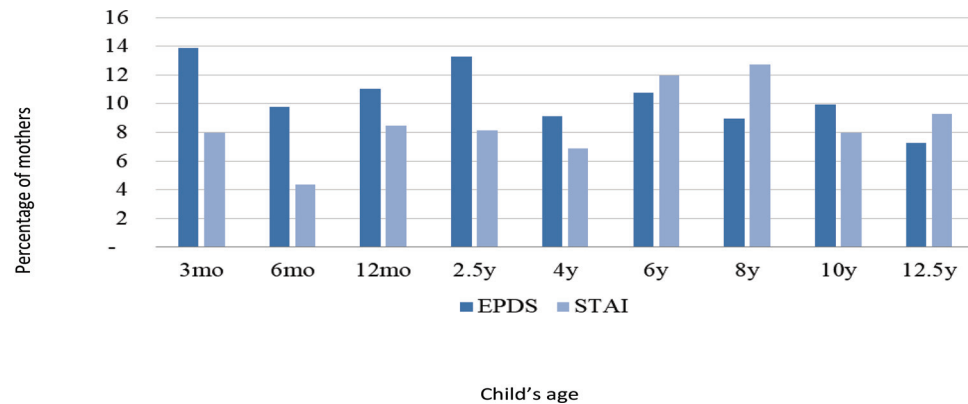
Table 2
Depression and Anxiety Scores Over Time (M and SD)

Timeframe	Depression			Anxiety		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
3 months	187	5.11	3.73	188	28.99	7.99
6 months	185	4.95	3.66	183	28.36	7.17
12 months	181	5.05	3.81	177	29.11	7.62
2.5 years	181	4.78	3.92	184	30.24	8.22
4 years	175	4.46	3.87	174	28.57	6.90
6 years ^a	158	5.08	3.30	159	30.90	8.51
8 years	170	4.98	3.87	181	31.54	8.51
10 years	151	4.44	4.42	151	30.79	8.62
12 years	151	4.18	3.64	151	30.50	8.15

^a Compared to the measurements at four and eight years after birth, the measurement at 6 years was more extensive, because it consisted not only of questionnaires, but children were also visited at their schools. Not all parents participated in this more extended measurement round.

Figure 2

Percentage of Mothers Scoring > 9 at Edinburgh Postnatal Depression Scale (EPDS) or > 40 at State-Trait Anxiety Inventory (STAI) at Each Measurement



Note. See the online article for the color version of this figure.

to 4.1% (12 months), with a mean of 1.7%. The unique (residual) occasion-specific variance ranged from 20.2% (12 months) to 45.8% (8 years), with a mean of 31.9%.

The relation between the chronic (trait) and transient (state occasion) parts of maternal symptomatology and child outcomes at the child's age of 12.5 years was estimated through regression analyses within the structural equation modeling framework, including the following potential confounding variables: sex of the child, the child's pubertal status, and maternal educational level. However, simultaneously regressing all occasion-specific factors (Oad3mo to Oad12.5y) on child externalizing and internalizing behavior resulted in significant multicollinearity and negative variances for the SDQ subscales. Therefore, following [Prenoveau et al. \(2017\)](#), we estimated a model including only nonadjacent time points (including the first and final measurement at 3 months and

12.5 years) for mother- and child-reported problem behavior separately. Both TSO models showed a borderline good fit to the data for the combined measure of depression and anxiety (CFI = .88; RMSEA = .07).

