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Directional bias in interpersonal emotion perception

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Accurately understanding others' emotional states is fundamental to effective social functioning. While extensive research exists on how humans recognize different emotions, little is known about how people assess emotional intensity. Through a preliminary survey and seven multi-site studies (n = 2866), we demonstrate that despite believing they gauge emotions accurately, systematic discrepancies emerge: individuals tend to rate others' emotions as more intense than those individuals rate themselves, particularly for negative emotions. This bias persists across text-based interactions, recorded videos, and live conversations, with both strangers and romantic partners. Interestingly, while people report preferring accurate judgments of their own emotional intensity, the discrepancy may serve adaptive functions, predicting higher empathic responses with strangers and greater relationship satisfaction in romantic relationships. These findings advance understanding of discrepancies in interpersonal emotional perception, highlighting their potential adaptive roles and providing insight into how they shape our social world and relationship outcomes.

The ability to accurately understand others' emotions forms the cornerstone of effective social interaction and meaningful relationships. Notably, emotion recognition extends beyond simply identifying whether someone is angry about a political policy or excited about social change—it requires gauging the intensity of these emotional states. In our daily lives, this challenge manifests constantly. Recognizing that your partner is excited about the upcoming date night or that your coworker is frustrated about a project delay is just the first step—an additional crucial skill lies in accurately assessing how excited or frustrated they truly are. Whether we are facing moments of adversity or joy, this nuanced emotional assessment fundamentally shapes both the quality of our social relationships and our ability to navigate social landscapes effectively.

Previous research on emotion recognition focused on identifying which emotions people experience (e.g., distinguishing between fear and sadness)[1–3], how contexts constrain the understanding of these emotions[4–7], and how accurately we understand others' emotions in dynamic social settings (often called Empathic Accuracy)[8–14]. Studies have shown, for example, that we tend to be more accurate in identifying the emotions of ingroup than of outgroup members[15], and are better at understanding the emotions of friends or romantic partners than strangers[16]. This stream of research is based on identifying which emotion is being expressed, while potential biases in assessing the *intensity* of these emotions remain largely unexplored. Our study aims to fill this gap by systematically examining such biases across valence, context, communication modality, and relationship type, as well as by asking what social function these biases might serve.

Importantly, we know from psychological research that our perception does not accurately represent the external world. For instance, we amplify edges and borders to ease figure–ground differentiation—

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leading to visual illusions such as the Kanizsa figures, where strategically placed shapes make us perceive a triangle that isn't actually drawn[17,18]. We also over- and underestimate magnitudes based on prior knowledge and expectations (Contraction bias)[19,20], and we rely heavily on our own perspective while discounting others' (Egocentric bias)[21,22]. Notably, these cognitive biases extend beyond basic perception, shaping how individuals perceive and evaluate others (for two recent meta-analyses, see refs. 23,24). However, most of these studies focused exclusively on perceptual biases within romantic relationships and were primarily concerned with evaluations of the partner in relation to the self or the relationship rather than the perception of partners' emotions.

Few studies examined bias in perceiving partners' emotions. Among these, studies examining relationship-directed emotions show consistent patterns: Individuals demonstrated systematic overestimation of how negatively their partners felt toward them both in daily life and specifically during disagreements[25,26]. Building on this work, research examining everyday interactions found similar overestimation patterns when using a broader approach that measured general negative affect rather than relationship-directed emotions[27]. Meanwhile, research focusing on discussions of stressful personal events found less clear evidence of directional bias, with overestimation of partners' negative emotions occurring only when partners displayed very high levels of emotional expression[28]. Notably, most studies have exclusively focused on biases in perceiving negative emotions, while the biases in perceiving positive emotions remain largely unexplored, with some findings indicating underestimation and other studies suggesting no significant directional bias[25,28–30]. Moreover, to the best of our knowledge, researchers have yet to explore whether these biases in intensity perception also occur during interactions between strangers.

Error management theory proposes that when judgments are made under uncertainty, natural selection favors decision-making mechanisms biased toward less costly errors. This occurs when false positive errors (assuming X when not-X is true) and false negative errors (assuming not-X when X is true) have asymmetrical costs. This theory suggests that cognitive biases are not design flaws, but adaptive features that minimize the overall cost of errors even if they increase the total error rate[23,24,26,28,31,32]. Applying this framework to emotion perception, we note that it may be more adaptive to overestimate the intensity of negative emotions (a false positive error)[26,28]—for instance, perceiving a newborn's cry as more urgent than it is, or interpreting a stranger's somewhat angry expression as angrier than they actually are. In contrast, the evolutionary prediction for positive emotions is less clear, as the error type that might pose greater cost seems to vary more widely across different situations and relationship types[28,32]. Additionally, errors in perceiving others' positive emotions, especially when these emotions are not directed toward the perceiver, might carry fewer immediate survival consequences[32]. These differences could explain why biases in perceiving positive emotions might be less pronounced or consistent than those observed for negative emotions.

The evolutionary advantage of overestimating negative emotions is supported by research showing that negative stimuli are more salient than positive ones, leading to heightened attention allocation ("bad is stronger than good"[33–35]). Whereas increased attention can improve accuracy, it may also lead to an amplified weighting of negative information in our overall assessment, thereby boosting the perceived intensity of negative emotions. Goldenberg and colleagues provide some evidence for this theory, finding that participants consistently overestimated the average emotion when viewing a series of negative facial expressions, which the researchers attributed to the enhanced memorability of more salient expressions; interestingly, this overestimation effect was not limited to negative emotions—it was also observed with positive emotions, though to a lesser extent, implying that this bias toward salience exists across both emotional valences[36].

Error management theory predicts that overestimation bias for negative emotions will become more pronounced under conditions of uncertainty[23,31,32]—such as when perceiving strangers' emotions or whenever information is limited. In such circumstances, perceivers likely rely more on their own experiences and stereotypical knowledge. Another example could be when access is limited to crucial contextual factors that might influence the perception of the other's emotional state, such as the other person's emotion-regulation abilities, coping strategies, current life circumstances, or preceding events[37,38]. In contrast, closer relationships and greater contextual knowledge may lead to more accurate perception[39,40] and might reduce overestimation of the intensity of another's negative emotions.

Importantly, while greater familiarity in close relationships can reduce uncertainty, failing to recognize a partner's negative emotional states can be particularly damaging[23,24]. Negative emotions serve as critical communication mechanisms within relationships—they alert us when relational problems require attention or when a partner needs emotional support[26,28]. When these signals are underestimated, partners may feel misunderstood or neglected, potentially leading to relationship dissatisfaction and eventual distancing[28,31,32]. Interestingly, a meta-analysis of romantic relationships found no significant association between directional bias and relationship satisfaction. However, this meta-analysis examined bias in the context of general relationship attitudes rather than specifically focusing on emotional judgment[24]. Moreover, while error management theory suggests that overestimation of negative emotions is preferable to underestimation[24,26,28], prior research has overlooked a key nuance. Specifically, when examining the association between directional bias in emotion perception and relationship satisfaction, it is possible that extreme deviations in either direction can reduce relationship satisfaction[26,41]. This potentially nuanced dynamic could dovetail numerous studies that highlight the theoretical importance of accurately assessing one's partner's emotions[23,24,26,28]. The interplay among these perspectives suggests a more complex, potentially curvilinear relationship between directional bias and relationship outcomes. Importantly, overestimation can have its drawbacks—recent evidence shows that social media users overperceive others' moral outrage, potentially amplifying intergroup hostility and increasing social polarization[42].

A methodological note is warranted at this point. Consistent with prior work on empathic accuracy[9,10,40,43,44], emotion-intensity perception[25–30], and neuroimaging/physiology[8,45–50], which calibrate measures to self-reports, we treat targets' self-reports as the ground truth—the best available proxy for their emotional experience. Following this approach, we interpret discrepancies between observer and target ratings as overestimation or underestimation of the target's emotional intensity, rather than as systematic over- or under-reporting by the targets of their own emotional intensity. While we acknowledge that self-reports may be subject to bias, we expect such biases to be more context-dependent, which makes them unlikely to produce systematic effects across different contexts or to account for consistent patterns in judgments of others' emotional intensity. For instance, in some situations, individuals may downplay negative emotions to appear strong and resilient, whereas in others, they may amplify their reports to convey sensitivity or to increase the likelihood of receiving support. Notwithstanding, we acknowledge both possible interpretations of our effects in the discussion.

Building on the findings regarding perceptual and relationship-based biases, we first investigated people's metacognition about the assessment of intensity of emotions—that is, how people think about their own and others' abilities to gauge the intensity of emotions. We refer to this survey as preliminary, since it examined metacognitive beliefs about emotional intensity judgments rather than directly measuring participants' actual performance. Across 403 UK participants, the survey revealed intriguing patterns in how people perceive

their own ability to assess others' intensity of emotions versus how they believe others assess their own (i.e., the respondent's) emotions. While participants viewed themselves as relatively accurate in assessing the intensity of others' emotions (particularly with close acquaintances), they consistently believed that others underestimated the intensity of their own emotions. This perception held true for both close acquaintances and strangers. Notably, while participants expressed a preference for others to accurately assess their intensity of emotions, they believed this rarely occurred in practice (see section 1 in Supplementary Information for full details). These metacognitive beliefs, however, represent only part of the picture. To fully understand the complexity of assessing the intensity of others' positive and negative emotions in social interactions, it is essential to examine behavioral patterns in actual human behavior in different contexts and relationship types.

The current study presents a comprehensive investigation into perceptual biases in how we evaluate the intensity of others' positive and negative emotions. Across seven studies, with a total of 2463 participants, and diverse communication modalities (text, audio, video), we offer a broad examination of this phenomenon. Moreover, by focusing on two distinct relational contexts—strangers and romantic partners—the research aims to detect how the perception of the intensity of others' emotions might fluctuate based on interpersonal closeness. We predicted an overestimation of negative emotions for both strangers and romantic partners. For positive emotions, we had no a priori hypothesis given the limited existing research on perceptual biases in positive emotional states. Finally, we investigated the implications for human interactions and predicted a non-linear association between directional bias and relationship satisfaction.

Across all seven studies, we identified a robust overestimation bias: people tend to overestimate the intensity of emotions experienced by others (Studies 1–3, 5, 6A). This bias emerged consistently across multiple communication modalities: in written texts (Study 1), recorded videos (Study 2), and live conversations with audio-only or audio-video inputs (Studies 3 and 5). Alternative explanations regarding general scale usage bias and the potential impact of immediate versus delayed emotional assessments were systematically tested (Studies 4 and 5). As predicted, the magnitude of this overestimation bias was found to be greater and more consistent for negative compared to positive emotions, and the effect sizes were larger for strangers compared to romantic couples (Studies 1–3, 5, 6A, 6B). Importantly, we reveal social advantages to overestimating the intensity of others' emotions: among strangers, stronger emotional reactions in listeners were associated with higher overestimation, which in turn predicted greater empathic responses (Study 5). In romantic relationships, moderate overestimation of negative emotions was found to positively contribute to relationship satisfaction (Studies 6A and 6B), aligning with our prediction of a non-linear association between directional bias and relationship satisfaction, and suggesting that such bias may serve useful social functions.

