

BRIEF REPORT

Predicting child problem behaviour at school age: The role of maternal sensitivity, child temperament and theory of mind

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Abstract

The present longitudinal study aims at investigating the interplay between child temperament, mother-child interaction quality and child Theory of Mind (ToM) at preschool age with regard to the development of child problem behavior at school age in 115 participants. Maternal sensitivity and child temperament were assessed when children were 4 years old. At 5 years of age, child ToM was assessed. At 8 years of age, child problem behavior was assessed. Results showed that child problem behavior was independently predicted by child temperamental negative affectivity and maternal sensitivity. The current study underlines the important role of both endogenous as well as exogenous factors for healthy child development.

KEYWORDS

childhood, maternal sensitivity, problem behavior, temperament, ToM

1 | INTRODUCTION

Problem behaviour in childhood is associated with negative pathways later in life, such as psychosomatic disorders and criminality (Fergusson, Horwood, & Ridder, 2005). Thus, it is of major interest to identify precursors of problem behaviours, so that prevention can be established at an early stage. In a developmental-ecological framework, the

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development of problem behaviours results from complex interactions between child characteristics, familial and extra-familial factors (Belsky, 1984; Loeber, Burke, & Pardini, 2009).

A main factor of the environment that is known to affect mental health is the parent–child relationship (Belsky, 1984; Bowlby, 1969; Miller-Lewis, Searle, Sawyer, Baghurst, & Hedley, 2013). The caregiver's sensitivity, which is defined as the ability to notice, understand and respond appropriately to the child's needs (Ainsworth, Blehar, Waters, & Wall, 1978), has been linked to positive child outcomes, such as secure attachment (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2008), good emotion regulation (Halligan, Cooper, Wheeler, Crosby, & Murray, 2013) and lower rates of behaviour problems (Easterbrooks, Bureau, & Lyons-Ruth, 2012; see Weinfield, Sroufe, Egeland, & Carlson, 2008, for a review).

However, there are theoretical accounts arguing that environmental influences do not affect all children equally: The differential susceptibility hypothesis (Belsky, 2004) proclaims that persons who are susceptible to environmental stressors might be more negatively affected by adverse circumstances but, on the other hand, might also be the ones benefitting most if the environment is very supportive. Child temperament is regarded as a main factor of differential susceptibility (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007). Temperament is defined as 'biologically rooted individual differences in behaviour tendencies that are present early in life and are relatively stable across various kinds of situations and over the course of time' (Bates, 1987, p. 1101). A major aspect of temperament is negative affectivity, which is characterized by negative emotions such as discomfort, frustration and low soothability (Rothbart & Derryberry, 1981). High negative affectivity has been linked to problem behaviours in childhood as well as antisocial behaviour later in life (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Chang, Shelleby, Cheong, & Shaw, 2012; Northerner, Trentacosta, & McLearn, 2016). Individuals with high negative affectivity have problems with adapting to new environments and respond with intense emotional reactions, which can be a challenge for sensitive parenting (Shaw, Bell, & Gilliom, 2000). Studies supporting the differential susceptibility hypothesis showed that maternal sensitivity moderated the link between a difficult temperament (e.g., difficulties with adaptability and mood) and problem behaviour (Bradley & Corwyn, 2008; Mesman et al., 2009). Similarly Wong, Stacks, Rosenblum, and Muzik (2017) found that infant negative affectivity correlated positively with toddler behaviour problems and that parental reflective functioning moderated this link. A meta-analysis also supported the differential susceptibility model by showing that children with a difficult temperament were more vulnerable to negative parenting but also profited more from positive parenting (Slagt, Dubas, Deković, & van Aken, 2016).

