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# Attachment and perceptual accuracy of hard and flat partner emotions in everyday life

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## Abstract

Perceiving partner emotions accurately is relevant for relationship functioning and may relate to perceivers' attachment orientations. Here we tested whether attachment anxiety and avoidance affect the perception of a hard and a flat partner emotion which can signal a relationship threat, that is, irritation and indifference towards the partner, and of general affective valence. We assessed whether individuals (1) over- or underestimate (directional bias) and (2) track changes (tracking accuracy) in their partner's emotions. Ninety-four couples reported on their own emotions and their perception of their partner's emotions multiple times per day during 1 week. Results revealed that more avoidantly attached men less accurately tracked changes in partner irritation and more anxiously attached men less accurately tracked changes in partner affective valence. No other significant associations of attachment with tracking accuracy nor with directional bias were found. Overall, the findings suggest no robust relation between attachment insecurity and perception of partner irritation, indifference and affective valence in everyday life.

KEYWORDS
attachment, bias, hard and flat emotions, perceptual accuracy

## 1 | INTRODUCTION

The ability to (relatively) accurately perceive close others' emotions plays a vital role in the development and maintenance of satisfying relationships (e.g., Ickes & Simpson, 2001; Sened et al., 2017). Emotions provide important information about individuals' needs and concerns and can help their partner coordinate actions in order to make them feel validated, understood and cared for (Fischer & Manstead, 2016; Van Kleef, 2010). When perception of partner emotions is biased or inaccurate, this can lead to inappropriate responses with potentially relationship-damaging effects (Fletcher & Kerr, 2010; Overall et al., 2015; but note that some types of biases, for example, positively biased global relationship perceptions, can also serve relationships; Gagné & Lydon, 2004). For example, when people inaccurately perceive their partner as being irritated, this may lead them to behave defensively, which can in turn provoke actual irritation in their partner. However, when individuals underestimate or miss their partner's signals of irritation, they cannot take action to remedy the situation, likely resulting in decreased relationship satisfaction over time.

The ways in which individuals perceive and attend to their partner's emotional signals are proposed to be affected by their attachment style (Mikulincer & Shaver, 2003). A few previous studies examined how perceivers' attachment styles relate to the perceptual accuracy of their partner's general negative emotions (Overall et al., 2015; Sadikaj et al., 2018). In the current study, we build further on this work, pinpointing two specific negative emotions that can convey a relationship threat (i.e., irritation and indifference towards the partner) as well as general affective valence, with the aim to extend our knowledge of the domains of partner signals for which attachment-related biased processing may occur. In line with previous studies, we focus on two components of perceptual accuracy, that is, (1) *directional bias*: the tendency to over- or underestimate partners' emotions and (2) *tracking accuracy*: the degree to which individuals accurately track changes in these emotions (Fletcher & Kerr, 2010). These two components are

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independent and individuals can simultaneously be biased and accurate (Overall et al., 2012), for example, an individual may generally overestimate their partner's negative emotions, but at the same time track *changes* in those emotions accurately. Using experience sampling methodology (ESM), we examined how perceivers' attachment styles relate to these components of perceptual accuracy of partner emotions in everyday life.

According to attachment theory, individuals develop representational models of the self and close others based on experiences in interactions with caregivers and other attachment figures (Bowlby, 1973). Such models are called internal working models (IWMs) and are proposed to guide individuals' expectations, perceptions and behaviour in attachment relationships throughout the lifespan (Mikulincer & Shaver, 2003). Securely attached individuals' IWMs reflect confidence in attachment figures and a view of the self as worthy of love and care. These individuals are proposed to process a broad range of attachment-relevant information, such as partner signals, in a relatively open way (Dykas & Cassidy, 2011). In contrast, insecure IWMs reflect negative expectations regarding attachment figures' responsiveness and availability, supporting negatively biased perceptions of close others. Two insecure attachment styles are typically distinguished: anxious attachment and avoidant attachment. Anxiously attached individuals long for connection but worry about abandonment or rejection and are hypervigilant towards their attachment figures (Feeney, 2016; Mikulincer & Shaver, 2003). Avoidantly attached individuals long for independence, believing that they cannot rely on their partners and striving to maintain emotional distance from close others (Feeney, 2016; Mikulincer & Shaver, 2003).

Attachment anxiety and attachment avoidance may affect directional bias and tracking accuracy of partner emotions. Both more anxiously and more avoidantly attached individuals are proposed to have a more negative directional bias, due to their *negatively biased perceptions* of close others. Moreover, insecurely attached individuals are proposed to use attentional strategies that, dependent on their attachment style, hyperactivate or deactivate their attention to partner signals, which should affect how accurately insecurely attached individuals *track changes* in their partner's emotions (Dykas & Cassidy, 2011; Kobak & Bosmans, 2019). On the one hand, anxious attachment is proposed to be associated with increased attention to signals in close others and thus with higher tracking accuracy, especially if these signals may convey a threat to the relationship (Simpson et al., 2011). On the other hand, more avoidantly attached individuals are hypothesized to divert their attention away from close others' signals (Dykas & Cassidy, 2011). Thus, attachment avoidance is proposed to be associated with lower tracking accuracy.

Prior research examining associations between attachment insecurity and perceptions of partners has provided some evidence for the proposed associations, although many studies did not distinguish between directional bias and tracking accuracy. For instance, when appraising the same negative partner behaviour, more insecurely attached individuals do so in a more negative way than more securely attached individuals (e.g., Collins & Feeney, 2004). Focusing on perceptual accuracy using the partner's own report as the accuracy benchmark, insecurely attached individuals were found to perceive their partners as less satisfied and less committed than their partners reported to be (Rodriguez et al., 2019). Further distinguishing between attachment anxiety and avoidance, Simpson et al. (2011) reported that more avoidantly attached individuals inferred their partner's thoughts and feelings less accurately compared to less avoidantly attached individuals during discussions with their partner. For attachment anxiety, context seemed to moderate perceptual accuracy. Compared to less anxiously attached individuals, more anxiously attached individuals perceived their partner's thoughts and feelings more accurately during more versus less relationship-threatening discussions. However, it remained unclear whether these attachment-related differences in perceptual accuracy were related to differences in directional bias, tracking accuracy or both, as these studies did not distinguish between them.

Only a few studies to date simultaneously considered negativity bias and tracking accuracy of perceptions of partner signals and their association with attachment insecurity. In two daily diary studies and one conflict discussion study, Overall and colleagues (2015) found that more avoidantly attached individuals showed a higher directional bias, that is, showed a greater overestimation of their partner's negative emotions, than less avoidantly attached individuals. However, avoidant attachment was not related to tracking accuracy. Additionally, attachment anxiety was not related to either directional bias or tracking accuracy. Similarly, in a study that employed an event-contingent recording design (i.e., individuals reported on their own and perceived partner negative emotions following interactions with their partner), avoidant attachment was related to a higher negativity bias but not to tracking accuracy. Again, no significant associations between attachment anxiety and directional bias or tracking accuracy were found (Sadikaj et al., 2018).

