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Perceived partner responsiveness promotes intellectual humility

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ABSTRACT

The relatively novel construct of intellectual humility describes people's tendency to be open-minded and non-defensive when appraising oneself and one's beliefs. Although intellectual humility describes an intrapersonal style of processing information, we theorize that it also has interpersonal roots. This article describes four experiments and one daily-diary study examining the impact of perceived partner responsiveness and unresponsiveness on two manifestations of intellectual humility, lesser self-serving bias and openness to novel information that may contradicting existing beliefs. Studies 1–3 indicated that three well-established examples of self-serving bias—the tendency to rate oneself as better than an average peer, overclaiming personal responsibility for shared household activities, and hindsight bias—were strengthened when people were induced to perceive their partners as unresponsive, but weakened when they were led to perceive their partners as responsive. Study 4, a daily-diary study, demonstrated similar effects of everyday perceptions of responsiveness on hindsight bias, and also found that people reported having been more open to considering alternative, potentially conflicting points of view when they felt that their social environment was responsive to them. Finally, Study 5 found that perceived partner responsiveness led people to adopt a broader perspective. Together, these studies point to perceptions of responsiveness and unresponsiveness as one factor that lessens and intensifies, respectively, openness and non-defensiveness.

1. Introduction

Much research speaks to people's tendencies to overestimate their strengths and the accuracy of their beliefs. Perhaps in response, researchers have become interested in the opposite side of this coin, a construct referred to as *intellectual humility*. Intellectual humility has been defined as "a hypo-egoic phenomenon that involves a non-defensive willingness to see oneself accurately by acknowledging one's personal limitations" (Hill & Laney, 2016, p. 243). Researchers have operationalized intellectual humility in various ways, but most include two components: openness to information that may conflict with personal views and relatively weak needs to enhance one's ego (e.g., Bauer & Wayment, 2008; Hill & Laney, 2016; Leary et al., 2017; Tangney, 2009).

Intellectual humility is a relatively new construct, but research already documents these two components. Concerning the former, Leary et al. (2017) showed that persons high in intellectual humility tend to be less convinced of their personal beliefs and more attuned to the strength of persuasive messages. As for the latter, Deffler, Leary, and Hoyle (2016) demonstrated that individuals high in intellectual humility were less likely to claim that they knew things that they in fact did not know. Together, these studies support the idea that intellectually humble individuals are open-minded because their interpretation of situations "is not predicated on how that situation makes one feel about oneself; that is, the person's awareness is detached from egoistic appraisals of the situation" (Bauer & Wayment, 2008, p. 12).

Although existing theories without exception conceptualize intellectual humility as a personal trait, the present article proposes that it also has interpersonal roots. Based on several relevant and well-supported theories, we propose that people may be better able to respond openly to their social environment and to exhibit lesser needs for self-enhancement when they feel understood, validated, and cared for by significant others. This prediction follows from the general principle that self-perception, and particularly the processes through which people maintain a stable, positive view of the self, depends on reflected appraisals: how others are believed to value the self (Leary & Guadagno, 2011). In this article, we report four experiments and a daily diary study exploring the interpersonal roots of openness to novel

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information that is potentially contrary to existing views and weaker needs for egoistic self-enhancement.

1.1. Intellectual humility as openness and lower ego-defensiveness

Before explaining why interpersonal factors ought to contribute to intellectual humility, it will be useful to briefly review research on the two components of intellectual humility that we describe. To be sure, we do not equate intellectual humility with the absence of egoistic self-enhancement. Intellectual humility has more components than self-serving biases, and self-serving biases reflect numerous mechanisms other than intellectual humility, as decades of social-psychological research has demonstrated. Nevertheless, intellectual humility is usually defined as "the degree to which people recognize that their beliefs might be wrong" (Leary et al., 2017, p. 793), a definition that features prominently the two general processes that were the focus of our research.

The first component is receptiveness to novel information, even if that information might reveal personal shortcomings or contradict current beliefs. Correlational studies have shown that intellectual humility is associated with the need for cognition, as well as openness to experience (e.g., Davis et al., 2016). Both the need for cognition and openness to experience have been studied extensively and, under certain common circumstances, tend to be associated with more effective information processing and decision making, and higher levels of creativity (see Cacioppo, Petty, Feinstein, & Jarvis, 1996; McCrae & Costa Jr, 1997; Petty, Briñol, Loersch, & McCaslin, 2009, for reviews). These constructs are somewhat broader than intellectual humility, which more narrowly focuses on the specific idea that because one's own knowledge and experience is inevitably limited, and because other people, on average, should be no less honest and well-informed than oneself, being open to their input may be informative. In this narrower sense, the only study of which we are aware that explicitly examines openness is Leary et al. (2017), who found that attitude change among intellectually humble individuals, compared to less intellectually humble people, was more dependent on the strength of persuasive messages. (Price, Ottati, Wilson, & Kim, 2015, found that open-minded cognition predicted empathic concern for outgroups, but they did not explicitly look at receptivity to novel information.) Most theoretical accounts presume that this form of openness increases people's knowledge and their ability to work collectively with diverse others. Support for this idea comes from research on attitude correctness, which shows that individuals high in the subjective sense that their attitudes are correct and valid are more likely to resist persuasive messages and to send more competitive messages to another student with whom they anticipated debating (Petrocelli, Tormala, & Rucker, 2007; Rios, Demarree, & Statzer, 2014).

The second component of intellectual humility, lower ego-defensiveness, is a well-established social-psychological construct. Extensive research spanning many specific operational measures shows that people tend to construe themselves and their circumstances in a manner that inflates their self-view and competence. This tendency is exemplified, for example, in well-known phenomena such as the tendency to evaluate oneself more favorably than most other people—the so-called "better than average effect" (Alicke & Govorun, 2005; Brown, 2012),—to claim greater personal responsibility for success than failure (Mezulis, Abramson, Hyde, & Hankin, 2004), to express unrealistic optimism about the future (Weinstein, 1980), to perceive more control over events than is actually the case (Langer, 1975), and to see one's own decisions as less biased than the decisions of others (Pronin & Kugler, 2007). These tendencies are commonly interpreted as evidence of a broad self-serving bias that helps people minimize their shortcomings while maintaining a positive sense of self-worth (Sedikides & Gregg, 2008).

Some of the most compelling evidence for the self-serving nature of these biases comes from research in which the self is threatened. Such threats—for example, facing actual or likely failure on a prognostically important task—tend to magnify self-serving biases, presumably because the defensive bias protects the self from having to acknowledge a diminished view of one's capabilities or worthiness (Campbell & Sedikides, 1999). Conversely, research shows that when the self is bolstered—such as by a self-affirming intervention that makes salient one's positive attributes and values—self-serving biases tend to be reduced (Sherman & Cohen, 2006).

In the large majority of existing studies, threats and affirmations are personal in nature—that is, the active threat or affirmation applies specifically to the individual's personal abilities, beliefs, values, or expected future. In the present research, we sought to provide evidence for a different sort of affirmation, an *inter*personal one, perceived partner responsiveness. We conducted five studies aimed at demonstrating that when people feel that significant others are responsive to their needs, intellectual humility is enhanced. That is, we predicted that when people perceive others to be responsive, they will be more open to alternative points of view and self-enhancing biases will be reduced. On the other hand, when people feel that significant others are not responsive to their needs, we predicted that they will be less open to alternatives and self-serving biases will be magnified. More generally, these studies indicate that intellectual humility, in addition to being an intrapersonal attribute, also reflects interpersonal functions of the self.