Results

Directional bias

In Study 1, 201 English-speaking US participants were recruited from the MTurk platform (https://www.mturk.com/). They were presented with 20 brief vignettes, each depicting the real negative or neutral experiences of various individuals. Upon reading each vignette, participants were asked to rate the emotions of the writer, including both positive (e.g., happy) and negative (e.g., anger) emotions. To investigate potential emotion-intensity judgment bias across all emotions, we calculated the mean difference between the participants' ratings and those supplied by the writers during the stimulus-collection stage (for more information, see "Methods" section). Emotion-intensity judgment bias scores exceeding zero signify an overestimation of the intensity of the emotions conveyed by the writer, whereas scores falling below zero signify an underestimation of the intensity of the emotions conveyed by the writer. To determine the existence of a directional bias in the perceived intensity of others' emotions, a linear mixed model was utilized. This model revealed an overestimation effect ($b = 0.31$, $SE = 0.07$, $t_{(176.54)} = 4.70$, $p < 0.001$, $d = 0.35$, 95% Confidence Interval [0.20, 0.51], see Table S2), indicating that individuals are prone to overestimate the intensity of others' emotions when reading about their experiences. To further examine whether this effect differs for positive and negative emotions, we calculated separate scores for each emotional category. The linear mixed model revealed a significant overestimation effect for negative emotions ($b = 0.40$, $SE = 0.06$, $t_{(188.59)} = 7.09$, $p < 0.001$, $d = 0.52$ [0.36, 0.67]), but not for positive emotions ($b = -0.10$, $SE = 0.06$, $t_{(189.09)} = -1.85$, $p = 0.066$, $d = 0.13$ [−0.01, 0.28], $BF_{10} = 0.24$, see Table S3 and Fig. 1).

Overestimation effect in full videos

Study 2 expanded our investigation to video stimuli to ask whether the tendency to overestimate the intensity of others' emotions extends to dynamic audiovisual stimuli. We explored this effect across positive, negative, and mixed emotional valences, broadening the scope from Study 1's focus on negative and neutral stimuli. Furthermore, by conducting this study with Israeli participants, in contrast to Study 1's US-based sample, we aimed to assess the phenomenon's consistency across different linguistic and cultural contexts. A large community sample of 1219 Israeli participants was analyzed, collected via PanelView and iPanel (Israeli equivalents of MTurk). Each participant viewed a unique set of four videos randomly selected from the Israeli empathic-accuracy stimuli set[44], which comprises 155 videos of 25 individuals sharing autobiographical emotional stories. The randomization ensured that all 155 stimuli were presented across participants, with each video rated by 15 to 35 participants. After each video, participants rated the storytellers' emotions. Similar to Study 1, to quantify the emotion-intensity judgment bias, we calculated the mean difference between participants' ratings and those provided by the storytellers during the stimulus-collection stage[44] (see "Methods" section for details). A linear mixed-model analysis revealed an overestimation effect ($b = 0.48$, $SE = 0.04$, $t_{(218.31)} = 13.72$, $p < 0.001$, $d = 0.93$ [0.77, 1.09], see Table S4). Note that for each video, participants rated both positive emotions (e.g., happiness) and negative emotions (e.g., sadness), regardless of whether the video itself had more positive, negative, or mixed emotional content. To examine how this effect might vary based on the type of emotion being rated (emotion valence) and the emotional content of the videos (video valence), we incorporated these factors and their interaction into a linear mixed-model analysis. A significant effect was found for emotion valence ($b = -0.27$, $SE = 0.02$, $t_{(5599.98)} = -15.38$, $p < 0.001$, $d = 0.21$ [0.18, 0.23]), indicating that the overestimation was higher for negative emotions ($M = .74$ [0.63, 0.85]) than positive emotions ($M = 0.11$ [0.001, 0.22]). Video valence also demonstrated a significant effect ($b = 0.17$, $SE = 0.08$, $t_{(122.02)} = 2.09$, $p = 0.039$, $d = 0.19$ [0.01, 0.37]). Specifically, negative-valence videos showed greater overestimation ($M = 0.63$ [0.42, 0.85]) than positive videos ($M = 0.28$ [0.13, 0.44]; mean difference = 0.35, $SE = 0.13$, $t_{(131.77)} = 2.62$, $p = 0.029$, $d = 0.23$ [0.05, 0.40]). Mixed-valence videos did not significantly differ from the other two valence categories (mixed vs. positive: mean difference = 0.20, $SE = 0.10$, $t_{(131.65)} = 2.05$, $p = 0.128$, $d = 0.18$ [0.01, 0.35], $BF_{10} = 0.21$; mixed vs. negative: mean difference = −0.15, $SE = 0.12$, $t_{(131.15)} = -1.19$, $p = 0.711$, $d = 0.10$ [−0.07, 0.27], $BF_{10} = 0.11$). The interaction between positive emotion valence and negative video valence did not reach statistical significance ($b = -0.04$, $SE = 0.02$, $t_{(5606.73)} = -1.83$, $p = 0.067$, $d = 0.02$ [0.00, 0.03], $BF_{10} = 0.07$, see Table S5). Post hoc analyses with Bonferroni correction indicated a consistent pattern whereby overestimation was higher for negative than for positive emotions across all video valence categories (see Fig. 2; details available in section 4.2.1 of the Supplementary

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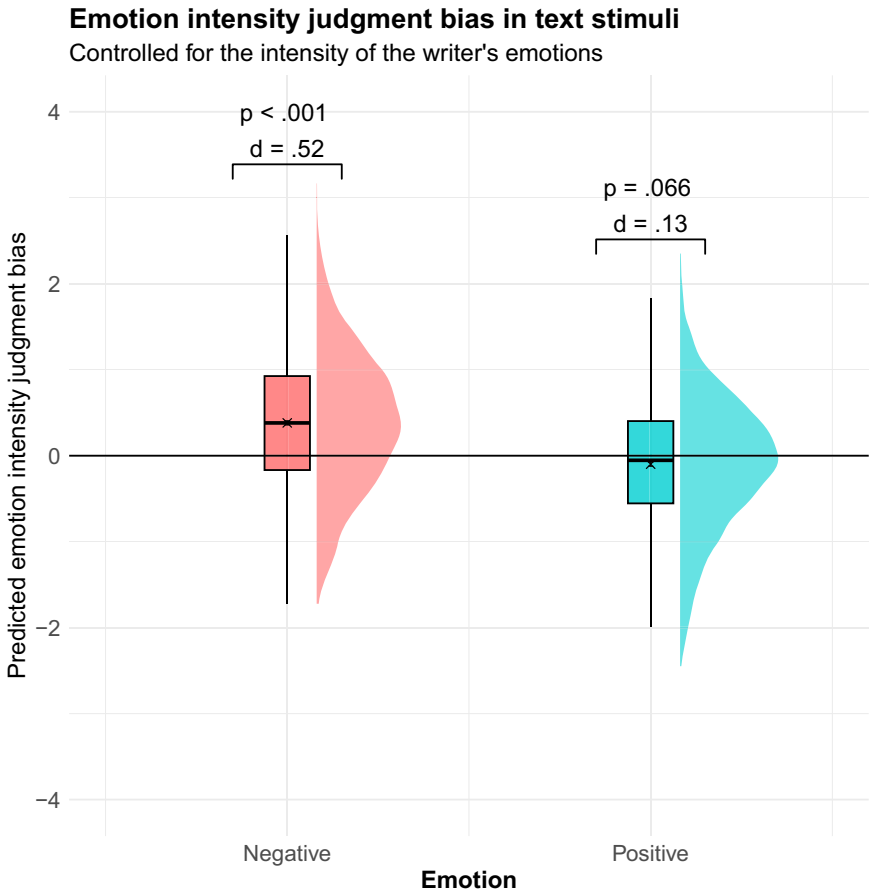

Fig. 1 | Emotion-intensity judgment bias in text stimuli in (Study 1), derived from a linear mixed-effects model (two-tailed) for positive (turquoise; $b = -0.10$, SE = 0.06, $t_{(189.09)} = -1.85$, $p = 0.066$, $d = 0.13$ [−0.01, 0.28], $BF_{10} = 0.24$) and negative (coral; $b = 0.40$, SE = 0.06, $t_{(188.59)} = 7.09$, $p < 0.001$, $d = 0.52$ [0.36, 0.67]) emotions. The Y-axis represents the emotion-intensity judgment bias score, adjusted for the intensity of the target's emotions: Targets' self-reports are treated as the ground truth; accordingly, positive values indicate what we consider to be overestimation of the intensity of the target's emotions (higher ratings by participants than by writers), while negative values indicate what we consider to be underestimation of the intensity of the target's emotions (lower ratings by participants than by writers). The visualization combines box plots and half-eye plots. Box plots display interquartile range (25th to 75th percentiles), median (line), and mean (black cross). Whiskers extend to the most extreme data points within 1.5 times the interquartile range from the box edges. Overlaid half-eye plots illustrate the probability density of the estimations. Statistical estimates were based on 7741 valid observations (after outlier exclusion) from 201 independent participants, each rating 20 autobiographical text stimuli selected from a pool of 79 texts written by nine independent writers.

Information). Together, findings from Study 2 demonstrate that the tendency to overestimate the intensity of others' emotions extends beyond textual content to naturalistic and dynamic videos where individuals have access to visual and auditory cues, in this case derived from another culture and language. This effect is particularly strong for negative emotions compared to positive ones in various stimulus contexts. Moreover, negative stimuli generally elicit more overestimation than positive stimuli.