A possible explanation for the absence of a significant association of attachment avoidance with tracking accuracy in previous studies is that avoidance-related defensive strategies most likely emerge when information can be excluded from conscious awareness, such as when people have internal control over the information (e.g., are asked to remember prior experiences) or can process information in a relatively passive way (e.g., the information does not require a response; Dykas & Cassidy, 2011). As partner signals in real life are outside of the perceiver's control and can serve to convey that their response is needed, avoidantly attached perceivers may not be able to cope with them by directing their attention away (Overall et al., 2015).

Concerning attachment anxiety, these prior findings lead to the consideration that either attachment anxiety might not be related to directional bias or tracking accuracy of partner signals in everyday life or that previous studies did not capture the conditions in which attachment anxiety-related differences arise. Concerning the latter, it could be that the specific partner signals assessed in previous studies may not have been particularly relationship-threatening to anxiously attached individuals (Overall et al., 2015). Specifically, assessed partner emotions (at least partly) reflected soft emotions (e.g., hurt, sad), whereas so-called hard emotions (e.g., angry, irritated) or flat emotions (e.g., bored, indifferent) were either not assessed

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or averaged with soft emotions to form a general negative emotions index.

Soft, hard and flat partner emotions are all negative emotions but can have differential effects as they serve different interpersonal functions (Sanford, 2010). Soft emotions can serve an affiliative function and enhance relationship closeness (Fischer & Manstead, 2016; Sanford, 2007a). The potential threat that soft negative emotions pose may be diminished because they also convey reassurance for anxiously attached individuals who long for closeness in their relationship. In contrast, hard and flat emotions serve socially distancing functions (Sanford, 2007b, 2010) and can be considered more relationship threatening, as indicated by associations between (the perception of) such emotions and negative appraisals of and behaviour towards the partner. Specifically, experiencing hard and flat emotions relates to negative and destructive interpersonal behaviours (e.g., Lemay et al., 2012; Sanford, 2007a, 2007b). Moreover, the perception of hard and flat emotions in the partner is associated with perceiving the partner as hostile and uncommitted, respectively (Sanford, 2010). Additionally, perceiving the partner as experiencing hard emotions has been found to relate to more negative and less positive communication from the perceiver (Sanford, 2007a) and perceiving partner's flat emotions relates to more negative communication from the perceiver (e.g., criticism, defensiveness; Sanford, 2007b), likely because perceiving such emotions in partners can be threatening. One could, therefore, hypothesize that hard and flat partner emotions, which can convey a threat to the (closeness in the) relationship, may activate attachment anxiety-related differences in perception, as anxiously attached individuals are highly sensitive and vigilant to relationship threats (Gere et al., 2013; Mikulincer & Shaver, 2016; Simpson et al., 2011). To date, however, no research examined associations of attachment insecurity with negativity bias as well as tracking accuracy of such partner emotions.

### 1.1 | The current study

This study aimed to extend our knowledge of types of partner signals for which attachment-related biased processing occurs. To this aim, we tested whether partner signals that can convey a relationship threat, that is, irritation and indifference towards the perceiver, are subject to attachment anxiety and avoidance-related negativity bias and tracking accuracy. To further explore whether any found effects are specific to such emotions, or whether they relate to negativity bias and tracking accuracy of partner emotion in general, we also assessed associations of perceivers' attachment styles with the perception of partners' affective valence (positive vs. negative affect). We tracked individuals' own and perceived partner emotions in real-time in the flow of their everyday lives using ESM. This study's hypotheses, methods, and analysis plan were preregistered at https://osf.io/pr6hn, after data collection but before any of the research questions were analysed.

As both partner irritation and indifference may signal relationship threats that activate negativity and vigilance in anxiously attached perceivers, we predicted an increased negativity bias and higher tracking accuracy of irritation and indifference for more anxiously attached perceivers. In line with theory and previous empirical findings (Overall et al., 2015; Sadikaj et al., 2018), we also expected to find an increased negativity bias of partner irritation and indifference for more avoidantly attached perceivers. Concerning tracking accuracy, either a negative or a non-significant association with attachment avoidance could be predicted. According to theory, attachment avoidance-related defensive strategies are expected to result in decreased tracking accuracy of partner emotions. However, empirical studies did not find an association between attachment avoidance and tracking accuracy of partner emotions in real life. We, therefore, expected to find no associations between attachment avoidance and tracking accuracy of partner irritation and indifference. We predicted no significant associations of attachment anxiety with directional bias and tracking accuracy of partner valence, nor did we expect a significant association of attachment avoidance with tracking accuracy of partner valence. We expected to find an increased negativity bias for partner valence for more avoidantly attached perceivers (Overall et al., 2015; Sadikaj et al., 2018). These hypotheses were tested in heterosexual couples, in which partners are theoretically distinguishable based on gender. We tested whether partners are also empirically distinguishable with respect to (attachment effects on) negativity bias and tracking accuracy, but based on previous studies we did not expect to find robust gender differences (Overall et al., 2015; Rodriguez et al., 2019; Sadikaj et al., 2018). In line with previous studies, we controlled in our analyses for the effect of perceiver's own emotions on their perception of their partner's emotions, that is, for the so-called projection bias or bias of assumed similarity which is often found in perceptual accuracy research (e.g., Kenny & Acitelli, 2001).

## 2 | METHODS

### 2.1 | Participants

Couples were recruited via social media, and flyers and ads were distributed in public places. Inclusion criteria were: over the age of 18, heterosexual, and fluent in Dutch. The full sample consisted of 101 couples (i.e., 202 individuals) who self-identified as heterosexual. Couples had been together for 4.46 years on average ($SD = 2.80$, range: 7 months–21 years). The majority of couples cohabitated ($n = 96$), seven couples were married and five couples had children together. Participants were 18–53 years old ($M = 26.04$, $SD = 5.28$), and the majority had the Belgian nationality (93%). Participants were recruited within the context of a larger study on emotion dynamics in romantic relationships, see osf.io/q3cy2 for previous publications using the same sample but focusing on different research questions and measures.

