Cognitive Biases as Mediators Between Child Externalizing Behaviors and Parental Stress: A Dyadic Mediation Model

Abstract

Research has linked preschool children's externalizing behaviors with increased parental stress, often through parenting behaviors and cognitions like self-efficacy. Less attention has been paid to how children's behaviors may create cognitive biases in parents, causing them to focus on or remember negative behaviors, thus increasing stress. This study examined whether parental attention and memory biases mediate the link between child externalizing behaviors and parental stress, and explored differences between mothers and fathers. The sample included 43 heterosexual couples with children aged 3–6 years. Results showed that memory biases (but not attentional biases) mediated this relationship, particularly for fathers, who were more likely to recall their child's negative behaviors, contributing to higher stress. No crossover effects were found between parents. These findings suggest that interventions targeting memory bias modification may be particularly beneficial for fathers, addressing cognitive schemas related to their child's behaviors.

Keywords: Cognitive biases, child externalizing behaviors, parental stress, actor-partner interdependence model

Highlights:

- Memory biases, not attentional ones, mediate the relationship between child externalizing behaviors and parental stress.
- Fathers are more likely than mothers to recall their child's negative emotions and behaviors.
- There are no crossover effects between mothers and fathers.

“My son/daughter never listens what I say and just does what he/she wants.”

“He/she often screams and is nervous. I am upset.”

These are typical comments parents of children displaying externalizing behaviors (EB) make when professionals ask for their child’s daily functioning. Such comments underline how much parents of children with EB may be stressed (Mak et al., 2020; Schellinger et al., 2020). Child’s EB is defined as agitation, or aggressive, oppositional, or noncompliant behaviors (Bagner et al., 2012; Schellinger et al., 2020). When intensive and pervasive (for 7.3% of preschool children) (Basten et al., 2016), EB can interfere with the child’s general functioning (Kretschmer et al., 2022; Petersen et al., 2015). Some studies have found that the intensity of behavioral problems tends to remain unchanged during childhood (Eisenhower et al., 2009; Renk, 2008, 2011). EB develop early in life with a high level of heterotypic stability, as illustrated by substance abuse or risky behaviors during adolescence and early adulthood (Kretschmer et al., 2022; Picoito et al., 2021).

Children displaying EB have been characterized as being particularly demanding. Parenting children with EB can be challenging and stressful, especially when the demands of raising the children exceed available resources (Zeng et al., 2023). The link between parental stress and child EB is well established cross-sectionally (Guajardo et al., 2009) and longitudinally (Stone et al., 2016), with higher levels of parental stress associated with higher levels of a child’s EB as early as preschool years. A meta-analysis based on the transactional nature of the relations between parents’ and children’s behaviors (Patterson, 1982; Sameroff, 1975) provides solid evidence on the strength of child-driven effects in eliciting changes in parents’ psychological stress (Yan et al., 2021). Specifically, their results underlined that children’s EB at an early stage predicted increases in parents’ subsequent stress. Moreover, these child-driven effects may have cumulative and cascading effects that continue over an

extended period and pose an enduring influence on parental functioning and children's developmental trajectories (Masten & Cicchetti, 2010). This child effect on parental stress does not differ between girls and boys and is quite stable over time. This stability could be explained by the fact that parents might develop a generalized cognitive schema or expectations about their child's behaviors early on, and these schemas influence parents' subsequent emotions and behaviors (Yan et al., 2021). Children's EB is likely to affect parents' early expectations of their children's behaviors. Indeed, when dealing with a child exhibiting early and consistent EB, a parent might selectively focus on these behaviors and develop a lower threshold for reacting to them, albeit in an ineffective way (Yan et al., 2018).

These recent results align with Lazarus' transactional model of stress (Lazarus & Folkman, 1984) and the Parent-Child Relationship Model (Abidin, 1990). These models emphasized that parental stress arises when parents perceive the demands they are confronted to as threatening, uncontrollable, and stable, while considering their available coping strategies as insufficient. Typically, parenting a child with EB can be viewed as stressful and threatening, leading to subsequent parental stress. Extending cognitive models such as Beck's model (1967, 2002) to the domain of parenting, new parents may develop early parental cognitions related to their child's behaviors. When parenting a child with EB, these parental cognitions can become maladaptive and dysfunctional, affecting how parents interpret their family experiences. Many studies have already examined children's EB as a stressor and parenting styles as mediators for understanding parental stress (Mak et al., 2020). However, parental cognitions, which are considered stable according to information-processing models, have been understudied (Fang et al., 2022). When studied, researchers have primarily focused on self-efficacy beliefs and parental attributions (Sher-Censor et al., 2018). These types of parental cognition serve as a backdrop for more dynamic, in-the-moment cognitive processing of information related to understanding a child's behavior. For example, in response to child

EB, parents tend to make attributions for understanding a child's difficult behaviors and identifying the cause of the child's misbehavior (Colalillo et al., 2015). Parental attributions are categorized into two domains based on the locus of causality, i.e. parent-causal attributions, and child-responsible attributions. Parents who hold parent-causal attributions tend to believe that their parenting behavior contributes to their children's behavioral difficulties, whereas parents who hold child-responsible attributions tend to perceive their child's behavioral difficulties as intentional and controllable by the child themself (Snarr et al., 2009). Studies suggest that parents of children with EB tend to report more biased, child-responsible attributions for their children's misbehaviors compared to parents from the general population (Kil et al., 2020). They perceive themselves as having less control over their children's misbehavior. This child-responsible attribution leads to higher level of parental stress (Allen et al., 2010). Parental cognitions as transdiagnostic processes are of highest importance because they can be targets for clinical family interventions (Kil et al., 2020).

Yan et al. (2021) demonstrated that parents might develop generalized cognitive schemas or expectations about their child's behaviors early on, and these schemas influence parents' subsequent emotions. Information-processing theories suggest that stressed individuals, compared to non-stressed ones, tend to prioritize the processing of threat-relevant information over non-threat-relevant information, known as attentional and memory biases. These biases consist of a dysregulation in the individual's preferential allocation of attention and/or memory recall towards specific stimuli. Consequently, early parental schemas could be influenced by the processing of threat-relevant information. Cognitive biases have been widely studied as precursors to individuals' stress and anxiety. Typically, as a relational threat, children's EB could lead to parents' attention and memory biases, resulting in an allocation of attention and memory recall towards the child's negative behaviors or emotions (Aktar, 2022; Creswell et al., 2006). By way of illustration, a parent of a child with EB would

tend to focus more attention on their child's negative behaviors (aggressiveness, non-compliance) and emotions (anger), rather than neutral or positive ones. Additionally, the parent would be more likely to remember episodes during which their child was angry or aggressive, rather than times when the child was calmly playing or happy. Consequently, the parent would feel as though they have more negative experiences with their child, which would increase their parental stress.