1.2. Why would perceived partner responsiveness lessen self-serving bias?

Because social-psychological research has more commonly investigated the lower-defensiveness component of intellectual humility, we focus on it, while noting that the same logic applies to openness (see introduction to Study 4). Existing research has identified several processes that dampen people's need to defensively enhance their sense of self-worth. A key example is self-affirmation, or, the tendency to highlight values or attributes that are favorable to the self, which may lessen "self-evaluative concern in the situation at hand and allow other motivations, such as a desire to be even-handed, rational, or healthful, to predominate" (Sherman & Cohen, 2006, p. 221). Research has shown, for example, that writing a paragraph about one's most valued life domain reduced people's tendency to optimistically inflate their performance estimates on a difficult test (Critcher, Dunning, & Armor, 2010) and that recalling prior acts of kindness engenders openness to health risk-related information (Reed & Aspinwall, 1998). Common to these and other examples of self-affirmation is the idea that when positive aspects of the self are salient, there is less immediate need to defend the self against threatening information (Sedikides & Gregg, 2008; Sherman & Cohen, 2006; Steele, 1988).

Self-affirmation manipulations typically have participants complete tasks that remind them of their *individual* strengths and integrity, such as mentally engaging with their most important personal values or desirable competencies. We reasoned that it would also be informative to show that *interpersonal* feedback can lessen self-enhancement needs. At least two existing lines of theorizing and research, both concerned with self-evaluation rather than defensiveness, support this proposal. The first, Leary's sociometer model, asserts that self-esteem is a meter of perceived interpersonal value, which, in part, is strongly influenced by one's social environment (Leary & Baumeister, 2000). This model posits that people monitor their social relations for cues about how they are valued by others. Self-esteem directly reflects this monitoring process, rising when the social environment seems encouraging, and declining when it seems unpromising or rejecting. Existing research supports this interpersonal conceptualization of self-evaluation, both generally in social life (e.g., Leary, Tambor, Terdal, & Downs, 1995) and in close relationships in particular (e.g., Murray, Griffin, Rose, & Bellavia, 2006).

A second relevant thread derives from attachment theory. In his seminal thesis, Bowlby (1982) argued that assessments of self-worth

derive from early relationships with caregivers, specifically whether caregivers are (or are not) reliably available and sensitive, wherein young children learn that they are worthy (or not worthy) of love and caring. These so-called internal working models of attachment, internalized in early life, are thought to generalize across the life-span. Extensive evidence links the quality of attachment relationships at all stages of life to perceptions of self-worth and competence (see Mikulincer & Shaver, 2016, for review).

In the present work, we extend these models of the interpersonal roots of self-evaluation to the two components of intellectual humility discussed earlier, openness and defensiveness. Existing research has shown that priming attachment security lessens defensive derogation of, and hostile attitudes toward, outgroup members (e.g., Mikulincer & Shaver, 2001; Saleem et al., 2015), but these studies did not examine self-enhancing bias. Other studies have shown that interpersonal threats and acceptance influence defensive reactions to self-relevant information. For example, Mikulincer (1998) demonstrated that people recall more positive self-relevant attributes following supraliminal presentation of attachment-threat related words. Similarly, Mikulincer and Arad (1999) showed that priming with secure-attachment words improved recall of expectation-incongruent information. Somewhat closer to the present work is Kumashiro and Sedikides (2005), who found that visualizing a close positive relationship after putative failure on a challenging intellectual-ability test led participants to be more open to receiving highly diagnostic information about their performance. Caprariello and Reis (2011) found a similar result using a subliminal prime. Whereas these latter studies point to the existence of a secure or close relationship as a resource in the face of threat, they do not directly address our more specific claim that feeling valued and understood by others, as opposed to feeling devalued and misunderstood by them, can reduce self-serving bias.

We focused on perceived partner responsiveness for several reasons. Reis, Clark, and Holmes (2004) defined perceived partner responsiveness as a "process by which individuals come to believe that relationship partners both attend to and react supportively to central, core defining features of the self" (p. 203). Responsiveness contributes to intimacy and security in close relationships; when people feel that their partners understand and value the self, they are more likely to be open and to expect acceptance (Reis & Clark, 2013). Therefore, activating the idea that partners are responsive to one's needs should reduce concerns about relational value, and, in turn, lessen the need to defensively self-enhance; alternatively, believing that one is not valued by others should heighten these needs (Crocker, 2011; Leary & Guadagno, 2011).

A second reason is that activating representations of the self as understood and accepted should make the authentic self (an inner sense of who one really is) more salient (Kernis & Goldman, 2006), diminishing potential benefits from inflated self-perceptions. Finally, a third reason is that when people feel valued in one domain, such as in their close relationships (which usually ranks at or near the top of most people's list of important values; Sheldon, Elliot, Kim, & Kasser, 2001), their perspective on the self encompasses more diverse elements (Critcher & Dunning, 2015), minimizing self-esteem threats from shortcomings in a single domain.

2. The present research

We conducted four experiments and one daily diary study to investigate whether and, if so, how perceived partner responsiveness affects self-serving bias and openness to novel, potentially contradictory information. The first three experiments used two manipulations of perceived partner responsiveness in replications of three conceptual demonstrations of well-known egoistic self-enhancement effects: the "better-than-average" effect, overclaiming personal responsibility for shared household work, and hindsight bias. (The rationale for each of these examples is described in the introduction to each study.) Study 4 was a daily diary study, intended to document the operation of these processes in everyday life. In Study 4, we examined the second component of intellectual humility, openness to novel, potentially contradictory viewpoints. In Study 5, we extended our research to broadened perspectives, a putative mechanism behind self-affirmation effects (Critcher & Dunning, 2015), to determine whether the effects of perceived partner responsiveness can be explained similarly.

In all five studies, our hypothesis was that perceived partner responsiveness, whether manipulated or assessed as it varied across days, would be associated with lesser self-enhancing bias and/or greater openness to novel, potentially contradictory, viewpoints.

3. Study 1

Study 1 examined the "better than average effect." An extensive literature documents people's tendency to rate themselves more favorably than an average peer across a wide range of traits and skills (e.g., Alicke, 1985; Alicke & Govorun, 2005; Brown, 2012). Although several motivated and cognitive explanations have been supported, there is consensus that self-enhancement plays a substantial role in this effect (Brown & Brown, 2011; Guenther & Alicke, 2010). Our goal in Study 1 was to show that perceived partner responsiveness lessens the tendency to describe oneself more favorably than the average student, whereas perceived unresponsiveness heightens the effect.

We followed Guenther and Alicke's (2010) procedure, in which college student participants are asked to compare themselves to the average student at their university on 23 trait adjectives. Prior to their self-ratings, participants were assigned randomly to one of four experimental conditions. In the *responsive* condition, they were asked to describe a responsive partner in some detail. In the *acquaintance* condition, they described a neutral acquaintance. In the *unresponsive* condition, participants described someone they knew who was unresponsive to them. In the *control* condition, participants were asked to describe an organizational tool.

In this study, and in all of the other studies, all data were collected and all data exclusions were made before analyses relevant to the hypotheses were conducted. All conditions and data exclusions are reported.

3.1. Method

3.1.1. Participants

A power analysis specifying a medium effect size (f = 0.25) indicated that for a one-way analysis of variance (alpha = 0.05), a total sample size of 180 (45 per condition) would be needed (G*Power; Faul, Erdfelder, Buchner, & Lang, 2009). Given the likelihood that data from some participants would have to be excluded, we ran 212 individuals from the psychology research pool, who received extra credit in one of their courses. Prior to analysis, data from 30 participants (14.1%) were deleted from the analytic sample (8 for computer failures, 9 who ignored instructions and wrote about something other than the assigned topic, 6 who were well-acquainted with the experimenter (who would be able to see their self-ratings, which were provided on paper), and 7 for stereotyped or inattentive responding (using the same number for > 2/3rds of the items or skipping a page or more), yielding a sample of 182 participants (72.5% female).