Overestimation effect in live audio and video interactions

While Study 2 demonstrated the overestimation effect using relatively naturalistic stimuli, it remained unclear whether this phenomenon would persist in live interactions or if it was confined to laboratory settings with pre-recorded stimuli. To address this question, Study 3 aimed to extend the findings to more authentic, real-time exchanges, simulating emotional interactions that occur during phone or video calls. To investigate this, we reanalyzed data from a Zoom-based experiment of dyadic online interactions[51]. Two hundred and thirty Hebrew-speaking Israeli participants were randomly paired into 115 same-gender dyads of strangers (see "Methods" section). In each pair, one participant (the "storyteller") shared a recent negative autobiographical story with the other participant (the "listener"). The dyads were evenly split between two conditions: an Audio-only condition, where participants could hear but not see each other, and an Audio +Video condition, where participants could both hear and see each other (without seeing themselves). Following the interaction, both participants rated the storyteller's emotions, enabling us to calculate emotion-intensity judgment bias scores similar to those in Studies 1–2. To investigate potential differences in this effect across emotion valence (positive and negative emotions) and condition (Audio-only or Audio+Video), we incorporated separate scores for each emotional category, along with their interaction, into a linear mixed-model analysis. A significant effect was found for overall overestimation ($b = 0.40$, $SE = 0.07$, $t_{(111.97)} = 5.69$, $p < 0.001$, $d = 0.54$ [0.34, 0.73]). Moreover, a significant effect was found for emotion valence ($b = -0.23$, $SE = 0.07$, $t_{(111.30)} = -3.38$, $p = 0.001$, $d = 0.32$ [0.13, 0.51], see Fig. 3), indicating that the overestimation was higher for negative emotions ($M = 0.67$ [0.47, 0.86]) than positive emotions ($M = 0.21$ [0.01, 0.40]). No difference was found for the condition or for the interaction (see Table S6).

Overestimation effect – addressing alternative explanations

Although Studies 1–3 consistently demonstrated the tendency to overestimate the intensity of others' emotions, alternative explanations for this effect warranted investigation. One possibility is that people simply tend to use more extreme points on emotion rating

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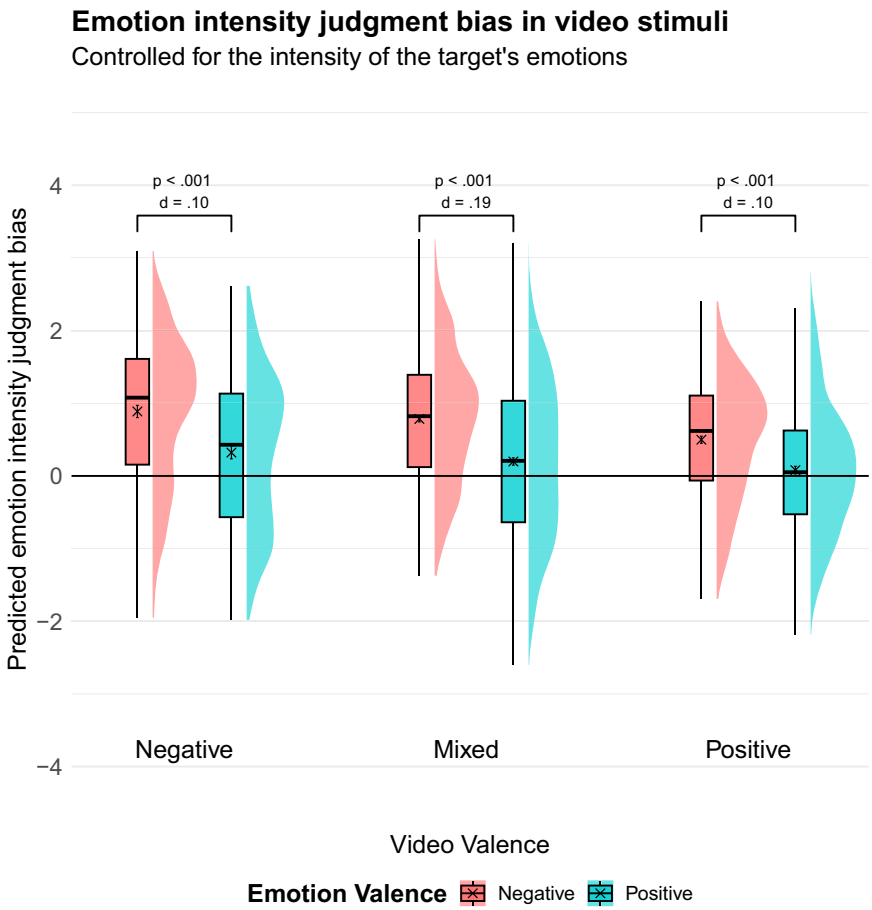

Fig. 2 | Emotion-intensity judgment bias in video stimuli (Study 2), derived from a linear mixed-effects model (two-tailed) comparing positive (turquoise) and negative (coral) emotions across video valence categories with Bonferroni correction (Negative video valence: mean difference = 0.57, SE = 0.08, $t_{(5561.46)} = 7.23$, $p < 0.001$, $d = 0.10$ [.07, 0.12]; Mixed video valence: mean difference = 0.63, SE = 0.04, $t_{(5589.29)} = 14.24$, $p < 0.001$, $d = 0.19$ [0.16, 0.22]; Positive video valence: mean difference = 0.44, SE = 0.06, $t_{(5579.66)} = 7.82$, $p < 0.001$, $d = 0.10$ [0.07, 0.13]). The Y-axis represents the emotion-intensity judgment bias scores, adjusted for intensity of the target's emotions: Targets' self-reports are treated as the ground truth; accordingly, positive values indicate what we consider to be overestimation of the intensity of the target's emotions (higher ratings by participants than by storytellers), while negative values indicate what we consider to be underestimation of the intensity of the target's emotions (lower ratings by participants than by storytellers). The visualization combines box plots and half-eye plots. Box plots display interquartile range (25th to 75th percentiles), median (line), and mean (black cross). Whiskers extend to the most extreme data points within 1.5 times the interquartile range from the box edges. Overlaid half-eye plots illustrate the probability density of the estimations. Statistical estimates were based on 6841 valid observations (after outlier exclusion) from 1221 independent participants, each rating four autobiographical video stimuli selected from a pool of 134 videos shared by 25 independent storytellers.

scales when responding to any emotional stories, regardless of whether they're rating their own or others' emotions. If this were true, the overestimation found in Studies 1–3 would merely reflect a general response bias in how people use emotion rating scales, rather than a true bias in judging others' emotions specifically. To test this alternative explanation, Study 4 reanalyzed data from another dyadic experiment with 234 Hebrew-speaking participants (117 same-gender pairs; see "Methods" section)[51]. This study mirrored Study 3's design but with one crucial difference: participants were asked to rate their own emotional reactions to the stories rather than estimate the storytellers' emotions. If the overestimation effect found in Studies 1–3 reflects a general tendency to use extreme scale points when rating emotions, listeners should rate their own emotions as more intense than storytellers' ratings. Finding no such pattern would suggest that the overestimation bias is specific to judging others' emotions rather than a general response tendency. A linear regression model showed no significant deviation from zero ($b = -0.06$, $t_{(114.00)} = -0.63$, $p = 0.530$, $d = 0.06$ [−0.12, 0.24], $BF_{10} = 0.04$, see Table S7 and Fig. 4), with the average emotional intensity similarity between listener and storyteller falling below zero. These findings suggest that listeners generally rate the intensity of their own emotional responses similarly to the intensity of emotions reported by the storytellers themselves, strengthening the case for a specific overestimation bias when asked to assess the intensity of others' emotions.

Another explanation of the results may be related to the immediacy with which perceivers had to judge the intensity of other people's emotions, making ratings immediately after the stimuli appeared with no time for reflection or emotion regulation, while the storytellers themselves often told stories that they had some time to reflect on. To ensure that the bias is not merely a result of an immediate judgment, and also to examine stability of this bias over time, Study 5 expanded on the design of Study 4 by introducing a delayed assessment component[51]. Listeners completed a follow-up survey one to three days after the initial interaction, recalling the encounter and rating the emotions conveyed by the *storyteller*. Additionally, participants completed a brief questionnaire assessing their empathic reaction—defined as the level of empathic distress and concern experienced following the recollection of the story[52]. Similar to Study 3, a linear mixed model revealed a significant effect for overall overestimation ($b = 0.75$, $SE = 0.10$, $t_{(102.92)} = 7.82$, $p < 0.001$, $d = 0.77$ [0.55, 0.99]), indicating that

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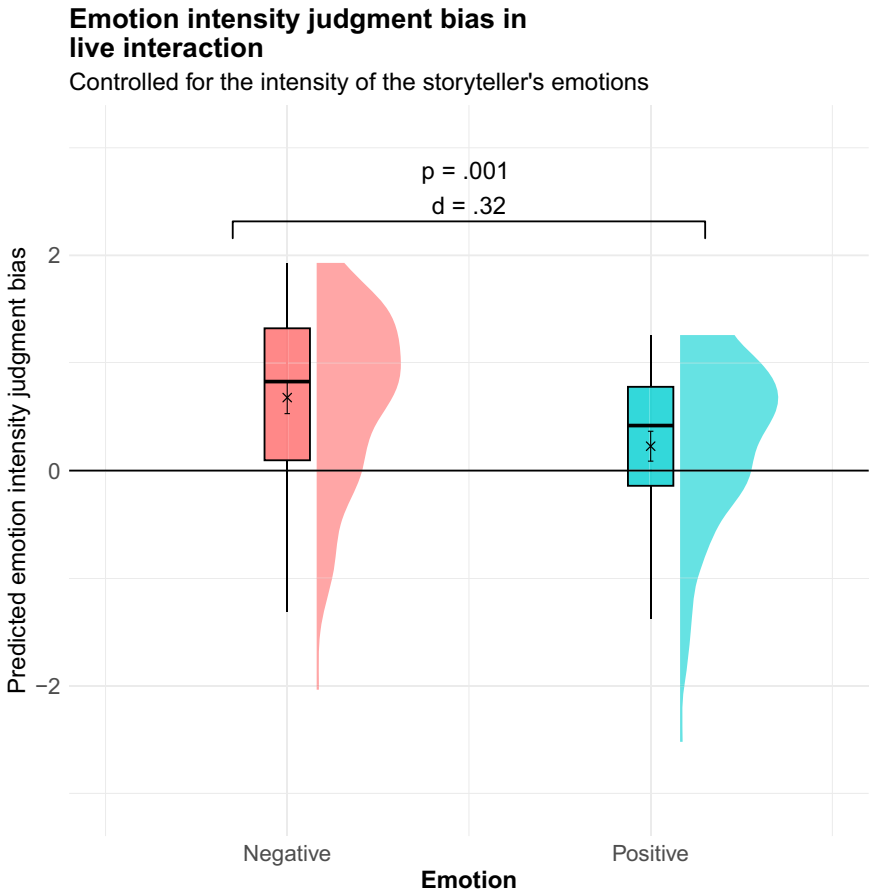

Fig. 3 | Emotion-intensity judgment bias in live interactions (Study 3), derived from a linear mixed-effects model (two-tailed) comparing positive (turquoise) and negative (coral) emotions ($b = -0.23$, SE = 0.07, $t_{(111.30)} = -3.38$, $p = 0.001$, $d = 0.32$ [0.13, 0.51]). The Y-axis represents the emotion-intensity judgment bias scores, adjusted for the intensity of the target's emotions: Targets' self-reports are treated as the ground truth; accordingly, positive values indicate what we consider to be overestimation of the intensity of the target's emotions (higher ratings by participants than by storytellers), while negative values indicate what we consider to be underestimation of the intensity of the target's emotions (lower ratings by participants than by storytellers). The visualization combines box plots and half-eye plots. Box plots display the interquartile range (25th–75th percentiles) median (line) and mean (black cross). Whiskers extend to the most extreme data points within 1.5 times the interquartile range from the box edges. Overlaid half-eye plots illustrate the probability density of the estimations. Statistical estimates were based on 225 valid observations (after outlier exclusion) from 115 independent pairs.

even after a few days, listeners still tended to overestimate the intensity of their conversation partner's emotions. Notably, this effect size was larger than that observed for immediate post-interaction judgments. The analysis also showed a significant effect for emotion valence ($b = -0.35$, $SE = 0.08$, $t_{(102.56)} = -4.65$, $p < 0.001$, $d = 0.46$ [0.25, 0.66]), with greater overestimation for negative emotions ($M = 1.13$ [0.89, 1.38]) compared to positive emotions ($M = 0.43$ [0.18, 0.67]). No significant effects were found for condition or interaction (see Table S8).