[Table 4](#) shows standardized regression coefficients (β) for the simultaneous regression of nonadjacent occasion factors (3 and 9 months, and 4; 8; and 12.5 years) on child externalizing and internalizing problem behavior as reported by the mother and the child. As can be seen, there was a trait effect of maternal symptomatology on mother-reported internalizing problems ($\beta = .37$, $SE = .11$, $p < .001$), indicating that the chronic variance in maternal symptomatology was related to child internalizing problems when the child's was 12.5 years. Thus, an increase of one standard deviation on the combined anxiety/depression trait factor was associated with a .37 standard deviation increase in maternal-reported

Table 3

Correlations Between Depression and Anxiety Scores Across Measurements and the SDQ Internalizing and Externalizing Scales, as Reported by the Mother and the Child at the Child's Age of 12.5 Years

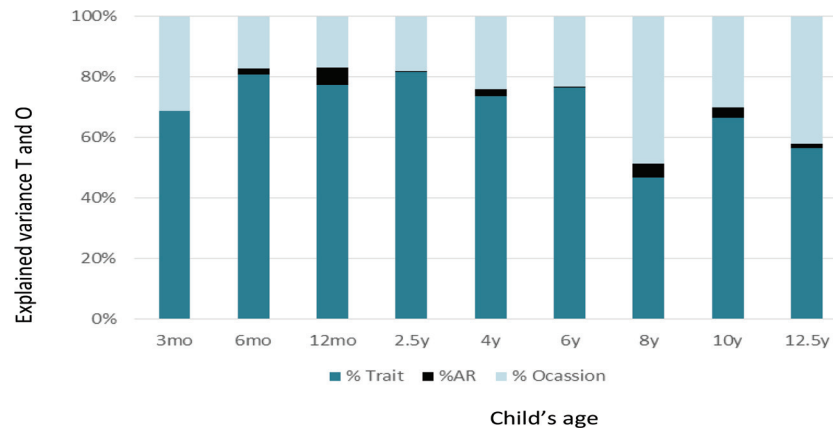
Variable	STAI 3m	STAI 6m	STAI 12m	STAI 2.5y	STAI 4y	STAI 6y	STAI 8y	STAI 10y	STAI 12.5y	SDQ-Int mother	SDQ-Ext mother	SDQ-Int child	SDQ-Ext child
EPDS 3m	.72**									.18*	-.03	.15	-.02
EPDS 6m		.60**								.21*	.03	.16	.01
EPDS 12m			.70**							.17*	.05	.13	.00
EPDS 2.5y				.56**						.20*	.08	.14	.10
EPDS 4y					.56**					.19*	-.06	.11	-.10
EPDS 6y						.42**				.11	.08	.05	.10
EPDS 8y							.74**			.20*	.07	.07	.06
EPDS 10y								.75**		.20*	.03	.20	.07
EPDS 12.5y									.76**	.32**	.04	.18*	-.02
SDQ-Int mother	.18*	.25**	.17*	.15	.14	.14	.21	.18*	.20*				
SDQ-Ext mother	-.01	.10	-.03	.05	.04	.03	.08	.08	-.01	.26**			
SDQ-Int child	.10	.13	.12	.16	.05	.11	.12	.08	.13	.62**	.06		
SDQ-Ext child	.02	.06	-.03	.04	.01	.07	.02	.07	-.02	.22**	.34**	.53**	

Note. STAI = State-Trait Anxiety Inventory; SDQ = Strengths and Difficulties Questionnaire; Int = Internalizing subscale; Ext = Externalizing subscale; EPDS = Edinburgh Postnatal Depression Scale; Int = internal; Ext = external; m = month; y = year.

* $p < .05$. ** $p < .01$.

Figure 3

Variance in Maternal Anxiety/Depression Symptomatology Across Measurements on the Combined Anxiety/Depression Construct Explained by (a) the Trait Factor, (b) the Previous Occasion-Specific Factors (The Autoregressive Pathway), and (c) Unique Occasion-Specific Variance (Residual Variance)



Note. See the online article for the color version of this figure.

internalizing problems. For child-reported internalizing problems, the trait effect was also significant ($\beta = .26$, $SE = .11$, $p = .02$). No trait effect emerged for maternal or child-reported externalizing problems, however. With regard to the occasion-specific factors, in the combined anxiety/depression model, no associations with the child outcomes at 12.5 years after birth emerged. Sex, and to a lesser extent pubertal status, emerged as significant confounding variables. More specifically, mothers reported more externalizing problems in boys ($\beta = .17$, $SE = .09$, $p = .05$), and with regard to the children, girls reported more internalizing problems ($\beta = -.31$, $SE = .09$, $p < .00$). Furthermore, in the depression-only model, mother-reported pubertal onset was positively related to mother-reported internalizing problems of the child.