### 2.2 | Procedure

The full study procedure consisted of baseline online questionnaires, a lab session, an ESM part and follow-up questionnaires. For the current study, only the baseline questionnaires, which included demographic

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questions, attachment style and relationship satisfaction questionnaires, and the ESM part were used. Data collection took place in 2016. For the ESM part, each partner received a smartphone along with instructions on how to use it. Partners simultaneously received notifications on the smartphone for 1 week. Notifications were sent six times per evening on weekdays between 5 PM and 10 PM, and 14 times per day on weekend days between 10 AM and 10 PM. These time spans were chosen based on the expectation that couples are more likely in contact during these hours (as working during the day on weekdays is considered the norm in Belgium). Per day, each time span was divided into equal time intervals and beeps were sent at random times in each interval. Couples received on average 62 beeps ($SD$ = 4, range: 47–72). At each beep, participants were asked to answer several questions concerning their feelings and experiences, including their feelings of irritation and indifference towards their partner, their perception of their partner's feelings of irritation and indifference towards them, and whether they had been in contact with their partner since the previous beep. If participants did not respond to the beep within 90 s or, after starting the ESM questionnaire, took longer than 90 s to respond to a question, the questionnaire became unavailable to them, resulting in missing data for that sampling moment. We had ESM data for 94 couples. Compliance per participant was high (93% on average). The study procedure was approved by the Social and Societal Ethics Committee KU Leuven. All participants provided written informed consent. Couples received a financial compensation of maximally €100 at the end of the study.

## 2.3 | Measures

### 2.3.1 | Attachment anxiety and attachment avoidance

Participants' attachment anxiety and attachment avoidance were measured using a 12-item version of the Experiences in Close Relationships (ECR) questionnaire (Brennan et al., 1998; Wei et al., 2007). Six items tap into attachment anxiety (e.g., 'I worry that my partner does not care about me as much as I care about him/her') and six items measure attachment avoidance (e.g., 'I try to avoid getting too close to my partner'). Participants were asked to rate the items concerning how they feel in romantic relationships in general on a scale from 1 (*not at all*) to 7 (*totally*). One item assessing attachment anxiety (i.e., 'I do not often worry about being abandoned') was deleted due to a low Cronbach's alpha. We calculated mean scores across the five remaining attachment anxiety items ($\alpha$ = .58) and across the six attachment avoidance items ($\alpha$ = .73).

### 2.3.2 | Perceived and experienced partner irritation and indifference

At each beep, we assessed both dyad members' experienced partner irritation ('Do you feel irritated by your partner?') and partner indifference ('Do you feel indifferent and uninterested towards your partner?'). Additionally, both dyad members rated their perceptions of their partner's irritation and indifference towards them (i.e., 'My partner seems irritated by me'; 'My partner seems indifferent towards me'). Responses were rated on a sliding scale ranging from 0 (*not at all*) to 100 (*totally*).

### 2.3.3 | Perceived and experienced valence

At each beep, participants also reported how they felt and how they perceived their partner felt at that moment in terms of valence and arousal by means of two affect grids (Russell et al., 1989). These affect grids were two-dimensional 9 × 9 matrices of which the horizontal axis represents valence (ranging from 'unpleasant' to 'pleasant ') and the vertical axis represents arousal (from 'sleepy ' to 'highly active'). The centre represents the neutral mid-point. Affective labels were attached to every end- and mid-point for ease of interpretation (e.g., the lower left corner was labelled 'depressed' as an example of an emotion with negative valence and low arousal). Participants were explained how to interpret the grid before the ESM part of the study started. Here we focus on the ratings of own and perceived partner affective valence (ranging from 0 to 8, with lower scores indicating more negative valence).

### 2.3.4 | Relationship satisfaction

Relationship satisfaction was assessed with an adjusted version (to accommodate unmarried couples) of the Kansas Marital Satisfaction Scale (Schumm et al., 1986). This three-item questionnaire assessed the extent to which participants were satisfied with their relationship, their partner as their life companion and their relationship with their partner. Participants rated the items on a scale ranging from 1 (*not at all satisfied*) to 7 (*completely satisfied*). An average score across the three items was calculated to reflect a participant's relationship satisfaction ($\alpha$ = .88).

### 2.3.5 | Partner contact

Participants were asked at each sampling moment whether they had been in contact with their partner since the last beep. Response options were 'no', 'we have texted/been chatting', 'we have called' and 'we have seen each other'. Couples were considered to have had contact when at least one of the partners indicated they had at least one form of contact (i.e., texted, called or seen each other). Partners agreed on 91% of the occasions and had been in contact on average 84% of the sampling moments to which they both responded.

## 2.4 | Analysis plan

Analyses were conducted using the nlme package in R (Pinheiro et al., 2021; R Core Team, 2021). We based our analyses on the truth and bias

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model (West & Kenny, 2011), which allows us to model directional bias and tracking accuracy simultaneously. Multi-level analyses were conducted as the repeated ESM measurements (Level 1) are nested within individuals (Level 2). We conducted analyses separately for irritation, indifference and valence. As an example, we describe here the analyses for partner irritation. In the models, both the female and male partners take the roles of perceivers (i.e., the one perceiving their partner's emotions) and targets (i.e., the one whose emotions are perceived). The accuracy benchmark is the target's actual self-reported irritation. In the Level 1 model, a perceiver's judgement of the target's irritation at time *t* is the function of an intercept, the target's actual self-reported irritation at time *t*, the perceiver's own irritation at time *t* and error variance; the three first parameters are considered random effects. The corresponding equations, accounting for the gender difference, are as follows:

$$\begin{aligned}&\text{Perception of target's irritation}_{t_{iF}}^{cM}\\&= b_{0iF} + b_{1iF}\,\textit{Target's actual irritation}_{tiM}^{cM}\\&\quad + b_{2iF}\,\textit{Perceiver's own irritation}_{tiF}^{cF} + e_{tiF},\\&\text{Perception of target's irritation}_{t_{iM}}^{cF}\\&= b_{0iM} + b_{1iM}\,\textit{Target's actual irritation}_{tiF}^{cF}\\&\quad + b_{2iM}\,\textit{Perceiver's own irritation}_{tiM}^{cM} + e_{tiM},\end{aligned}$$

where $t =$ time $t$; $i = dyad$ i; $M =$ male partner; $F =$ female partner; $cM/cF =$ centred on the mean of M/F's irritation.

Perceptions of target's irritation and target's actual irritation are centred on that target's mean actual self-reported irritation across beeps. Perceiver's own irritation is centred on that perceiver's mean irritation across sampling moments (see Sadikaj et al., 2018, for the same centring strategy). This centring strategy means that the random intercept ($b_{0i}$) reflects the directional bias: the difference between the perception of target's irritation and the target's experienced irritation when both perceiver and target are at their respective means levels of irritation. A positive value for the intercept indicates that a perceiver overestimates their partner's irritation. The random effect of the target's actual irritation ($b_{1i}$) reflects tracking accuracy. The random effect of perceiver's own irritation ($b_{2i}$) reflects the projection bias.