Social advantages of overestimation bias

Across four studies, we consistently demonstrated a robust bias to overestimate the intensity of others' emotions. While establishing the existence of this bias is important, the discrepancy between people's self-perceived accuracy (found in our preliminary survey) and their actual tendency to overestimate raises questions about its underlying mechanisms and potential adaptive value. One possible adaptive function relates to empathy. According to theories of empathy, there exists a bidirectional (conscious or unconscious) relationship between our emotions and our perception of others' emotions. Through simulation mechanisms, we project our own mental and emotional states onto others[24,53], while simultaneously, others' emotions affect our own emotional responses, creating experience sharing[54–56]. These processes facilitate our understanding of others' emotional experiences, enabling us to feel empathy for them and motivating us to offer help and care[57,58]. Based on these theories, stronger emotional responses in an individual will increase the intensity of emotions they perceive in others (leading to greater overestimation), which in turn would predict stronger empathic reactions (measured by levels of empathic concern and personal distress).

To test these hypotheses, we conducted a mediation analysis in our fifth study, Study 5, with three key variables: the mean intensity of the listener's emotions during the interaction (predictor), their emotion-intensity judgment bias for the storyteller's emotions measured several days later (mediator), and their empathic reaction (assessed days after the interaction; outcome). There was a significant indirect effect of the intensity of the listener's own emotions through the emotion-intensity judgment bias (β = 0.17, [0.04, 0.31], $p = 0.012$), as well as a significant direct effect (β = 0.24 [0.01, 0.47], $p = 0.038$), with the mediation effect estimated to account for 41.66% of the total effect of the model. As hypothesized, the results suggest that listeners who experienced stronger emotional reactions during the interaction showed a greater tendency to overestimate the intensity of the storyteller's emotions. These overestimations, in turn, predicted greater empathic reactions several days later. Specifically, the relationship between the initial intensity of the listeners' emotions and their subsequent empathic response was partially mediated by their

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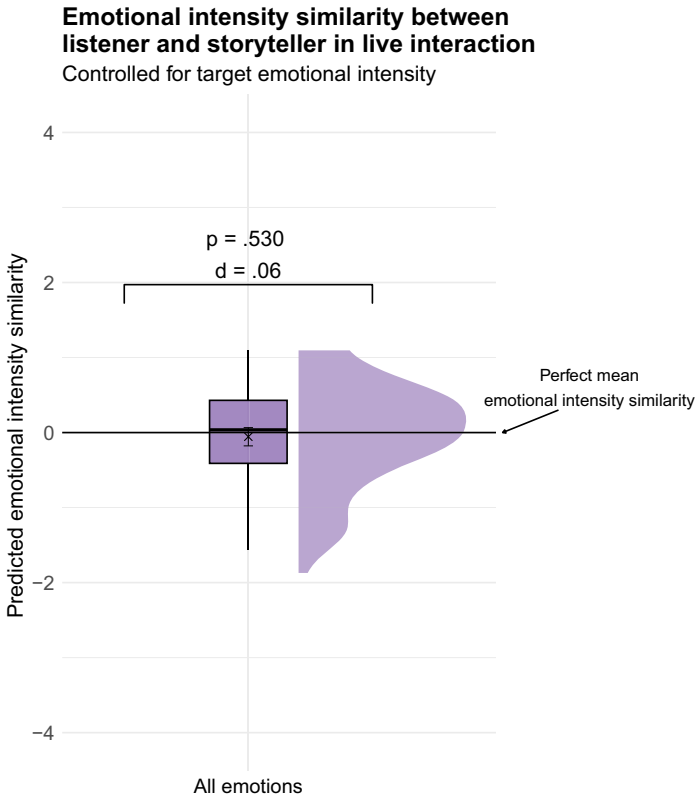

Fig. 4 | Emotional intensity similarity between listener and storyteller in live interactions (Study 4), derived from a linear regression model (two-tailed) comparing the overall emotional-intensity similarity between listener and storyteller to zero ($b = -0.06$, $t_{(114.00)} = -0.63$, $p = 0.530$, $d = 0.06$ [−0.12, 0.24], $BF_{10} = 0.04$). The Y-axis represents the emotional intensity similarity between listener and storyteller scores, adjusted for the intensity of the target's emotions: positive values indicate that the listener reported more intense emotions than the storyteller, while negative values indicate that the listener reported less intense emotions than the storyteller. The visualization combines box plots and half-eye plots. Box plots display interquartile range (25th–75th percentiles) median (line) and mean (black cross). Whiskers extend to the most extreme data points within 1.5 times the interquartile range from the box edges. Overlaid half-eye plots illustrate the probability density of the estimations. Statistical estimates were based on 116 valid observations (after outlier exclusion) from 116 independent pairs.

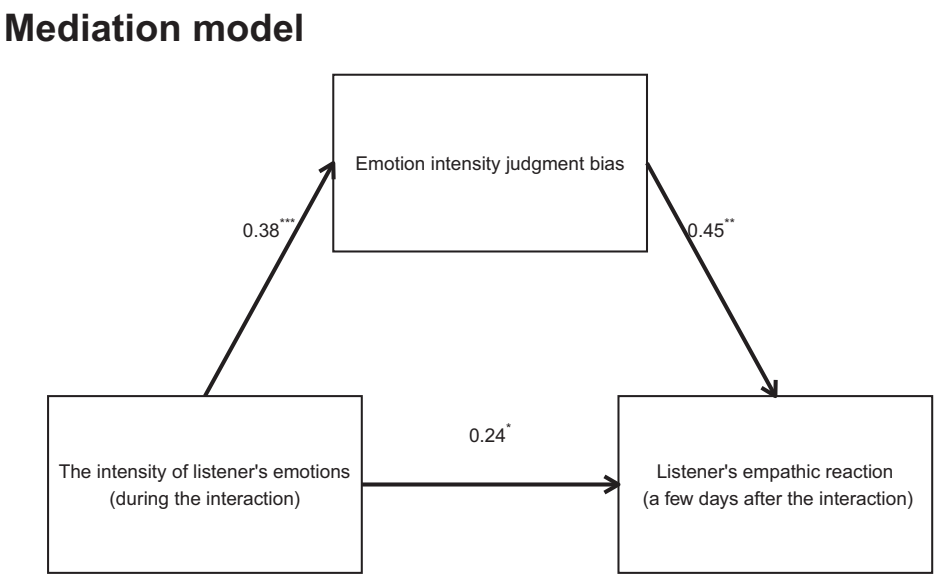

Fig. 5 | Mediation model illustrating the relationship between the intensity of the listener's emotions, emotion-intensity judgment bias, and empathic reaction. The numbers on each path represent standardized linear regression coefficients (β) from two-tailed tests. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

tendency to overestimate the storyteller's emotions (see Fig. 5). These findings suggest that the overestimation bias may serve an adaptive social function by enhancing empathic responses in social interactions.

Overestimation and relationship satisfaction in romantic couples

Studies 6A and 6B shift the focus from strangers to close relationships. First, we examine whether the observed directional bias persists when

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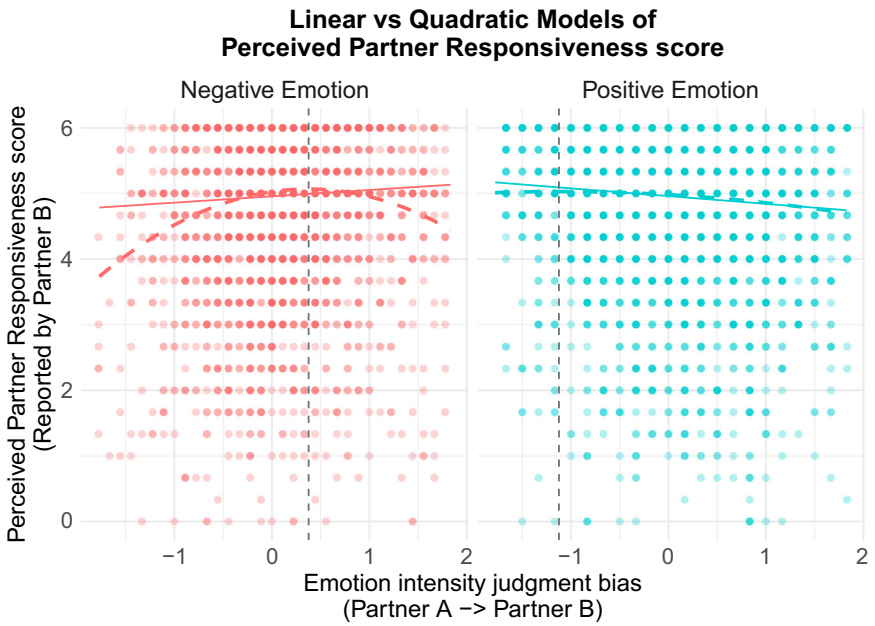

Fig. 6 | The association between emotion-intensity judgment bias and Perceived Partner Responsiveness (PPR) scores for negative (coral) and positive (turquoise) emotions in Study 6A. The X-axis represents Partner A's emotion-intensity judgment bias of Partner B's emotions. Partner B's self-reports are treated as the ground truth; accordingly, positive values indicate what we consider to be overestimation of the intensity of the partner's emotions, while negative values indicate what we consider to be underestimation of the intensity of the partner's emotions. The Y-axis shows Partner B's reported PPR score. Solid and dashed lines illustrate linear and quadratic model predictions, respectively. Vertical dashed lines indicate the peak PPR score predicted by the model for each emotion valence.

individuals have extensive contextual information about each other, potentially leading to more accurate assessments of the intensity of the other person's emotions and reduced overestimation. We then investigated whether such directional bias serves an adaptive function in relationship satisfaction. To address these questions empirically, Study 6A reanalyzed data from a 21-day diary study of 100 Israeli heterosexual couples who were new parents, assessed three months after the birth of their first child[59]. Participants provided daily evening ratings of their own emotions and their perceptions of their partner's emotions[60]. A linear mixed-model analysis indicated significant overestimation for negative emotions ($b = 0.06$, $SE = 0.02$, $t_{(248.17)} = 3.42$, $p < 0.001$, $d = 0.22$ [0.09, 0.34]) but not for positive emotions ($b = 0.00$, $SE = 0.02$, $t_{(251.34)} = 0.27$, $p = 0.789$, $d = 0.02$ [−0.11, 0.14], $BF_{10} = 0.03$, see Table S9).