Another child characteristic that has shown relations to child problem behaviour is Theory of Mind (ToM). ToM is defined as the ability to impute mental states to oneself and others and to understand that one's own mental states differ from other persons' mental states (Premack & Woodruff, 1978; Wellman, Cross, & Watson, 2001). This ability develops around the fourth birthday (Wellman et al., 2001; Wellman & Liu, 2004). One theory that might explain the link between ToM and problem behaviour is social-deficit theory (Crick & Dodge, 1994; Dodge, 1986). According to this theory aggressive children over-interpret others' intentions as hostile and, therefore, react aggressively. Indeed, studies support this notion by showing a negative link between ToM and aggression (Austin, Bondü, & Elsner, 2017), as well as child attention problems, memory, impulsivity, executive functions and social problems (Fahie & Symons, 2003).

The present study aims to investigate the interplay between child temperamental negative affectivity, maternal sensitivity and child ToM at pre-school age with regard to the development of child problem behaviour at school age. We assumed that (1) child negative affectivity and maternal sensitivity would predict child problem behaviour and that (2) children with high negative affectivity would be more negatively affected by low sensitivity but would also profit most from high sensitivity (differential susceptibility hypothesis). Based on previous findings that maternal sensitivity fosters later child ToM development (Licata, Kristen, & Sodian, 2016), we supposed that (3) ToM would serve as a partial mediator between maternal sensitivity and child problem behaviour. As a control variable, we assessed child IQ. High IQ has been shown to be related to better ToM abilities (Tardif, So, & Kaciroti, 2007), as well as to lower rates of problem behaviours (Cook, Greenberg, & Kusche, 1994).

2 | METHOD

2.1 | Sample

The study was part of a longitudinal study (2007–2017) investigating social–cognitive development from infancy to childhood. The families were recruited from public birth records and mainly came from the middle socio-economic class in an urban area in Germany. Addresses were obtained through local birth records.

The sample of the present study consisted of $N = 115$ children ($n = 68$ girls, $n = 87$ boys), for whom the quality of the mother–child interaction was coded. When children were 4 years' old ($M = 50.64$ months, standard deviation [SD] = 0.80), child temperament, child problem behaviour and maternal emotional availability were assessed (t1). When children were 5 years' old ($M = 60.69$ months, $SD = 0.64$), child ToM was assessed (t2). When children were 8 years' old, child IQ and problem behaviour were assessed (t3). T3 was divided into two measurement points (Wave A and Wave B): In Wave A, children were $M = 93.37$ months' old ($SD = 1.25$), and, in Wave B, children were $M = 95.40$ months' old ($SD = 1.03$).

Data on child temperament were obtained for $N = 108$ children ($n = 7$ mothers did not fill out the questionnaire). Data on child ToM (t2) were assessed from $N = 110$ children ($n = 3$ children did not respond to one or both false belief tasks, $n = 2$ children did not attend). Child problem behaviour (t3) was assessed in $n = 87$ children ($n = 10$ children did not attend, Wave B, $n = 1$ child had to be excluded due to a severe developmental delay, $n = 17$ parents did not fill out the questionnaire), and IQ was measured in $N = 105$ children ($n = 12$ children did not attend). Maternal education could be assessed in $N = 109$ mothers ($n = 6$ mothers did not give an answer): Nine years of school (a non-college-bound track in the German school system) were attended by 1.8% of the mothers, 22.0% had 10 years of school, 25.7% had a high-school degree (13 years) and 50.5% had a bachelor or master's degree. At t3, 79.1% of the mothers were married/in a relationship. Additionally, 11.3% of the children had no siblings, 54.8% had one sibling, 18.3% had two siblings and 6.1% had three or more siblings.

The ethics committee approved the study (Title: Theory of Mind in childhood).

2.2 | Measures

All assessments took place in a laboratory setting at Ludwig Maximilian University in Munich, Germany. The tasks were administered by trained study assistants and PhD students.

