

Now You Have My Attention: Empathic Accuracy Pathways in Couples and the Role of  
Conflict

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This work was supported by an Israel Science Foundation Grant (#615/10) awarded to the fifth author. Correspondence concerning this article should be addressed to Haran Sened,

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### Abstract

Recent research on empathy finds evidence for two different pathways that enable individuals to accurately infer other persons' inner mental states: an automatic, indirect pathway that operates by having a mental state similar to the target's *and* (correctly) assuming that this state is similar to the target's, and a more controlled direct pathway that involves assessing the target's mental state with no regard for one's own. We present three daily diary studies (N=53, 38 and 80 couples) examining the contribution of these pathways to empathic accuracy in daily assessments of romantic partners' negative moods, and examine the effects of gender and relational conflict on these pathways.

Our studies revealed that both pathways consistently contributed to accuracy. Additionally, partners demonstrated greater indirect accuracy on conflict (vs. non-conflict) days, and indirect accuracy was somewhat higher for women than for men on conflict days (with the opposite pattern on non-conflict days). More importantly, we found evidence for a novel third pathway, in which the perception of conflict itself led to (correct) higher estimation of negative affect and thus, to higher accuracy. This pathway figured more consistently for men than for women.

In our discussion, we link the pathways obtained in these studies to the extant social neuroscientific literature on empathy systems, arguing that the indirect pathway involves the effects of experience sharing, while the direct and conflict-based pathways involve the mental state attributions (Zaki & Ochsner, 2011). These findings demonstrate the importance of examining various empathic pathways for the understanding of empathic processes.

*Keywords:* Empathic Accuracy, Gender Differences, Daily Conflict, Experience Sharing, Mental State Attribution

## Now You Have My Attention: Empathic Accuracy Pathways in Couples and the Role of Conflict

Empathic accuracy (Ickes & Hodges, 2013) is the extent to which an individual possesses the ability (or, perhaps, abilities) to infer others' thoughts, emotions, or other inner states. Empathic accuracy comes in handy in diverse situations, ranging from romantic or caregiving interactions to police interrogations and business negotiations. Different aspects of empathic inference have been referred to using various terminologies including theory of mind (e.g. Walker & Murachver, 2012), mentalization (e.g., Fonagy, Gergely, Jurist, & Target, 2002), mind perception (e.g., Zaki & Ochsner, 2011) and perspective taking (e.g. Vorauer & Sucharvna, 2013).

In a recent review, Zaki and Ochsner (2011) classify empathic accuracy studies into two major categories –accuracy research, examining how well people judge others' inner states, and process research, examining the cognitive and neural processes underlying such judgments. As the authors explain, accuracy research has been plagued by inconclusive results and therefore has been partially eclipsed by process research in the recent decade.

Process studies of empathic inferences suggest that these stem from the operation of two main pathways. Though various researchers refer to these using different terms, all converge on the idea that some accuracy is driven by the automatic sharing of mental states, typically emotional ones, whereas some accuracy is driven by more controlled, attributed/cognitive processing of cues. The first pathway requires two steps to arrive at a judgment of another person's mental state, and is thus termed the *indirect* pathway (Kenny & Acitelli, 2001). The initial step involves *real similarity* in the emotional experience.

Real similarity may come about through emotional contagion (e.g. Hatfield, Cacioppo, & Rapson, 1994), the phenomenon in which observing a person experiencing an emotion can

cause the same emotion in the observer. In discussing this pathway, Zaki and Ochsner (2011) refer to the Experience Sharing System, a neurological system through which observing a person having an emotion activates similar brain pathways to experiencing the emotion directly. This system is also sometimes referred to as the Emotional Empathy System (Shamay-Tsoory, 2011). Importantly, real similarity might also come about simply by sharing the same external context – e.g., by both the perceiver and the target being present at the same fun party, boring lecture, or upsetting funeral<sup>1</sup>.

For real similarity to turn into empathic accuracy, a subsequent step – referred to as *assumed similarity*, the assumption that the target feels like the perceiver – is necessary. If partners are both in the same mood (real similarity), and one of them also assumes that their spouse feels the same way as they do (assumed similarity), he or she will be correct and thus accurate. Assumed similarity is also sometimes referred to as a bias (e.g. Kenny & Acitelli, 2001) or as projection (e.g. Overall, Fletcher, Simpson, & Fillo, 2015).

The second, *direct* pathway operates through more deliberate processing of cues to infer, cognitively, another person's inner state. For example, when meeting a friend who recently broke up with his girlfriend, we might assume that he is depressed using our knowledge of such situations, even in the absence of any contagious displays of emotion, and even if our friend is attempting to display the opposite emotion, e.g. looking happy and telling jokes. This pathway is thought to be tied to the Mental State Attribution System (Zaki & Ochsner, 2011), or the Cognitive Empathy System (Shamay-Tsoory, 2011).

Of course, some cues, such as facial cues or body posture, may be processed by both pathways. For example, when attempting to assess a smiling person's emotion, we may draw on our cognitive knowledge that smiling is associated with happiness. On the other hand, seeing a smiling person will also tend to make us happier, influencing our own assessment in

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<sup>1</sup> We wish to thank an anonymous reviewer for an earlier version of this paper for this clarification.

turn (Sato, Fujimura, Kochiyama, & Suzuki, 2013).

It should be noted that the terms *direct* and *indirect* accuracy pathways, used for consistency with past research (e.g. Kenny & Acitelli, 2001), do not refer to the immediacy of the accuracy experience or lack thereof. In fact, the indirect pathway may well be more automatic and less conscious and deliberate than the direct one (Hodges & Wegner, 1997). They simply refer to the fact that the indirect accuracy involves the perceiver's own mood, beyond the direct association between the target's mood and the perceiver's assessment.

Few studies have attempted to combine process and accuracy research by examining accuracy along separate pathways. In one such early study, Kenny and Acitelli (2001) demonstrated the distinct contribution of the two pathways to romantic partners' total empathic accuracy regarding each other. In that study, accuracy was defined as the correlation between targets' feelings and perceivers' judgments of those feelings. Accuracy was partitioned into indirect and direct accuracy. In this study, males' and females' judgments of their partners' caring and equity relied predominantly on direct accuracy, whereas their judgments of sexual enjoyment relied more on indirect accuracy; judgments of closeness relied equally on both pathways.

The current study aims to further integrate the process and accuracy lines of research by examining the role of both sources of empathic accuracy over time in the daily life of intimate couples. Examining the sources of empathic accuracy in couples can be particularly important, as its effect are not always straightforward; For example, Kilpatrick, Bissonnette and Rusbult (2002) found that it is linked to relationship satisfaction in the first few years of marriage, a link that declines in later years. Ickes and Simpson (2008) explain that partners are usually motivated to be more accurate, though in some cases (e.g. when being accurate means realizing that there is a threat to the relationship) they might have the opposite motivation, to be less accurate. Thus, looking into the inner workings of accuracy can expand

on previous research which looks at accuracy as a whole.

A more recently developed paradigm for examining empathic accuracy, especially among committed couples, uses daily diaries (Howland & Rafaeli, 2010; Wilhelm & Perrez, 2004). In this paradigm, partners are asked to complete daily diaries including reports of their own feelings as well as inferences regarding their partners'. Accuracy is then operationalized by comparing the perceivers' inferences to targets' self-reports. This peek into the daily lives of couples affords high ecological validity, and enables examination of changes in empathic accuracy over time.

Previous daily diary studies have examined the association between person-level variables (e.g., depression) and daily empathic accuracy as a whole. For example, Gadassi, Mor, and Rafaeli (2012) found that women's depressive symptoms were linked to lower daily accuracy for both partners. Overall and Hammond (2013) found that perceivers with more depressive symptoms tended to overestimate their partner's negative behavior, but were more accurate than perceivers with less depressive syndromes in tracking changes in the partners' negative behaviors over time. Overall, Fletcher, Simpson and Fillo (2015) found that perceivers with more attachment avoidance and anxiety tended to overestimate their partners' negative emotions, though their direct accuracy (termed tracking accuracy in that study) was similar.

To our knowledge, only one study (Wilhelm & Perrez, 2004) has examined the relative contributions of direct and indirect processes to the accuracy of empathic inferences in daily life. This study, the first to apply daily diary methods to the study of empathic accuracy, found that partner presence plays a role in the balance of the contributions of the two pathways. Specifically, for some negative emotions (namely, tension and sadness), the accuracy derived from indirect accuracy was responsible for a larger portion of total accuracy when both partners were at home, but not when one or both of them were away. The likely

explanation for this pattern is that the indirect accuracy, based as it is on real similarity in emotional experience, requires physical proximity. Like physical proximity, other contextual factors may also affect the degree to which accuracy is derived from the direct and indirect pathways. The current study will examine one such factor - the presence or absence of conflict.