At Level 2, the random effects reflecting the perceiver's directional bias ($b_{0i}$), tracking accuracy ($b_{1i}$) and projection bias ($b_{2i}$) are modelled as a function of a fixed intercept, the perceiver's attachment anxiety, the perceiver's attachment avoidance and an error term. The corresponding equations are as follows:

$$\begin{aligned}b_{0iF} &= B_{00F} + B_{01F}\,\textit{Attachment}\quad \textit{anxiety}_{iF}{}^{C}\\&\quad + B_{02F}\,\textit{Attachment}\quad \textit{avoidance}_{iF}{}^{C} + u_{0iF},\\b_{1iF} &= B_{10F} + B_{11F}\,\textit{Attachment}\quad \textit{anxiety}_{iF}{}^{C}\\&\quad + B_{12F}\,\textit{Attachment}\quad \textit{avoidance}_{iF}{}^{C} + u_{1iF},\\b_{2iF} &= B_{20F} + B_{21F}\,\textit{Attachment}\quad \textit{anxiety}_{iF}{}^{C}\\&\quad + B_{22F}\,\textit{Attachment}\quad \textit{avoidance}_{iF}{}^{C} + u_{2iF},\\b_{0iM} &= B_{00M} + B_{01M}\,\textit{Attachment}\quad \textit{anxiety}_{iM}{}^{C}\\&\quad + B_{02M}\,\textit{Attachment}\quad \textit{avoidance}_{iM}{}^{C} + u_{0iM},\\b_{1iM} &= B_{10M} + B_{11M}\,\textit{Attachment}\quad \textit{anxiety}_{iM}{}^{C}\\&\quad + B_{12M}\,\textit{Attachment}\quad \textit{avoidance}_{iM}{}^{C} + u_{1iM},\\b_{2iM} &= B_{20M} + B_{21M}\,\textit{Attachment}\quad \textit{anxiety}_{iM}{}^{C}\\&\quad + B_{22M}\,\textit{Attachment}\quad \textit{avoidance}_{iM}{}^{C} + u_{2iM}.\end{aligned}$$

Participants' attachment anxiety and attachment avoidance are grand-mean centred. $B_{00}$, $B_{10}$ and $B_{20}$ reflect the directional bias, tracking accuracy and projection bias, respectively, for perceivers with average levels of attachment anxiety and avoidance. $B_{01}$, $B_{11}$ and $B_{21}$ reflect the effects of perceivers' attachment anxiety on directional bias, tracking accuracy and projection bias, respectively. $B_{02}$, $B_{12}$ and $B_{22}$ reflect the effects of perceivers' attachment avoidance on directional bias, tracking accuracy and projection bias, respectively. Errors were allowed to be correlated across dyad members, and error variances to differ for men and women.

The model can be fitted by means of the longitudinal actor–partner interdependence model (L-APIM) approach, which combines all effects in one equation. The L-APIM approach allows to test whether the partners are empirically distinguishable based on gender, that is, whether there are differences in the effects between males and females. To this aim and following recommendations by Gistelinck et al. (2018), we ran two different models: (1) a distinguishable model in which we simultaneously estimate intercepts and slopes for men and women separately; and (2) an indistinguishable model in which these effects are the same for female and male perceivers. We ran a likelihood ratio test (LRT) contrasting these two models. If the indistinguishable model has a worse fit than the distinguishable model (i.e., the LRT is significant, $p < .05$), this indicates that the dyad members are empirically distinguishable. Results from these analyses revealed that for two of the three outcome variables, the distinguishable model provided a better fit (i.e., for irritation: $\chi^2$ (24) = 65.01, $p < .001$; and valence: $\chi^2$ (24) = 64.72, $p < .001$; but not for indifference: $\chi^2$ (24) = 32.65, $p = .11$). To allow comparability across outcomes, we considered men and women as distinguishable in the analyses for all outcome variables, but in keeping with the preregistered analysis plan, also report the findings for the indistinguishable model for indifference and consider any potential differences in conclusions.

In our main analyses, we included only beeps at which participants had partner contact since the previous beep, as being in contact with the partner is expected to increase judgement accuracy of the partner's feelings (Rauers et al., 2013). We also conducted a set of preregistered sensitivity analyses to check the robustness of findings to alternative analytical decisions. First, as the measures were temporally ordered, we ran sensitivity analyses controlling for a possible effect of time by calculating for each beep how many minutes had passed since

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participants received the first beep and adding this variable as a (fixed effect) predictor in the Level 1 models. Second, as relationship satisfaction may be related to both attachment insecurity (Candel & Turliuc, 2019) and perception of partner signals (Sened et al., 2017) and thus might (in part) account for obtained results, we reran the analyses adding relationship satisfaction as a predictor variable in the Level 2 model to control for its effects. Third, we ran the models including all available beeps (i.e., moments when partners had been in contact as well as moments without contact). Fourth, we conducted sensitivity analyses in which we centred the perceiver's own emotion such as suggested by West and Kenny (2011), that is, on the mean of the target's actual emotion (rather than on the perceiver's mean emotion as in our main analyses) to assess whether findings converge when the directional bias is adjusted for projection bias. Upon reviewer's suggestion, we performed additional non-preregistered analyses: (1) sensitivity analyses controlling for relationship duration, as this may serve as a proxy for the level of acquaintance which can relate to perceptual accuracy (Ickes & Hodges, 2013); (2) sensitivity analyses in which we selected only those moments at which partners had seen each other (as indicated by at least one of the partners); (3) an exploratory analysis in which we averaged irritation and indifference per beep to explore attachment effects on directional bias and tracking accuracy of a negative threatening emotions index.

#### 2.4.1 | Missing data

In line with previous studies using different ESM items from the same dataset (e.g., Sels et al., 2020), seven couples that did not or barely participated in the ESM part were excluded from the analyses, leaving 94 couples for analyses. Three male participants had missing scores on the attachment and relationship satisfaction variables and were excluded from the analyses, leaving 91 male and 94 female partners for analyses. When one or both dyad members had missing data for a sampling moment, this sampling moment was not included in the model. This resulted in an average of 55 beeps per person ($SD = 7$, range: 32–70).

## 3 | RESULTS

### 3.1 | Descriptive statistics

Table 1 reports descriptives of and correlations among the study's main variables. Within-dyad correlations revealed that experienced emotions positively correlated between partners within a couple, as did perceived partner emotions. Moreover, we found positive within-dyad correlations of the perceiver's own emotion and the target's own emotion with the perceiver's perception of their partner.

### 3.2 | Perceived partner irritation

The fixed effects of the main analyses with perceived partner irritation as outcome are shown in Table 2. Effects that were significant in the main analyses and replicated across the different sensitivity analyses in terms of direction and significance are in boldface. The results from the sensitivity analyses are reported in Supplementary Table S1.

On average, both male and female perceivers showed positive tracking accuracy, meaning that increases in their partner's irritation were related to increases in their perception of their partner's irritation. Additionally, we found evidence for a main effect of projection bias in both men and women: when perceivers experienced higher irritation, they perceived their partners to be more irritated as well. There was no overall directional bias, suggesting that perceivers did not over- or under-estimate their partner's level of irritation.