3.1.2. Procedure

When participants arrived at the lab, they were greeted by an experimenter who gave them an information letter explaining that they would be answering questions about their life, opinions, and attitudes. Participants were then told to follow computerized instructions, which guided them through the manipulations via MediaLab.

The priming manipulations were adapted from Caprariello and Reis (2011). Participants were assigned randomly to one of four conditions. In the *responsive* condition, they were asked to describe someone who best fulfilled the criteria of a responsive partner (e.g., "He or she knows the real

you," "He or she is interested in what you are thinking and feeling," "He or she esteems you, shortcomings and all"). In the *acquaintance* condition, they described a neutral acquaintance (e.g., "He or she knows you, but not particularly well," "It is generally nice to run into or hang out with this person," "You have generally positive feelings towards this person, but you don't know him or her well"). In the *unresponsive* condition, participants described someone who met the criteria of an unresponsive person (e.g., "He or she knows you fairly well, but often seems discouraging," "He or she is often critical and seems unwilling to be helpful or supportive," "He or she doesn't seem to like you much"). In each condition, participants were asked to spend 15 min answering three open-ended questions about this person: (a) "What does this relationship personally mean to you? How does this person fit into your life?" (b) "How does this relationship make you feel? If possible, use specific examples," and (c) "Imagine this person sitting next to you at this very moment. What might you talk about? What's the first thing you'd want to ask him or her, if anything?" In the *control* condition, participants were asked three comparable open-ended questions about an organizational tool (e.g., "Studies show that being organized helps people get through the day. What effect do you think this has on people's productivity?").

Once participants had completed the priming procedure, they were told that they were moving to a different study, and were given a paper copy of the trait-adjective rating task (see below). To bolster this cover story, participants were told that its purpose was to help the department better understand the traits of students who take Psychology classes.

3.1.3. Measures

Following Guenther and Alicke's (2010) protocol, participants were given a list of 23 trait adjectives and asked to describe "how much you possess or exhibit each trait, relative to the average [name of university] student." Adjectives were presented in one of 10 randomized orders. (Order did not affect responses and is not discussed further.) The following adjectives were used, after Guenther and Alicke (2010): cooperative, faithful, open-minded, motivated, intelligent, truthful, generous, brave, kind, sociable, logical, neat, interesting, candid, forgiving, fit, cultured, imaginative, sophisticated, tolerant, attractive, athletic, and friendly. For each adjective, participants rated themselves on −9 ("exhibit much less") to +9 ("exhibit much more") scale. The scale midpoint, 0, was labeled "I'm exactly average."

Principal components analyses indicated that ratings were essentially unidimensional, so, consistent with Guenther and Alicke (2010), we created a total self-rating score by averaging across the full set of 23 trait adjectives. Positive scores indicate rating oneself above average, whereas negative scores indicate rating oneself below average.

3.2. Results and brief discussion

Composite ratings were analyzed with a 4 (condition) × 2 (sex) analysis of variance, using post hoc tests to probe significant effects.[2] The main effect for condition was significant, $F(3,173) = 3.28$, $p = .022$, $eta^2 = 0.051$, as was the main effect for sex, $F(1,173) = 5.51$, $p = .020$, $eta^2 = 0.029$. Consistent with prior studies, men rated themselves more highly than women did, $M_{men} = 3.02$ (sd = 1.49), $M_{women} = 2.41$ (sd = 1.60). The condition × sex interaction was not significant ($p = .584$).

A post hoc Fisher's Least Significant Difference test indicated that participants in the responsive condition rated themselves significantly less positively than did participants in the unresponsive condition ($p = .003$) and marginally less positively than did participants in the acquaintance condition ($p = .07$). Also, participants in the organizational tool condition rated themselves marginally less positively than participants in the unresponsive condition ($p = .062$). No other pairwise differences approached significance. Mean values are displayed in Table 1.

Table 1
Mean of composite self-ratings.

	Responsive	Acquaintance	Unresponsive	Organizer
Mean	2.09_a	$2.67_{b,c}$	3.10_c	$2.48_{a,b}$
sd	1.49	1.28	1.94	1.55
n	43	50	41	48

Note. A composite score of 0 would indicate rating oneself as exactly average compared to other students. Means sharing a subscript do not differ from each other ($p > .07$) in pairwise Fisher's Least Significant Difference tests.

Study 1 found that participants in the responsive condition showed weaker self-serving bias, in the form of defensive inflation of self-views, than participants in the other two conditions, whereas participants in the unresponsive condition showed more of this bias. To be sure, self-serving bias was still evident in all conditions, in that the means of all 4 conditions were greater than zero. Nevertheless, activating people's sense of perceived partner responsiveness weakened this proclivity, indicating that when people feel that others are responsive to them, they have less need to defensively enhance their self-perceptions.

4. Study 2

In Study 2 we examined the effect of perceived partner responsiveness on self-serving attributions of responsibility for shared household tasks. Many studies show that when cohabiting partners report the percentage of household tasks they personally do, their responses typically sum to more than 100% (e.g., Kruger & Gilovich, 1999; Marini & Shelton, 1993; Press & Townsley, 1998; Ross & Sicoly, 1979). This finding is usually taken as evidence of a self-serving bias in attributions of responsibility (Leary & Forsyth, 1987), consistent with research showing that believing that one's contributions "make a difference" promotes affective well-being (Sun et al., 2017). Based on our theorizing, we expect partners to take more credit for household tasks when they feel that partners have been unresponsive, whereas we expect them to take less credit for household tasks when they feel that partners have been responsive.

Study 2 used a less direct manipulation of perceived partner responsiveness, adapted from Lemay Jr, Clark, and Feeney (2007). We did this for two reasons: first, as a conceptual replication with a different induction, and second, to lessen the possibility of demand characteristics. Lemay et al. asked subjects to recall either 2 or 8 kind or considerate things that they had done for their partner in the past week. We modified this manipulation to focus on perceived responsiveness, asking participants to recall 2 or 10 kind or considerate things that *their partner* had done for them in the past week. Based on research showing that the relative accessibility of experiences (i.e., the ease/difficulty of recall) influences subsequent judgments (reviewed by Schwarz, 1998), we reasoned that it is easy to recall 2 kind things that a partner has done for oneself, which should activate feelings of partner responsiveness. However, people typically find it difficult to recall 10 kind things that a partner has done in one week, which should prime doubts about responsiveness.

A key advantage of this manipulation is that if demand characteristics exist, one might reasonably expect that being asked to think about a large number of kind behaviors should imply that the experimenter wishes one to perceive high responsiveness and hence should yield lesser self-enhancing attributions. Our hypothesis, however, is the opposite: that being asked to think about a large number of kind behaviors will be associated with *greater* claims of responsibility.

[2] Sex was included as a factor in this analysis as well as in the later experiments because of prior studies showing significant differences between men and women on these judgments (particularly self-evaluations and judgments about household responsibilities, the foci of Studies 1 and 2); see Pomerantz, Saxon, and Kenney (2001) and Shelton and John (1996) for reviews.

Table 2
Mean of composite reports of the percentage of home work done.

	Responsive	Control	Unresponsive
Mean	55.28_a	57.32_b	60.10_c
sd	9.75	8.97	9.57
n	251	253	268

Note. Means sharing a subscript do not differ from each other ($p < .015$) in pairwise Fisher's Least Significant Difference tests.