### **Conflict and Empathic Accuracy in Close Relationships**

Conflict is an important aspect of couples' lives, and reactions to it can affect both partners and their relationship in many ways. For example, Bolger, DeLongis, Kessler and Schilling (1989) found that interpersonal conflict was the most powerful stressor in the lives of married couples, and the only stressor for which habituation did not occur after a few days. It can be a major source of negative mood, overwhelming the effect of support in the relationship, among other hindrance behaviors (i.e. behaviors in which partners interfere with each other's goals or display negative attitudes toward one another; Rafaeli, Cranford, Green, Shrout, & Bolger, 2008). Various behaviors during conflict and its resolution have been shown to predict divorce rates up to 16 years later (Gottman & Levenson, 1999; Birditt, Brown, Orbuch, & McIlvane, 2010).

Conflict might influence empathic accuracy by creating motivation to be empathically accurate. Several authors have suggested that differences in accuracy are often driven by motivational factors (e.g. Ickes, Gesn, & Graham, 2000; Ickes, 2011; Hall et al., 2009; Zaki, 2014); these factors may, in turn, be affected by conflict. Specifically, the conflict might threaten partners' power in the relationship, leading to increased accuracy (Ebenbach & Keltner, 1998).

Interestingly, Simpson, Ickes and Blackstone (1995; see also Simpson, Oriña, & Ickes, 2003) have demonstrated that in certain cases partners might be motivated to be especially inaccurate. In their study, couples were subjected to a relational threat situation (by being



asked to rate photographs of other potential dating partners). Those who felt closer in their relationship were less accurate as to their partner's thoughts and feelings. Importantly, as Ickes and Simpson (2008) note in a later review, this motivated inaccuracy phenomenon appears to be the exception rather than the rule, and is relevant only in situations that are highly threatening to the relationship, and in which evidence of partners' thoughts is ambiguous. In most other cases, the general motivation remains that of accuracy.

Finally, motivation might also differ between genders. Men tend to be more avoidant of conflict within intimate relationships than women (Christensen & Heavey, 1990, 1993), and when conflict does happen tend to be quicker to engage in problem-solving (Woodin, 2011). Interestingly, this might be the case even if this is not what their partners want. In a study by Segrin, Hanzal, and Domschke (2009) married men's positive problem solving was associated with their own, but not their wives' marital satisfaction. Whatever the effect on their partners, when conflict occurs, men might be further motivated towards accuracy, as it might seem (and at times be) helpful in their attempt to end the conflict quickly. On the other hand, their avoidance of conflict might make them less motivated to engage in the conflict, which might result in less motivation to be accurate. Thus, we examined gender differences in an exploratory manner.

A recent daily diary study by Lane, Stadler and Bolger (2012) supports these ideas. In this study, empathic accuracy regarding positive and negative moods was examined on conflict and non-conflict days. On days in which men reported a conflict, they showed higher (direct) accuracy for negative moods. In contrast, on days in which women reported a conflict but men did not, women assumed that they were more similar to their partners in both positive and negative moods; although this study did not explicitly investigate accuracy pathways, assumed similarity might be indicative of indirect accuracy as one of its components.

### **The Present Studies**

In three dyadic daily diary studies, we set out to examine the roles of direct and indirect accuracy in couple members' inferences regarding each other's negative moods, as well as the degree to which conflict affects these roles. Figure 1 illustrates the juxtaposition of the two accuracy pathways. These two pathways can be thought of as adding up to *total accuracy* – which reflects the raw association between the target's actual mood and the perceiver's judgment of that mood. Notably, though both partners in each couple serve as perceivers and targets, we refer to one as the "perceiver" and to the other as the "target" when discussing specific judgments.

To assess the relative strength of the two accuracy pathways, we adopt West and Kenny's (2011) Truth-and-Bias framework. In this framework, a judge (the perceiver) infers some value (in our case, regarding the target's negative mood). The degree to which this inference is influenced directly by the actual judged value (i.e., by the target's self-reported negative mood) is referred to as the "truth force". The degree to which the inference it is influenced or biased by extraneous information (e.g., in our case, by the perceiver's own negative mood) is referred to as the "bias force".

The Truth-and-Bias framework allows us to partition total accuracy into the two components discussed earlier (namely, direct and indirect accuracy). Indirect accuracy involves two components – real similarity (in our case, between the perceiver's and the target's negative mood), and bias force (i.e., the association between the perceiver's negative mood and their judgment regarding the partner's negative mood; this can also be thought of as assumed similarity). Direct accuracy corresponds to the truth force. It is important to note that bias (and the bias force) do not imply inaccuracy. Indeed, this force might contribute to total accuracy above and beyond the truth force. This occurs when real similarity is high, which makes any assumed similarity effectively correct.

The current research consists of three studies. The first study sought to examine the

associations among the two accuracy pathways, conflict, and gender in a partially exploratory manner. Based on the first study, we were able to formulate several specific hypotheses regarding the relative strength of the two accuracy pathways when conflict was present or absent, and regarding the moderating role of gender in the operation of these two pathways. Studies 2 and 3 tested these hypotheses, with a particular focus on the possibility (drawn from Study 1's conclusions) that the perception of conflict itself serves as an additional accuracy pathway

### **Study 1**

In our first study, we sought to examine the two accuracy pathways and the way they are affected by conflict. Four tentative hypotheses guided our work:

1. Perceivers' inference of targets' negative mood will be associated with targets' self-reported negative mood, a indicator of direct accuracy (pathway c in Figure 1).  
Additionally, even when adjusting for their direct accuracy, perceivers' inferences will also be associated with perceivers' own self-reported negative mood (pathway b in Figure 1).
2. These associations will be moderated by conflict (and possibly by gender and the interaction of gender by conflict). Specifically, we expect conflict to generate a greater motivation for accuracy; consequently, we expect direct accuracy, assumed similarity, or possibly both to be stronger on days in which conflict is reported.
3. Perceivers' own self-reported negative mood will partially mediate the association between targets' self-reported negative mood and perceivers' inference of these moods.
4. This mediation will be moderated by conflict (and possibly by gender and the interaction of gender by conflict). Specifically, for the reasons detailed above (hypothesis 2), we expect mediation to be stronger on days in which conflict is

reported.

## **Method**

**Participants.** Fifty seven adult (age > 18) Israeli heterosexual couples who have been cohabiting for at least four months were recruited for a 14-day diary study. We excluded four couples for insufficient diary entries (< 6). Among the remaining 53 couples, the mean age for men was 29.8 years (range: 21–58, SD=6.7) and the mean age for women was 27.8 years (range: 20–55, SD=6.45). One participant had only partial high-school education (10 years). All other participants had at least a high-school education with an average of 3.2 years (SD=2.1) of postsecondary education. Average relationship duration was 5.0 years (range: 1-26 years, SD=3.8 years). Among the couples, 35 (66%) were married and 13 (24.5%) had at least one child.

**Procedure.** As part of a course requirement, undergraduate students recruited couples as participants. Participant couples were entered in a raffle for a night at a bed-and-breakfast. At the study's initiation, a research assistant visited the couple's home, introduced the study's goal of examining daily processes in couples' lives, and gave each participant a password for a secure online data collection site ([www.surveymonkey.com](http://www.surveymonkey.com)). After providing informed consent, participants were instructed in the use of the daily diaries. Every day, both partners were requested to complete the daily questionnaire as closely as possible to when they went to sleep at night. Additionally, care was taken to limit each respondent's access to their partner's data. To do so, participants were asked not to discuss their responses with one another, and were unable to change or view their responses once submitted. Participants completed 88.3% (N=1310) of the daily diaries.

**Measures.** The data reported are based on items from the daily diary portions of a larger project examining daily processes in committed couples. Only measures relevant to the current report are described below. These daily measures included a mood questionnaire, a

judgment questionnaire (regarding the partner's mood), and a single conflict item.

*Daily moods* were assessed using an adapted and shortened daily diary version (Cranford et al., 2006) of Lorr and McNair's (1971) Profile of Mood States, which included 15 items assessing 5 subscales – anger, contentment, sadness, anxiety and vigor. The questionnaire requires participants to rate the extent to which they feel various moods on a 5-point Likert scale, with items such as "angry", "hopeless", and "nervous" at the moment of answering (i.e. "Please mark to which extent you feel the following feelings right now, in the evening). As we are dealing with conflict, we decided to focus on negative emotions. Thus, we analyzed only the negative items (9 items assessing 3 subscales – anger, anxiety, and sadness), aggregating them into a single negative mood index.