2.2.1 | Mother–child interaction quality

The Emotional Availability Scales (EAS, Biringen, 2008, fourth edition) were used to assess maternal sensitivity based on a videotaped 10-min mother–child free play interaction in a laboratory setting. Mothers were instructed to 'play with their child as they usually would do at home'. A basket full of age-appropriate toys was provided. Maternal *sensitivity* assesses the mother's ability to be warm and emotionally connected to the child. The focus lies particularly on the appropriateness and authenticity of the affect. A sensitive mother mostly shows positive affect, and her verbal and nonverbal emotional expressions are congruent. Mother and child show enjoyment with each other clearly. In addition, the rating also comprises aspects like timing and flexibility in play. In case of an optimal rating, a 'special dance-like quality can be observed. The scale is rated on a 1–7 scale (7 = highest rating, 1 = lowest rating). The coding was carried out by two trained coders. In order to assure reliability, all videos were coded by a first observer, and 35% of the videos were coded by a second observer. Cohen's Kappa resulted $\kappa = .83$.

Validity of the EAS has been demonstrated in various studies, showing a significant relation between maternal sensitivity and infant secure attachment (Cheung & Elliott, 2016; Ziv, Aviezer, Gini, Sagi, & Koren-Karie, 2000).

Regarding overtime reliability of the EAS, most studies report moderate correlations between different time points (Biringen, Matheny, Bretherton, Renouf, & Sherman, 2000; Bornstein, Hahn, & Haynes, 2010; Hallers-Haalboom et al., 2017; Riddell et al., 2011). Moderate to strong retest reliability of the EAS has been reported (Endendijk, Groeneveld, Deković, & van den Boomen, 2019).

2.2.2 | Temperament

Children's temperamental negative affectivity was assessed using the German version of the *Children's Behaviour Questionnaire-very short form* (CBQ-VSF; Putnam & Rothbart, 2006). The CBQ was designed to measure temperament in children aged 3–7 years. The very short form, which consists of 36 items rated on 1–7-point scales by the parent (in our case, the mother), was constructed referring to the factor pattern of the standard form. Factor analysis of the CBQ resulted in three broad factors (Rothbart, Ahadi, Hershey, & Fisher, 2001) similar to three personality dimensions of the Big Five (Goldberg, 1990): surgency, effortful control and negative affectivity. For the present study, we focussed on negative affectivity, which loads high on fear, sadness, discomfort, anger/frustration and negative on reactivity/soothability. Reliability of the CBQ in the present study was good, with Cronbach's alpha ranging from $\alpha = .72$ to $.75$, which is similar to other studies (e.g., Ahadi, Rothbart, & Ye, 1993; Kochanska, De Vet, Goldman, Murray, & Putnam, 1994; Rothbart et al., 2001). Validity of the CBQ was confirmed in several studies, showing that the CBQ correlated with the CBCL scales to a largely equivalent degree across scales and raters (Clark et al., 2020). Reliability of the measurement has also been confirmed in several studies, showing good internal consistencies (Rothbart et al., 2001).

2.2.3 | Theory of Mind

Children's ToM was assessed through two false belief tasks from the German version of the ToM Scale (Wellman & Liu, 2004; see Hofer & Aschersleben, 2004, for the full German version). In the *Contents False Belief* task, the child was asked to judge another person's false belief about what was in a 'smarties' box when the child knew what was in it. The child was shown a 'smarties' box and was asked what he/she thought was inside. Then the box was opened, revealing a piglet inside. The container was closed again, and the child was asked the control question ('What was in the box?'). After this, a playmobile figure was introduced by telling the child that the figure had never looked inside the box. In the end, the test question ('What does Lukas think is inside the box?') as well as the control question ('Has he ever looked inside?') were asked. The second task was a *Location (Explicit) False Belief* task, which requires the child to judge whether someone would search for an object based on a false belief. The child was told that a playmobile figure was looking for his mittens; those could be either in the closet or in the backpack (which were presented on coloured drawings). The child was then told that in reality, the mittens were in the backpack, but that the playmobile figure believed that they were in the closet. The test question that followed was 'Where will Paul look for his mittens?', as well as the control question 'Where are they really?' If the child answered test and control question correctly, he/she was rewarded one point. The child could achieve a score between 0 and 2 in the sum of the two false belief tasks. A study that examined the psychometric criteria of the German version of the ToM scale found a good reproducibility, Reproducibility (REP) = .95 (Kristen, Thoermer, Hofer, Aschersleben, & Sodian, 2006).