Few studies have focused on parental cognitive biases. For example, Allen et al. (2010) showed mothers' heightened sensitivity to misbehaviors of teens with EB in the long-term. Manti et al. (2019) found that parents of children displaying high levels in EB could have an interpretation bias by overestimating their child's dysfunctional behaviors. These studies suggest that parents' attentional and memory biases may exist while not strictly measuring them. Still, one wonders whether these two cognitive biases contribute to the same extent to parental stress. A meta-analysis on cognitive biases in anxiety (Leung et al., 2022) showed different levels of information processing between attentional and memory biases. Attentional bias was generally assumed to operate automatically at the early stage of information processing, with memory bias occurring at the later stages of processing, which involve strategic regulation and controlled processing. As such, memory bias could be associated with more elaborative and reflective thinking, which activates schemas related to an individual's personal concerns.

Finally, many previous studies on children's EB and parental stress focus on an intra-individual perspective, mainly with mothers (e.g., Mackler et al., 2015; Stone et al., 2016), and sometimes on independent samples of mothers and fathers (de Maat et al., 2021; Mackler et al., 2015; Neece et al., 2012; Stone et al., 2016). Both parents are the primary socialization agents for children and should be included in all studies on parenting. The few studies that have compared these relationships between independent samples of mothers and fathers, have

shown similar levels of parental stress between them, but different pathways (Deater-Deckard & Scarr, 1996). On the one hand, the fathering vulnerability hypothesis suggests that fathers could be more vulnerable to family problems and difficulties than mothers (Cummings et al., 2004; Hoegler et al., 2024; Kopystynska et al., 2020). On the other hand, mothers could be more affected by child EB because they interact more frequently and are more responsive to their children, than fathers (Connell & Goodman, 2002; Kiff et al., 2011; Lewis & Lamb, 2003; Meunier et al., 2011). However, using independent samples of mothers and fathers does not allow the interdependence between the mother and the father within the same parental couple to be considered. Indeed, mothers and fathers are interdependent. Interdependence theory (Van Lange & Balliet, 2015) shows that close individuals can affect one another's outcomes during an interaction. High levels of dependence, such as between parental partners, lead to more reciprocal influence in behaviors, cognitions, and emotions. One of the processes by which parents are hypothesized to influence one another is crossover (Matei et al., 2021), for example, if the cognitive bias of one parent affects the parental stress of the other parent. Thus, considering gender differences and crossover effects is of great importance when studying triadic associations, as in the current study.

The current study

The current study first aims to consider the existence of attentional and/or memory biases in parents of children with EB. We hypothesized a positive association between the intensity of child EB and these biases. Specifically, the current study focused on children's behaviors rather than general tendencies by using cues related to positive and negative behaviors and emotions exhibited by the children. Indeed, attention and memory biases are typically best manifested when exposed to relevant pictures or words (e.g., children's behaviors) (Lipp & Derakshan, 2005).

The second aim is to investigate attentional and memory biases as mediators in the relationship between children's EB and parental stress. In terms of process, attentional and memory biases could act as independent mediators, underlying automatic vs. controlled information processing. They could also influence each other and induce a double mediation pathway for understanding the relationship between a child's EB and parental stress. Figure 1 illustrates both mediational pathways.

[Insert Figure 1 here]

Our third aim is to examine mother – father differences (i.e., actor effects) and crossover effects between mothers and fathers (i.e., partner effects) in the mediational cognitive bias pathway between children's EB and parental stress. For this, we use a dyadic mediation model. Due to mixed support for the mother – father differences in parental stress, we investigate the mother – father differences in the strength of the mediational path of cognitive biases in the relationship between a child's EB and parental stress. Next, due to the interactional nature of parental influence, we expected crossover effects between mothers and fathers to occur, i.e. that higher levels of a child's EB experienced by one parent would be related to more cognitive biases in the other parent and that higher levels of cognitive biases in one parent would be associated with higher levels of parental stress in the other parent (see Figure 2).

[Insert Figure 2 here]

Method

Participants and Procedure

Data were collected in 2017 from a sample of 43 heterosexual parental couples sharing the same household. The participants' ages ranged from 23 to 43 years old (M = 34.63 years

old, *sd* = 4.16). About 19.2% of participants completed secondary school, whereas 44.4% had a university degree and 34.3% a post-graduate degree. In our study, most parental couples (40.5%) had an average monthly income between €3000 and €3999, while 4.8% had an income between €1000 and €1999, 19% between €2000 and €2999, 23.8% between €4000 and €4999, and 11.9% had an income of €5000 or more. About 4.8% Twenty one percent of participants had only one child, 46.5% had two children, 28.3% had three children, and 4% had four children. When parents had multiple children in this age range, they were asked to select the oldest child. The children's ages ranged from 30 to 80 months old (*M* = 51.84 months old, *sd* = 13.83). Twenty-one percent of the children were consulting a psychologist for EB.

The recruitment aimed to collect data from children both exhibiting and not exhibiting EB, through children's schools and advertisements on social networks, including flyers. Separate advertisements were designed for the two groups. To recruit children displaying EB, the ads specifically targeted parents of children aged 3 to 6 years with challenging behaviors. For the recruitment of normative children, the ads only targeted parents of children aged 3 to 6 years.

Participants were informed of their rights and that they could withdraw from the study at any time. Institutional ethical review board approval was obtained from the University of XXXXX, for the project intitled "Cognitive biases in parents of children displaying externalizing behaviors".

Three waves of data were completed. First, mothers and fathers independently completed an online questionnaire related to their child's EB. Two weeks later, they were both invited to the lab to complete an online questionnaire and computer tasks (i.e., assessment of the attention and memory biases). A week later, they completed an online

questionnaire related to their parental stress. Of the initial 148 participants who completed the first questionnaire on child EB, 43 couples (i.e., 86 participants) completed all measures. Consequently, 62 participants (41.89%) dropped out after the first wave of data collection. Notably, no attrition was observed between the second and third waves.