The reliabilities of this index were computed using the procedures outlined in Cranford et al., (2006). Cranford and colleagues suggest calculating multiple reliabilities for diary based measures. The within-person reliability is the reliability of the index as an indicator of changing moods for any given person, and is roughly equivalent to performing an Alpha-Cronbach test on the data after subtracting each person's average response from their mood rating. The between-person reliability is the reliability of the index as an indicator of specific participants' moods (which differ among different participants), and is roughly equivalent to performing an Alpha-Cronbach test on the data for all participants on one specific day.

The within-person (i.e. daily, for the same participant) reliability was .81 for men and .84 for women; the between-person (i.e. between participants, across all days) reliability was .74 for men and .69 for women.

*Judgments* about the partner's moods were assessed using the same items, with instructions referring to the partner's mood instead of one's own. The within-person reliability of the index when used for judging partners' mood was .85 for men and .83 for women; the

between-person reliability was .79 for men and .72 for women.

*Conflict* on a given day was assessed with a simple dichotomous item, inquiring whether "a situation in which you and your partner disagreed significantly" had occurred.

The items requiring inferences regarding the partner's moods were presented after the items assessing one's own mood. The conflict question was presented after both sets of mood items, with some other filler items in between.

**Analytic Approach.** The first two hypotheses were tested using West and Kenny's (2011) truth-and-bias model. In this model, judgments (e.g., a perceiver's rating of a target's negative mood) are statistically predicted using a "truth" variable (namely, the target's self-reported negative mood), a "bias" variable (i.e., some other variable which affects the judgment – in our case, the perceiver's own negative mood), and various moderators of both truth and bias. Following West and Kenny's (2011) suggestions, we centered all variables by subtracting the truth variable's mean for each person from their own truth, bias, and judgment scores. This allows us to interpret the intercept as an index of directional bias (as it answers the question: does the perceiver tend to overestimate or underestimate the target's negative mood, on an average day; For an unbiased perceiver, the average judgement would be identical to the average truth value, and thus would be centered to zero by this method.). Because we utilize both the target's and the perceiver's mood in predicting the perceiver's judgment, our model can be thought of as an example of the Actor-Partner-Interdependence Model (APIM: Kenny, Kashy, & Cook, 2006), with the perceiver being the "actor" and the target being the "partner". This approach simultaneously estimates actor effects (e.g. the effects of the perceiver's negative mood on the perceiver's judgment of the target's negative mood), as well as partner effects (the effects of the target's negative mood on the perceiver's judgment of this mood), and accounts for the mutual dependence of these factors.

The specific model for the current study was as follows:

$$\begin{aligned}
\text{Judgment}_{ijk} = & (b_{00} + b_{0j}) + (m_{00} + m_{0j})\text{Moderator}_{jk} + \\
& (b_{10} + b_{1j} + (m_{10} + m_{1j}) * \text{Moderator}_{jk}) * \text{Truth}_{jk} + (b_{20} + b_{2j} + (m_{20} + m_{2j}) * \text{Moderator}_{jk}) * \text{Bias}_{jk} + \\
& \text{Gender} * ((b_{00G} + b_{0jG}) + (m_{00G} + m_{0jG}) * \text{Moderator}_{jk} + \\
& (b_{10G} + b_{1jG} + (m_{10G} + m_{1jG}) * \text{Moderator}_{jk}) * \text{Truth}_{jk} + (b_{20G} + b_{2jG} + (m_{20G} + \\
& m_{2jG}) * \text{Moderator}_{jk}) * \text{Bias}_{jk}) + e_{ijk}
\end{aligned}$$

Each variable appears twice – as an average across genders and as a gender specific variable. The dummy variable Gender was encoded as -0.5 for men and 0.5 for women.

Focusing on the first part of the equation not multiplied by Gender (the second part is identical, with all effects being gender effects), judgment of person *i* (the female couple member in this case) in couple *j* on day *k* is predicted by three groups of variables. The first component, directional bias, consists of the average (i.e., fixed) directional bias intercept ( $b_{00F}$ ) plus this person's variation from the average intercept (i.e., the random effect  $b_{0ij}$ ); average moderation (i.e., conflict) effect on the directional bias ( $m_{00}$ ) and the person's variation from this average moderation effect ( $m_{0j}$ ) multiplied by this person's moderator variable on the  $k^{\text{th}}$  day ( $\text{Moderator}_{jk}$ ). The second component, the truth effect, consists of the average truth force slope ( $b_{10}$ ) and this person's variation from this average ( $b_{1j}$ ); the average moderation of the truth force slope ( $m_{10}$ ) and this person's variation in the moderation of the truth force slope ( $m_{1j}$ ) multiplied by  $\text{Moderator}_{jk}$ ; all multiplied by this person's truth variable on the  $k^{\text{th}}$  day ( $\text{Truth}_{jk}$ ). The third component, the bias effect, consists of the average bias force slope ( $b_{20}$ ) and this person's variation from this average ( $b_{2j}$ ); the average moderation of the bias force slope ( $m_{20}$ ) and this person's variation in the moderation of the bias force slope ( $m_{2jF}$ ) multiplied by  $\text{Moderator}_{jk}$ ; all multiplied by this person's bias variable on the  $k^{\text{th}}$  day ( $\text{Bias}_{jk}$ ). Finally, we add this person's error term on this particular ( $k^{\text{th}}$ ) day ( $e_{ijk}$ ).

The second set of variables is identical, but multiplied by the Gender dummy variable;

thus, significant effects for the second set of variables can be interpreted as significant gender effects.

We used a mixed linear model as advised by Kenny, Kashy, and Cook (2006). Target's and perceiver's negative mood as well as their 2-way interactions with conflict (the moderator) were included in the model. As mentioned earlier, interactions with gender were assessed by running the model again with different encoding.

Hypotheses 3 and 4 which concern the strength of indirect pathways were assessed using the methods suggested by Bauer, Preacher, and Gil (2006) for testing significance and strength of mediation effects in multilevel models. These methods include an estimate of association strength using the normal distribution along with a confidence interval calculated using a Monte Carlo simulation method.

Standardized regression coefficients, which are included for all estimates were calculated by running the analyses on standardized variables. As there are issues with standardized coefficients as measures of effect size (Bring, 1994), t values were included as an additional indicator whenever possible.

## **Results**

**Descriptive statistics.** Of the 618 diary days in which data was available from both partners, 515 days (83.3%) were ones in which both agreed that there was no conflict, 52 days (8.4%) were ones in which both agreed there was a conflict, 34 days (5.5%) had conflict reports from the female partner only, and 17 (2.8%) had conflict reports from the male partner only. The median number of conflict days reported by participants was 1 (7.1% of the potential 14 days), with the middle half of participants reporting 0 to 2 conflict days. 33 participants (28.95%) did not report any conflict days. Descriptive statistics regarding self-reported and partner-reported negative moods appear in Table 1.

### **Direct accuracy and assumed similarity as predictors of negative mood**



**judgments.** Consistent with our predictions, as shown in Table 2, we found that for both men and women, the targets' negative mood levels (the truth effect – direct accuracy) and perceivers' negative mood levels (a bias effect – or assumed similarity) significantly predicted perceivers' empathic judgments. In partial support of Hypothesis 2, the assumed similarity bias effect (i.e., the effect for the perceivers' own negative mood) was significantly stronger for men ( $b = 0.552[SD = 0.049]$ ,  $p < .0001$ ) than for women ( $b = 0.295[SD = 0.052]$ ,  $p < .0001$ ).

The expected moderation by conflict and by gender x conflict was not found. However, men were found to slightly overestimate their partners' negative mood on a trend level ( $b = 0.044[SD = 0.026]$ ,  $p = 0.098$ ). This overestimation was not found for women ( $b = -0.02[SD = 0.025]$ ,  $p = 0.414$ ). We also found a significant association between conflict and judgments of negative mood.

**Real similarity.** We also examined the effects of conflict on real similarity – the association between perceiver and target's moods. As can be seen in Table 3, partner's moods were significantly related and significantly more so on conflict days. Gender effects were not examined as effects are symmetrical between couple members in this analysis. As conflict evaluation were not always the same between couple members, a significant difference in intercepts was found, indicating that participants who perceived conflict had higher negative moods overall than those who did not.

**Indirect accuracy.** As suggested by Bauer, Preacher and Gil (2006), indirect accuracy (pathway  $a * b$ ) was estimated using Monte Carlo simulations (MacKinnon, Lockwood, and Williams, 2004) to obtain confidence intervals for the indirect effects. As can be seen in Table 4, consistent with Hypothesis 3, perceivers' own mood partially mediated the association between targets' mood (the truth variable) and perceivers' judgment (the judgment variable), on both conflict and non-conflict days.