There was no robust evidence for effects of attachment anxiety on directional bias or tracking accuracy of partner irritation. These findings suggest that more anxiously attached perceivers did not show a more negative directional bias nor did they show differences in how accurately they tracked changes in their partner's irritation compared to less anxiously attached perceivers.

Attachment avoidance was not significantly associated with directional bias in the perception of partner irritation, indicating that more avoidantly attached perceivers did not show a higher negativity bias in their judgement of their partner's irritation compared to less avoidantly attached perceivers. Attachment avoidance was negatively associated with tracking accuracy in male perceivers, implying that men higher in attachment avoidance less accurately tracked changes in their partner's irritation. This effect replicated across sensitivity analyses, that is, was robust to alternative analytical decisions. Female perceivers' attachment avoidance was not significantly related to their level of tracking accuracy. Finally, more avoidantly attached male, but not female, perceivers showed a higher projection bias.

### 3.3 | Perceived partner indifference

Results from the main analysis with perceived partner indifference as outcome are presented in Table 3. Again, significant effects in bold replicated across the different sensitivity analyses. Supplementary Table S2 reports the results of the sensitivity analyses.

We found no significant directional bias effect: perceivers on average did not over – or underestimate their partners' indifference. Changes in perceptions of partner indifference were positively associated with changes in targets' indifference as well as with changes in the perceivers' indifference as indicated by positive tracking accuracy and projection bias effects, respectively.

In the main analyses, attachment anxiety was positively associated with directional bias and projection bias in men, and with tracking accuracy in women, but these findings were not robust across sensitivity analyses. Thus, there was no robust evidence that perceivers showed differences in their directional bias or tracking accuracy dependent on their levels of attachment anxiety. Similarly, no significant effects of attachment avoidance on directional bias or tracking accuracy emerged, which suggests that avoidantly attached perceivers do not overestimate their partners' indifference nor do they less accurately track changes in their partners' indifference compared to less

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**TABLE 1** Descriptives of and correlations among the main variables.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Attachment anxiety M | | | | | | | | | | | | | | | | |
| 2. Attachment anxiety F | 0.09 | | | | | | | | | | | | | | | |
| 3. Attachment avoidance M | 0.09 | 0.13 | | | | | | | | | | | | | | |
| 4. Attachment avoidance F | 0.16 | 0.28** | 0.07 | | | | | | | | | | | | | |
| 5. Perceived irritation M | 0.21* | 0.23* | 0.17 | 0.22* | | 0.40*** | 0.65*** | 0.45*** | 0.55*** | 0.37*** | 0.41*** | 0.29*** | −0.32*** | −0.23*** | −0.30*** | −0.24*** |
| 6. Perceived irritation F | 0.02 | 0.03 | 0.1 | 0.11 | 0.53*** | | 0.39*** | 0.57*** | 0.27*** | 0.50*** | 0.22*** | 0.40*** | −0.24*** | −0.26*** | −0.24*** | −0.25*** |
| 7. Own irritation M | 0.16 | 0.23* | 0.16 | 0.21* | 0.93*** | 0.56*** | | 0.36*** | 0.51*** | 0.30*** | 0.47*** | 0.23*** | −0.25*** | −0.17*** | −0.31*** | −0.18*** |
| 8. Own irritation F | 0.13 | 0.11 | 0.13 | 0.24* | 0.46*** | 0.83*** | 0.44*** | | 0.27*** | 0.56*** | 0.19*** | 0.47*** | −0.27*** | −0.25*** | −0.25*** | −0.33*** |
| 9. Perceived indifference M | 0.23* | 0.16 | 0.18 | 0.22* | 0.87*** | 0.54*** | 0.85*** | 0.46*** | | 0.28*** | 0.57*** | 0.24*** | −0.20*** | −0.14*** | −0.25*** | −0.17*** |
| 10. Perceived indifference F | 0.14 | 0.16 | 0.18 | 0.18 | 0.57*** | 0.85*** | 0.56*** | 0.84*** | 0.56*** | | 0.21*** | 0.62*** | −0.21*** | −0.21*** | −0.24*** | −0.26*** |
| 11. Own indifference M | 0.18 | 0.22* | 0.28** | 0.26* | 0.83*** | 0.47*** | 0.89*** | 0.40*** | 0.91*** | 0.52*** | | 0.17*** | −0.15*** | −0.11*** | −0.21*** | −0.10*** |
| 12. Own indifference F | 0.11 | 0.11 | 0.19 | 0.20* | 0.46*** | 0.79*** | 0.46*** | 0.86*** | 0.49*** | 0.90*** | 0.49*** | | −0.16*** | −0.15*** | −0.17*** | −0.21*** |
| 13. Perceived valence M | −0.03 | −0.12 | 0.20 | −0.05 | −0.25* | −0.18 | −0.32** | −0.20 | −0.16 | −0.16 | −0.20 | −0.15 | | 0.25*** | 0.46*** | 0.42*** |
| 14. Perceived valence F | −0.19 | 0.00 | 0.12 | −0.24* | −0.21* | −0.14 | −0.29** | −0.20* | −0.18 | −0.15 | −0.16 | −0.08 | 0.28** | | 0.42*** | 0.45*** |
| 15. Own valence M | −0.11 | 0.09 | −0.02 | −0.07 | −0.30** | −0.18 | −0.39*** | −0.19 | −0.27* | −0.18 | −0.33** | −0.13 | 0.62*** | 0.42*** | | 0.28*** |
| 16. Own valence F | 0.02 | −0.07 | 0.17 | −0.04 | −0.12 | −0.07 | −0.19 | −0.15 | −0.09 | −0.11 | −0.04 | −0.06 | 0.62*** | 0.52*** | 0.25* | |
| *M* | 3.23 | 3.76 | 2.16 | 2.02 | 10.79 | 9.04 | 9.45 | 9.76 | 10.14 | 9.57 | 9.20 | 8.35 | 5.36 | 5.53 | 5.42 | 5.34 |
| *SD* | 0.96 | 0.87 | 0.80 | 0.80 | 8.48 | 7.65 | 7.64 | 8.36 | 9.33 | 9.39 | 8.14 | 7.69 | 0.83 | 0.76 | 0.93 | 0.90 |

*Note*: For descriptives and correlations of time-varying variables contact moments were selected. Within-dyad correlations are presented above the diagonal. Between-dyad correlations, for which time-varying variables were aggregated across beeps per person, are presented below the diagonal. Males, $N = 91$; Females, $N = 94$.Abbreviations: M = Male; F = Female.
*$p < .05$, **$p < .01$, ***$p < .001$.