. **Measures**

Children's EB. We used the 32 items of the externalized-aggressive behavior scale (e.g., my child is disobedient, or my child screams a lot) of the preschool version of the Child Behavior Checklist (CBCL) (Achenbach & Rescorla, 2000). The CBCL uses 3-point Likert scales (1 = *not at all present,* 2 = *moderately present*, and 3 = *often present*). Higher scores indicate higher levels of EB. The psychometric properties of the initial version of the scale were good, with α of .96 and *r* of .87 for test-retest reliability. The internal consistency for the current sample was .91. In our sample, 14% of the children were in the clinical or borderline range.

Cognitive biases. We used the Visual Probe Task (VPT) (MacLeod et al., 1986) (see Figure 3) which provides a direct measure of the allocation of visuospatial attention. It involves presenting a series of pairs of stimuli on a computer screen. This task used two stimulus modalities (i.e., pictures and words). Because EB is characterized by the expression of anger, the pictures used represented preschool children's faces displaying anger vs. neutral emotions. Recognition of facial expressions is automatic and does not require conscious awareness (Morris et al., 1998). EB is also characterized by specific children's features represented here by adjectives (i.e., the second modality).

Before the current study, as cue stimuli, 71 positive adjectives (e.g., smiling, relaxed, compliant) and 57 negative adjectives (e.g., nervous, violent, non-compliant) were matched on word length and the number of syllables, and tested on a prior validation on an

independent sample of 28 participants (n = 22 women; n = 22 parents). The participants' ages ranged from 18 to 60 years old (M = 37.75 years old, sd = 12.52). Most of the participants were in a relationship (n = 24). Participants rated all adjectives twice with a 5-point Likert scale. First, they were asked to indicate if the adjectives represented positive features of a child. Second, they were asked to indicate if the adjectives represented negative features of a child. Only the adjectives showing a high score of positivity (e.g., smiling) or negativity (e.g., violent) were used for assessing cognitive biases.

In the current study, each trial started with a central fixation cross for 500 ms. followed by a stimulus pair (a child's neutral face paired with a child's angry face, or the adjectives) presented in two areas of a computer screen for 500 ms. or 1250 ms. The child's face was that of a boy or a girl, depending on the gender of the child of the participants. Immediately after the pictures or adjectives disappeared, a small arrow (probe) replaced one of the stimuli. The parents were asked to respond to the probe as quickly and accurately as possible by pressing a response button. An attentional bias towards children's negative emotions or behaviors is reflected by faster response times to probes displaying representations of children's negative emotions or behaviors than one showing neutral cues. The task used two stimulus durations to examine the time-course and component processes of attentional biases. An attentional bias for relatively short-duration negative cues (i.e., 500 ms.) is likely to reflect early processes involved in initial visual orienting and thus rapid automatic capture of attention by salient stimuli. Longer stimulus duration (i.e., 1250 ms.) is likely to be more sensitive to later strategic processes involved in maintenance of attention or avoidance. The VPT scores were calculated as the difference between the reaction time for the positive adjectives or faces and the reaction time for the negative adjectives or faces. Positive scores indicated attention toward negative adjectives or faces (De Raedt et al., 2012). The VPT is one of the most widely used tasks for measuring attentional bias. A meta-analysis (Todd et al.,

2018) highlighted its reliability, notably because the stimuli presentation times are fully controlled by the experimenter, enabling the investigation of bias time-course.

[Insert Figure 3 here]

To measure memory biases, the Incidental Recall Task (IRT) (Gotlib et al., 2004; see Figure 4) was utilized. Each parent was tested individually, seated in front of a computer, with their index finger on a key labeled "yes" and their middle finger on a key labeled "no." Participants were instructed to focus on a cross at the center of the screen. The words "Describe him or her?" appeared on the screen for 500 milliseconds (ms), followed by a 250-ms pause. Subsequently, a stimulus adjective (e.g., quiet, nervous) was displayed in capital letters. Parents indicated whether the adjective described their child by pressing the appropriate key. The computer recorded both the response latency and the response for each trial. The intertrial interval was 1000 ms, and adjectives were presented in a random order. After the practical trials were completed, the experimenter left the room until the parent had finished. Subsequently, parents performed the digit-symbol copying task from the Wechsler Adult Intelligence Scale-IV (WAIS-IV) for three minutes as a distracter task. During this time, the experimenter remained outside the room. Upon returning, the experimenter provided the parent with a sheet of paper and instructed them to recall as many adjectives as possible from the previous task within a maximum of three minutes, regardless of whether they had endorsed the adjectives as child descriptive. To prevent deliberate reporting strategies, a cognitive load procedure was included: Parents memorized a six-digit number at the start of the task to be recalled at the end. Information-processing bias was assessed through reaction time and incidental recall measures. Reaction time was first calculated as the mean latency to decide (yes or no) for the words in each content category (i.e., negative vs. positive), that is, to make a child-referential judgment. More specifically, the IRT reaction time was the difference between the reaction time for deciding “yes” for the positive adjectives and the reaction time

for deciding “yes” for the negative adjectives. The reaction time for deciding “no” was introduced as a control measure. Incidental recall scores were then operationalized as the number of adjectives that were both originally endorsed and subsequently recalled from each content category, divided by the total number of words that were endorsed and recalled. Studies using the IRT have consistently shown evidence and reliability for measuring memory bias (see the meta-analysis by Everaert et al., 2022).

[Insert Figure 4 here]

Participants were tested individually in a quiet, dimly lit room. They were seated at 60 cm from the monitor in a height-adjustable chair. To avoid any primary effect, half of the participants began with the VPT while the other half began with the IRT. The experimental session lasted approximately 40 minutes.

Parental stress. The 18 items of the Parental Stress Scale (PSS) (Berry & Jones, 1995) were back translated in XXXXX. The XXXX-version of the PSS was validated using an independent sample of 287 parents (N = 250 mothers) aged between 20 and 58 years old (M = 36.55 years old, sd = 7.11). The final version of the PSS was composed of 13 items (e.g., I am happy in my role as a parent, reverse item) with a 5-point Likert scale (1 = *Strongly disagree* and 5 = *Strongly* agree) with an α of .85. PSS was negatively and moderately correlated with the scale of the Visual Analogue Mood Scale (Couper et al., 2006) related to negative emotions (r = -.32, p < .001). In the current study, α was .80.