In order to examine Hypothesis 4, we checked if conflict moderated the mediation effect (see Muller, Judd, & Yzerbyt, 2005) : Contrast analyses (suggested in the supplemental material for Bauer, Preacher and Gil, 2006) found that although indirect accuracy was higher on conflict days than on non-conflict ones the difference was not significant ( $F(2,366) = 2.07$ ,  $p = .128$ ). On non-conflict days, indirect accuracy was significantly higher for men than for women ( $F(2,79.5) = 5.88$ ,  $p = .003$ ; Monte Carlo CI for men: 0.089,0.225; for women: 0.049,0.167). On conflict days, there was no significant difference in indirect accuracy between men and women ( $F(2,231) = 2.25$ ,  $p = .107$ ).

**Additional analyses.** As noted above, conflict itself was found to be associated with perceivers' judgments. We therefore decided to examine the possibility that these judgments may be affected by the perceivers' report of conflict itself. Specifically, to use the terminology of the truth-and-bias model, we reasoned that conflict itself may be an additional bias variable (alongside the "original" bias variable – i.e., perceivers' mood, which we discussed above). An amended model which includes this additional bias variable is presented in Figure 2. It includes this new bias effect (pathway e). Moreover, since perceivers' report of conflict may be associated with targets' actual negative mood (pathway d), conflict may actually serve as an additional mediator for total accuracy (pathway d\*e).

To examine this possibility, we constructed a model similar to that used in Hypotheses 3 and 4, with conflict as the mediator (controlling for all other variables, including the original bias variable, of course). As seen in the bottom panel of Table 4, the perceiver's report of conflict indeed served as a mediator. Contrast analysis did not show a difference between men's indirect accuracy through conflict and women's ( $F(2,45.3) = 1.22$ ,  $p = 0.303$ ).

## Discussion

The results of Study 1 are consistent with our first and third hypotheses – namely, that perceivers' judgments would be associated with both targets' self-report (the truth variable)

and perceivers' own self-report (the bias variable), and that perceivers' self-report will serve as a partial mediator of the association between their judgment and the targets' self-report. As expected, these results suggest that accuracy regarding a target's mood is obtained both directly and indirectly.

The results also provide partial support for our second hypothesis, as assumed similarity (the association between perceiver's judgments of their partners' negative moods with their own self-reported negative moods) was stronger for men than for women. However, contrary to our hypothesis, we did not find any other moderation by conflict or gender.

Our fourth hypothesis was only partially supported – men's indirect accuracy was higher than women's on non-conflict days, but other differences were not significant. However, as *p* values were somewhat close to significance (.128,.107) we suspected that this was due to the lower power of the study for detecting conflict related effects, as conflict occurred only on a small part of the study days.

Finally, an interesting, though unpredicted finding was that self-reported conflict itself might serve as a second bias variable, alongside the perceiver's own mood. Self-reported conflict was associated with judgments of negative mood, which led us to look for indirect accuracy through self-reported conflict, which was found in further analysis, suggesting a third accuracy pathway.

## **Study 2**

The findings of Study 1 suggest that men are more indirectly accurate than women on non-conflict days. Additionally, the findings demonstrated a new indirect accuracy pathway through self-reported conflict. However, as these were unexpected findings, we sought to replicate them alongside the predicted hypotheses supported in Study 1. Additionally, as most days were not conflict days, we suspected that some of the effects regarding conflict – i.e.,

that women showed higher indirect accuracy on conflict days than men, and that indirect accuracy was higher on conflict days than on non-conflict ones for both genders - did not reach significance due to lower power for conflict effects. Thus, we attempted to conduct a study with more diary days to allow greater statistical power. For this second study, we posited the following hypotheses:

1. [Replication] Perceivers' inference of targets' negative mood will be associated with targets' self-reported negative mood, an indicator of direct accuracy (pathway c in Figure 1). Additionally, even when adjusting for their direct accuracy, perceivers' inferences will also be associated with perceivers' own self-reported negative mood (pathway b in Figure 1).
2. [Replication of partial results] The association between perceiver's inference and perceiver's own mood will be stronger for men.  
[Extension of Hypothesis 2] Perceiver's inference of target's negative mood will also be associated with perceiver's perception of conflict (pathway e in Figure 2).
3. [Replication] Perceiver's self-reported negative mood will partially mediate the association between target's self-reported negative mood and perceiver's inference of target's negative mood (i.e., there will be indirect accuracy through assumed similarity).
4. [Elaboration on Hypothesis 4] This mediation will be higher on conflict days; it will also be higher for women than for men on conflict days and higher for men than for women on non-conflict days.
5. [New hypothesis] The association between target's self-reported negative mood and perceiver's inference of target's negative mood will also be mediated by self-reported conflict.

## Method

**Participants.** Forty three adult (age > 18) Israeli heterosexual couples who have been cohabiting for at least 6 months were recruited for a 21-day diary study. Five couples where at least one partner failed to complete at least 6 entries were excluded. Among the remaining 38 couples, mean age for men was 29.9 years (range: 20–65, SD=9.9) and mean age for women was 27.8 years (range: 20–57, SD=8.6). All participants had at least a high-school education with an average of 2.5 years (SD=2.3) of postsecondary education. Average relationship duration was 4.6 years (range: 10 months to 27 years, SD=5.22 years). Among the couples, 30 (78.9%) were married and 17 (44.7%) had at least one child.

**Procedure and measures.** This data was also collected as part of a larger project. Data collection and analyses were similar to Study 1, with a few differences: Some measures completed by the participants (but irrelevant to the current study) were different, and participants were entered into a raffle offering a prize worth approximately 80\$. Participants completed 84.5% of the daily diaries (N=1348).

The within-person reliability of the negative mood index (which was composed of the same items as in Study 1) was .86 for men and .89 for women. The between-person reliability was .77 for men and .80 for women. The reliability of the index when used for judging partners' mood was .82 for men and .85 for women. The between-person reliability was .77 for men and .72 for women.

**Analytical approach.** Based on our findings in study 1, we treated self-reported conflict as a second bias variable. As the previous model already calculated both random and fixed effects of conflict and its interaction with gender on judgment, the model itself did not change, but our interpretation of it did. We also added Monte Carlo mediation analysis of the association between truth and judgment, as we have done in Study 1.

## Results

**Descriptive statistics.** Of the 622 diary days in which data was available from both

partners, 502 days (80.7%) were ones in which both agreed that there was no conflict, 48 days (7.7%) were ones in which both agreed there was a conflict, 45 days (7.2%) had conflict reports from the female partner only, and 27 (4.3%) had conflict reports from the male partner only. The median number of conflict days reported by participants was 2 (9.5% of the potential 21 days), with the middle half of participants reporting 1 to 3 conflict days. 15 participants (19.74%) did not report any conflict days. Descriptive statistics regarding self-reported and partner-reported negative mood appear in Table 1.

**Direct accuracy, assumed similarity, and conflict as predictors of negative mood judgments.** Consistent with our predictions, as shown in Table 5, we found that for both men and women, the target's negative mood levels (the truth effect – direct accuracy) and the perceiver's negative mood levels (a bias effect – or assumed similarity) significantly predicted the perceiver's empathic judgment. The assumed similarity bias effect was stronger for men ( $b = 0.453$ [SD = 0.068],  $p < .0001$ ) than for women ( $b = 0.382$ [SD = 0.056],  $p < .0001$ ). The association between conflict and judgments of negative mood was only on a trend level in this study.

Like in Study 1, a trend level gender main effect was found, whereby men slightly overestimated ( $b = 0.092$ [SD = 0.046],  $p = 0.055$ ), and women slightly underestimated ( $b = -0.058$ [SD = 0.021],  $p = 0.01$ ) their partner's negative mood.

**Real similarity.** As can be seen in Table 3, similarly to Study 1, partner's moods were significantly related and significantly more so on conflict days than on non-conflict days. Participants who perceived conflict again had higher negative moods overall than those who did not.

**Indirect accuracy.** As in Study 1, Monte Carlo simulations were conducted to obtain confidence intervals for the indirect effects. As can be seen in Table 4, consistent with Hypothesis 3, perceivers' own mood partially mediated the association between targets' mood

and perceivers' judgment.

In partial support of our elaboration of Hypothesis 4, contrast analyses found that indirect accuracy was significantly higher on conflict days than on non-conflict days ( $F(2,122) = 4.34, p = 0.015$ ). No difference was found between accuracy of men and women on conflict days ( $F(2,98.7) = 1.98, p = 0.143$ ) or non-conflict days ( $F(2,63.5) = 0.78, p = 0.463$ ).