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**TABLE 2** Directional bias, tracking accuracy and projection bias of perceivers' judgement of their partner's irritation.

| | Male perceivers | | | | Female perceivers | | | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | 95% CI | *t* | *B* | *SE* | 95% CI | *t* |
| Directional bias | 0.70 | 0.93 | [−1.12, 2.52] | 0.75 | −0.11 | 0.75 | [−1.57, 1.36] | −0.14 |
| Tracking accuracy | **0.25** | 0.03 | [0.19, 0.31] | 8.40*** | **0.24** | 0.04 | [0.17, 0.31] | 6.77*** |
| Projection bias | **0.60** | 0.04 | [0.52, 0.68] | 14.66*** | **0.49** | 0.03 | [0.43, 0.56] | 14.36*** |
| Effect of attachment anxiety | | | | | | | | |
| Directional bias | −0.54 | 0.54 | [−1.60, 0.51] | −1.01 | −0.54 | 0.52 | [−1.55, 0.47] | −1.04 |
| Tracking accuracy | 0.05 | 0.03 | [−0.01, 0.10] | 1.58 | −0.01 | 0.04 | [−0.09, 0.07] | −0.22 |
| Projection bias | 0.04 | 0.04 | [−0.04, 0.13] | 1.08 | −0.05 | 0.04 | [−0.13, 0.02] | −1.41 |
| Effect of attachment avoidance | | | | | | | | |
| Directional bias | −0.26 | 0.66 | [−1.55, 1.03] | −0.40 | −0.89 | 0.57 | [−2.01, 0.23] | −1.55 |
| Tracking accuracy | **−0.10** | 0.04 | [−0.16, −0.03] | −2.73** | 0.03 | 0.04 | [−0.05, 0.11] | 0.80 |
| Projection bias | 0.11 | 0.05 | [0.01, 0.21] | 2.12* | −0.06 | 0.04 | [−0.13, 0.02] | −1.43 |

*Note*: Effects in boldface are significant effects that replicated across the different sensitivity analyses.Abbreviations: B, unstandardized beta: CI, Confidence interval: SE, standard error.
*$p < .05$,
**$p < .01$, ***$p < .001$.

**TABLE 3** Directional bias, tracking accuracy and projection bias of perceivers' judgment of their partner's indifference.

| | Male perceivers | | | | Female perceivers | | | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | 95% CI | *t* | *B* | *SE* | 95% CI | *t* |
| Directional bias | 2.15 | 0.92 | [0.36, 3.94] | 2.35* | 0.32 | 0.92 | [−1.48, 2.12] | 0.35 |
| Tracking accuracy | **0.12** | 0.03 | [0.07, 0.17] | 4.41*** | **0.06** | 0.02 | [0.01, 0.11] | 2.45* |
| Projection bias | **0.67** | 0.04 | [0.59, 0.74] | 17.66*** | **0.63** | 0.04 | [0.54, 0.71] | 14.61*** |
| Effect of attachment anxiety | | | | | | | | |
| Directional bias | 1.33 | 0.63 | [0.09, 2.57] | 2.10* | 0.59 | 0.72 | [−0.83, 2.01] | 0.81 |
| Tracking accuracy | −0.02 | 0.03 | [−0.07, 0.03] | −0.69 | 0.06 | 0.03 | [0.00, 0.11] | 1.97* |
| Projection bias | 0.08 | 0.04 | [0.01, 0.16] | 2.23* | 0.03 | 0.05 | [−0.06, 0.12] | 0.61 |
| Effect of attachment avoidance | | | | | | | | |
| Directional bias | −0.71 | 0.76 | [−2.21, 0.79] | −0.93 | −0.13 | 0.80 | [−1.70, 1.44] | −0.16 |
| Tracking accuracy | 0.00 | 0.03 | [−0.06, 0.06] | 0.01 | 0.00 | 0.03 | [−0.05, 0.06] | 0.08 |
| Projection bias | 0.05 | 0.04 | [−0.04, 0.14] | 1.16 | 0.02 | 0.05 | [−0.08, 0.12] | 0.38 |

*Note*: Effects in boldface are significant effects that replicated across the different sensitivity analyses.Abbreviations: B, unstandardized beta: CI, Confidence interval: SE, standard error.
*$p < .05$, **$p < .01$, ***$p < .001$.

avoidantly attached perceivers. The results of the indistinguishable model are reported in Supplementary Table S3 and lead to the same conclusions.

### 3.4 | Exploratory analysis: Averaged partner irritation and indifference

The results of the model in which we looked at the average of irritation and indifference are reported in Table S4 and also showed no significant effects of attachment anxiety or attachment avoidance on directional bias or tracking accuracy.

### 3.5 | Perceived partner valence

Results from the main analyses with perceived partner valence as outcome are presented in Table 4. Results from the sensitivity analyses are presented in Supplementary Table S5.

Both male and female perceivers accurately tracked changes in their partner's valence and perceived their partner's valence to be similar to their own valence, as evidenced by main effects for tracking accuracy and projection bias. Neither males nor females showed a directional bias in their perception of their partners' valence. Attachment anxiety was not associated with directional bias. In male perceivers, higher attachment anxiety was associated with lower tracking accuracy. This

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**TABLE 4** Directional bias, tracking accuracy and projection bias of perceivers' judgment of their partner's valence.

| | Male perceivers | | | | Female perceivers | | | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | 95% CI | *t* | *B* | *SE* | 95% CI | *t* |
| Directional bias | 0.00 | 0.08 | [−0.16, 0.15] | −0.05 | 0.12 | 0.09 | [−0.06, 0.31] | 1.31 |
| Tracking accuracy | **0.25** | 0.02 | [0.20, 0.29] | 10.75*** | **0.30** | 0.02 | [0.25, 0.35] | 12.10*** |
| Projection bias | **0.40** | 0.02 | [0.35, 0.44] | 15.98*** | **0.36** | 0.02 | [0.32, 0.41] | 15.19*** |
| Effect of attachment anxiety | | | | | | | | |
| Directional bias | −0.04 | 0.06 | [−0.15, 0.08] | −0.62 | −0.11 | 0.08 | [−0.27, 0.05] | −1.38 |
| Tracking accuracy | −0.05 | 0.02 | [−0.09, −0.00] | −2.19* | −0.01 | 0.03 | [−0.06, 0.05] | −0.21 |
| Projection bias | 0.05 | 0.02 | [0.01, 0.09] | 2.29* | −0.03 | 0.02 | [−0.08, 0.02] | −1.30 |
| Effect of attachment avoidance | | | | | | | | |
| Directional bias | 0.15 | 0.07 | [0.02, 0.29] | 2.18* | −0.17 | 0.09 | [−0.34, 0.01] | −1.88 |
| Tracking accuracy | 0.02 | 0.03 | [−0.03, 0.07] | 0.63 | −0.02 | 0.03 | [−0.07, 0.04] | −0.64 |
| Projection bias | −0.02 | 0.03 | [−0.08, 0.03] | −0.75 | 0.03 | 0.03 | [−0.02, 0.08] | 1.17 |

*Note*: Effects in boldface are significant effects that replicated across the different sensitivity analyses.Abbreviations: B, unstandardized beta: CI, Confidence interval: SE, standard error.
*$p < .05$, **$p < .01$, ***$p < .001$.

effect replicated across all sensitivity analyses, except for the one that included no-contact moments. Thus, less anxiously attached men more accurately tracked changes in their partners' valence compared to more anxiously attached men but only in those moments when they had been in contact with their partner. Female perceivers' attachment anxiety was not related to tracking accuracy of their partners' valence. In male perceivers, attachment avoidance was associated with a more positive directional bias in the main analyses, but this finding was not robust across sensitivity analyses. Female perceivers' attachment avoidance also was not robustly associated with directional bias. Moreover, attachment avoidance was not related to tracking accuracy either in men or women, indicating that the degree to which individuals accurately track changes in their partners' valence does not depend on their level of attachment avoidance.