4.1. Method

4.1.1. Participants

In Study 2, we based our power analysis on the effects obtained in Study 1 comparing the two key groups (responsive, unresponsive) and the control group. These mean differences were $d = 0.29$ (responsive-control) and $d = 0.37$ (unresponsive-control). Based on the smaller value, 251 participants per group would be needed to achieve power of 0.80. Because it is typical in online experiments to exclude data from approximately 15–20% of participants for poor attention (Chandler, Mueller, & Paolacci, 2014), we aimed for 300 participants per group.

A total of 894 individuals took part in the study. Prior to analysis, data from 122 participants (13.6%) were deleted from the analytic sample (34 for leaving the manipulation or 7 or more items blank, 6 who noted personal reasons why they felt that their ratings were not meaningful, 25 for stereotyped responding (giving the same response across items irrespective of item content), and 57 for scores of 6 or higher on the infrequency subscale of the Attentive Responding Scale (as recommended by the authors, Maniaci & Rogge, 2014a), leaving a sample of 772 participants (62.3% female) for analysis. Participants indicated their age in categories, as follows: 18–24, 1.4%; 25–34, 22.5%; 35–44, 38.3%; 45–54, 23.1%; 55–64, 13.0%; 65–74, 1.7%, which yields a mean age of 42.38 years.

4.1.2. Procedure

Participants were recruited through ResearchMatch,[3] and were eligible to participate if they were cohabitating with a romantic partner. Participants were not compensated for participation. To prime responsiveness, in the *responsive* condition, participants were asked to describe "2 kind or considerate things your relationship partner has done to help you in the past 7 days." In the *unresponsive* condition, participants were asked to describe "10 kind or considerate things your relationship partner has done to help you in the past 7 days." In the *control* condition, participants were asked to "list 5 qualities or traits that come to mind when you think about an acquaintance you know a little bit, and don't have strong feelings toward, one way or the other." Participants then were shown a list of 27 household tasks.

4.2. Measures

4.2.1. Personal responsibility ratings

Tasks were chosen by first compiling a list of all items used in 26 published studies examining attributions of responsibility for household activities, and retaining all non-redundant items. This list included some traditionally female tasks (e.g., cooking meals; washing, ironing, and mending clothes), some traditionally male tasks (e.g., yard work, auto maintenance and repair), and some gender-neutral tasks (e.g., pet care, paying bills). See Appendix A, Supplemental Online Materials (SOM), for the complete list. One additional item assessed global ratings of one's contribution to shared household tasks ("All things considered, I take responsibility for ___% of the housework").

Participants were asked to estimate the extent of their personal responsibility for each activity in a typical week, by indicating a percentage between 0% (*do none of it*) and 100% (*do all of it*). Participants were instructed to only consider the amount of work done by themselves and their romantic partners—that is, they were told to exclude contributions by children or a housekeeper.

4.2.2. Attentive Responding Scale

We used the 6-item infrequency subscale of the ARS-18 (Maniaci & Rogge, 2014a) to identify invalid responses due to inattention. Respondents rated each item on a 5-point Likert scale and received higher scores for each increasingly implausible response. These scores were summed and a cut-score of six, recommended by Maniaci and Rogge (2014a), was used to identify inattentive respondents.

4.3. Results and brief discussion

Composite scores were analyzed with a 3 (condition) × 2 (sex) analysis of variance, with post hoc tests to probe significant effects. The main effect for condition was significant, $F(2,766) = 15.83$, $p < .001$, $eta^2 = 0.037$, as was the main effect for sex, $F(1,766) = 46.68$, $p < .001$, $eta^2 = 0.055$. Consistent with prior studies, women reported doing a greater percentage of housework than men did, $M_{women} = 59.38\%$ (sd = 9.70), $M_{men} = 54.71\%$ (sd = 8.80). The condition × sex interaction was not significant ($p = .604$).

As shown in Table 2, post hoc Fisher's Least Significant Difference test indicated that participants in the responsive condition reported doing a significantly smaller share of housework than participants in the control ($p = .02$) or unresponsive conditions ($p < .001$). Also, participants in the unresponsive condition reported doing significantly more housework than participants in the control condition ($p < .001$).

A separate analysis of the single item assessing global perceptions of one's personal contributions to housework yielded a similar result. The main effect for condition was significant, $F(2,766) = 16.50$, $p < .001$, $eta^2 = 0.033$, as was the main effect for sex, $F(1,766) = 194.46$, $p < .001$, $eta^2 = 0.194$. The condition × sex interaction was not significant ($p = .142$). Consistent with the earlier results, participants in the unresponsive condition reported doing the greatest proportion of housework, $M = 62.34\%$ while participants in the responsive condition reported the lowest proportion, $M = 52.44\%$. The mean response in the control condition fell in between, $M = 54.37\%$. All pairwise comparisons were significant at $p = .022$ or lower.

As in Study 1, there was still evidence of self-enhancing bias, given that the average response in all three conditions exceeded 50%. Nevertheless, participants who had been primed to see their partners as responsive showed a weaker tendency to inflate personal contributions, whereas participants primed to see their partners as unresponsive showed a stronger tendency.

It might be argued that the "kind and considerate" actions participants recalled dealt with housework activities—for example, a partner voluntarily doing one's chores. However, in this case, participants in the unresponsive condition, who were asked to recall a greater number of these acts, should have claimed a lower percentage of household activities, not a higher number, as we found. To further rule out possible confounding by overlap between the content of the responsiveness manipulation and the measure of self-enhancing bias, Study 3 used an outcome measure unrelated to the content of the priming task.

5. Study 3

Hindsight bias, also called the "I-knew-it-all-along" effect (Wood, 1978), refers to the tendency to believe that one knew the answer to a question or problem all along, even though direct evidence suggests otherwise (Roese & Vohs, 2012). Although this term refers to several distinct phenomena, here we refer to people's tendency to self-enhance

[3] ResearchMatch is a not-for-profit web-based recruitment national registry that links researchers with individuals interested in participating in research (Harris et al., 2012). ResearchMatch has a current roster of > 100,000 volunteers, who have signed up out of interest rather than financial incentives.

by reporting that they previously knew something that they now know to be true. Theorists attribute this tendency to the desire to see oneself as knowledgeable and capable of predicting future outcomes, which enhances both sense-making and perceptions of control (e.g., Campbell & Tesser, 1983; see Roese & Vohs, 2012, for a review).

To assess hindsight bias, we used the so-called hypothetical design, in which participants are given the answer to a question and then asked to say what they would have responded had they not been told the answer. Existing research shows that this procedure induces systematic bias toward the provided answers (Pohl, 2007; Werth & Strack, 2003), giving participants the sense that they "knew it all along." To make the task engaging yet capable of revealing hindsight bias, we pilot-tested 40 "trivia questions" that are similar to common online quizzes and relatively entertaining with 100 Amazon Mechanical Turk participants, without revealing the correct answers. In order to identify items that are relatively unastonishing but whose answers are still typically unknown, which are optional conditions for triggering hindsight bias (Werth & Strack, 2003), we selected 13 items based that had the fewest outliers and no correct responses (see Procedure and Appendix B, SOM).

5.1. Method

5.1.1. Participants

We based our power analysis on the median effect of the pairwise comparisons in Study 2 ($d = 0.34$), which indicated that 188 participants per group (564 in total) would be needed to achieve power of 0.80. Because the task seemed likely to attract attention by online browsers who might not complete it, we expected a somewhat higher exclusion rate than the 13.6% obtained in Study 2. We therefore aimed for approximately 30% above the estimated sample size, or 269 participants per group (806 in total). In all, 854 individuals (56.7% female) took part in the study. Prior to analysis, data from 275 participants (32.2%) were deleted from the analytic sample (260 for failing the attention check, 18 for leaving the manipulation items blank, and 9 for skipping more than half of the hindsight items; some participants were excluded for more than one reason).[4] This left a sample of 579 individuals (58.5% female) for analyses.