In support of our Hypothesis 5, according to Monte Carlo confidence intervals, the perceiver's report of conflict again served as a mediator (The non – Monte Carlo analytic estimate also showed significance, but only on a trend level). Contrast analysis showed that men's indirect accuracy through conflict was higher than women's on a trend level ( $F(2,34.5) = 2.58, p = .09$ ; Monte Carlo CI for men: 0.006,0.087; for women: -0.045,0.002).

## **Discussion**

The results of Study 2 are consistent with our hypotheses, except for gender effects in indirect accuracy which were not found. All three pathways were found; Participants' judgements were associated with perceiver's own self-reported mood and perceiver's perception of conflict, but there was still direct accuracy left which was not accounted for by these variables. Accuracy associated with perceiver's own mood was stronger on conflict days than on non-conflict days, and accuracy associated with perception of conflict was somewhat stronger for men.

## **Study 3**

As the major hypotheses of Study 2 were confirmed, we sought to replicate them with a larger sample.

**Participants and Recruitment.** Data for this study was also collected as part of a larger project. Eighty six adult (age > 18) Israeli heterosexual couples who have been cohabiting for at least 6 months were recruited for a 35-day diary study. Six couples were at

least one partner failed to complete at least 6 entries were excluded. Among the remaining 80 couples, mean age for men was 29.3 years (range: 23–43,  $SD=4.4$ ) and mean age for women was 26.7 years (range: 21–38,  $SD=3.9$ ). All participants had at least a high-school education with an average of 2.9 years ( $SD=2.3$ ) of postsecondary education. Average relationship duration was 4.6 years (range: 1-17 years,  $SD=2.9$  years). Among the couples, 56 (70%) were married and 21 (26.2%) had at least one child.

**Procedure, Measures and Analytical approach.** The gathering and analysis of data was similar to Study 2 with a few differences. Some questionnaires completed by the participants (but irrelevant to the current study) were different, the couples received a payment of 400 NIS (about 120 U.S. dollars) and were entered into a raffle for a weekend at a bed-and-breakfast. Additionally, questionnaires were completed via a different data collection website, Qualtrics ([www.qualtrics.com](http://www.qualtrics.com)). Finally, in this study, couples were invited to the lab for a thorough explanation of the diary procedure, and were each assigned a researcher who contacted them if they missed a diary report. Participants completed 99.5% of the diaries ( $N=5574$ ), which might be related to these contact procedures.

The within-person reliability of the negative mood index (which was composed of the same items as in Study 1) was .84 for men and .83 for women. The between-person reliability was .82 for men and .76 for women. The reliability of the index when used for judging partner's mood was .87 for men and .86 for women. The between-person reliability was .79 for men and .76 for women.

The analytical approach was identical to Study 2.

## Results

**Descriptive statistics.** Of the 2762 diary days in which data was available from both partners, 2030 days (73.5%) were ones in which both agreed that there was no conflict, 368 days (13.3%) were ones in which both agreed there was a conflict, 184 days (6.7%) had



conflict reports from the female partner only, and 180 (6.5%) had conflict reports from the male partner only. The median number of conflict days reported by participants was 6 (17.1% of the potential 35 days), with the middle half of participants reporting 3 to 9 conflict days. 5 participants (3.13%) did not report any conflict days. Descriptive statistics regarding self-reported and partner-reported negative mood appear in Table 1.

**Direct accuracy, assumed similarity, and conflict as predictors of negative mood judgments.** Consistent with our predictions, as shown in Table 6, we found that the partner's negative mood levels (the truth effect) and the perceiver's negative mood levels (the bias effect) significantly predicted the perceiver's empathic judgment. In support of Hypothesis 2, like in previous studies, the assumed similarity bias effect (i.e., the effect for the perceivers' own negative mood) was significantly stronger for men ( $b = 0.431$ [ $SD = 0.036$ ],  $p < .0001$ ) than for women ( $b = 0.354$ [ $SD = 0.049$ ],  $p < .0001$ ). We also found a significant association between conflict and judgments of negative mood. This effect was significantly stronger for men ( $b = 0.182$ [ $SD = 0.022$ ],  $p < 0.0001$ ) than for women ( $b = 0.076$ [ $SD = 0.027$ ],  $p = 0.006$ ). Additionally, unlike previous studies, the bias effect was significantly stronger on conflict days than on non-conflict days. Finally, unlike previous studies, no gender main effects were found.

**Real similarity.** As can be seen in Table 3, similarly to previous studies, partner's moods were significantly related and significantly more so on conflict days than on non-conflict days. Again, participants who perceived conflict had higher negative moods overall than those who did not.

**Indirect accuracy.** As seen in Table 4, consistent with Hypothesis 3, perceiver's own mood partially mediated the association between targets' mood and perceivers' judgments for both men and women. In support of our elaborated Hypothesis 4, conflict was found to moderate the mediation effect. Contrast analyses found indirect accuracy through assumed

similarity to be higher on conflict days than on non-conflict days ( $F(2,297) = 44.77, p < .0001$ ). Indirect accuracy through assumed similarity was found to be higher for women than for men on conflict days ( $F(2,256) = 6.29, p=0.002$ ; Monte Carlo CI for men: 0.12,0.21; for women: 0.135,0.234) and higher for men than for women on non-conflict days ( $F(2,333) = 5.33, p=0.005$ ; Monte Carlo CI for men: 0.023,0.063; for women: 0.022, 0.054).

In accordance with our Hypothesis 5, and as can be seen in the bottom panel of table 4, the perceiver's report of conflict served as a mediator. Following the trend found in Study 2, contrast analysis showed that men's indirect accuracy through conflict was significantly higher than women's ( $F(2,85.3) = 5.32, p =0.007$ ; Monte Carlo CI for men: 0.03,0.065; for women: -0.015, 0.012).

## **Discussion**

As we had expected, Study 3 provided evidence for the replicability of those findings that had been consistent across the two earlier (and smaller) studies. In particular, accuracy was demonstrated through all three pathways. Additionally, following findings that were on a trend level or significant in only one of the studies, indirect accuracy was higher on conflict days than on non-conflict days, and also varied by gender: on conflict days women demonstrated higher indirect accuracy than men through real and assumed similarity while on non-conflict days men had higher indirect accuracy than women. Finally, men had higher accuracy through the conflict pathway than women.

### **General Discussion**

The present series of studies were inspired by Zaki and Ochsner's (2011) call for research exploring the processes underlying empathic accuracy. We focused on the processes through which members of romantic couples judge each other's negative mood, and on the way these judgments are affected by the presence of conflict. The results from all three studies clearly demonstrate that three empathic pathways each play a role in accuracy

regarding one's partner's moods: the indirect and direct ones found in previous research and a third, novel pathway, which we term conflict-based accuracy<sup>2</sup>. Below, we discuss each of the three pathways, and then zoom out to a bigger-picture view of the processes involved.

### **The Indirect pathway (and its moderation by conflict)**

Being accurate regarding one's partner's mood through the indirect pathway requires the combination of real and assumed similarity. In all three studies, we found: (a) that both real similarity and assumed similarity were considerable in magnitude, and (b) that the association between the target's negative mood and the perceiver's judgment (i.e., total accuracy) was significantly mediated by the perceiver's negative mood. Thus, some of the participants' ability to infer their partners' mood was associated with the confluence of their mood indeed being similar to their partners' (Hatfield, Cacioppo, & Rapson, 1994; Rizzolatti, Fabbri-Destro, & Cattaneo, 2009) and the similarity between their reports of their partner's mood and their own (Kenny & Acitelli, 2001; Wilhelm & Perrez, 2004).

In all three studies (though significant only with the larger two samples in Study 2 and 3), the indirect pathway to accuracy was stronger in the presence (vs. the absence) of conflict. This moderation effect appears to occur through higher real similarity (a moderation found in all studies) though possibly also through higher assumed similarity (a moderation found to be significant only in Study 3). This might suggest that conflict is simply more common when partners are in physical proximity (e.g., both at home), a time when they can (and do) pay greater attention to each other; such physical proximity could increase both components of the indirect pathway – namely, real similarity (which rises because of shared, if noxious, experiences) and assumed similarity (which rises for similar reasons). This suggestion is in line with Wilhelm and Perrez's (2004), who found that, for certain moods, indirect accuracy

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<sup>2</sup> Conflict-based accuracy is, statistically, indirect as much as the indirect pathway as it also works through a third variable (perceiver's self-reported conflict); We avoid terming it indirect to avoid confusion with the original indirect pathway.

was stronger when participants were together, at home, than when either partner was at work.