Prior meta-analyses on romantic relationships found no significant association between directional bias and relationship satisfaction[23,24]. However, these meta-analyses examined directional bias in general relationship attitudes rather than emotion perception. Although theoretical work has discussed the importance of accurately assessing one's partner's emotions for relationship satisfaction, and how biased perception can influence relationship outcomes[26,28], this question has not yet been fully explored empirically. Particularly understudied is the possibility of a curvilinear relationship—where moderate deviation from accurate assessment toward overestimation of negative emotions might be beneficial, but extreme deviations in either direction could reduce satisfaction. To address this gap, we examined the association between each partner's emotion-intensity judgment bias score and their partner's reported relationship satisfaction.

Previous research on emotion perception suggests that accurate understanding of a partner's negative emotions is essential for responding to their needs[23,61,62], affects how close the partner feels to them[28,63], and relates to the partner feeling better within the relationship (i.e., experiencing more positive and less negative emotions)[43]. However, studies have not investigated how biased perception of the partner's emotions relates to relationship-satisfaction measures. Therefore, in the current investigation, we look at three relationship-satisfaction measures: the Perceived Partner Responsiveness scale (PPR), evaluating the respondent's perceptions of their partner's responsiveness[64,65]; the Closeness scale, measuring emotional and physical closeness[66]; and the Positive Relationship Feelings subscale, quantifying levels of positive emotions within the relationship[67,68].

For each relationship-satisfaction measure, a linear mixed model was conducted with emotion-intensity judgment bias score, emotion valence, and their interaction as fixed effects (see "Methods" section for the full model). To test our hypothesis about curvilinear relationships, we compared each model to a similar model using orthogonal polynomials of degree 2 for the emotion-intensity judgment bias score.

For the PPR, the model comparison indicated that the non-linear model significantly improved goodness of fit ($\chi^2_{(2)} = 114.30$, $p < 0.001$), suggesting a non-linear relationship between emotion-intensity judgment bias and PPR. Significant interactions between the orthogonal polynomials (degree 1 and 2) of emotion-intensity judgment bias score and emotion valence implied different associations for positive and negative emotions (see Table S10).

For negative emotions, an inverted-U curve was observed, indicating that large deviations from accurate assessment, whether overestimation (i.e., emotion-intensity judgment bias above zero) or underestimation (i.e., emotion-intensity judgment bias below zero), were related to lower PPR scores. However, the peak PPR value (5.07 [4.93, 5.20]) corresponded to a slight overestimation (0.37). A contrast analysis between overestimation and underestimation further supported the conjecture that overestimation of negative emotions was associated with higher PPR than underestimation (mean difference = 0.37, $SE = 0.05$, $t_{(7585.56)} = 6.97$, $p < 0.001$, $d = 0.08$ [0.06, 0.10]). For positive emotions, we found an opposite trend. The peak PPR value (5.03 [4.89, 5.17]) corresponded to an underestimation (−1.12). A contrast analysis demonstrated that underestimating positive emotions was associated with higher PPR than overestimating them (mean difference = −0.16, $SE = 0.04$, $t_{(7586.62)} = -4.37$, $p < 0.001$, $d = 0.05$ [0.03, 0.07], see Fig. 6).

These patterns were consistently observed across all other relationship-satisfaction measures (see section 4.6 in the Supplementary Information).

In Study 6B, we replicated the results of Study 6A with an independent sample of 80 heterosexual couples[69]. While we observed a similar pattern of individuals overestimating the intensity of their partner's negative emotions, this effect did not reach statistical significance. However, we replicated Study 6A's findings on the relationship between emotional overestimation and relationship satisfaction. We found a non-linear relationship between these variables. For negative emotions, higher relationship satisfaction was associated with overestimation rather than underestimation of the intensity of a partner's emotions. Conversely, for positive emotions, underestimation was associated with higher relationship satisfaction. For comprehensive details on all these analyses, see section 4.7 in the Supplementary Information.

Discussion

The interpretation of the intensity of others' emotions—how deeply someone experiences a feeling—lies at the core of human social perception. Beyond simply identifying emotions as happiness, sadness, or anger, we must gauge their magnitude: Is our child genuinely happy in school, or just mildly content? Does a coworker's response to team conflict display slight tension or intense anxiety? These assessments of the intensity of the other's emotions shape our daily interactions, guiding whether we respond with a quick message of support or drop everything to provide immediate assistance.

Across seven studies, we investigated bias in judging the intensity of others' emotions and its possible effects on social behavior. Our findings revealed an intriguing paradox: People believe they and others tend to accurately identify or underestimate the intensity of others' emotions, yet our results consistently showed overestimation when assessing both strangers' and romantic partners' negative emotions (as we had hypothesized). This overestimation effect for negative emotions persisted across various modalities—from text-based interactions to recorded videos and live conversations—and remained stable even when participants reassessed the storyteller's emotions a day after their interaction, suggesting a fundamental phenomenon in human social perception rather than an artifact of any particular communication channel. For positive emotions, a less consistent pattern emerged – strangers' positive emotions were sometimes overestimated, while no systematic bias was observed for romantic partners' positive emotions. The stronger and more consistent overestimation bias for negative versus positive emotions aligns with negativity bias theory, which suggests that negative stimuli are more salient and command greater attention than positive ones[33–35]. Such negative stimuli utilize more memory resources, which may lead to overestimation[36]. This heightened sensitivity to negative emotions likely serves an adaptive function. Error management theory suggests that, from an evolutionary perspective, a higher rate of false positives in detecting the intensity of negative stimuli provides a survival advantage by ensuring that potential threats requiring immediate action are not overlooked[31,32]. Unlike negative emotions, evolutionary predictions for positive emotions are less straightforward. The costs of misperceiving positive emotions—either through false positives or false negatives—may depend on specific contexts and relationship types. This could explain our inconsistent findings regarding positive emotions, where we observed varied patterns of overestimation, no significant bias, or marginal underestimation. Furthermore, when the positive emotions aren't directed at the perceiver (for instance, how much your friend enjoyed their vacation), they potentially carry fewer immediate survival implications compared to emotions directed toward oneself (such as a partner's satisfaction with the relationship). Future research should investigate how this distinction between self-directed and non-self-directed positive emotions influences biases in perceiving emotional intensity, as well as how different contexts affect these perception patterns. The overestimation bias in judging the intensity of others' emotions aligns with similar overestimation biases observed when predicting one's own future emotions, a phenomenon known as "affective forecasting"[70–74], as well as some cases of assessing the intensity of one's own past emotions[75]. Collectively, these biases may be parsimoniously explained through the broader framework of psychological distance, which posits that as psychological distance increases (in time, space, social connection, or hypotheticality), individuals tend to think about objects or events more abstractly[76]. Accordingly, considering someone else's emotions or reflecting on one's own emotions in the past or future involves greater abstraction compared to experiencing one's emotions in the present. This abstract thinking may reduce attention to mitigating details or contextual factors, which could otherwise temper emotional judgments.

Notably, the observed effect sizes for overestimation of the intensity of others' emotions were descriptively larger in studies with strangers compared to those with romantic partnerships. Error management theory offers a framework that could predict two competing patterns. On the one hand, higher motivation to understand emotions in close relationships might lead to greater overestimation among romantic partners[28]; on the other hand, greater uncertainty when interacting with strangers might drive stronger overestimation biases in those contexts[31,32]. Our results appear to support the latter explanation, suggesting that uncertainty plays a more dominant role in shaping these perceptual biases than motivational factors do. As such, both familiarity and contextual knowledge may serve as important moderators: The more we know about others and their typical emotional expressions, the more accurately—though still not perfectly—we gauge the intensity of their emotions. It's worth noting that participants' motivation to understand strangers' emotions in our experimental settings may have been heightened compared to real-world interactions, as they were explicitly instructed to pay attention to the targets' emotions as part of the study task. Future research should address this limitation by examining these biases in more naturalistic settings with varying levels of motivation.

Our findings suggest that the overestimation bias may serve a broad adaptive social function, as it appears to enhance empathic responses in interactions with both strangers and romantic partners, particularly during negative events. In strangers, overestimation predicts higher empathic responses, which often drive prosocial behavior[54,77]. In romantic couples, we extend previous investigations by revealing a curvilinear association between directional bias and relationship satisfaction. We found that moderate overestimation of *negative emotions*—which could be perceived as threats to the relationship or a partner's well-being—predicts higher relationship satisfaction compared to underestimation or even accurate estimation. This pattern suggests an adaptive mechanism in relationships, balancing the need for empathy and support with the motivation to continually invest in the relationship: Perceiving a partner's negative emotions as slightly more intense than they actually are fosters closeness and promotes supportive behaviors. Interestingly, our findings reveal a complementary pattern for *positive emotions*. Unlike negative emotions, underestimating the intensity of positive emotions in one's romantic partner was associated with higher relationship satisfaction. This suggests that perceiving a partner's positive emotions as less intense than they actually are might encourage continued efforts to maintain and enhance the relationship through sustained support and relationship maintenance.