Analysis Strategy

Data analyses were performed with SPSS 26 software. We first conducted preliminary analyses to check for multivariate outliers and normality. We found no outliers. Skewness and kurtosis values for all variables fell within the thresholds of |0.76| and |6.79|, respectively

(Finney & DiStefano, 2006), except for attentional measures, which were non-normally distributed (Table 1). We then used Spearman rho for the correlations. We used the Process Macro for SPSS for testing multiple mediations with a regression-based and bootstrapping approach (Hayes, 2019), which does not assume normal distribution. Process Macro allows multiple mediations models to be tested, i.e. (a) the two-mediator parallel model and (b) the two-mediator serial model (Figure 1). Estimating a multiple mediator model allows for a statistical comparison of indirect effects operating through different mediators (Coutts & Hayes, 2023).

We used the MEDYAD to test the dyadic hypothesis. MEDYAD is a regression-based and bootstrapping approach to implement the Actor-Partner Interdependence Model extended to Mediation (APIMeM) (Coutts et al., 2019). MEDYAD allows mediation analysis to be conducted with distinguishable dyadic data (i.e., heterosexual parental couples) and allows the estimation of the direct and indirect effects of each parent's assessment of a child's EB on their own and partner's parental stress through their own and partner's cognitive biases as mediators (Figure 2). Moreover, it allows (a) mother – father differences and (b) crossover effects between mothers and fathers to be tested. MEDYAD estimates model coefficients using separate regression equations as in most ordinary least squares regression analyses, an approach that has been shown to give similar results to structural equation-based analysis (Coutts et al., 2019).

Results

Preliminary and Correlational Analyses

Means, standard deviations, paired samples t-tests, and two-tailed Spearman's correlations among measures are displayed in Table 1. Table 2 shows two-tailed Spearman's correlations for the mothers' and fathers' samples respectively. The paired samples Wilcoxon

tests were non-significant, indicating that mothers and fathers did not show any score differences. Intercorrelations between mothers' and fathers' scores on CBCL and PSS were high ($r > 0.61$, $p < 0.001$), and IRT scores were moderately correlated ($r = 0.51$, $p < 0.01$). Because IRT scores for positive and negative cues were highly negatively correlated ($r = -0.99$, $p < 0.001$), only one measure was used, i.e. the IRT scores for negative cues. There were no significant effects of family income and educational status on any of the variables of interest ($p > 0.01$).

Correlational analyses between CBCL and VPT/IRT allowed for assessing the relationship between child EB and parents' cognitive biases (objective 1). CBCL and VPT scores were not significantly correlated ($r < 0.10$), while CBCL and IRT scores showed strong correlations ($r = -0.35$ for reaction time and $r = 0.59$ for IRT scores for negative cues).

Preliminary to the mediation analyses, PSS scores were positively and strongly correlated with CBCL ($r = 0.57$) and with IRT scores ($r = -0.38$ for reaction time and $r = 0.54$ for IRT scores for negative cues). VPT scores were not significantly correlated with PSS or IRT scores.

[Insert Tables 1 and 2 here]

Mediation Analyses

Because VPT scores were not associated with CBCL and PSS, only the IRT scores were included in the mediational path. The bootstrapping Process Macro was performed to examine if the parent's memory biases were mediators in the relationship between children's EB and parental stress. First, the regression analysis showed that CBCL was positively related to IRT scores ($b = 0.22$, $t = 9.79$, $p < 0.001$). While controlling for IRT, the second regression analysis showed that CBCL was related to PSS ($b = 0.62$, $t = 3.86$, $p < 0.001$). The results of the indirect effect based on 5000 bootstrap samples indicated a significant indirect positive

relationship between CBCL and PSS mediated by IRT (*Effect* = 0.34, *Bootstraap* CI_{95} = 0.09 and 0.55). IRT, as mediators, accounted for approximately 34% of the total effect on PSS. Moreover, there was a significant direct effect between CBCL and PSS. Table 3 displays the results of the mediation analyses.

[Insert Table 3 here]

APIMeM Analyses

APIMeM analyses of the indirect effect of CBCL on PSS through its effects on IRT are presented in Table 4. CBCL, as measured by fathers (father actor effect), predicted fathers' IRT scores ($b = 0.16$, $t = 3.21$, $p = 0.003$), such as, for fathers, a high level of CBCL was associated with higher levels of IRT scores for negative cues (i.e., pictures and words representing children's negative behaviors and emotions). Moreover, fathers' IRT were associated with fathers' PSS ($b = 1.85$, $t = 2.19$, $p = 0.03$). CBCL, as measured by mothers (mother actor effect), did not predict mothers' IRT scores ($b = 0.08$, $t = 0.05$, $p = 0.16$). Moreover, mothers' IRT were not associated with mothers' PSS ($b = 0.88$, $t = 0.97$, $p = 0.34$). CBCL had a direct significant effect on PSS, only for fathers. One partner effect was significant, i.e. CBCL, as measured by fathers, on mothers' IRT scores ($b = 0.20$, $t = 4.30$, $p < 0.001$). As such, a high level of CBCL as measured by fathers, was associated with more mothers' IRT scores for negative cues. A 95% bias-corrected confidence interval based on 5000 bootstrap samples showed that the father actor indirect effect (see Table 4) of CBCL on PSS through IRT did not include zero (*Effect* = 0.29, *Bootstraap* CI_{95} = 0.01 and 0.64), suggesting a significant indirect effect. No other indirect effects were statistically significant.

[Insert Table 4 here]

Discussion

The current study first aimed to consider the existence of attentional and memory biases in parents of children displaying EB, and second, to investigate attentional and memory biases as mediators in the relationship between children's EB and parental stress. The third objective was to examine mother – father differences (i.e., actor effects) and crossover effects between mothers and fathers (i.e., partner effects) in the mediational cognitive bias pathways between children's EB and parental stress.

Memory Biases in Parents of Children displaying EB

Our preliminary results confirmed previous cross-sectional and longitudinal studies (Guajardo et al., 2009; Kochanova et al., 2021; Mak et al., 2020; Stone et al., 2016) related to the positive association between children's EB and parental stress with higher levels of parental stress being associated with higher levels of children's EB during preschool years (i.e., 3 to 6 years old). Our results also showed the existence of memory biases in parents of children with EB. Thus, when parents of a challenging child attempt to recall memories involving their child, those memories are often negatively biased. De Los Reyes and Kazdin (2005) have already shown that, during clinical assessment, parents tend to recall a child's negative behaviors more than their positive ones. According to Brunk and Henggeler (1984), parents of child with EB tended to develop early cognitive sets or generalized schemas about their child's behaviors, and parents respond more to these early developed cognitive sets or schemas than to the child's actual behaviors.