A complementary social-cognitive explanation for increased indirect accuracy on conflict days was posited by Fletcher & Kerr (2010), who suggested that assumed similarity may also be a by-product of relational judgments. Specifically, they reasoned that assumed similarity might be related to a process in which judgments concerning the relationship (e.g., "we are in conflict") lead to similar conclusions concerning self and partner; thus, judging that "we are in conflict" might lead to judgments that "I am angry" and "my partner is angry". In the current study, conflict judgments involved exactly this type of a relational statement (i.e., "we had a conflict"), which may have driven higher assumed similarity, and thus, indirect accuracy. The two possibilities (proximity and/or relational judgments) could be untangled in future studies; this would require monitoring couples' physical proximity<sup>3</sup>, and assessing conflict (or other relational events) with measures that allow partners to acknowledge discrepancies about its existence (e.g. "do you believe there was a conflict", "does your partner believe there was a conflict" as opposed to "was there a conflict").

### **The Direct and the Conflict-Based Pathways**

The direct association between the target's negative mood and the perceiver's judgment of it (when controlling for indirect accuracy) was significant in all three studies: perceivers were able to assess their partners' negative mood not only by (correctly) assuming that the targets' moods are similar to their own, but also by directly inferring the targets' negative mood. This is in accord with previous findings using multiple paradigms (e.g., Carrington & Bailey, 2009; Kenny & Acitelli, 2001; Wilhelm & Perrez, 2004), which support a direct pathway for empathic accuracy.

Contrary to our initial hypotheses, direct accuracy was not moderated by conflict (as

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<sup>3</sup> Study 3 did include an item asking couples how many hours they spent together each days; a preliminary analysis controlling for it showed similar, though reduced, conflict effects suggesting physical proximity is part, but not all of the story.

well as by gender). However, in all studies, participants provided higher judgments of partners' negative mood on conflict days than on non-conflict days (i.e., a conflict main effect). Mediation analysis revealed that these higher judgments led to higher accuracy, over and above assumed similarity or direct accuracy. Thus, our results suggest a third, novel pathway to accuracy, one which we termed conflict-based accuracy. This pathway involves the remaining accuracy which is mediated by the perceiver's report of conflict, after adjusting for both direct and indirect accuracy.

### **The larger picture: A systemic view of accuracy pathways**

As noted earlier, affective neuroscience studies of accuracy (for review, see Shamay-Tsoory, 2011; Zaki & Ochsner, 2011) have pointed to the existence of two main accuracy systems. The first, referred to as the Experience Sharing System (ESS) or as emotional empathy, involves similar activation of brain regions among observers and their targets, activation which is likely to be mostly automatic. The second, referred to as the Mental State Attribution System (MSAS) or as cognitive empathy, involves accuracy derived from observers' deliberate efforts to assess their targets' internal states. In this section, we try to link the pathways found in our study to these two systems.

The indirect pathway to accuracy, found to be significant in all of our studies, involves the confluence of real and assumed similarity, with assumed similarity resulting in accuracy only when real similarity is high. One way in which real similarity may be created involves shared exposure to identical external stimuli. For example, Golland, Arzouan, and Levit-Binnun (2015) demonstrated that participants who jointly watched the same (negative or positive) emotional clips had synchronized emotional brain responses, and would have presumably shown high real (and assumed) similarity.

Another way in which real similarity may be high involves the phenomenon of emotional contagion, in which the perceiver takes on the target's emotional response. For

example, Jabbi, Swart, and Keysers (2007) demonstrated that participants who viewed others' disgusted or pleasant facial expressions had similar neurological patterns to those of participants who watched actual disgusting or pleasant food-related stimuli. This phenomenon is thought to reflect the operation of the ESS (Zaki & Ochsner, 2011), which allows for a shared experience even in the absence of shared stimuli. Together, shared experience with or without shared stimuli, make up the indirect pathway to accuracy.

Any remaining accuracy – in our case, the accuracy arrived at through the direct pathway and the conflict-based pathway - reflects the operation of the MSAS (Zaki & Ochsner). In other words, we identify conflict-based accuracy as one product of MSAS functioning – in this case, accurate mental state attributions which make use of the perception of *conflict*. Of course, other inputs besides conflict may also serve as cues for MSAS operations; we return to this idea in our discussion of future directions. The systemic view of accuracy pathways and their overlap with the systems identified by affective neuroscience (Shamay-Tsoory, 2011; Zaki & Ochsner, 2011) is presented in Figure 2.

### **Gender Differences**

We explored gender as a possible moderator of the accuracy pathways. Studies 1 and 3 found that indirect accuracy was stronger for men on non-conflict days (and Study 3 also found that indirect accuracy was stronger for women in conflict). In addition, Studies 2 and 3 found that the conflict-based pathway was stronger for men.

These findings are exploratory in nature, and were not consistent across all studies. Nonetheless, they seem to fit with the systemic view of accuracy pathways described above. Specifically, whereas men showed higher indirect accuracy than women on non-conflict days, they showed lower indirect accuracy than women on conflict days, yet higher conflict-based accuracy. As we speculated in the general introduction, this gender difference might reflect differences in motivation.

As Ickes, Gesn, and Graham (2000), have argued, women's greater accuracy (found in many, though not all, reviewed studies) reflects their higher motivation to be accurate. This motivation is fueled, in part, by the socially-prevalent gender stereotype, which depicts women as supposedly more empathic and understanding than men. In "compliance" with this stereotype, men (being typically less motivated to be accurate) might rely more on processes which do not require conscious effort – i.e., on indirect accuracy, which operates through shared experience, with or without shared external stimuli.

During conflict, things change. Specifically, under conflict, men might become more motivated to be accurate; indeed, previous studies have found men to be more likely to attempt to "solve" relational conflicts (for review, see Woodin, 2011). To attain greater accuracy, men seem to make greater use of the conflict-based pathway, which is a part of the MSAS – in other words, a process that requires more conscious effort. Additionally, though both men and women show greater indirect accuracy on conflict days, this increase is stronger for women (though not always significantly). This might suggest that, under conflict, women actually rely *more* on effortless processes of shared experience.

An alternative, non-motivational, explanation for these gender differences could be differences in expressiveness – that perceivers of one gender might be more accurate because their partners display their emotions more clearly or more honestly. Previous studies have found that men tend to be less expressive (Goldschmidt & Weller, 2000; Kring & Gordon, 1998). This may improve men's accuracy, or hinder their partners'. However, as our data shows gender differences vary by pathway and by conflict, to explain our findings complex expressivity phenomena would have to occur - men's expressivity would need to be lower than women's on non-conflict days while being higher on conflict days in ways which affect the indirect pathway, and simultaneously lower in ways which affect the conflict pathway. Although we do not have direct expressivity data, both self and partner reports of negative

mood are higher for women on both conflict and non-conflict days (though not necessarily significantly). This suggests, in line with previous research, that women simply consistently express somewhat more negative emotions, and that this is recognized by their partners. This simple and consistent difference does not match the complex pattern of differences in accuracy. Concerning the perception of conflict, women reported more conflict days than men, suggesting that they did not manage to express their perception of conflict better. Thus, men's higher accuracy through the conflict-based pathway does not seem to be related to them easily recognizing that conflict occurred due to their partners' higher expressivity. Nevertheless, these are partial indications; expressivity could certainly play a role, which could be better understood in a future study that measures it directly.

### **Limitations and Future Directions**

Though the three studies reported utilize repeated measures, our analyses were of concurrent associations and do not permit us to conclude directional causality. Specifically, participants' own moods could have been influenced by their inferences regarding their partners or could have been primed by their perception of conflict.

We attempted to mitigate this possibility by presenting the partner-inference items after the self-report ones with filler items in between, and presenting the conflict item much later. Nonetheless, this mitigation does not completely rule out the possibility of reverse causation. Further research should examine this directionality question (e.g., by showing one of the partners the other's responses and examining the influence on their own responses). In certain respects, however, the directionality question is less important in this context than in others. Specifically, the phenomena of accuracy, real similarity, and assumed similarity are of interest regardless of their causal ordering, as they speak to fundamental dynamics in the emotional life of a dyad.

One possible (and unfortunate) effect of our mitigation efforts to reduce the



probability of reverse causality might have been an anchoring effect, with judgement items presented after self-report ones. However, we have attempted to reduce possible anchoring by having other, unrelated questionnaires presented between the self-report and judgement items.

Our results show that partners quite often disagree about the presence of conflict on particular days. The use of a single item to assess conflict may have exacerbated this problem. Future research could utilize a list of more objective questions (e.g. "did you shout at each other?"), alongside subjectively-framed questions (e.g. "did you/your partner feel there was conflict?").

Further research is needed about the associations between the different empathic accuracy pathways and relationship satisfaction. Various studies have found such an association (e.g., Cohen, Schulz, Weiss, & Waldinger, 2012), though it has been absent or even negative in certain studies or for certain forms of accuracy (e.g., Simpson, Oriña, & Ickes, 2003; Wilhelm & Perrez, 2004). The distinction among the different accuracy pathways (made possible by the methods presented here) could help clarify the subtleties of the connection between various forms of accuracy (e.g., direct, assumed similarity-based, conflict-based) and satisfaction.