5.1.2. Procedure

Participants were recruited using ResearchMatch and were not compensated for participation. We used the same conditions and priming procedures as in Study 2.

After the manipulation, participants were shown the list of 13 questions selected during pilot-testing (see Appendix B, SOM). Participants were told that they would be testing trivia questions, and that they would be given the real answers to the questions, since we have found that "most participants like to know the answer." However, they were instructed to respond as they would have *without* knowing the actual answer. Thus, each question was presented along with its answer. Participants were then asked to give "Your answer, prior to knowing the actual value." For example, one question read "How many paintings did Pablo Picasso create? (**Answer**: 1,885 paintings)." Because these questions, absent of the actual answers, typically yield substantially wrong responses, hindsight bias is indicated by providing an answer that is *closer* to the actual answer (Pohl, 2007). We therefore created an index of hindsight bias, using procedures developed by Werth and Strack (2003). For each question, a discrepancy score was computed, based on the absolute value of the difference between the participant's answer and the correct answer, divided by the standard deviation. These discrepancy scores were then summed across all 13 questions. Higher scores indicate a greater willingness to acknowledge that one's own answer deviated from the actual response, and is thus indicative of *less* hindsight bias.

Because these questions sometimes pulled for very extreme responses by some participants, to maximize robustness we winsorized all responses beyond the 5th and 95th percentiles (Tukey, 1977). For 5 questions (Picasso, Pittsburgh bridges, United Nations, Nile River, Churchill), the 95th percentile was relatively close to the actual answer, which would have obviated variance associated with overestimates. For these questions, following the winsorizing procedure recommended by Wilcox (2011), we specified a value of 1.5 x the semi-interquartile range (i.e., the difference between the 25th and 75th percentile) over the actual answer as the maximum value.

Following the hindsight item, participants were given an instructional manipulation check, adapted from Oppenheimer, Meyvis, and Davidenko (2009). In this item, participants were shown a list of 10 sporting activities and an Other category, each with a square checkoff button next to it. The instructions we used asked them to check "Other" and type "I read the instructions" in the space provided. Checking any of the sporting activities was considered an inattentive response.

5.2. Results and brief discussion

Composite scores were analyzed with a 3 (condition) × 2 (sex) analysis of variance, using post hoc tests to probe significant effects. The main effect for condition was significant, $F(2,573) = 8.67$, $p < .001$, $eta^2 = 0.029$, whereas the main effect for sex was marginally significant, $F(1,573) = 3.58$, $p = .059$, $eta^2 = 0.006$. Men showed greater hindsight bias than women, $M_{men} = 13.81$ (sd = 4.48), $M_{women} = 14.54$ (sd = 4.51). The condition × sex interaction was not significant ($p = .744$).

Mean values are displayed in Table 3. Post hoc Fisher's Least Significant Difference tests indicated that participants in the unresponsive condition showed significantly higher levels of hindsight bias than participants in the control condition ($p = .002$) or those in the responsive condition ($p < .001$). The responsive and control conditions did not differ significantly ($p = .351$).

As in Studies 1 and 2, Study 3 showed that self-enhancing biases, here in the form of hindsight bias, were significantly weaker when perceived partner responsiveness had been primed, compared to perceived partner unresponsiveness. The only difference from prior results is that in Study 3, the difference between the responsive and control conditions was not significant.

6. Meta-analysis of Studies 1–3

Because the pairwise comparisons in Studies 1–3 yielded a somewhat inconsistent pattern of significance tests, we conducted a meta-analysis summarizing the results of all three studies. For this analysis, we used the Organizer condition as the control group for Study 1, and we reversed the scores in Study 3 so that across three studies, a higher score would indicate higher levels of self-serving bias. We conducted a fixed-effects weighted means meta-analysis, using Hedges's optimal weights for meta-analysis, as recommended by Lipsey and Wilson (2001). Calculations were implemented with Braver, Thoemmes, and Rosenthal's (2014) spreadsheet.

Results of these analyses are reported in Table 4. Across the studies, all three pairwise comparisons yielded a significant difference. Self-serving bias was significantly lower in the Responsive condition than in the Unresponsive and in the Control conditions, whereas self-serving bias was significantly greater in the Unresponsive than in the Control condition.

7. Study 4

Study 4 examined these processes in the context of natural,

[4] The percentage of participants dropped for inattention is comparable to other Internet samples. In a review, Maniaci & Rogge, 2014b, stated that "as many as 25–45% of participants [in online studies] routinely skip blocks of instructions" (p. 446).

Table 3
Mean levels of hindsight bias.

	Responsive	Control	Unresponsive
Mean	14.97_a	14.55_a	13.17_b
sd	4.45	4.41	4.50
n	191	197	191

Note. Values report sum across 13 items of absolute discrepancies from the true answer expressed in standard deviation units. Higher scores indicate less hindsight bias. Means sharing a subscript do not differ significantly ($p < .05$) in pairwise Fisher's Least Significant Difference tests.

Table 4
Meta-analytic summary of Studies 1–3.

	d	*z*	p	95% CI
Responsive vs. unresponsive	−0.469	−6.99	< 0.0001	−0.595, −0.342
Responsive vs. control	−0.173	−2.64	= 0.007	−0.298, −0.047
Unresponsive vs. control	0.309	4.67	< 0.0001	0.184, 0.434

Note: d represents the weighted average mean defensive comparing the first-named condition to the second named condition, across Studies 1–3. Results from Study 3 have been reversed so that all three studies are scored to indicate that higher scores indicate higher levels of self-enhancement.

everyday activity. Studies 1–3 provide evidence for the hypothesized causal chain, but these experimental manipulations do not necessarily have high ecological validity—i.e., they may not represent influential processes in spontaneous, everyday activity. Further, the validity of a proposition is best documented when complementary methods are used (Brewer & Crano, 2014). Daily diary studies are particularly helpful in this regard, because they allow researchers to track the ebb and flow of social processes in "life as it is lived" (Bolger, Davis, & Rafaeli, 2003). A further advantage of the daily diary approach is that it allowed us to examine these processes within-person: whether daily increases or decreases in perceived partner responsiveness, over and above one's average level, were systematically predictive of increases or decreases in intellectual humility.

In Study 4, a sample of university undergraduates completed diary reports for 14 days. We repeated our investigation of self-serving bias with a novel measure of hindsight bias.[5] More important to our aims was an examination of the other component of intellectual humility, openness to alternative perspectives. These questions asked whether, on each day, participants had solicited input and opinions that might differ from their own, whether they were open to alternative perspectives, and whether they had conceded a point of difference to someone else. These items were based on pilot testing a longer set of items derived from the Templeton Foundation white paper on intellectual humility (Samuelson, Church, Jarvinen, & Paulus, 2012). We hypothesized that daily fluctuations in perceived partner responsiveness above one's personal mean would be associated with greater openness and lower hindsight bias, whereas daily fluctuations in perceived partner responsiveness below one's personal mean would be associated with less openness and greater hindsight bias.

7.1. Method

7.1.1. Participants

We estimated power with Optimal Design software (Spybrook et al., 2011), with the following assumptions, based on prior research in our lab: a small effect size (d = 0.20), alpha = 0.05, an average of 12 daily diaries (out of 14) completed per participant, 50% of the variance being attributable to between-persons differences, and between-persons variance of the level 1 effect of 0.20. To achieve power of 0.95 would require a minimum of 130 participants. Because attrition of 20%–30% due to inattention or incompleteness is typical in diary studies of this sort, we set a target sample size of 186.