Sensitivity Analyses

We also performed separate analyses for anxiety and depression symptomatology. Also in these models, the significant trait effect on mother-reported internalizing problems emerged for both anxiety ($\beta = .27$, $SE = .10$, $p < .01$) as well as for depression symptomatology ($\beta = .30$, $SE = .11$, $p < .01$). For child-reported internalizing problems, the trait effect was marginally significant for depression symptomatology ($\beta = .19$, $SE = .11$, $p = .10$), but not for anxiety. Furthermore, we found a significant relationship between transient maternal depression symptomatology at the child's age of 12.5 years and maternally reported internalizing problem behavior ($\beta = .24$, $SE = .16$, $p = .02$). No additional occasion effects emerged for mother-reported or child-reported internalizing or externalizing problems in the anxiety or depression models. As a robustness analysis, we also estimated the combined anxiety/depression and the separate anxiety and depression TSO models including the occasion factors at 6 months and 2.5, 6, and 10 years (results not shown). Model fit indices were the same as in the original models, and no additional significant relationships emerged between the included occasion factors and the child outcomes.

Discussion

The aim of the current study was to investigate the relationship between maternal anxiety and depression symptomatology throughout the first 12.5 years of parenthood and children's internalizing and externalizing problems at the age of 12.5 years. Children's problems were reported by both mother and child. Using latent TSO modeling, variance in maternal anxiety and depression symptomatology was decomposed into a chronic (trait) and a transient (occasion-specific) part, and we subsequently investigated whether these parts related differently to child internalizing and externalizing problems. In this community sample, at each point in time, about 10% of mothers scored above cut-off indicating potential clinical anxiety and/or depression symptomatology. The majority of mothers never scored above cut-off for depression (60.16%) or anxiety (67.21%). The results of our TSO modeling analysis indicated that the majority of the variance in maternal anxiety and depression symptomatology could be explained by the chronic trait factor. This chronic trait part of maternal anxiety and depression symptomatology was related to both mother- as well as to child-reported internalizing problems. For the occasion-specific part, only maternal depression symptomatology at the child's age of 12.5 years was associated with more mother-reported internalizing problems at this age. There were no associations with externalizing problems of the child.

The association between chronic (clinical-level) maternal depression and children's internalizing and externalizing problem behavior at child ages 3–5 years has been found before (Brennan et al., 2000; Hentges et al., 2020; Netsi et al., 2018). However, using the TSO model (Cole et al., 2005), we could address the limitations of previous studies in operationalizing chronicity (i.e., by defining chronicity regardless of severity and based on mothers' own history of symptomatology). In the only (to our knowledge) other study in which TSO modeling was used to examine associations between trait and state depression and anxiety and child outcomes (Prenoveau et al., 2017), the trait variance in both generalized anxiety

Table 4

Standardized Regression Coefficients (β ; SE) for Pathways Between Trait-State Occasion Factors for Anxiety/Depression Across Measurements and Child Internalizing and Externalizing Behavior (Combined Model)

Variable	Oad3mo	Oad12mo	Oad4y	Oad8y	Oad12.5y	Trait
SDQ-Int mother 12.5y	.07 (.12)	-.04 (.31)	.01 (.18)	.09 (.15)	.12 (.13)	.38** (.11)
SDQ-Int child 12.5y	.02 (.12)	.01 (.31)	-.11 (.19)	.03 (.16)	.03 (.14)	.26* (.11)
SDQ-Ext mother 12.5y	-.09 (.12)	-.06 (.33)	-.08 (.19)	.01 (.16)	-.04 (.14)	.02 (.11)
SDQ-Ext child 12.5y	.03 (.13)	-.07 (.33)	-.05 (.20)	.03 (.16)	-.10 (.14)	-.01 (.11)