Our systemic view of the indirect, direct, and conflict-based accuracy pathways and their possible links to ESS and MSAS functioning requires further examination. Indeed, both systems could affect either direct or indirect accuracy; for example, the MSAS may lead to indirect accuracy when observers make a conscious, deliberate choice to treat their own emotional state as a cue to assess their partner's. Studies combining naturalistic methods together with imaging or physiological methods may be particularly useful in this regard.

Finally, by no means do we suggest that the three pathways found in this study offer a complete view on accuracy. Instead, we believe that modern mediation analyses of accuracy data will lead to many other interesting findings. In particular, we fully expect additional

cues, other than conflict, to serve as mediators of accuracy judgments, shedding further light on the processes involved.

## **Conclusion**

Our findings demonstrate the potential benefits of combining accuracy and process research. As Zaki and Ochsner (2011) noted, such a combination affords us a better understanding of situation-specific associations between the judgment processes involved and the ultimate accuracy achieved. Our results demonstrate that the contribution of all three pathways to accuracy depends on both person-level variables – in this case, gender, and day-level ones – in this case, the presence or absence of conflict cues.

In light of our results, we presented a systemic view of the different pathways and their possible link to the underlying neurological systems identified in recent years (namely, the more emotional ESS and the more cognitive MSAS; Shamay-Tsoory, 2011, Zaki & Ochsner, 2011). In our view, considering the direct, indirect, and cue-based pathways to accuracy will further the understanding of the fascinating human capacity for empathic accuracy.

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Table 1

*Self-reported and partner-reported negative mood by gender and conflict*

			Self-reported negative mood	Partner-reported negative mood
		N	M (SD)	M(SD)
<b>Study 1</b>				
Men	Non-Conflict	581(88.2%)	0.26(0.38)	0.24(0.37)
	Conflict	78(11.8%)	0.62(0.62)	0.55(0.63)
Women	Non-Conflict	562(86.3%)	0.29(0.43)	0.33(0.44)
	Conflict	89(13.7%)	0.66(0.66)	0.8(0.72)
<b>Study 2</b>				
Men	Non-Conflict	577(88%)	0.26(0.45)	0.19(0.36)
	Conflict	79(12%)	0.49(0.58)	0.55(0.62)
Women	Non-Conflict	581(84%)	0.24(0.41)	0.35(0.48)
	Conflict	111(16%)	0.65(0.68)	0.67(0.63)
<b>Study 3</b>				
Men	Non-Conflict	2234(80.1%)	0.25(0.41)	0.27(0.42)
	Conflict	555(19.9%)	0.52(0.71)	0.6(0.74)
Women	Non-Conflict	2228(80%)	0.32(0.46)	0.32(0.45)
	Conflict	557(20%)	0.67(0.69)	0.78(0.802)



Table 2

*Study 1 effects of target and perceiver self-reported moods on perceiver's judgments of negative mood, with conflict and gender as moderators*

	b (SE)	95% CI	Standardized beta (SE)	t(df)
Intercept	0.014(0.026)	-0.039,0.067	0.043(0.062)	0.55(30.6)
Intercept*Gender	-0.073(0.039) <sup>†</sup>	-0.151,0.006	-0.09(0.046)	-1.88(0.04)
Conflict	0.157(0.047)**	0.062,0.253	0.116(0.034)	3.37(28.4)
Conflict*Gender	-0.069(0.09)	-0.251,0.114	-0.028(0.031)	-0.76(32.7)
Target Mood (Truth)	0.316(0.032)***	0.249,0.385	0.26(0.025)	9.84(16.6)
Target Mood*Gender	0.041(0.088)	-0.137,0.219	0.012(0.035)	0.47(37.7)
Target Mood*Conflict	0.058(0.096)	-0.139,0.255	0.011(0.025)	0.61(28)
Target Mood*Conflict*Gender	-0.112(0.195)	-0.513,0.288	-0.009(0.026)	-0.57(29.1)
Perceiver Mood (Bias)	0.427(0.035)***	0.357,0.498	0.447(0.034)	12.33(39.8)
Perc. Mood*Gender	-0.283(0.075)***	-0.433,-0.132	-0.139(0.038)	-3.77(47.1)
Perc. Mood*Conflict	0.036(0.069)	-0.101,0.173	0.025(0.023)	0.52(141)
Perc. Mood*Conflict*Gender	0.138(0.143)	-0.151,0.428	0.015(0.025)	0.97(36.9)

<sup>†</sup>p<0.1 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001 Gender effects are positive when values are higher for women

The effects of the target's mood are direct accuracy effects; the effects of the perceiver's mood are assumed similarity effects, which are part of the indirect accuracy pathway.

Table 3

*Real similarity (effect of partner's negative mood on own negative mood) by conflict*

	b (SE)	95% CI	Standardized beta (SE)	t(df)	Conflict-Non conflict contrast	
					df	F
<b>Study 1</b>						
No Conflict						
Intercept	-0.032(0.013)*	-0.056,-0.006	-0.059(0.028)	-2.45(1147)	2,1043	16.63***
Similarity	0.305(0.049)***	0.205,0.404	0.241(0.039)	6.18(41.6)	2,39.2	23.94***
Conflict						
Intercept	0.198(0.038)***	0.123,0.272	0.441(0.083)	5.22(956)		
Similarity	0.389(0.125)**	0.135,0.643	0.306(0.098)	3.11(37.1)		
<b>Study 2</b>						
No Conflict						
Intercept	-0.03(0.015)*	-0.06,-0.001	-0.05(0.028)	-2.05(1186)	2,1179	10.67***
Similarity	0.211(0.059)***	0.092,0.329	0.157(0.044)	3.56(62.5)	2,42.3	11.33***
Conflict						
Intercept	0.169(0.041)***	0.089,0.249	0.323(0.077)	4.14(1172)		
Similarity	0.495(0.16)**	0.176,0.814	0.368(0.116)	3.16(32.2)		
<b>Study 3</b>						
No Conflict						
Intercept	-0.038(0.008)***	-0.054,-0.022	-0.065(0.015)	-4.55(5413)	2,5410	40.05***
Similarity	0.154(0.025)***	0.105,0.203	0.107(0.017)	6.27(53.2)	2,62.8	30.62***
Conflict						
Intercept	0.135(0.018)***	0.101,0.169	0.236(0.031)	7.71(5407)		
Similarity	0.289(0.062)***	0.166,0.411	0.2(0.043)	4.68(76.9)		

†p&lt;0.1 \*p&lt;0.05 \*\*p&lt;0.01 \*\*\*p&lt;0.001

Table 4  
*Indirect accuracy due to bias and conflict*

	b (SE)	Monte Carlo 95% CI	Standardized beta (SE)
<b>Indirect accuracy through assumed</b>			
<b>similarity</b>			
Study 1			
Non-conflict	0.132(0.024)***	0.088,0.18	0.107(0.019)
Conflict	0.213(0.046)***	0.129,0.701	0.171(0.037)
Study 2			
Non-conflict	0.08(0.023)***	0.037,0.128	0.062(0.018)
Conflict	0.224(0.048)***	0.137,0.321	0.175(0.037)
Study 3			
Non-conflict	0.04(0.006)***	0.027,0.052	0.027(0.004)
Conflict	0.178(0.018)***	0.145,0.213	0.122(0.012)
<b>Indirect accuracy through conflict</b>			
<b>perception</b>			
Study 1			
Conflict-based accuracy	0.015(0.007)*	0.004,0.03	0.012(0.005)
Study 2			
Conflict-based accuracy	0.009(0.005) <sup>†</sup>	0 <sup>1</sup> ,0.021	0.006(0.004)
Study 3			
Conflict-based accuracy	0.016(0.003)***	0.011,0.023	0.011(0.002)

†p<0.1 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001 <sup>1</sup>rounded from above zero.