## 4 | DISCUSSION

Insecure attachment-related perceptual biases in the processing of social information have been proposed to interfere with insecurely attached individuals' abilities to maintain satisfying relationships (Mikulincer & Shaver, 2003). However, studies assessing the effect of insecure attachment on the perceptual accuracy of partner emotions in everyday life have not consistently found the proposed associations, possibly because contextual factors (e.g., which specific information is processed) affect whether attachment-related processing biases come about (Dykas & Cassidy, 2011; Overall et al., 2015). Here we examined how attachment relates to the perception of emotions that may signal a threat to the (closeness in the) relationship, by focusing on a hard and a flat emotion, that is, irritation and indifference towards the partner. To explore whether any found effects were specific to such emotions or concerned the perception of partner emotion in general, we additionally assessed the perception of partners' affective valence. We simultaneously tested for attachment-related differences in perceivers' over- or under-estimation of their partner's emotions (directional bias) as well as in their tendency to accurately track changes in their partner's emotions (tracking accuracy). Overall, the results revealed almost no robust associations between either attachment anxiety or attachment avoidance and directional bias and tracking accuracy of all assessed partner emotions.

We predicted that more anxiously attached perceivers would show a heightened negativity bias and vigilance towards partner irritation and indifference. Contrary to these predictions, we found no significant associations of attachment anxiety with either negativity bias or tracking accuracy of partner irritation and indifference. These findings are in line with previous studies that focused on the perception of partner signals that (at least partly) reflected soft emotions (Overall et al., 2015; Sadikaj et al., 2018). Adding to the literature, our results indicate that even when assessed partner signals can indicate a threat to (the closeness in) the relationship, that is, feelings of irritation and indifference towards the perceiver, no anxious attachment-related differences in perception of partner signals emerge. One possible explanation for the lack of effects of attachment anxiety is that more securely attached individuals are as sensitive as more anxiously attached individuals in their perception of their partner's emotions that signal a possible relationship threat, as both groups value maintaining their relationships and should be motivated to accurately track their partners' signals of relationship commitment and investment (Overall et al., 2012). Interestingly, we found some evidence that more anxiously attached men were *less* accurate in tracking changes in their partner's affective valence. Together, these findings seem to suggest that more anxiously attached men are equally vigilant towards changes in their partner's emotions when such emotions are directly relevant to their relational concerns of abandonment and rejection, but pay less attention to changes in partner signals less directly conveying a

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potential relationship threat. Although previous studies also suggest that attachment–anxiety differences in attentional strategies arise in response to more versus less stressful or threatening contextual factors (Mikulincer et al., 2000; Simpson et al., 2011), the direction of effects is not consistent across studies. Moreover, we did not find attachment anxiety-related differences in tracking accuracy for female perceivers. More research is clearly needed to disentangle in which situations anxious attachment-related differences in the attention to partner emotions arise.

For more avoidantly attached individuals, we had expected to find a more negative directional bias in the perception of all three partner signals (i.e., irritation, indifference, and valence). The results did not support these predictions: no attachment avoidance-related differences in directional bias were found. These findings are incongruent with theory and previous research suggesting that avoidantly attached individuals tend to perceive their partners in a more negatively biased way (Overall et al., 2015; Sadikaj et al., 2018). Although speculative, a possible explanation for the discrepancy between the current and previous studies' findings may be found in the way in which the perception of partner signals was assessed. In previous studies, participants rated their perception of their partner's emotions each day (Overall et al., 2015) or rated how they remembered thinking their partner felt during a specific interaction (Overall et al., 2015; Sadikaj et al., 2018), which involves some degree of recall, albeit relatively short term. In this study, we tracked individuals' own and perceived partner emotions in real-time in the flow of their everyday life using ESM. This approach may limit the effect of negative recall-related mechanisms that play a role in avoidantly attached individuals' appraisals of social information (Simpson et al., 2010). Possibly, previously found avoidant attachment-related negativity bias of partner emotions (at least in part) reflects negative recall effects rather than negative interpretation effects. Replication in future ESM studies will be important to assess whether this speculative explanation is plausible.

We predicted no effects of attachment avoidance on tracking accuracy of all three assessed partner signals. These predictions were largely supported: there were no attachment avoidance-related differences in tracking accuracy, except for male perceivers' tracking accuracy of their partner's irritation. Specifically, men higher in attachment avoidance less accurately tracked changes in their partner's irritation. Although this finding fits with the proposition that avoidantly attached individuals tend to defensively exclude attachment-relevant information (Dykas & Cassidy, 2011), in previous studies as well as this study associations between attachment avoidance and tracking accuracy of partner signals were largely absent. As has been suggested before, avoidance-related deactivating strategies most likely arise when the information does not require a response or individuals have internal control over the information (Dykas & Cassidy, 2011; Overall et al., 2015). Real-life partner signals do not meet these conditions, as they can serve to convey that a response is needed and are outside the perceiver's control. Thus, it may be less likely that avoidantly attached individuals can cope with partner signals in daily life by directing their attention away from these signals, resulting in an absence of robust associations between attachment avoidance and tracking accuracy. Of note, prior research indicates that the effect of the partner's (i.e., target's) attachment style interacts with how well perceivers are able to track their partner's emotions. Specifically, couples in which both partners were more avoidantly attached showed lower tracking accuracy of partner negative affect compared to couples in which either the perceiver, the target, or both were less avoidantly attached (Sadikaj et al., 2018). Indeed, partner readability, which may be lower for avoidantly attached partners who tend to suppress their emotions (Winterheld, 2016), is a relevant factor for perceptual accuracy (Simpson et al., 2001). Future studies may thus benefit from looking into the interaction between both partners' attachment styles to gain a more comprehensive interpersonal understanding of the effects of attachment on the perception of partner signals (see also Rodriguez et al., 2019).