Recruitment went better than planned and we ended up with 274 participants. Students were recruited for a two-week daily diary study in exchange for extra credit in one of their Psychology courses and a chance to win an Amazon gift card. Data cleaning, explained below, resulted in an analytic sample of 231 participants (136 females). The mean number of responses was 12.68 out of 14 possible days (sd = 1.32); 81% of the final sample completed diaries for 12, 13, or 14 days. Participants were run in 7 waves over a single academic year, three during the Fall semester and four during the Spring semester. They averaged 20.16 years of age (sd = 1.31). Race was distributed as follows: 47.6% White/Caucasian, 7.8% Black/African-American, 34.2% Asian, 7.4% Other, 4.3% Prefer Not to Answer. Twenty-two participants (9.5%) self-described as Hispanic/Latino.

Prior to conducting any analyses, we cleaned the data based on several criteria recommended by McCabe, Mack, and Fleeson (2012) and which are common in daily diary studies. First, we dropped 15 participants (5.5%) for completing fewer than 9 of the 14 daily diaries. Second, an additional 10 participants (3.6%) were dropped for failing more than half of the two attention checks included in each nightly survey. Third, we screened for blank scales and stereotyped responding. One participant (0.4%) was excluded for leaving > 1/3 of the scales blank across all days. To assess stereotyped responding, we excluded data if participants gave the same response for all items on at least 4 of the 7 scales that had positively and negatively worded items (indicating that they were probably not paying attention to item content). Additionally, we tallied how often participants used the same response across scales that had no reverse-scored items. Those who used the identical response for all items on at least 8 of the 15 scales for at least one-third of their nightly surveys were considered to be responding stereotypically. In total, thirteen participants (4.7%) were dropped for stereotyped responding. Finally, some participants' response time suggested that they were not reading the items carefully and responding thoughtfully. The median response interval was 10:01 min (sd = 5:33 min) per diary. On this basis, we excluded 4 participants (1.5%) whose completion times were > 1 standard deviation below the median, but only if they also had a high rate of stereotyped responding. In all, 43 out of 274 participants (15.7%) were dropped, leaving an analytic sample of 231 participants (136 females).

For participants included in the final dataset, we also excluded individual nightly surveys for either of two reasons. First, if on a given nightly survey the participant used the same response for all 7 scales with item reversals and the same response for all 15 total scales, these surveys were excluded. Five (0.2%) nightly surveys met this exclusion criterion. Second, 13 (0.4%) surveys submitted after the 5:00 am cutoff for accessing the survey webpage were dropped.

7.1.2. Procedure

Participants were recruited via an online listing of experiments and attended an introductory session during which they completed a set of questionnaires not relevant to the present report, and were given detailed instructions for the online diary. All participants began 14-nights of surveys on the Monday or Tuesday following their intake session. Beginning on the start date and continuing for 13 consecutive evenings, participants received an email link to the web-hosted survey for that evening at 8:00 pm, with a reminder text message and email at 12:00 am if they had not yet completed the survey. Survey links expired at 5:00 am later that morning. If participants did not complete the survey on a given night, we sent a "check-in" email the following morning to remind them about the study. We also emailed participants after 7 days to ask about problems and to thank them for participating. As an additional incentive for compliance, participants received lottery tickets for each completed diary, according to the following schedule: 1

[5] Study 4 also included a homemade measure of claims of responsibility but it did not yield useful data and is not discussed further.

ticket for each day completed; for 8–10 daily surveys, 5 extra lottery tickets; 11–12 daily surveys, 10 extra lottery tickets; and 13–14 daily surveys, 20 extra lottery tickets. These lottery tickets were entered into a drawing for one $100 and two $50 Amazon.com gift cards.

7.2. Measures

7.2.1. Perceived responsiveness

Our measure of daily perceived responsiveness was derived from two sources. First, we used 8 items from an item response theory analysis conducted by Crasta, Maniaci, Rogge, and Reis (2017) that is being prepared for journal submission.[6] Second, we included three additional items from prior studies that directly tapped Reis and Shaver's (1988) conceptualization of perceived responsiveness. The full set of items is presented in Appendix C, SOM. A sample item is, "Today, the people around me were responsive to my needs." A 1 ("not at all") to 7 ("a great deal") response format was used. A single responsiveness score was created by averaging across the 11 items. Alpha coefficients for each day ranged from 0.89 to 0.93, mean = 0.91.

7.2.2. Openness

To assess openness to alternative perspectives, we began with the Templeton Foundation white paper on intellectual humility (Samuelson et al., 2012), which defined intellectual humility in terms of open-mindedness, a sense of one's own fallibility, recognition of one's intellectual debt to others, and the absence of over-confidence in one's opinions and powers. Accordingly, we created a list of 26 ways in which these qualities might be reflected in the everyday life of undergraduates. We gave that list to a pilot sample of undergraduates, asking them to indicate whether that behavior had occurred on that day. We then dropped the 10 least frequent items as well as 2 other items that seemed more closely related to defensiveness, resulting in a list of 14 items (see Appendix D, SOM). A sample item is, "Today, I was really open listening to other peoples' opinions, even when they differed from my own." Each day, participants were asked to indicate whether they didn't do that behavior (scored 0), whether they "did it a little" (scored 1), or whether they "did it moderately to a lot" (scored 2). The order of items on each page of the survey was randomized for this and all other measures.

Principal components analyses conducted separately for each diary day indicated that a single-component solution was best (eigenvalues ranged from 3.83 to 5.75; eigenvalues for a second component ranged from 1.21 to 1.62) and so we created a composite score by summing the 14 items on each day (alpha coefficients computed per day ranged from 0.66 to 0.81, mean = 0.76).

7.2.3. Hindsight bias

Each day, participants answered 4 general questions about their experience of hindsight on that day (see Appendix E, SOM). A sample item is "Today, I made mistakes in my coursework, even though I knew the right answers all along." Each question was rated on a 1 (not at all) to 7 (a great deal), with the midpoint, 4, labeled as "somewhat." A single hindsight score was created by averaging across the 4 items. Alpha coefficients for each day ranged from 0.70 to 0.89, mean = 0.83.

7.2.4. Attention checks

Two instructional checks of attentiveness were used (Oppenheimer et al., 2009). The first appeared on page 3 of the daily survey and consisted of a duplicate item from the responsiveness scale followed by instructions to leave it blank ("Today, my friends understood my point of view. Please leave this question blank if you are paying attention."). If subjects selected one of the scale options instead of leaving the question blank, they received the following pop-up message:

> We noticed that you are not paying attention to the questions and instructions! Please make sure to pay attention throughout the rest of the survey.

The second attention check appeared on page 7 of the survey. The question again consisted of a duplicate item, followed by instructions to select a particular number from a 1–7 Likert scale ("Right now, I feel determined. Please select option ___ if you are paying attention."). This number was generated randomly on each nightly survey to prevent participants from memorizing the number needed to pass the attention check.

7.3. Results and brief discussion

Because these data had a nested structure, with daily reports (level 1) nested within persons (level 2), we used the MIXED procedure in SPSS (Bolger & Laurenceau, 2013). The key predictor, daily perceived responsiveness, was person-mean centered; to be sure that the obtained effects were entirely within-person, we also included the individual's 14-day mean perceived responsiveness as a predictor in all analyses (Bolger & Laurenceau, 2013). Diary day was entered in all analyses to control for linear response trends across the 14 days of the study. Following Bolger and Laurenceau's (2013) recommendations, a random effect was included for the intercept in all model, but fixed effects were used for the within-person effects; additionally, we specified an autoregressive error structure. Analyses also included the prior day's value for the dependent variable, so that the obtained effects can be interpreted as reflecting change from the prior day's value to the current day.[7] Gender did not moderate any of the effects described below, so this factor was removed from the analyses.