Table 5

*Study 2 effects of target and perceiver self-reported moods on perceiver's judgments of negative mood, with conflict and gender as moderators*

	b (SE)	95% CI	Standardized beta (SE)	t(df)
Intercept	0.021(0.041)	-0.064,0.105	0.023(0.084)	0.5(30.9)
Intercept*Gender	-0.161(0.044)**	-0.252,-0.071	-0.165(0.044)	-3.63(31)
Conflict	0.098(0.051) <sup>†</sup>	-0.007,0.202	0.063(0.033)	1.93(24.9)
Conflict*Gender	-0.059(0.069)	-0.202,0.084	-0.019(0.025)	-0.86(20.7)
Target Mood (Truth)	0.266(0.048)***	0.168,0.363	0.216(0.035)	5.52(37.2)
Target Mood*Gender	0.006(0.09)	-0.179,0.19	-0.006(0.034)	0.06(26.5)
Target Mood*Conflict	0.093(0.098)	-0.111,0.297	0.029(0.029)	0.94(25.6)
Target Mood*Conflict*Gender	-0.127(0.199)	-0.534,0.279	-0.014(0.026)	-0.64(29.1)
Perceiver Mood (Bias)	0.422(0.047)***	0.327,0.317	0.448(0.048)	9.02(36.4)
Perc. Mood*Gender	-0.185(0.09)*	-0.367,-0.002	-0.081(0.046)	-2.05(40.5)
Perc. Mood*Conflict	0.047(0.073)	-0.11,0.204	0.027(0.029)	0.65(13.3)
Perc. Mood*Conflict*Gender	0.244(0.174)	-0.115,0.603	0.035(0.029)	1.4(24)

<sup>†</sup>p<0.1 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001 Gender effects are positive when values are higher for women.

The effects of the target's mood are direct accuracy effects; the effects of the perceiver's mood are assumed similarity effects, which are part of the indirect accuracy pathway.

Table 6

*Study 3 effects of target and perceiver self-reported moods on perceiver's judgments of negative mood, with conflict and gender as moderators*

	b (SE)	95% CI	Standardized beta (SE)	t(df)
Intercept	0.025 (0.027)	-0.028,0.078	0.036(0.046)	0.92(77)
Intercept*Gender	-0.046(0.039)	-0.124,0.033	-0.057(0.034)	-1.16(64.7)
Conflict	0.128(0.018)***	0.092,0.164	0.087(0.012)	7.13(76.9)
Conflict*Gender	-0.098(0.036)**	-0.169,-0.027	-0.035(0.012)	-2.76(80.8)
Target Mood (Truth)	0.37(0.03)***	0.311,0.43	0.252(0.02)	12.38(81.6)
Target Mood*Gender	-0.017(0.065)	-0.147,0.112	-0.012(0.021)	-0.27(80.6)
Target Mood*Conflict	-0.008(0.05)	-0.11,0.093	-0.001(0.015)	-0.17(59.5)
Target Mood*Conflict*Gender	-0.071(0.083)	-0.237,0.094	-0.009(0.012)	-0.87(52.7)
Perceiver Mood (Bias)	0.372(0.024)***	0.324,0.42	0.398(0.023)	15.36(96)
Perc. Mood*Gender	-0.186(0.044)***	-0.272,-0.0992	-0.09(0.021)	-4.26(98)
Perc. Mood*Conflict	0.14(0.034)***	0.072,0.207	0.062(0.014)	4.13(57.6)
Perc. Mood*Conflict*Gender	0.023(0.06)	-0.097,0.143	0.004(0.013)	0.38(62.7)

†p<0.1 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001 Gender effects are positive when values are higher for women

The effects of the target's mood are direct accuracy effects; the effects of the perceiver's mood are assumed similarity effects, which are part of the indirect accuracy pathway.

Figure 1

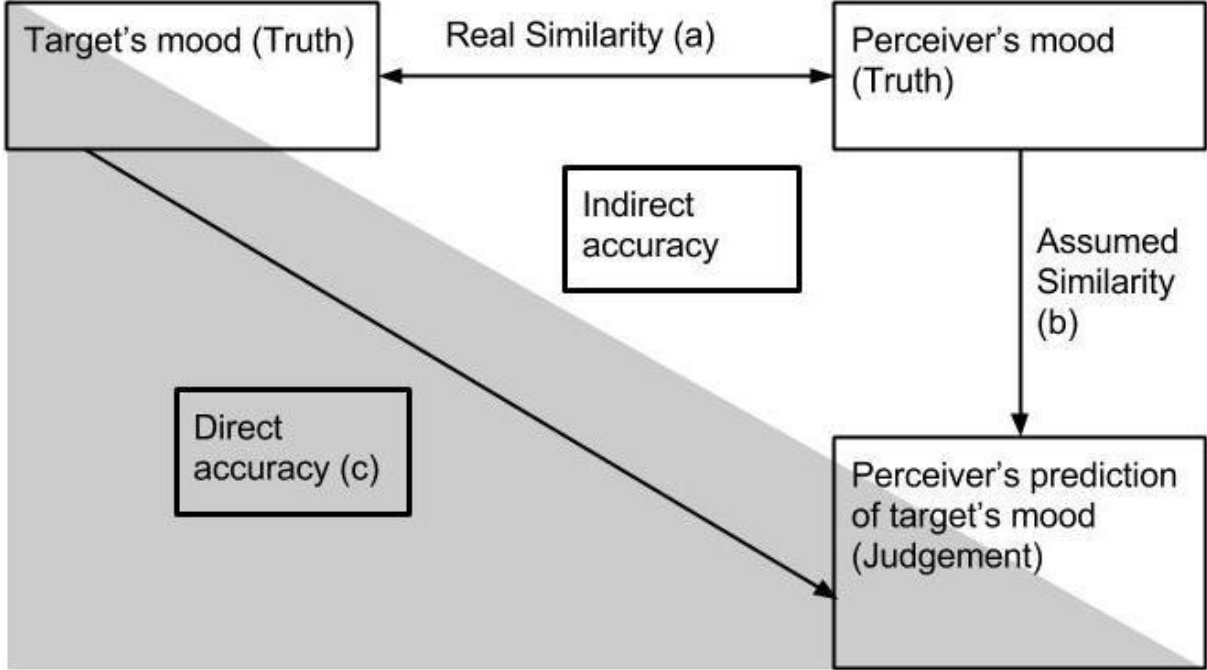


Figure 1 Illustration of proposed statistical model (c) is the Truth force; (b) is the Bias force.

Figure 2

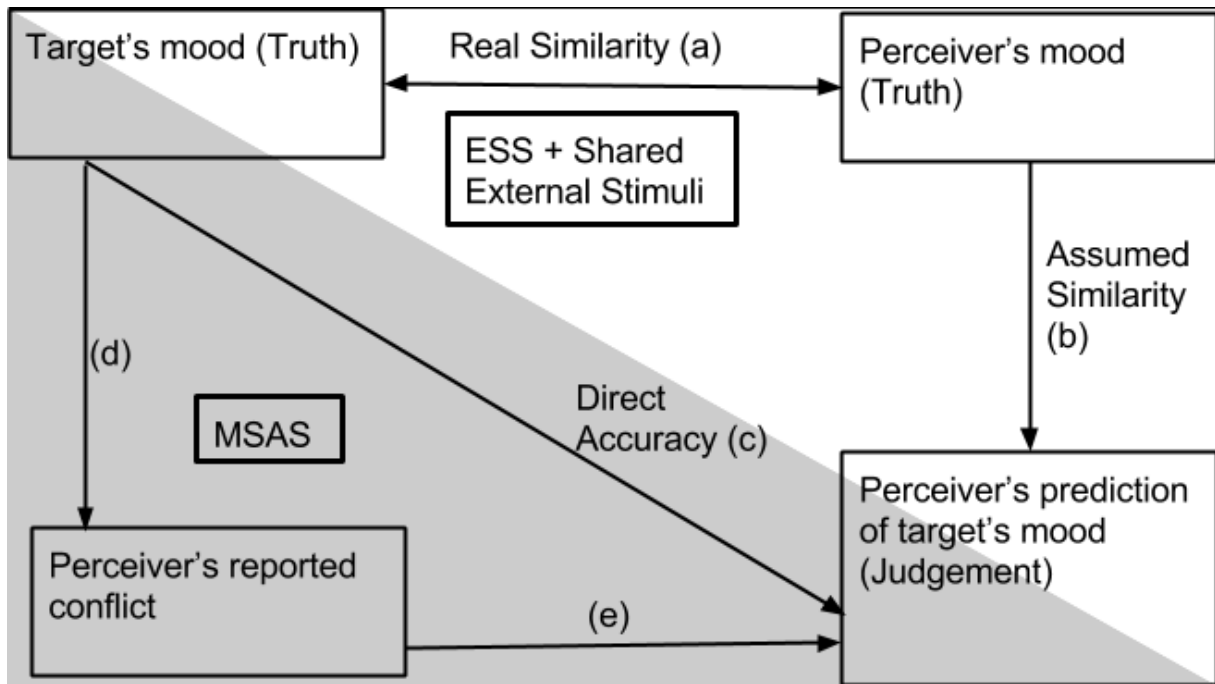


Figure 2 Updated mediation model (c) is the Truth force; (b) and (e) are Bias forces.