2.2.4 | Problem behaviour

The German version of the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997) is a brief behavioural screening questionnaire detecting child problem behaviours in 3- to 16-year-olds. It consists of 25 items, leading to the following five scales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship

problems and prosocial behaviour. The addition of the first four scales results in a total problem score, which was used in the present study. The child's behaviour is rated on a 0- to 2-point scale (0 = not applicable, 1 = partially applicable, 2 = totally applicable). In our study, the questionnaire was filled out mostly by the children's mothers ($n = 2$ questionnaires were filled out jointly by the mother and the father, $n = 2$ questionnaires were filled out by the fathers). Validity of the SDQ has been proven in several studies, for example, by showing high correlations with the CBCL (e.g., Klasen, Woerner, Rothenberger, & Goodman, 2003). Reliability of the SDQ is also high with a mean of Cronbach's $\alpha = .73$ (Goodman, 1997).

2.2.5 | Child IQ

Each child's IQ was measured using the German version of the *Wechsler Intelligence Scale for Children* (WISC-IV, Wechsler, 2003; German version Petermann & Petermann, 2011). The WISC-IV is an intelligence test for children between the ages of 6 and 16 years. It has 15 subtests, allocated to four subscales: verbal comprehension, processing speed, working memory and perceptual reasoning. In the present study, only the two index scores verbal comprehension and perceptual reasoning were assessed. The index scores of the WISC-IV have excellent reliability and validity, ranging from $r = .87$ to $r = .94$ (Wechsler, 2003).

3 | RESULTS

All analyses were completed by IBM SPSS Statistics 25. First, descriptive of the variables are presented. Afterwards, inferential analyses are reported.

3.1 | Descriptive analyses

In Table 1, descriptive statistics for all study variables are listed.

As depicted in Table 2, child perceptual reasoning IQ, child verbal comprehension IQ, child negative affectivity and maternal sensitivity were related to child problem behaviour. Maternal sensitivity was not related to child ToM.

3.2 | Inferential analyses

3.2.1 | Preliminary analyses

Before computing inferential statistical analyses, missing data were analysed. Data were missing for maternal education ($n = 6$), child IQ ($n = 10$), temperament ($n = 7$), ToM ($n = 5$) and child problem behaviour ($n = 28$). Little's Missing Completely At Random (MCAR) test (Little, 1988) was applied and revealed that data were missing at random, $\chi^2 = 112.74$, $p = .33$. Hence, multiple imputation was performed by applying the expected maximization (EM) algorithm, and further analyses were conducted with imputed data.

3.2.2 | Multiple hierarchical regression analysis

To answer the first hypothesis that child negative affectivity and maternal sensitivity would predict child problem behaviour, we conducted a multiple hierarchical regression analysis with child problem behaviour as the

TABLE 1 Descriptive statistics

	Age (years)	N	M	SD	Range		
Problem behaviour	8	87	7.08	4.67	1	-	19
Maternal sensitivity	4	115	4.24	1.16	1	-	7
Negative affectivity	4	108	4.00	0.92	1.58	-	5.75
ToM	5	110	1.55	0.67	0	-	2
Perceptual reasoning IQ	8	105	106.46	13.10	78	-	129
Verbal comprehension IQ	8	105	108.64	12.49	75	-	152

Abbreviations: SD, standard deviation; ToM, Theory of Mind.