These contrasting patterns for positive and negative emotions suggest that 'negative bias'—viewing one's partner, their emotions, or the relationship as more negative than an objective benchmark[23,24]—is associated with greater relationship satisfaction. This finding aligns with error management theory's predictions about how pessimistic perceptions can protect relationships by preventing complacency and

encouraging maintenance behaviors[24,28]. Interestingly, these findings challenge participants' self-reported preferences from our preliminary survey, in which participants reported preferring an accurate assessment of their emotional intensity. However, it is important to note that whereas moderate overestimation can be beneficial, the non-linear association between directional bias and relationship satisfaction reveals that *extreme* overestimation of negative emotions may negatively impact the relationship. This finding bridges error management theory, which proposes that decision-making mechanisms aim to minimize the overall cost of errors even at the expense of increasing total error rate[31,32], with numerous studies stressing the importance of accuracy in understanding partners' emotions[23,24,26,28,78]. Therefore, while moderate bias could be beneficial, completely misinterpreting or greatly exaggerating one's perception of emotional situations cannot be adopted as a default strategy. To further validate these findings and test their generalizability, future research should examine these patterns across a broader range of relationship types, including non-romantic close relationships. Additionally, investigating how these biases develop over the course of a relationship could provide valuable insights into relationship formation and maintenance processes.

Limitations and future directions

Our research has several limitations that should be addressed in future studies. First, most of our studies focused predominantly on negative emotional events. While this approach provided valuable insights into the processing of negative events, it may have limited our understanding of how individuals assess the intensity of positive events. Moreover, in most studies, fewer positive emotions were measured compared to negative emotions, ranging from 2 to 11 for positive emotions and 3 to 14 for negative emotions across studies, which in some cases resulted in reduced reliability for positive emotion scales (see "Methods" section). Future research should give equal attention to positive emotional experiences and use equivalent numbers of items to assess intensity perception of both positive and negative emotions, allowing for a more comprehensive examination of intensity judgment across the full spectrum of emotions.

Second, our studies focused on bias in emotion-intensity perception in general, and did not differentiate between judging emotions directed toward the perceiver herself versus toward external factors. In Studies 1–5, participants only assessed emotions related to external events rather than emotions directed at them personally. In our romantic couple studies (Studies 6A and 6B), we cannot determine the target of partners' emotions since participants rated general mood rather than emotions tied to specific events. Therefore, most of our data concerns emotion perception when the target's emotions are not directed at the perceiver. While previous research has demonstrated overestimation of negative emotions directed at the romantic partner[26], they did not examine the curvilinear association between such perceptions and relationship satisfaction. When the target's emotions are directed at the perceiver (whether romantic partner or stranger), biases in emotional intensity perception may have different effects on relationship satisfaction or interaction outcomes, which should be investigated in future research.

Third, as noted earlier, we define the ground truth as the target's self-report of their emotional state, hence both accuracy and bias are assessed relative to these values. Nonetheless, our current design cannot distinguish between observers overestimating targets' negative emotions versus targets under-reporting their true emotional intensity. We cannot rule out the possibility that, at least in some cases, people underreport the negativity of their own emotions, for example, to appear stronger or more resilient, or to present themselves as nicer and more stable/less volatile. If this were the case, then what we define as a beneficial moderate overestimation may in fact be a beneficial accurate estimation of the other's emotional intensity. However, motivations to underreport the intensity of one's own emotions do not apply in all contexts, and it is less likely that targets underreported their emotions across the diverse contexts, cultures, and familiarity levels examined in this study. Research actually suggests the opposite pattern can occur, where people may exaggerate their reports of negative emotions, specifically when they believe they are expected to feel a particular emotion that they do not experience sufficiently (e.g., not feeling sad enough in what should be a sad situation)[79]. Therefore, even if there are cases where people underreport their own emotions, this is unlikely to account for the consistent bias described here.

Another alternative explanation is that targets underreported negative emotions due to memory decay or resolution of the original negative situation at the time of reporting. However, we do not believe this explanation can account for the entire effect, as the temporal dimension varies considerably across our studies. While in some studies, targets shared stories that occurred long ago, in Studies 3–5, participants were asked to share recent experiences, and in Studies 6A and 6B, participants rated their mood at that exact moment and in relation to the current day. This variation in temporal proximity across studies suggests that memory decay alone cannot fully explain our findings. Nevertheless, we think that future studies should investigate these alternative explanations more directly. Moreover, future research should combine emotion self-report measures with explicit assessments of perceived pressure to conceal emotional intensity, along with physiological measures to capture channels of emotional responses that might remain unexpressed behaviorally.

Additionally, as noted above, our romantic couple studies (Studies 6A and 6B) used general mood ratings rather than emotions tied to specific events. This design may have attenuated the overestimation effect compared to what would be observed with event-specific emotional reports. Future studies could address this by incorporating event-specific emotional reports to capture a more detailed picture of emotion-intensity judgment in close relationships, or to compare, within-study, between emotion-intensity estimation of both strangers and couples.

Lastly, Gottman et al. demonstrated that different communication predictors are associated with concurrent marital satisfaction compared to those that predict changes in marital satisfaction over time[80]. Given that Studies 6A and 6B focused on a timeframe of only 3–5 weeks, future research should explore the longitudinal effects of positive and negative emotion-intensity judgments over extended periods.

Methods

The preliminary survey and Studies 2–5 were approved by the Hebrew University of Jerusalem's ethics committee, Study 1 was approved by the Columbia University Institutional Review Board, and Studies 6A and 6B were approved by Bar-Ilan University's ethics committee. Participants provided informed consent for all studies. For Studies 1–6, participants' biological sex was determined based on self-report using the terms "male" and "female". We did not exclude any additional datasets that yielded non-converging or contradictory findings.

Study 1

Participants. A total of 203 English-speaking US participants were recruited via MTurk and received monetary compensation at a rate of $5 per hour. Two did not complete at least 50% of the task and, therefore, were removed from the sample, resulting in 201 participants (40.30% female, M_{age} = 34.65, SD_{age} = 9.56) from diverse ethnic backgrounds (14 Asian, 16 Black, 7 Latinx, 150 White, and 14 Multiracial).

Stimuli. A total of 79 short autobiographical events were used as stimuli. To obtain these stimuli, 9 American English-speaking participants (3 female, M_{age} = 29.56, SD_{age} = 4.13) from diverse ethnic backgrounds (2 Asian, 1 Black, 3 White, and 3 unreported) were recruited from Columbia University. They were asked to write brief accounts of 16

memories from the past five years: eight that evoked negative emotions and eight neutral memories without strong emotional associations. The events were then rated by the participants on a scale of 1 ("not at all") to 7 ("a lot") for ten emotions: bad, anxious, happy, ashamed, calm, disgusted, sad, lonely, angry, and guilty. Additional measures were collected but are not relevant to the current study.

Between 4 and 14 texts were selected from each participant, resulting in a total of 79 texts, of which 59 were negative. The texts were edited to remove the gender indicators and event timestamps.

Procedure. Participants read 20 brief vignettes depicting real negative or neutral experiences of different individuals. Following each text, they rated the writer's emotions (bad, anxious, happy, ashamed, calm, disgusted, sad, lonely, angry, and guilty) on a 1–7 scale from "not at all" to "a lot". Additional questions and trait questionnaires were administered, both beyond the scope of this manuscript.

Measures

Emotion-intensity judgment bias score. This score measures the difference between the perceived and actual emotional intensity of the target. It's calculated by subtracting the mean intensity of the emotions reported by targets (i.e., writers) from the mean rating given by evaluators (i.e., participants; for similar measures, see refs. 74,81,82). Positive emotion-intensity judgment bias scores indicated an overestimation of the intensity of the target's emotions, while negative scores indicated an underestimation of the intensity of the emotions. We applied this method to also calculate separate scores for both negative (i.e., bad, anxious, ashamed, disgusted, sad, lonely, angry, and guilty; Cronbach's $\alpha = 0.78$ [0.77, 0.79]) and positive (i.e., happy and calm; Cronbach's $\alpha = 0.59$ [0.55, 0.63]) emotions.

Target's emotional intensity. This score was calculated as the average of the self-reported intensity of the target's emotion ratings.

Data analysis. All statistical analyses were performed using R software[83]. For each analysis, outliers scoring above or below 2.5 standard deviations in the relevant dependent variable were removed. All key findings and conclusions persist when analyses include the complete dataset with no outlier exclusions. Complete analyses with and without outliers are available in the R code provided in our open-source materials. The significance level for all statistical tests was set at $\alpha = 0.05$, with all tests performed two-tailed.

For all mixed-model analyses, we assessed normality using the Anderson-Darling test and homoscedasticity using Levene's and Breusch–Pagan tests. While not all assumptions were fully met in every case, visual inspection of Q–Q plots and residual plots indicated that violations were minor, and skewness and kurtosis values were generally within or near acceptable ranges. Recent simulation studies support proceeding with linear mixed models under such conditions. Schielzeth et al. (2020)[84] demonstrated that mixed-effects models are largely robust even to quite severe violations of distributional assumptions, with parameter estimates remaining largely unbiased when sample sizes are adequate[85]. Knief and Forstmeier further showed that p-values from Gaussian models remain reliable under non-normality, particularly at sample sizes of $N \geq 100$[85]. The documented robustness of linear mixed models to distributional violations, combined with our diagnostic assessments and adequate sample sizes, supported the use of standard analytical approaches without compromising inference validity.

Since this research involved secondary analyses of existing datasets that were not originally collected to address our specific research questions, we did not conduct a priori power analyses before data collection and did not pre-register our analysis plan. To assess the statistical power of our analytical approach, we conducted sensitivity analyses for each study's primary overestimation effect. Using the simr package[86], we calculated the statistical power for detecting the observed overestimation effects across varying effect sizes. For each model, we simulated 200 datasets at multiple parameter values to determine the minimum effect size detectable with 80% power. The analysis revealed that our sample sizes were sufficient to detect Cohen's d values ranging from 0.18 to 0.28 across studies with 80% power, which is within the range of effect sizes commonly reported in behavioral research. Full results of these power simulations, including detailed tables and visualization of power curves for each study, are available in section 5 of the Supplementary Information.

In Study 1, a linear mixed model was employed to examine potential directional bias in the judgment of the intensity of others' emotions. Seventy-seven trials (1.94%) that fell beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, leaving 3895 valid trials from 201 participants for analysis. Two random effects were incorporated into the model: participant identifier and stimulus nested within a writer identifier. To account for variations in how strongly writers rated their emotions, the standardized mean score of their emotional ratings was included as a fixed effect in the model. The intercept represents the general deviation from an accurate judgment of the intensity of the writers' emotions, controlled for the intensity of the writers' emotions.

To determine whether the results differed between positive and negative emotions, an additional linear mixed-effects model was employed. The emotion-intensity judgment bias score, measured separately for positive and negative emotions, served as the dependent variable. For this measure, 203 data points (2.56%) beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, leaving 7741 valid trials from 201 participants for analysis. Random effects included participant identifier and stimulus nested within a writer identifier. Emotion valence (negative or positive) was included as a fixed effect. Writers' mean emotional ratings, standardized separately for positive and negative emotions, were included as a fixed effect to account for variations in intensity of the writers' emotions. To quantify the strength of evidence for null effects, we conducted a complementary Bayesian analysis using the brms package[87]. Priors for fixed effects were normal(0, 1.276), with standard deviations based on the dependent variable. Models were estimated using MCMC sampling with 4 chains of 10,000 iterations (1000 warmup). Convergence was confirmed via trace plots and $\hat{R} < 1.01$. Bayes Factors (BF_{10}) were computed using the Savage–Dickey density ratio method[88], quantifying evidence for the alternative (effect exists) relative to the null (no effect).