On the contrary, our study showed that parents of a child with EB did not demonstrate any attentional bias. Attention bias is generally assumed to operate automatically at the early stage of information processing (Leung et al., 2022). When encountering a potential threat (such as a child's face displaying negative emotions or described with negative adjectives), parents with an attentional bias would automatically and firstly process the threatening

aspects of this information or/and may have difficulty disengaging attention from them. In our study, this automatic process was not confirmed and not associated with either child EB or parental stress. Our results suggest that parents of a child with EB would not focus their attention more on the child's negative behaviors and emotions, rather than on positive or neutral ones. One possible explanation concerns our methodological choice. The task used two stimulus modalities, i.e. pictures representing preschool children's faces and adjectives related to children's features. Perhaps, participants could not have shown any attention bias in the current study because the pictures were not those of their own child but of other children. Indeed, the degree to which someone would demonstrate a bias towards a specific stimulus is likely to depend on the salience of that stimulus to the individual. As such, parents would not demonstrate any attentional bias towards children's negative emotions, but rather towards their own children's negative emotions. So, the absence of results could be due to the lack of specificity of the stimuli. Furthermore, attention bias in the parent – child relationship could also be measured in a real relationship through an observational setting (e.g., eye tracking).

Memory Biases as Mediators in the Association Between Child EB and Parental Stress

Our results support that memory biases are mediators in the relationship between child EB and parental stress. During a child-parent interaction, parental cognitive schemas could be activated and influence parents' emotions (Yan et al., 2021). The existence of these parental cognitive schemas regarding the child's behaviors could explain the mediating effect of parental memory bias in the relationship between children's EB and parental stress. Parents of a child with EB could remember their child's negative emotions and behaviors more than their positive ones, which consequently could lead to more parental stress. Indeed, memory bias occurs at the later stages of information processing, which involves strategic regulation and controlled processing.

Actor and Partner Effects: Empirical Evidence Towards the Mediational Memory Bias Pathway between Child EB and Parental Stress only for Fathers

The paired samples tests showed similar levels of parental stress in mothers and fathers, and intercorrelations between mothers' and fathers' scores on children's EB and parental stress were high. It means that (a) mothers and fathers within the same parental couple could present similar levels of parental stress and that (b) having a child with high level of EB was positively and highly related to parental stress, for both mothers and fathers.

However, the mother – father difference would be found in the mechanism explaining the association between child EB and parental stress. Considering actor effects, APIMeM analyses show that the mediational memory bias pathway between child EB and parental stress was confirmed for fathers, but not for mothers. Only children's EB as measured by fathers had a direct and indirect effect (via father's memory bias) on parental stress, which was not observed for mothers. However, our results did not support the fathering vulnerability hypothesis because mothers would be equally stressed as fathers. Yet, paternal and maternal stress could be explained by different pathways. Our results allowed us to identify one possible paternal pathway, i.e. memory bias. Suggestions could be made to understand this result. In his systematic review, Yaffe (2023) showed that, compared to mothers, fathers employ a more authoritarian style of parenting patterns, characterized by more coercive, restrictive, punitive, and harsher parental behaviors, which may stem from the traditional gender differences between men and women in terms of social roles, traits, behaviors, and attitudes. Using coercive parental strategies with a child with EB could be useless and even lead to higher levels in EB (Moed, 2024; Patterson et al., 2016). Consequently, the discrepancy between expected child behaviors (e.g., respect for authority) and the child's actual behaviors (e.g., non-compliant behaviors) may lead to these memory biases in fathers, which could generate increased parental stress.

Next, the interdependence theory underlines that mothers and fathers are interdependent, so that they can influence each other's behaviors, cognitions, and emotions (Van Lange & Balliet, 2015). This mutual influence has been identified as a crossover effect (Matei et al., 2021; Newland et al., 2015). In the current paper, we expected crossover effects between mothers and fathers to occur, i.e. that higher levels of children's EB experienced by one parent would be related to more cognitive biases in the other parent and that higher levels of cognitive biases in one parent would be associated with higher levels of parental stress for the other parent. However, such effects were not found. Our results only suggest that the child's EB, as assessed by the father, positively influenced the mother's memory bias, i.e. fathers' perception of a high level of child EB was associated with more memory biases towards the child's negative behaviors and emotions in mothers. The unique contribution of the fathers on the mothers' could be explained by the fathers' and mothers' contributions at the different developmental stages of the child. Scott et al. (2018) and Dong et al. (2022) showed that father's parenting and cognitions were more influential on mothers during preschool years, in contrast to the predominant influence of mothers on fathers during earlier stages. However, this result needs to be replicated and discussed in future research.

Limitations and Future Research Directions

Despite the strengths of this research (inclusion of a dyadic perspective and identification of a key mechanism for explaining father stress), a few limitations must be acknowledged. First, the study sample was small (i.e., 43 parental couples), which limited the generalizability of the findings and increased the risk of Type II errors. Second, children's EB, cognitive biases, and parental stress have been assessed with self-reported, static, and cross-sectional measures, i.e., tasks on computers and questionnaires. Using an experience sampling method which integrates momentary assessment of parental stress and cognitive tasks and an observational setting for children's EB would allow for the dynamic assessment

of underlying cognitive mechanisms in the relationship between child EB and parental stress during daily functioning (Boemo et al., 2022). Third, previous research on depression and anxiety showed that memory biases were linked to initial biases in interpretation (Hertel et al., 2014; Tran et al., 2011). Consequently, assessing the interpretation bias in the relationship between child EB and parental stress would be of great importance and should be included in future research. Fourth, the short interval between the measurement times did not allow a causality pathway between child EB and parental stress to be identified. Finally, the absence of results for the attention bias as a mediator in the relationship between child EB and parental stress could also be due to the methodological choice of using VPT. Instead, eye-tracking methodology is a direct measure of attention allocation, as gaze direction and focus of attention are assumed to be tightly coupled. Through the assessment of a mother's and father's eye gaze, it would be possible to analyze attentional processes continuously during a triadic family interaction and to evaluate both early and late components of attention (Suslow et al., 2020).