Note. β = standardized coefficient for the pathway from the trait-state-occasion model factor (Oad3mo to Oad12.5y) to the child outcome at the child's age of 12.5 years (SDQ Int or SDQ Ext as reported by the mother or the child). SDQ = Strengths and Difficulties Questionnaire; Int = Internalizing subscale; Ext = Externalizing subscale; Oad = combined anxiety/depression occasion factor; mo = month; y = year.

* $p < .05$. ** $p < .01$.

disorder and major depressive disorder was related to child internalizing and externalizing problem behavior at the child's age of two years. We partly replicated these findings, in a nonclinical sample of mothers and with children who were markedly older, as we only found associations with internalizing, but not externalizing, problem behavior. Because a relatively low percentage of mothers in our sample scored above clinical cut-off scores for anxiety and depression, the current study provides further evidence that chronic, subclinical, symptomatology may also have consequences for child behavior and development (Kingston et al., 2018). This way, our study builds on previous findings by showing that chronic maternal anxiety and depression symptomatology, regardless of the degree of severity, is associated with children's internalizing problems when they are at the start of adolescence and are transitioning to secondary school (i.e., at the age of 12.5 years).

When assessing maternal symptomatology longitudinally, during a considerable period of time (i.e., 12.5 years), the chronic "trait" variance in anxiety and depression seems to be mainly responsible for the observed levels of symptomatology. That is, about 66% of the variance in maternal anxiety and depression scores at a specific moment in time could be explained by this chronic source of variance in maternal symptomatology. This percentage is well in line with earlier research into the relative stability of trait anxiety and depression (Struijs et al., 2020). Thus, only a small portion of the variance in maternal symptomatology at a given point in time can be attributed to transient influences. We can only speculate whether transient postpartum symptoms therefore did not have a lasting effect on child development, or that postpartum symptoms stabilized after birth and thus ended up in the trait factor in our analyses. As the birth of a child is a significant life event, challenging parents' available resources over a relatively long period of time (Henshaw et al., 2018; Hong Law et al., 2019; Young et al., 2020), it cannot be excluded that individual differences in how the transition to parenthood is experienced might have a stable influence on trait variance in maternal distress. An important and interesting avenue for future research would be to include multiple measurements of distress during pregnancy, and preferably already before conception. This way, the relative influence of the transition to parenthood on transient versus stable maternal distress could be captured (for an example in the domain of parental personality, see Denissen et al., 2019).

Why only the chronic part of maternal symptomatology would be associated with internalizing problems in child behavior was beyond the focus of the current study. However, there are several factors that could explain this association. First, maternal distress

is associated with the quality of parenting behavior (Crnic et al., 2005; Koss & Gunnar, 2018; Stein et al., 2014). The quality of the parent–infant interaction is fundamental for children's healthy development (Osher et al., 2020). One of the most central elements of high-quality parenting is the ability to be sensitive to the child's needs (Stein et al., 2014). Parental sensitivity is related to lower infant stress levels (Albers et al., 2016), and developmental milestones when children grow older, such as social competence (Sroufe, 2005) and self-regulatory capacities (Bridgett et al., 2015; Morawska et al., 2019). Maternal symptomatology could thus be related to children's internalizing problems through decreased quality of parenting and less sensitivity. Second, the acquisition of internalizing problems through the modeling of parental behavior could play a role. For example, children display increased fear in response to parents' anxious behavior (Bögels & Brechman-Toussaint, 2006). Third, it is possible that a shared genetic susceptibility for developing symptoms of psychopathology could explain the association between the chronic part of maternal symptomatology and children's internalizing problems (Koss & Gunnar, 2018; Stein et al., 2014). This susceptibility could reflect genetic effects, in that mothers who have a chronic predisposition for negative affect are likely to pass on this disposition to their children, who would then be more likely to face problems themselves.