TABLE 2 Intercorrelations between the study variables

N = 115	1	2	3	4	5	6
(1) Child problem behaviour	1					
(2) Child perceptual reasoning IQ	−0.31*	1				
(3) Child verbal comprehension IQ	−0.23*	0.32**	1			
(4) Child negative affectivity	0.36**	−0.12	−0.12	1		
(5) Child Theory of Mind	−0.19	0.15	0.36*	−0.10	1	
(6) Maternal sensitivity	−0.22*	0.01	0.10	−0.10	−0.06	1

** $p < .01$,

* $p < .05$, two-tailed.

outcome variable using the enter method. In step 1, the control variables were entered. In a second step, variables that were collected at t1 (maternal sensitivity and negative affectivity) were entered. To test whether maternal sensitivity served as a moderator with regard to the link between negative affectivity and behaviour problems (second hypothesis), we included an interaction term (sensitivity \times negative affectivity) in a third step. In order to avoid multicollinearity, relevant terms were centred before entering them into moderation analysis. To test whether ToM would serve as partial mediator between maternal sensitivity and child problem behaviour (third hypothesis), child ToM (t2) was entered in step 4. As depicted in Table 3, child problem behaviour was significantly predicted by child perceptual reasoning IQ, child negative affectivity and maternal sensitivity. There was no interaction effect between child negative affectivity and maternal sensitivity; thus, no additional analyses with regard to differential susceptibility were performed. Maternal ToM did not mediate the link between maternal sensitivity and child problem behaviour. The overall model explained 26.6% of the variance of the outcome variable.

3.2.3 | Post-hoc analysis

In order to investigate which effect sizes we were able to detect, we conducted a post-hoc power analysis with G*Power 3.1.9.7. We assumed different levels of powers with a sample size of $N = 115$, and an alpha level of $p < .05$. The analysis revealed that by assuming a power of .80, the effect size to be detected is $f^2 = 0.13$, with a power of .50, the effect size to be detected is $f^2 = 0.07$ and, with a power of .20, the effect size to be detected is $f^2 = 0.03$.

TABLE 3 Multiple hierarchical regression analysis to predict child problem behaviour

<i>N</i> = 115	<i>F</i>	<i>p</i>	<i>R</i> ²	Adj. <i>R</i> ²	β	<i>p</i>
<i>Step 1</i>	7.68	<.001	0.12	0.10		
Child perceptual reasoning IQ					-.26	.027
Child verbal comprehension IQ					-.15	.228
<i>Step 2</i>	9.29	<.001	0.25	0.22		
Child perceptual reasoning IQ					-.24	.018
Child verbal comprehension IQ					-.10	.386
Child negative affectivity					.30	.001
Maternal sensitivity					-.18	.047
<i>Step 3</i>	7.42	<.001	0.25	0.22		
Child perceptual reasoning IQ					-.24	.015
Child verbal comprehension IQ					-.10	.391
Child negative affectivity					.30	.001
Maternal sensitivity					-.18	.048
Child negative affectivity \times maternal sensitivity					.01	.992
<i>Step 4</i>	6.58	<.001	0.27	0.22		
Child perceptual reasoning IQ					-.24	0.17
Child verbal comprehension IQ					-.06	.627
Child negative affectivity					.29	.001
Maternal sensitivity					-.20	.035
Child negative affectivity \times maternal sensitivity					.01	.987
Child Theory of Mind					-.12	.273

4 | DISCUSSION

The present study investigated the role of maternal sensitivity, child temperament and ToM at pre-school age with regard to problem behaviour 4 years later. Results showed that lower maternal sensitivity and higher child temperamental negative affectivity, as well as lower child IQ, predicted higher problem behaviour. However, there was no interaction effect between maternal sensitivity and child negative affectivity nor did child ToM mediate the link between maternal sensitivity and child problem behaviour.

Our findings generally support theories and findings on the importance of maternal sensitivity with regard to healthy child development (e.g., Ainsworth et al., 1978) and specifically with regard to child problem behaviour (e.g., Easterbrooks et al., 2012). They extend previous findings by underlining the importance of maternal sensitivity also during early/middle childhood. Moreover, they support the assumption that temperament – and specifically negative affectivity – might be a key etiological factor of mental disorders (Garstein & Skinner, 2018; Wong et al., 2017). However, the differential susceptibility hypothesis (Belsky, 2004) was not supported, since maternal sensitivity did not moderate the link between child temperament and problem behaviour.