Study 2

Participants. A total of 1722 Hebrew-speaking participants from the general community were recruited via Israeli online pools and received monetary compensation at a rate of 25 NIS per hour [~$7]. After exclusion of participants for various reasons (detailed in section 2.1 of the Supplementary Information), 1224 participants (53.35% females, 46.41% males, 0.25% preferred not to say, $M_{age} = 31.79$, $SD_{age} = 7.68$, $M_{years\ of\ education} = 14.93$, $SD_{years\ of\ education} = 3.07$) and 4053 video trials remained. As part of a larger project, 21 videos lacked specific emotion ratings for the target. Removing these 553 trials resulted in a final sample of 1,222 participants (53.36% females, 46.40% males, 0.25% preferred not to say, $M_{age} = 31.78$, $SD_{age} = 7.69$, $M_{years\ of\ education} = 14.93$, $SD_{years\ of\ education} = 3.07$) and 3500 video trials.

Stimuli. The complete Israeli Empathic Accuracy set was used for this experiment[44]. This set comprised 155 videos, each featuring one of 28 participants sharing a short autobiographical emotional story in Hebrew (~2–3 min per video). Each participant contributed 6–8 different stories. The storytellers then watched their own stories and continuously rated, simultaneously to each video, the affective valence they had felt while telling the story using a continuous sliding scale

from 0 ("negative") to 100 ("positive"). The scale was sampled every half-second, allowing us to collect a continuous measure of valence experienced by the storyteller throughout the entire video. At the end of each video, they were asked to rate to what degree they felt the following eight emotions on a scale of 1 ("not at all") to 9 ("very much"): embarrassment, anger, sadness, happiness, disgust, pride, fear, and excitement. Since this rating was not collected for 21 of the 155 videos, data from 134 videos were analyzed here (25 storytellers: 13 females, $M_{age} = 23.84$, $SD_{age} = 3.37$). To determine the video's valence, we used the storytellers' continuous rating from each video. Videos in which at least 80% of the continuous rating was above 50 were defined as positive ($n = 43$), and those in which at least 80% of the continuous rating was below 50 were defined as negative ($n = 22$). The remaining videos were classified as mixed valence ($n = 69$). This threshold ensured that videos were categorized based on the predominant emotional valence reported by storytellers throughout most of the recording. To test the robustness of our findings, we conducted supplementary analyses using alternative thresholds (75% and 60%, see section 3.1 in the Supplementary Information) for categorizing video valence, which showed similar patterns and are reported in section 4.2 of the Supplementary Information.

Procedure. Participants watched four randomly selected videos from the Israeli Empathic-Accuracy stimuli set[44]. Each participant viewed only one video per storyteller. While watching the videos, participants completed a continuous rating task, assessing the storytellers' emotional state at each moment using an identical sliding scale to the one the storytellers used when rating their own emotional valence (from 0 "negative" to 100 "positive"). Continuous rating analysis is reported in the Supplementary Information section 4.2.5 due to technical limitations in data collection. Following each video, participants rated the storyteller's eight specific emotions (embarrassment, anger, sadness, happiness, disgust, pride, fear, and excitement) on a 1–9 scale from "not at all" to "very much" and answered a content-related question to ensure attentiveness. Lastly, participants completed the Reading the Mind in the Eyes task (RMET)[89], where participants identified mental states from photographs showing only the eye region of faces, as well as several standardized questionnaires: the Four-Item Mentalising Index (FIMI)[90], Interpersonal Reactivity Index (IRI)[91], and the Intellectual Humility scale[92]. These additional measures were collected as part of a broader research agenda and were not analyzed in the current manuscript. Demographic information was also collected from all participants.

Measures. All measures were consistent with those employed in Study 1. Note that in this study, emotion-intensity judgment bias scores were calculated separately for negative emotions (embarrassment, anger, sadness, disgust, and fear; Cronbach's $\alpha = 0.64$ [0.62, 0.66]) and positive emotions (happiness, pride, and excitement; Cronbach's $\alpha = 0.69$[0.68, 0.71]).

Data analysis. Analysis procedures for Study 2 closely paralleled those of Study 1, with slight modifications. To determine whether people tend to overestimate the intensity of others' emotions when assessing them through videos, a linear mixed model similar to the first model in Study 1 was employed. Fifty-two trials (1.49%) that fell beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, leaving 3448 valid trials from 1219 participants for analysis. To examine potential differences in this effect across emotion valence (positive and negative emotions) and video valence (positive, negative, or mixed), an additional linear mixed-effects model was employed. The emotion-intensity judgment bias score, measured separately for positive and negative emotions, served as the dependent variable. For this measure, 159 data points (2.27%) beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, leaving 6841 valid data points from 1221 participants for analysis. Random effects included participant identifier and stimulus nested within a storyteller identifier. Fixed effects included emotion valence (negative and positive), video valence (positive, negative, or mixed), and their interaction, with effect coding for emotion valence and video valence. To account for variations in how strongly the storytellers rated their emotions, the intensity of the storytellers' emotions was standardized separately for each emotion and video valence combination. These standardized scores were included as a fixed effect in the model. The intercept represents the general deviation from an accurate judgment of the intensity of the storytellers' emotions, controlled for the intensity of the storytellers' emotions ratings. The coefficients represent the deviation of each level from the grand mean.

To quantify the strength of evidence for null effects, we conducted a complementary Bayesian analysis using the same approach as Study 1, with priors based on the standard deviation of the dependent variable (SD = 1.692). Bayes Factors (BF_{10}) were computed using the Savage–Dickey density ratio method.

To further investigate the interaction between emotion valence and video valence, a post hoc analysis with Bonferroni correction was conducted using estimated marginal means using the *emmeans* function from the emmeans package[93].

Study 3

Participants. A total of 270 Israeli Hebrew-speaking participants were recruited through social media advertising and the Hebrew University of Jerusalem's recruitment platforms. Participants were randomly assigned to same-gender pairs (135 pairs). In exchange for their participation, they received either course credit or monetary compensation at a rate of 40 NIS per hour [~$15]. After exclusions (detailed in section 2.2 of the Supplementary Information), the final sample comprised 115 pairs (230 participants; 74.78% females, $M_{age} = 25.45$, $SD_{age} = 3.01$, $M_{years\ of\ education} = 14.72$, $SD_{years\ of\ education} = 1.89$).

Procedure. Participants were randomly assigned to same-gender pairs. Within each pair, one participant was randomly designated as a "storyteller" and the other as a "listener". Each storyteller shared a recent negative life event with the listener via Zoom under one of two conditions: (1) Audio-only, with cameras off, or (2) Audio+Video, where participants could see each other but not themselves, using Zoom's "hide self-view" feature. In both conditions, both participants had open microphones. After the conversation, both rated the storyteller's 25 emotions (embarrassment, anger, sadness, happiness, disgust, pride, fear, excitement, relief, pity, guilt, shame, enjoyment, hope, contempt, worry, despair, craving, envy, disappointment, awe, remorse, gratitude, surprise, and amusement) on a 0–8 scale from "not at all" to "very much". In other words, storytellers rated their own emotions, while listeners estimated the storytellers' emotions. Participants then completed additional measures, including: a modified version of the Layperson-Based Listening Scale (LBLS)[94] assessing listening quality; one question assessing empathy; the Toronto Empathy Questionnaire (TEQ)[95]; IRI[91]; a trust questionnaire[96]; and questions about story evocation, distress, emotion conveyance/understanding, identification with the story, and interest in their partner. Participants also reported loneliness and anxiety levels. These additional measures were collected as part of a broader research agenda[51] and were not analyzed in the current manuscript. Demographic information was also collected from all participants.

Measures. All measures were consistent with those employed in the previous studies. Note that in this study, emotion-intensity judgment bias scores were calculated separately for negative emotions (embarrassment, anger, sadness, disgust, fear, pity, guilt, shame, contempt, worry, despair, envy, disappointment, and remorse; Cronbach's

α = 0.86 [0.82, 0.90]) and positive emotions (happiness, pride, excitement, relief, enjoyment, hope, craving, awe, gratitude, surprise, and amusement; Cronbach's α = 0.81 [0.75, 0.86]).

Data analysis. Analysis procedures for Study 3 closely paralleled those of the previous studies, with slight modifications. To investigate the tendency to overestimate the intensity of others' emotions in live interactions in both interaction conditions and with both types of emotion valence, a linear mixed-effects model was employed. Five data points (2.17%) that fell beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, leaving 225 valid data points from 115 pairs for analysis. Random effects included the pair identifier. The emotion valence (negative and positive emotions), interaction condition (Audio-only or Audio+Video), and the interaction between them were included as fixed effects, with effect coding for emotion valence and interaction condition. To account for variations in how strongly storytellers rated their emotions, the intensity of the storytellers' emotions was standardized separately for each emotion valence and interaction condition combination. These standardized scores were included as independent variables in the model. The intercept represents the general deviation from an accurate judgment of the intensity of the storytellers' emotions, controlled for the intensity of the storytellers' own emotions ratings. The coefficients represent the deviation of each level from the grand mean.

Study 4

Participants. A total of 260 Israeli Hebrew-speaking participants were recruited through social media advertising and the Hebrew University of Jerusalem's recruitment platforms. Participants were randomly assigned to same-gender pairs (130 pairs). In exchange for their participation, they received either course credit or monetary compensation at a rate of 40 NIS per hour [~$15]. After exclusions (detailed in section 2.3 of the Supplementary Information), the final sample comprised 117 pairs (234 participants; 74.36% females, M_{age} = 24.37, SD_{age} = 2.66, $M_{years\ of\ education}$ = 14.10, $SD_{years\ of\ education}$ = 1.66).

Procedure. Study 4 replicated the design of Study 3 with one key modification: after the conversation, both participants rated the intensity of their *own* emotions during the storytelling. While storytellers continued to rate their own emotions as in Study 3, listeners now assessed the intensity of their own emotions instead of rating the intensity of the storyteller's emotions.

Measures

Emotional intensity similarity between the listener and the storyteller score. This score was calculated by subtracting the mean intensity ratings of the storyteller's emotions from the mean intensity ratings of the listeners' own emotion ratings.