General Conclusion and Implications

Notwithstanding the above limitations, the present study has highlighted (a) the existence of memory biases in parents of children with EB, (b) the mediating role of memory bias in the association between child EB and parental stress in fathers, and (c) the association between fathers' perception of high levels of child EB and increased memory biases in mothers.

The current findings have practical implications. Firstly, our results suggest that the relationship between a child's EB and parental stress can be explained by memory biases in fathers. Consequently, fathers might benefit from memory bias modification training that would modify their early parental schemas related to children's characteristics. Next, the

effect of fathers' perception of child EB on mothers' memory bias was thought to be connected to the mechanism of memory-sharing conversations (e.g., "today, Kevin/April was difficult when I picked him/her from school: he/she screamed and cried. It was terrible"). Such parental exchanges play a central role in the development of autobiographical memory and by extension memory bias, which can lead to parental stress. Parents scaffold each other's narratives about child characteristics. In the context of positive child behaviors, it is certainly a good point. However, when the child has EB, these memory-sharing conversations could lead to negative parents' memory bias. In our study, a father-driven effect was found, that could be explained by the predominant influence of fathers on mothers' parenting and cognitions during preschool years (Dong et al., 2022). Clinicians and experts in parenting could help parents by considering the strength of parents' narrations and conversations about the child, and by nuancing their speech about their child's behaviors. The narrative approach (Freedman & Combs, 2008) has already underlined the importance of language use and narrations in shaping perceptions of reality, notably family life (Galdiolo et al., 2016). However, these practical recommendations should be considered with caution due to the study's limitations.

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Table 1

Means, Standard Deviations, Paired Samples Wilcoxon Tests, and Correlations among Measures

	Mothers *M (sd)*	Fathers *M (sd)*	ZSkewness/ ZKurtosis	*Z*	1	2	3	4	5	6	7	8
1. CBCL	1.72 (0.36)	1.67 (0.38)	3.54/1.06	-1.65	_							
2. PSS	1.88 (0.50)	1.84 (0.53)	3.10/0.90	-0.64	0.57***	_						
3. VPT-a-500	-26.87 (216.08)	-5.47 (119.69)	-6.34/6.85	-0.08	0.10	0.02	_					
4. VPT-a-1250	35.32 (208.93)	20.15 (183.45)	14.89/6.92	-0.70	0.09	0.06	-0.10	_				
5. VPT-p-500	-48.35 (581.03)	28.40 (105.85)	-14.94/12.77	-0.22	-0.03	-0.01	-0.10	0.13	_			
6. VPT-p-1250	18.11 (148.40)	51.55 (309.54)	26.20/10.51	-0.60	-0.07	0.09	-0.04	0.02	0.21*	_		
7. IRT-RT	-43.37 (629.15)	36.88 (667.64)	-6.79/3.84	-0.86	-0.35**	-0.38***	0.05	-0.06	0.45***	0.05	_	
8. IRT-p	0.69 (0.12)	0.67 (0.11)	-2.13/0.76	-0.78	-0.58***	-0.54***	0.04	0.01	-0.02	-0.14	0.46***	_
9. IRT-n	0.31 (0.12)	0.33 (0.11)	2.17/0.80	-0.89	0.59***	0.54***	-0.03	0.02	0.02	0.13	-0.46***	-0.99***

Note. *** $p < .001$; ** $p < .01$; * $p < .05$

CBCL = Child Behavior Checklist; PSS = Parenting Stress Scale; VPT-a-500 = Visual Probe Task with adjectives (500 ms); VPT-a-1250 = Visual Probe Task with adjectives (1250 ms); VPT-p-500 = Visual Probe Task with pictures (500 ms); VPT-p-500 = Visual Probe Task with pictures (1250 ms); IRT-RT = Incidental Recall Task – Reaction time $_{negativecues}$ - Reaction time $_{positivecues}$; IRT-p = Incidental Recall Scores for positive cues; IRT-n = Incidental Recall Scores for negative cues

Table 2

Correlations among Measures for Mothers and Fathers

	1	2	3	4	5	6	7	8
1. CBCL	0.70***	0.65***	0.05	-0.03	-0.08	-0.01	-0.41*	0.65***
2. PSS	0.57***	0.61***	-0.04	0.13	0.01	0.21	-0.34*	0.66***
3. VPT-a-500	0.20	0.02	-0.48**	-0.12	-0.20	0.06	-0.09	-0.02
4. VPT-a-1250	0.17	0.08	0.10	-0.06	0.15	-0.04	-0.14	0.12
5. VPT-p-500	-0.12	-0.08	0.06	0.10	0.10	0.11	-0.10	0.07
6. VPT-p-1250	-0.16	-0.03	-0.14	0.08	0.22	0.07	-0.11	0.26
7. IRT-RT	-0.29	-0.49**	0.06	-0.01	0.68***	0.28	0.13	-0.48**
8. IRT-n	0.52***	0.46**	-0.21	-0.01	0.00	0.12	-0.45**	0.51**

Note. *** $p < .001$; ** $p < .01$; * $p < .05$

Mothers below the diagonal; Fathers above the diagonal; correlations between mother's and father's same measures on the diagonal

CBCL = Child Behavior Checklist; PSS = Parenting Stress Scale; VPT-a-500 = Visual Probe Task with adjectives (500 ms); VPT-a-1250 = Visual Probe Task with adjectives (1250 ms); VPT-p-500 = Visual Probe Task with pictures (500 ms); VPT-p-500 = Visual Probe Task with pictures (1250 ms); IRT-RT = Incidental Recall Task – Reaction time $_{negativecues}$ - Reaction time $_{positivecues}$; IRT-p = Incidental Recall Scores for positive cues; IRT-n = Incidental Recall Scores for negative cues

Table 3

Bootstrap Results for the Memory Biases as Mediators Between Child's EB and Parental Stress

Variables	*b*	*SE*	*t*	*95% Confidence Interval*	
CBCL → PSS	0.62**	0.16	3.86	0.30	0.94
CBCL → IRT	0.22**	0.02	9.79	0.18	0.27
CBCL → IRT → PSS	1.51*	0.52	2.89	0.47	2.55
Direct effect	0.62**	0.16	3.86	0.30	0.94
Indirect effect	0.34	0.12		0.09	0.56
Total effect	0.96**	0.12	8.29	0.73	1.19