One possible reason for our findings could be that our sample consisted of highly educated mothers with high sensitivity ratings of mothers whose children showed low rates of problem behaviours. Indeed, means in the SDQ total difficulties score are $M = 11.7$ in clinical samples (Becker, Woerner, Hasselhorn, Banaschewski, & Rothenberger, 2004) and $M = 16.39$ in child welfare (Janssens & Deboutte, 2009), compared to $M = 7.08$ in our sample. Analogously, means in EAS sensitivity ratings hover around $M = 4.0$ in clinical samples (Frigerio, Porreca, Simonelli, & Nazzari, 2019; Licata, Zietlow, Träuble, Sodian, & Reck, 2016) and in low SES adolescent mothers

(Crugnola, Ierardi, & Canevini, 2018), compared to $M = 4.24$ in our sample. It is possible that the differential susceptibility hypothesis only applies for samples with high rates of child problem behaviours and low maternal sensitivity. Another reason could be that our study was conducted with pre-schoolers whose development was followed until school age. It might be that differential susceptibility applies more for infants and toddlers since they are more susceptible for environmental influences. Indeed, studies confirming differential susceptibility were conducted with infants or toddlers (e.g., Klein Velderman, Bakermans-Kranenburg, Juffer, & Van Ijzendoorn, 2006; Northerner et al., 2016). The findings of Kochanska, Aksan, and Joy (2007) also support this line of reasoning, since they found an interaction between child temperament and the mother-child relationship only in the child's second year of life. A meta-analysis also found support for differential susceptibility only when temperamental negative emotionality/affectivity was assessed during infancy (Slagt et al., 2016). Thus, the first 2 years of life might be a sensitive period for differential susceptibility.

Contrary to our expectations, we did not find a link between child ToM and later problem behaviour. One explanation for this might be that it is 'affective' ToM (i.e., inferring about others' emotions) and not 'cognitive' ToM (i.e., inferring about others' intentions/beliefs) that is related to problem behaviour. For example, studies showed that only affective ToM was related to empathy (Shamay-Tsoory, Tomer, Berger, Goldsher, & Aharon-Peretz, 2005) and proactive aggression (Austin et al., 2017). Thus, future research should look at the role of affective ToM with regard to problem behaviour.

A reason that could explain why maternal sensitivity was not predictive of child ToM in the present study could be that the children were between 4 and 5 years of age. Licata, Kristen, and Sodian (2016); Licata, Zietlow, et al. (2016) found that maternal sensitivity in *infancy* predicted child ToM. We assume that in this regard, infancy might be a sensitive period in which maternal sensitivity has crucial effects on later social-cognitive development.

4.1 | Limitations

The first limitation to be noted is that both problem behaviour and temperament ratings were parent-report measures. Thus, the possibility of biases cannot be ruled out. Another limitation is that most parents of the present study were highly educated and came from the middle socio-economic class. It is possible that the differential susceptibility hypothesis would be confirmed in a different sample in which more families with multiple risks were represented. Last, a post-hoc power analysis showed that our sample size was underpowered to detect very small effects. This could another reason for why the interaction effect between child temperamental negative affectivity and maternal sensitivity was not significant.

5 | IMPLICATIONS FOR CLINICAL PRACTICE

In order to prevent child mental health problems, it is important to target the improvement of maternal sensitivity. Indeed, intervention studies have shown that by improving maternal sensitivity, child behaviour problems can be reduced (Klein Velderman et al., 2006). Even if temperament cannot be the direct target of intervention, studies found that a program tailored to the child's temperament profile was associated with reduced rates of psychiatric visits (Cameron, Rice, Sparkman, & Neville, 2013). Thus, a program that combines sensitivity training and individualized temperament guidance could be most successful in preventing child problem behaviour.

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CONFLICT OF INTEREST

None.

ETHICS STATEMENT

The ethics committee approved the study.

DATA AVAILABILITY STATEMENT

Data have not been shared because depositing data to a public access site was not part of the consent process.

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