Target's emotional intensity. Similar to the previous studies, this score was calculated as the average of the self-reported intensity of the target's emotion ratings.

Data analysis. To examine whether this directional bias can be found for a different task that assesses emotion-intensity related to stimuli, a linear regression model was employed with emotional intensity similarity between listener and storyteller as a dependent variable. One pair (0.85%) that fell beyond 2.5 standard deviations of the mean emotional intensity similarity between listener and storyteller score was excluded, leaving 116 pairs for analysis. To account for variations in how strongly storytellers rated their emotions, the standardized mean storyteller's emotion rating was used as an independent variable. The intercept represents the general deviation from a perfect similarity between the intensity rating of listeners' and storytellers' emotions mean ratings, controlled for the intensity of the storytellers' own emotions ratings. To quantify the strength of evidence for the null effect, we conducted a complementary Bayesian analysis using the same approach as Study 1, with priors based on the standard deviation of the dependent variable (SD = 1.158). Bayes Factors (BF_{10}) were computed using the Savage–Dickey density ratio method.

Study 5

Participants. A total of 272 Israeli Hebrew-speaking participants were recruited through social media advertising and the Hebrew University of Jerusalem's recruitment platforms. Participants were randomly assigned to same-gender pairs (136 pairs). In exchange for their participation, they received either course credit or monetary compensation at a rate of 40 NIS per hour [~$15]. After exclusions (detailed in section 2.4 of the Supplementary Information), the final sample comprised 108 pairs (216 participants; 77.78% females, M_{age} = 25.02, SD_{age} = 3.28, $M_{years\ of\ education}$ = 14.65, $SD_{years\ of\ education}$ = 2.40).

Procedure. Study 5 expanded on the design of Study 4 by incorporating a follow-up survey for listeners, administered one to three days after the initial interaction. In this survey, listeners were asked to recall the story shared during the Zoom interaction and rate the extent to which they believed the storyteller experienced each of the 25 previously listed emotions. Additionally, participants responded to eight questions assessing their own emotional empathic reaction to the stories on a 0–10 scale from "not at all" to "very much"[52].

Measures. The measures of *emotion-intensity judgment bias score* (negative emotions score, Cronbach's α = 0.87[0.83, 0.90]; positive emotions score, Cronbach's α = 0.87[0.83, 0.90]) and *target's emotional intensity* were calculated using the same methodology as the previous studies, with two additional measures included:

Listener's emotional intensity. This score was calculated as the average of the self-reported intensity of the listener's emotion ratings following the interaction.

Emotional empathic reaction. This score was calculated as the average of 8 items assessing the listener's distress and concern about the story, measured a few days after the conversation.

Data analysis. To examine whether emotion-intensity judgment bias persisted following extended reflection, a linear mixed-effects model was employed, similar to the model in Study 2. Two pairs (0.93%) that fell beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, leaving 214 valid data points from 108 pairs for analysis.

Next, a mediation model was conducted with the "mediation" package[97]. The mean intensity of the listeners' own emotions during the interaction was used as the predictor, the emotion-intensity judgment bias score (across all emotions) as the mediator, and the listener's empathic reaction a few days after the interaction as the outcome. To account for variations in how strongly the storytellers rated their emotions, the standardized mean storyteller's emotion rating was used as an independent control variable.

Study 6A

Participants. A total of 108 Israeli heterosexual couples completed a 21-day diary study three months after their first child was born. In exchange for their participation, they received monetary compensation at a rate of 600 NIS [~$150] and a breakfast coupon. Six couples withdrew before the diary portion began, and two couples were excluded as at least one partner failed to complete the minimum required 6 entries. The final sample consisted of 100 couples (200 participants; 50% females, M_{age} = 29.45, SD_{age} = 4.31, education distribution: 16% high school, 52.50% bachelor's/certification, 31.50%

master's or higher). The average relationship duration was 4.84 years (range: 1–13 years, *SD* = 2.96 years). Within this sample, 97 couples (97%) were married.

Procedure. Study 6A was a component of a larger research project in which partners completed daily diary questionnaires for 21 days before bedtime (see Sened et al. [59]). Using the adapted Profile of Mood States (POMS) questionnaire[60], participants rated both their own current mood and their perception of their partner's mood. The questionnaire contained 15 items with responses rated on a scale from 0 ("not at all") to 4 ("extremely"). Five mood dimensions were measured: contentment, vigor, anger, sadness, and anxiety, with three items (synonyms) per dimension (e.g., sad, hopeless, and blue for sadness). Importantly, participants rated their overall mood and their perception of their partner's general mood while filling out the questionnaire, rather than focusing on emotions tied to a specific event. Additionally, participants answered several questions to assess relationship satisfaction. These included the Positive Relationship Feelings subscale (6 items on a 0–4 scale from "not at all" to "extremely")[67,68], the Perceived Partner Responsiveness (PPR) scale (3 items on a 0–6 scale from "do not agree at all" to "strongly agree")[64,65], and the Closeness scale (2 items on a scale from 0 to 4 with midpoints)[66].

Measures. The measures of *emotion-intensity, judgment bias score,* and *target's emotional intensity* were calculated using the same methodology as the previous studies. Note that in this study, emotion-intensity judgment bias scores were calculated separately for negative emotions (anger, sadness, and anxiety; Cronbach's α = .74[.73, 75]) and positive emotions (contentment and vigor; Cronbach's α = 0.65[0.63, 0.68]). Three additional measures were included to assess relationship satisfaction:

Positive relationship feelings subscale. This score was calculated as the mean ratings of 6 items that quantified levels of positive emotions within the relationship.

Perceived partner responsiveness scale (PPR). This score was calculated as the mean ratings of 3 items, evaluating the responder's perceptions of their partner's responsiveness.

Closeness scale. This score was calculated as the mean ratings of 2 items, measuring emotional and physical closeness.

Data analysis. To investigate the overestimation effect in romantic couples, a linear mixed-effects model was applied. Two hundred nine data points (2.63%) that fell beyond 2.5 standard deviations of the mean emotion-intensity judgment bias score were excluded, resulting in 7743 valid data points from 100 couples (200 individuals). The model incorporated emotion valence (negative and positive) and the mean of the target partner's own emotion ratings, standardized separately for positive and negative emotions, to account for variations in how strongly the targets rated their emotions. Participant identifier nested within couple identifier was incorporated as a random effect.

To quantify the strength of evidence for the null effect, we conducted a complementary Bayesian analysis using the same approach as Study 1, with priors based on the standard deviation of the dependent variable (SD = 0.644). Bayes Factors (BF_{10}) were computed using the Savage–Dickey density ratio method.

Next, the association between the overestimation of a romantic partner's emotional intensity and that partner's reported relationship satisfaction was investigated. For each relationship-satisfaction measure, a linear mixed model was conducted. Emotion-intensity judgment bias score, emotion valence (positive and negative), and their interaction were included as fixed effects. To account for variations in how strongly the targets rated their emotions, the standardized mean of the target partner's own emotion ratings (calculated separately for positive and negative emotions) was also incorporated as a fixed effect. Participant identifier nested within couple identifier was incorporated as a random effect. To examine possible non-linear relationships, likelihood ratio tests were employed to compare each model with a corresponding model that utilized orthogonal polynomials of degree 2 for the emotion-intensity judgment bias score. The model demonstrating significant improvement in goodness of fit was selected for interpretation. In cases where the model with orthogonal polynomials of degree 2 was superior, contrast analysis was performed. This analysis evaluated the differences in estimated relationship satisfaction between instances of overestimation and underestimation of the intensity of the partner's emotions. These comparisons were conducted separately for positive and negative emotions.

Study 6B

Participants. A total of 86 Israeli heterosexual couples who had been living together for at least 6 months were recruited to participate in a 35-day diary study. In exchange for their participation, they received monetary compensation at a rate of 600 NIS [~$150] and a breakfast coupon. Six couples were excluded as at least one partner failed to complete the minimum required 6 entries. The final sample consisted of 80 couples (160 participants; 50% females, $M_{age} = 27.97$, $SD_{age} = 4.32$, $M_{years\ of\ education} = 14.86$, $SD_{years\ of\ education} = 2.32$). The average relationship duration was 4.60 years (range: 58–17.00 years, *SD* = 2.95 years). Within this sample, 56 couples (70%) were married, and 21 couples (26.25%) had at least one child.

Procedure. Study 6B was a component of a larger research project in which partners completed daily diary questionnaires for 35 days before bedtime (see Bar-Kalifa et al.[69]). Similar to Study 6A, participants used the adapted Profile of Mood States (POMS) questionnaire[60] to rate both their own current mood and their perception of their partner's mood. However, the questionnaire in Study 6B contained 18 items, as three additional items that assessed calmness were also included (these items were removed from Study 6A to reduce participant burden for first-time parents). This decision regarding which items to exclude was made during the original data collection and was unrelated to the aims of the current project. The same response scale, mood dimensions (except calmness), focus on overall mood rather than specific events, and relationship-satisfaction measures were used as in Study 6A.

Measures. All measures were consistent with those employed in Study 6A. Note that in this study, positive emotion-intensity judgment bias was calculated from contentment, vigor, and calmness ratings (negative emotions score Cronbach's α = 0.76 [0.75, 0.77]; positive emotions score Cronbach's α = 0.72 [0.71, 0.73]).

Data analysis. For Study 6B, 273 data points (2.47%) exceeding the same threshold were removed, leaving 10,785 valid data points from 80 couples (160 individuals). The statistical analysis procedure was identical to that employed in Study 6A.

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability

All data analyzed in this paper, including all participants and trials that were identified as outliers and therefore excluded from the main analyses, have been made publicly available via OSF and can be accessed at https://doi.org/10.17605/OSF.IO/T2VFK [98]. All experiments reported in this paper (except for the preliminary survey, which is fully

available on OSF) were based on studies originally designed to address different research questions. As a result, some additional data were collected that are not part of the present analyses and are therefore not included in the OSF repository, since they are being used or will be used in other projects by the original research teams. All data required to reproduce the analyses and results reported in this article are publicly available on OSF.

Code availability

All analysis codes have been made publicly available via OSF and can be accessed at https://doi.org/10.17605/OSF.IO/T2VFK [98].

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Author contributions

The preliminary survey was developed by S.G. and A.P. All other studies were conducted in the labs described in the paper (under the supervision of N.C., E.R., K.O., or A.P.) and reanalyzed by S.G. for the purpose of this study. S.G., N.C., and A.P. developed the study concept and analyses. All authors (S.G., M.R., H.S., E.R., K.O., N.C., and A.P.) drafted the manuscript and approved the final version for submission. N.C. and A.P. jointly supervised this work.

Competing interests

The authors declare no competing interests.

Additional information

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