In contrast to previous studies, we did not find an association between maternal symptomatology and externalizing problem behavior of the child. That we only found an association with internalizing problems is consistent with direct genetic transmission because trait negative affect (depression and anxiety) is phenotypically much closer to internalizing problems than to externalizing problems. The differences with previous studies might be explained by differences in the age of children. Previous studies measured children's behavior between ages 2–5, whereas in our study the children were 12.5 years old. It could be that younger children respond more often with externalizing problem behavior to maternal anxiety and depression symptomatology, whereas internalizing problems become more salient later on. Indeed, the age of onset of externalizing versus internalizing problem behavior seems to differ. Typically, externalizing problems have an earlier age of onset (Kessler et al., 2007) and tend to decrease over time during the preschool years (Miner & Clarke-Stewart, 2008). Furthermore, differences in the way children's developmental problems were measured might account for the differences in results with respect to externalizing problem behavior. In two studies (Brennan et al., 2000; Netsi et al., 2018), a total scale encompassing both internalizing and externalizing problems was

used, potentially concealing differential associations with internalizing and externalizing problems. To be able to reach robust and generalizable conclusions, future research should apply uniform procedures to measure children's internalizing and externalizing difficulties (see also Achenbach et al., 2016). Because, depending on the child's age, maternal symptomatology might be differently related to children's internalizing and externalizing problem behavior, we recommend using instruments suitable for distinguishing between these types of children's developmental difficulties.

Finally, chronic maternal symptomatology might only lead to externalizing problem behavior in children at the start of adolescence who have a specific vulnerability or susceptibility (diathesis stress or differential susceptibility hypothesis; Belsky, 1997a, 1997b, 2005). For example, children who received lower quality of care reported more externalizing problems in adolescence when they had a more negative temperament in infancy (Belsky & Pluess, 2012). Future research should take into account that the association between chronic maternal symptomatology and children's internalizing and externalizing problems might differ depending on specific characteristics of the child (e.g., children's genetic susceptibility; Belsky & van IJzendoorn, 2017); adverse experiences such as a traumatic event (Chemtob et al., 2010); and also the family context (i.e., concurrent paternal psychopathology (Gutierrez-Galve et al., 2019); or other psychosocial problems within the family).

With regard to the transient fluctuations in maternal symptomatology, only a marginally significant association emerged between maternal depression symptomatology at the child's age of 12.5 years and children's internalizing problems as reported by the mother. For all other ages, no associations between the transient variance in maternal symptomatology and child internalizing or externalizing problems at 12.5 years were found. This confirms that chronic variance in maternal anxiety and depression symptomatology appears more detrimental to child development, compared to transient fluctuations in symptomatology (i.e., the occasion-specific part).

The absence of significant pathways from occasion factors to children's internalizing and externalizing problems might be explained by the time that passed between the measurements of maternal symptomatology and those of children's behavior. With increasing time between adjacent occasion-specific factors (i.e., from 3 to 6 months, from 6 months to 1 year, and from 1 year to 2.5 years), the autoregressive effect became weaker. It is possible that the association between transient maternal symptomatology and children's internalizing problems is limited to points close in time. This notion is supported by the significant association between the (depression) occasion factor at 12.5 years and children's internalizing problems at 12.5 years. Multiple measurements of child adjustment would be required to empirically test the validity of this explanation.

Alternatively, because the mother-reported association between transient fluctuations in maternal depression symptomatology at 12.5 years and children's internalizing problems were not found in the child-reported measurement, it is possible that the current symptomatology of the mother affected her view of the child's behavior, leading to biased reporting of children's problems (Beijers et al., 2020; Fergusson et al., 1993).