Results of these analyses are presented in Table 5. As predicted, within persons, higher daily levels of perceived responsiveness significantly predicted greater levels of openness to alternative perspectives on that day, $B = 0.056$, $t(137.12) = 7.56$, $p < .001$. Additionally, participants with higher mean levels of perceived responsiveness also were generally higher in openness to alternative perspectives across the 14 days, $B = 0.046$, $t(106.08) = 2.88$, $p = .005$.

Daily perceived responsiveness marginally predicted daily reductions in hindsight bias, $B = -0.54$, $t(143.55) = 1.79$, $p = .076$. Between-person mean levels of perceived responsiveness also significantly predicted lower hindsight bias, $B = -0.169$, $t(123.56) = -2.57$, $p = .011$.

In sum, Study 4 contributes to this set of studies in two ways. First, we marginally replicated the prior experimental results for hindsight bias in the context of everyday activity, showing that increases and decreases in perceived levels of responsiveness predicted parallel shifts in this marker of self-enhancing bias. Second, Study 4 included a novel measure of the second component of intellectual humility, openness to alternative perspectives, and found a similar trend: when participants felt that their social environment had been responsive, they were more open, whereas when they felt that their social environment had been unresponsive, they were more closed to alternative perspectives.

8. Study 5

Another way of thinking about intellectual humility is that by recognizing personal limitations as well as strengths, and being open to inputs beyond one's own, people are taking a broader perspective on

[6] This study used item response theory (IRT) to develop a psychometrically optimized measure of perceived partner responsiveness. In that study, we collected all items used in prior research to measure this construct and then used IRT to select a subset of items that captured the most variance and best discriminated high and low responders. Copies of this analysis are available from the authors on request.

[7] When the prior day's value of the outcome variable is omitted, results are essentially the same.

Table 5
Responsiveness as a predictor of openness to alternative perspectives and hindsight bias.

				95% CI	
Outcome variable/predictor	B	SE	t	Low	High
Openness to alternative perspectives					
Daily perceived responsiveness	0.056	0.007	t(137.12) = 7.56**	0.041	0.070
Person mean perceived responsiveness	0.046	0.016	t(106.08) = 2.88**	0.014	0.077
Diary day effect	−0.016	0.004	t(540.05) = −3.98**	−0.024	−0.008
Prior day openness	0.238	0.019	t(1670.47) = 12.40**	0.201	0.276
Hindsight bias					
Daily perceived responsiveness	−0.054	0.030	t(143.55) = −1.79+	−0.114	0.006
Person mean perceived responsiveness	−0.169	0.066	t(123.36) = −2.57*	−0.300	−0.039
Diary day effect	−0.050	0.015	t(594.81) = −3.38**	−0.080	−0.021
Prior day hindsight	0.245	0.019	t(1807.13) = 13.00**	0.208	0.282

Notes. "Person mean" effects refer to between-person effects; that is, effects attributable to the person's average score across the diary period. "Daily" effects are within-person.
** $p < .01$.
* $p < .05$.
+ $p = .075$.

their circumstances. In Study 5, we sought to determine whether perceived partner responsiveness promotes intellectual humility in this way. In a prior paper, Critcher and Dunning (2015) demonstrated that self-affirmations alleviate the impact of people's sense of threat and defensiveness by broadening their perspective; that is, by adopting a broader perspective, self-evaluation is less strongly tethered to momentary feelings of threat. In Study 5, we sought to identify a similar broadening effect for perceived responsiveness, using a direct measure of the perspective breadth. We therefore chose the global-local visual processing task, in which participants are asked whether a shape is more similar to either of two alternatives, one with a similar global configuration and the other with similar local details (Kimchi & Palmer, 1982). This task also has the advantage of not directly focusing on judgments that involve the self, which adds evidence about the generalizability of this broadening process.

Because the global-local visual processing task has been used to identify global-local processing differences associated with mood (e.g., Gasper & Clore, 2002), and therefore, to rule out this factor, we controlled for mood. Our hypothesis, consistent with the prior studies, was that a manipulation of perceived responsiveness would induce participants to focus more on the global configuration.

8.1. Method

8.1.1. Participants

We used the same power analysis as in Study 3, which indicated a target sample size of 188 participants per condition. Based on the prior studies, to account for likely deletions, we aimed for an approximately 20% larger sample than this figure, or 225 per condition. A total of 752 individuals started the study. Prior to analysis, data from 232 participants (30.8%) were deleted from the analytic sample (230 for failing the attention check, 5 for leaving the manipulation items blank, 2 for skipping more than half of the trials, and 1 for choosing the same response on all 16 trials; a few individuals were dropped for more than one reason). This left a sample of 520 participants (54.0% female; 31 individuals left this question blank).

8.1.2. Procedure

Participants were recruited for a study on "relationships and perception" via ResearchMatch, and were not compensated for participation. Study 5 used the same conditions and priming procedures as Studies 2 and 3.

We employed a 16-trial version of the global-local visual orientation task developed by Kimchi and Palmer (1982) and used in prior research (e.g., Gasper & Clore, 2002). On each trial, participants were shown a screen with a geometric shape (composed of triangles or squares) on top and beneath this single shape, two images containing multiple shapes. The participant is asked to judge whether the single shape is more similar to the lower-right or lower-left image. (Fig. 1 shows a sample trial.) The pattern of one of these images was identical to the standard, but its 3 or 4 constituent elements differed. The pattern of the other image differed from the standard, but its constituent elements were identical. Thus, if participants said that the standard was more similar to the former image, they were scored as using global processing; if they said that the standard was more similar to the latter image, they were scored as using local processing. Across trials, the right-left position of the global-local option was counterbalanced, as was the shape associated with each option.

Following the visual orientation task, participants were asked to report their current mood, using a 20-item version of the PANAS (Watson, Clark, & Tellegen, 1988), with 1 (not at all) to 7 (a great deal) scales. A total mood score was created by taking the mean of positive items and subtracting the mean of negative items. The PANAS was followed by the same inattention measure used in Study 3.

8.2. Results and brief discussion

Composite global orientation scores were analyzed with a 3 (condition) × 2 (sex) analysis of variance. The main effect for condition was significant, $F(2,483) = 5.99$, $p = .003$, $eta^2 = 0.024$, whereas neither the main effect for sex, $F(1,483) = 1.73$, $p = .189$, $eta^2 = 0.003$, nor the condition × sex interaction, $F(2,483) = 0.13$, $p = .878$, $eta^2 = 0.001$, was significant. As mentioned earlier, 31 individuals did not indicate their gender. Because we wanted to test our hypothesis with as much data as possible, we dropped sex from the analysis. A one-way analysis of variance also yielded a significant result for condition, $F(2,517) = 6.07$, $p = .002$, $eta^2 = 0.023$. Means for this analysis are displayed in Table 6.

Post hoc Fisher's Least Significant Difference tests indicated that participants in the responsive condition showed a significantly more global focus than participants in the unresponsive condition ($p = .001$) and marginally more global focus than participants in the control condition ($p = .053$). The difference between the unresponsive and control conditions was not significant ($p = .132$).