In all our models, we found significant effects of perceivers' own emotions on their perception of their partners' emotions (projection bias). Projection bias effects are often found in perception research, using ESM as well as other research paradigms (e.g., Kenny & Acitelli, 2001; Overall et al., 2015; Papp et al. 2010), suggesting that perceivers' judgement of their partners' emotions is partly based on how the perceiver feels. We explicitly took the projection bias effect into account by including it in our models, so that it would not affect our findings. One could question, however, what including this effect means for our ability to find other significant associations. In this respect, it is important to note that over and above the projection bias effect, we consistently find an effect of the target's actual emotions on perception, suggesting that perceptions are not simply informed by how perceivers are feeling themselves, but also by how targets are actually feeling. In addition, when we reran the analyses without controlling for perceivers' own experienced emotion, no additional significant effects emerged, indicating that the overall lack of findings cannot be attributed to the inclusion of projection bias in our models.

### 4.1 | Strengths, limitations and future directions

This study's findings should be considered in the context of its strengths and limitations. Strengths of the current study include the use of ESM to track perception of partner emotions, which allowed us to capture what is going on in relationships in the flow of everyday life. Moreover, the focus on different specific emotions allowed us to examine whether attachment-related processing biases occur for particular types of partner signals. This study was limited in that it, similar to previous studies on attachment effects on directional bias and tracking accuracy of partner signals, assessed a community sample with relatively low levels of attachment anxiety and avoidance. This limits the generalizability of the findings to individuals with lower levels of attachment anxiety and avoidance. It will be important for future studies to include individuals higher in attachment insecurity to see whether findings converge. In addition, given that Cronbach's alpha was moderate for the attachment anxiety scale as assessed with the short version of the ECR, future studies may consider using the longer 36-item version of the questionnaire (Brennan et al., 1998).

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Additionally, here we aimed to enhance our knowledge of the domains of partner signals for which attachment-related biased processing occurs by assessing different types of partner signals. We specifically focused on a hard and a flat emotion that can signal a threat towards the (closeness in the) relationship. Although we did include the perception of partners' general affective valence to explore whether any effects were particular to the perception of hard or flat emotions, this study is limited in that we did not include soft negative emotions separately. As a result, we could not explicitly compare between these three types (soft, hard and flat) of negative emotions.

Moreover, we examined the perception of partner irritation and indifference towards the perceiver as examples of hard and flat emotions. Future studies may include different or multiple hard and flat emotions (e.g., angry, bored) to provide a better test of attachment-related differences in the perception of general negative hard and flat emotions. Besides, we examined the perception of partner irritation and indifference towards the perceiver because they likely indicate relationship threat (Sanford, 2007a, 2007b, 2010) but did not assess whether these emotions in general daily life were actually threatening to our participants. Additionally, we found overall little variability in (the perception of) these emotions which may have limited our ability to find effects. Relatedly, one could argue that stronger attachment effects may arise when perception of such emotions is assessed during relationship-threatening moments (e.g., conflicts; Simpson et al., 2011). To our knowledge, no previous research examined attachment effects on the perception of partner emotions focusing on conflict moments in daily life. In the current study, we did ask whether participants had been in conflict with their partner since the last beep but not many conflict moments were reported (i.e., at a total of 727 beeps at least one of the partners indicated a conflict). This suggests that we did not capture many moments of relationship conflict and also means that we could not solely focus on such moments in our analyses as there were not enough data points to run the models. Assessing attachment effects on the perception of partner emotions in daily life conflicts therefore remains an interesting avenue for future research.

The current findings provided some indication that couple members showed different effects based on their gender. Specifically, the models for perceived partner irritation and valence in which dyad members were treated as distinguishable based on gender provided a better fit compared to the models in which dyad members were treated as indistinguishable. Moreover, the few significant effects of attachment insecurity on tracking accuracy (i.e., the negative effects of attachment avoidance on tracking accuracy of partner irritation and of attachment anxiety on tracking accuracy of partner valence) were found in male perceivers and not in female perceivers. We do not suggest that these findings should be taken to reflect that male and female perceivers differ in their tracking accuracy of partner emotions because differences were not robust across different assessed partner emotions. Additionally, previous studies did not find that attachment effects on perceptual accuracy of negative partner emotions were moderated by gender (Overall et al., 2015; Sadikaj et al., 2018). Nevertheless, future research could further test gender differences in perceptual accuracy of different partner emotions to explore whether, and if so, when, gender differences emerge.

Finally, in our main analyses, we centred the perceiver's own emotion on their own mean (as was also done by Sadikaj et al., 2018). This approach diverges from the centring strategy as proposed by West and Kenny (2011), in which the perceiver's own emotion is centred on the mean of the target's emotion. The way in which the perceiver's own emotion is centred has implications for the interpretation of the intercept, that is, the directional bias effect. In our main analyses, the intercept reflects the directional bias when the perceiver and target are at their own respective average level of emotion. If the centring strategy of West and Kenny (2011) is applied, the intercept reflects the directional bias when both the perceiver and target are at the target's average level of emotion. In case of mean-level differences between both partners, this situation likely less often occurs in real life, which is why we opted for the former centring strategy in our main analyses. We ran sensitivity analyses using the alternative centring strategy and found one additional significant effect compared to our main analyses: more anxiously attached male perceivers overestimated their partner's irritation. This seems to suggest that, when both partners are at the female partner's average level of irritation, more anxiously attached male perceivers overestimate their partner's irritation to a greater extent than less anxiously attached male perceivers. Again, we do not find a similar effect for female perceivers. Thus, also using West and Kenny's (2011) centring strategy, we do not find evidence for robust effects of attachment anxiety on the perception of partner emotions. Although in the current study findings largely converged, we recommend future studies to compare the results of different centring strategies to see whether centring decisions affect their findings.

## 5 | CONCLUSION

To conclude, in the current study, we tested effects of attachment anxiety and attachment avoidance on directional bias and tracking accuracy of partner irritation, indifference and affective valence. Findings indicated no associations of attachment avoidance or anxiety with negativity bias in the perception of any of the assessed partner emotions. Male perceivers higher in attachment avoidance less accurately tracked changes in their partner's irritation and male perceivers higher in attachment anxiety less accurately tracked changes in their partner's affective valence. No other significant associations of attachment with tracking accuracy were found. Overall, these results suggest that attachment insecurity does not robustly relate to the perceptual accuracy of different partner signals in everyday life.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

## DATA AVAILABILITY STATEMENT

The data are not publicly available due to privacy regulations for this type of data.

## ETHICS STATEMENT

This study procedure was approved by the Social and Societal Ethics Committee KU Leuven.

## TRANSPARENCY STATEMENT

All results are reported honestly and the work is original. This study's hypotheses, methods and analysis plan were preregistered at osf.io/pr6hn, after data collection but before any of the research questions were analysed. The data are not publicly available due to privacy regulations for this type of data.

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