Strengths and Limitations

The present study has several strengths. First, mothers and children were followed longitudinally, over a considerable period of time (12.5 years), with nine assessments and relatively low dropout. Second, at the child's age of 12.5 years, not only the mother reported on the child's development, but also the children themselves. This gave us the opportunity to compare mothers and children's views on the child's developmental problems. The significant difference between mother and child reports of internalizing and externalizing problems underlines the importance of including the child's own observation next to the maternal report (Beijers et al., 2020; De Los Reyes & Kazdin, 2005). However, in our study, we found a much higher correlation between mother- and child-reported internalizing problems compared to externalizing problems. This pattern has been observed before (Madsen et al., 2020). Adding also other observations (such as reports of the other parent, teacher reports, clinical ratings, observational measures of parent-child interaction or social interactions at school) could increase the reliability of measurements of children's internalizing and externalizing problems and result in more fine-grained indices of child adjustment. Third, using TSO modeling, we were able to use both the trait and occasion variance in maternal symptomatology as separate predictors of children's internalizing and externalizing problems. Using this method, we could (a) account for the pattern of relative stability that is inherent to many psychopathological constructs and (b) prevent chronicity of symptomatology to be confounded with symptom severity, which is a limitation of many previous studies into chronicity of maternal anxiety and depression.

This study also has limitations that are important to note. First, our sample was relatively well-educated, most mothers lived with their partner, and mothers had a relatively low degree of symptomatology across these 12.5 years. This limits the generalizability of our findings to, for example, lower-educated mothers and mothers with risk factors for developing anxiety and depression symptomatology or mothers who already display clinical-level anxiety or depression symptomatology. Second, because we only included child symptoms at age 12.5 years, we were unable to investigate potential bidirectional effects between maternal and child symptomatology over time. Future research could test additional longitudinal models in which trait and occasion-specific variance in children's behavior is compared with trait and occasion-specific variance in maternal distress symptomatology. Third, accumulating research shows that fathers' symptomatology is also associated with children's internalizing and externalizing problems (Kvalevaag et al., 2013; Sweeney & MacBeth, 2016). Moreover, there are indications that mothers' and fathers' trajectories of affective symptomatology differ: while maternal symptomatology shows high stability over time, fathers' symptomatology gradually worsens (Hughes et al., 2020), at least for fathers with higher levels of symptomatology (Kiviruusu et al., 2020). Future research should aim to include both mothers and fathers and follow (the interaction of) their symptomatology, as well as associations of trait and occasion parts with child development longitudinally. Fourth, because it is the chronic variance in maternal symptomatology (regardless of severity) that is related to child behavior, it is likely that a whole range of child outcomes are affected. In future research, a more fine-grained picture of the association between maternal trait and

occasion-specific symptomatology and children's long-term development and well-being could be established, by including (a) markers of social-emotional development (peers, social network); (b) cognitive development (cognitive abilities; performance at school); (c) biological measures (brain functioning; stress); and (d) indices of physical and mental health (immune system functioning; clinical disorders).

Conclusion

When following maternal anxiety and depression symptomatology across and beyond the first decade of parenthood, the current study showed that the chronic part of maternal symptomatology (whether mild or severe) is related to children's internalizing problems at the age of 12.5 years. That the chronic variance in maternal symptomatology is related to child behavior indicates that prevention and treatment of maternal anxiety and depression symptomatology is worthwhile for all mothers with stable, enduring symptomatology, regardless of the degree of severity. Future longitudinal research should include both maternal and paternal symptomatology, as well as a wider variety of markers of child adjustment. Moreover, because children report significantly more internalizing and externalizing problems than mothers do, both researchers and practitioners should refrain from relying on the mother only for monitoring children's well-being. Given that a major part of anxiety and depression symptomatology is determined by a chronic underlying trait factor, offering long-term support and preventive interventions to both mothers and children—who risk developing this chronic trait factor themselves—is of vital importance for their health and development.

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