Note. ** $p < .001$; * $p < .01$

CBCL = Child Behavior Checklist; PSS = Parenting Stress Scale; IRT = Incidental Recall Scores for negative cues

Based on 5000 bootstrap samples

Table 4

Bootstrap Results for the APIMeM Analyses

Variables	*b*	*SE*	*t*	*95% Confidence Interval*	
Father actor effect					
CBCL → PSS	0.80*	0.33	2.44	0.13	1.47
CBCL → IRT	0.16**	0.05	3.21	0.06	0.26
CBCL → IRT → PSS	1.85*	0.85	2.19	0.13	3.57
Direct effect	0.80*	0.33	2.44	0.13	1.47
Indirect effect	0.29	0.16		0.01	0.64
Total effect	0.91**	0.26	3.50	0.38	1.43
Mother actor effect					
CBCL → PSS	0.43	0.29	1.48	-0.16	1.03
CBCL → IRT	0.07	0.05	1.41	-0.03	0.17
CBCL → IRT → PSS	0.88	0.91	0.97	-0.98	2.75
Direct effect	0.43	0.29	1.48	-0.16	1.03
Indirect effect	0.06	0.08		-0.16	0.17
Total effect	0.55	0.27	2.02	-0.01	1.10
Father partner effect					
a^{fm}	0.20***	0.05	4.30	0.11	0.30
b^{fm}	0.51	0.88	0.58	-1.28	2.29
c^{fm}	0.16	0.34	0.47	-0.54	0.86
Indirect effects					
a^{fm}, b^{mf}	-0.19	0.20		-0.62	0.19
a^{fm}, b^{m}	0.18	0.20		-0.18	0.62
a^{p}, b^{fm}	0.08	0.15		-0.22	0.39
Mother partner effect					
a^{mf}	0.10	0.05	1.86	-0.01	0.20
b^{mf}	-0.94	0.88	-1.06	-2.73	0.85
c^{mf}	0.09	0.28	0.33	-0.48	0.67
Indirect effects					
a^{mf}, b^{f}	0.18	0.14		-0.06	0.49
a^{m}, b^{mf}	-0.07	0.11		-0.33	0.09
a^{mf}, b^{fm}	0.05	0.10		-0.18	0.25

Note. *** $p < .001$; ** $p < .01$; $p < .05$

CBCL = Child Behavior Checklist; PSS = Parenting Stress Scale; IRT = Incidental Recall Scores for negative cues

Based on 5000 bootstrap samples

See Figure 2 for the partner effects letters.

Figure 1

Testing the Cognitive Biases Mediational Pathway

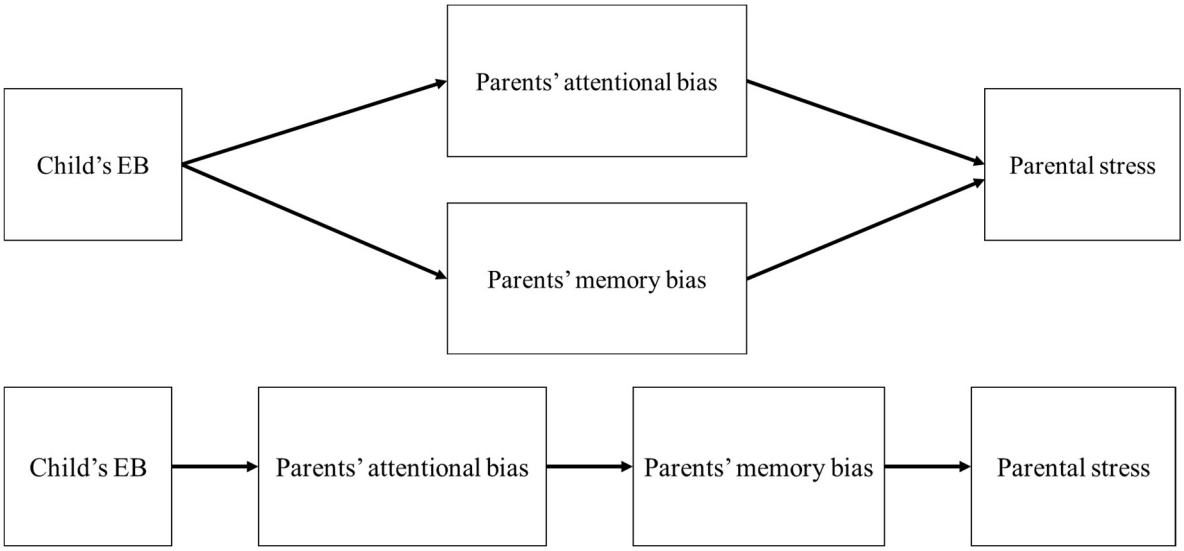


Figure 2

Testing (a) Mothers – Fathers Differences and Actor Effects (Continuous Line) and (b) Crossover or Partner Effects between Mothers and Fathers (Broken Lines) in the Mediational Cognitive Pathway between Child's EB and Parental Stress

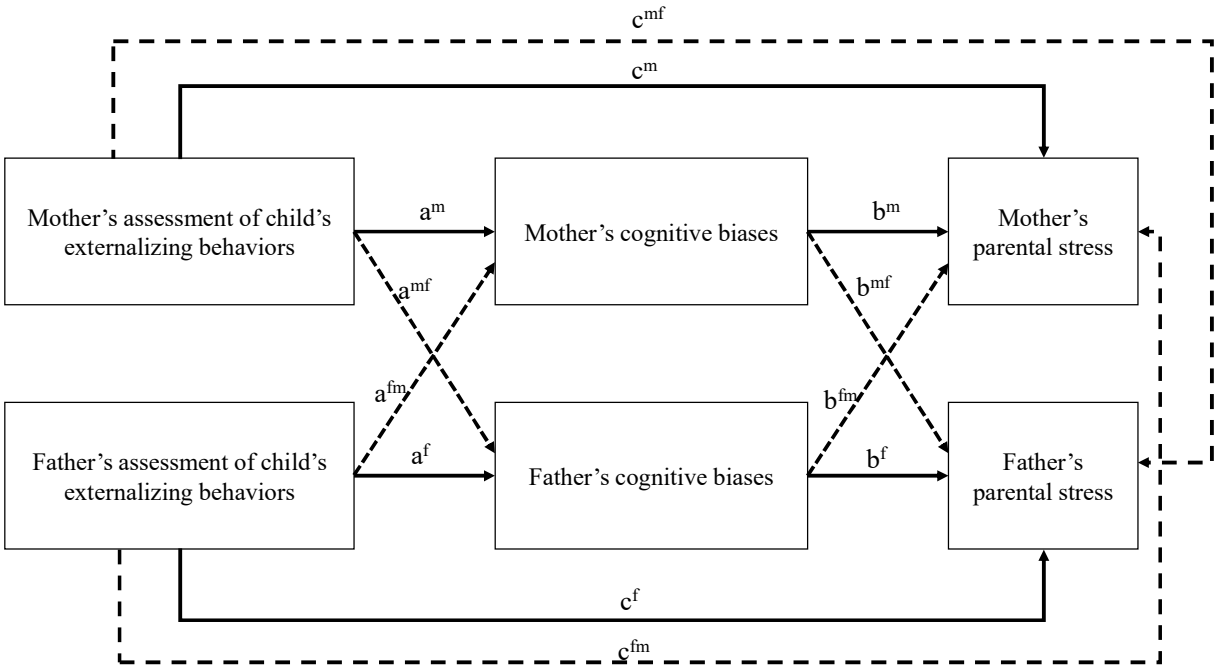
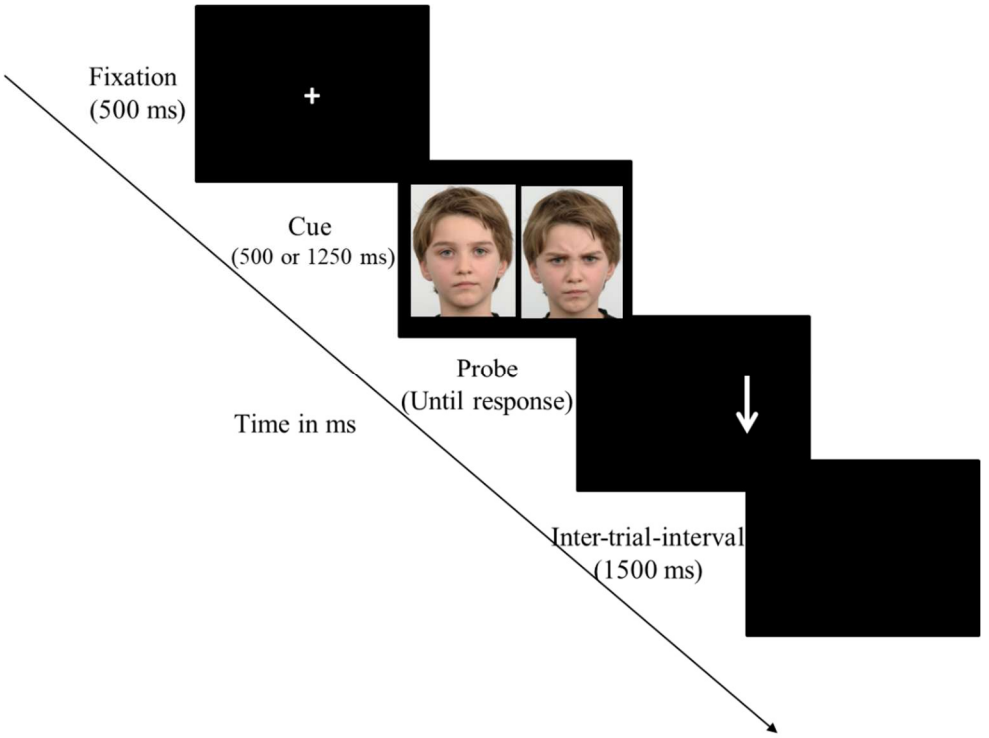


Figure 3

The Visual Probe Task with (a) Children's Faces Displaying Anger vs. Neutral Emotions and (b) Adjectives Representing Child's Specific Characteristics.



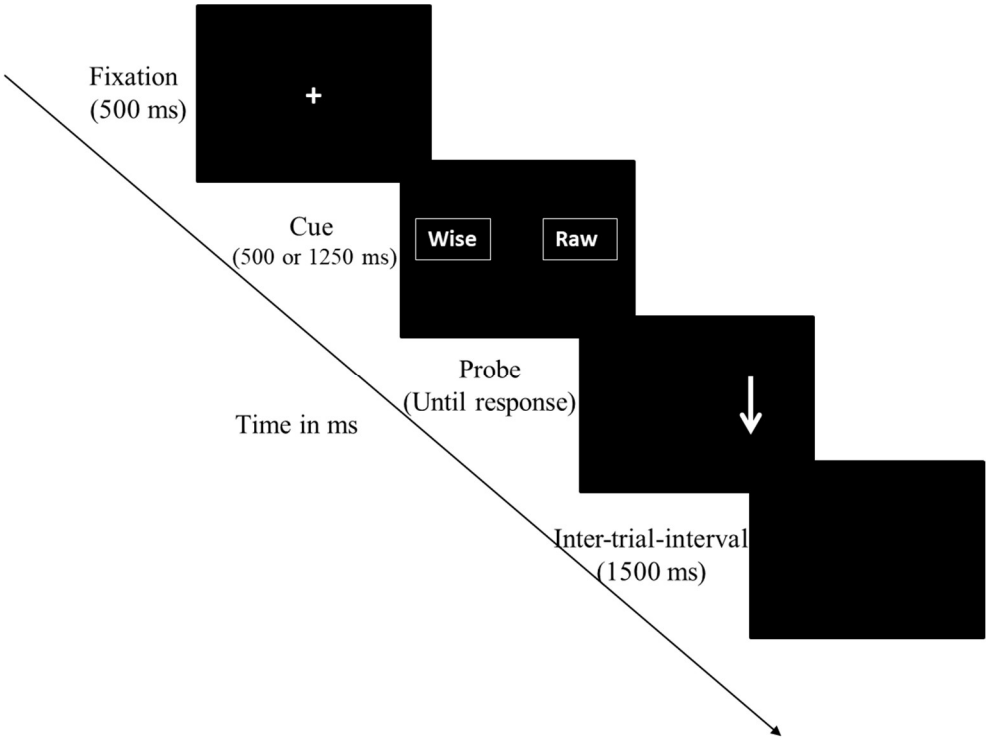


Figure 4

The Incidental Recall Task