Prior research has shown that global-local processing differences are associated with mood (Gasper & Clore, 2002). To ensure that these effects were not attributable to mood differences, we repeated the above one-way analysis of variance controlling for mood. Mood was not significantly related to global orientation scores, $F(1,468) = 1.75$, $p = .187$, $eta^2 = 0.004$, and the condition main effect remained

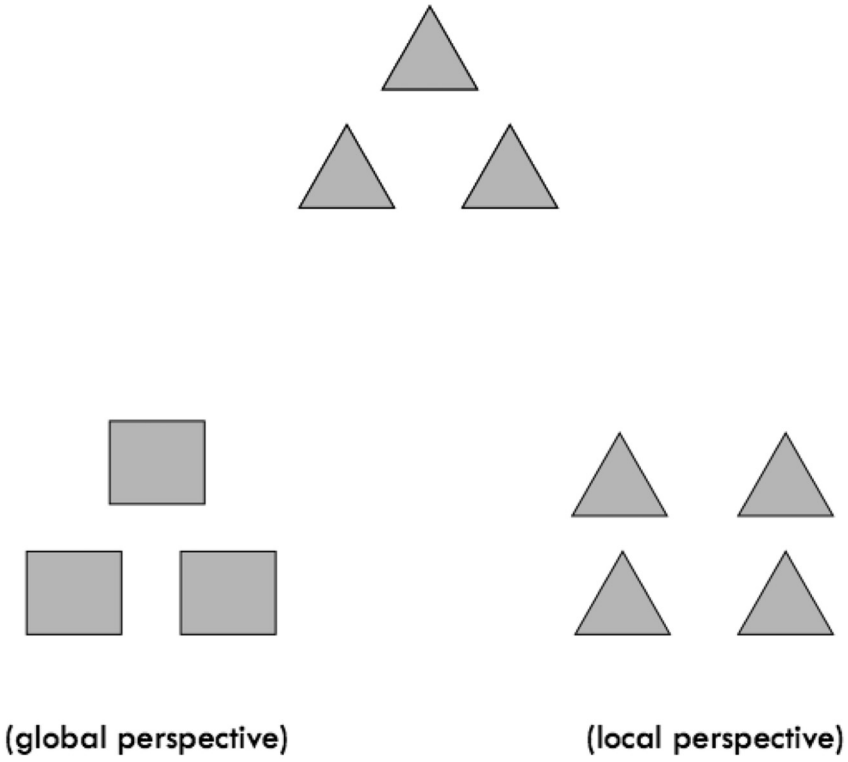

Fig. 1. Sample item from the global-local visual orientation task.

Table 6
Mean of Global orientation scores.

	Responsive	Control	Unresponsive
Mean	12.27_a	11.50_b	10.51_b
sd	4.38	4.70	5.04
n	178	170	172

Note. Higher scores indicate a more global orientation; the maximum possible score was 16. Means not sharing a subscript differ significantly ($p \leq .053$ or better) in pairwise Fisher's least significant difference tests.

significant, $F(2,468) = 7.11$, $p = .001$, $eta^2 = 0.029$.

9. General discussion

Findings from these five studies indicate that when people perceive a general sense of responsiveness, they exhibit weaker self-serving bias and a greater level of openness to novel, potentially contradictory information. Studies 1, 2, and 3 demonstrated a causal connection, using two different manipulations of perceived responsiveness and three different examples of defensiveness: the "better-than-average" effect, overclaiming personal responsibility for household activities, and hindsight bias. Meta-analyses indicated that perceived responsiveness lessened defensiveness compared to control conditions, whereas perceived unresponsiveness increased defensiveness. Study 4 showed complementary effects in everyday life, specifically finding that on days when people felt that their social environment was more responsive, they were more open-minded and reported less hindsight bias. Study 5 offered suggestive evidence for the hypothesized perspective-broadening effect of perceived partner responsiveness. Together, these studies point to perceptions of responsiveness and unresponsiveness as an influence on openness and non-defensiveness, two key components of intellectual humility (Bauer & Wayment, 2008; Hill & Laney, 2016; Leary et al., 2017).

These findings highlight the interpersonal roots of intellectual humility. This relatively new construct is typically conceptualized in intrapersonal terms, as a characteristic of an individual's approach to the outside world. Our results, while entirely compatible with this definition, extend our understanding of intellectual humility to include interpersonal sources, specifically reflecting the individual's perception of the degree to which the social environment understands, values, and cares for the self. Of course, non-interpersonal factors also contribute to intellectual humility but, as far as we are aware, this is the first set of studies to show a causal influence of the *inter*personal environment on these components of intellectual humility.

This is also, to the best of our knowledge, the first set of experiments to demonstrate an effect of perceived partner responsiveness on the three well-known exemplars of ego-defensiveness that we studied. In this respect, our research provides an interpersonal complement to existing studies of self-affirmation (see Sedikides & Gregg, 2008; Sherman & Cohen, 2006; Steele, 1988, for reviews). Prior studies show that reaffirming personal values and beliefs can lessen self-serving bias; the current research contributes to this literature by showing similar benefits from an interpersonal affirmation. Studies of self-affirmation ask participants to write about their important personal values, and for some participants, these values bear on close relationships (e.g., Knowles, Lucas, Molden, Gardner, & Dean, 2010). Although an interpersonal self-affirmation may share similarities with perceived partner responsiveness, there are a few key conceptual differences. First, self-affirmations concern values and therefore tend to be abstract and not person-specific, whereas perceived partner responsiveness refers to a specific relationship partner, as well as to interactions with them. Second, self-affirmation tends to focus on the self—"what *I* value" and "what is important to *me*,"—whereas perceived partner responsiveness directs attention to the other, a difference in perspective that may have important consequences. Third, unlike self-affirmations, perceived partner responsiveness, both conceptually and as it was operationalized in Studies 1 and 4, involves thinking about a partner who is aware of one's shortcomings. This may be particularly important in enhancing intellectual humility, inasmuch as the latter involves recognition of the limitations of the self. (It would be interesting here to contract the

effects of perceived partner responsiveness with unconditional positivity.) Thus, although perceived partner responsiveness likely taps some of the same underlying needs that self-affirmation does, it represents a distinct, and probably complementary, process.

Our studies also document the importance of perceived partner responsiveness "from the dark side." That is, we found that unresponsiveness heightened self-serving biases, presumably a strategy by which people strive to re-establish a sense of self-worth. It is noteworthy that in our meta-analysis, the magnitude of the unresponsive vs. control effect was almost twice as large as the responsive vs. control effect (Table 4), consistent with the idea that "bad is stronger than good" (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

Although we interpret these findings in terms of the broad principle of perceived partner responsiveness, they are also compatible with other models. For example, they support a central tenet of sociometer theory, namely that because self-esteem serves as a marker of one's perceived value to others, indications of other's respect and caring lessen the need to defensively bolster self-esteem whereas indications of their disrespect and lack of caring inflate this need (Leary & Baumeister, 2000; Leary et al., 1995; Murray et al., 2006). Research on communal relationships similarly suggests that self-interested needs are less prominent when people feel that close others are likely to be responsive to, and supportive of, their needs (Clark & Aragon, 2013). Our findings also fit with attachment theory's principle that people tend to respond defensively when their internal working models of the self are threatened (e.g., Shaver & Mikulincer, 2002). Elsewhere, we have argued that the construct of perceived partner responsiveness can serve an important integrative function by linking conceptually related variables into a parsimonious set of core principles (Reis et al., 2004). The present studies contribute to this integrative approach.

Some readers may be inclined to interpret our findings in terms of response consistency —that is, as showing that when responsiveness is primed, people feel more valuable to others and consequently they assess the more self favorably on interpersonally relevant measures. However, this explanation does not help explain our results. For one thing, two of our key measures (hindsight bias and perspective breadth) do not concern perceived value to others nor any other interpersonal constructs. For another, in Studies 1 and 2, priming responsiveness led to *lower* assessments of the self—that is, as *less* "better than average" and as contributing *less* to shared tasks. In other words, if our manipulations were simply about increasing people's self-perceived value to others, one might reasonably expect participants to rate themselves as *more* "better than average" and as contributing *more* to housework. We therefore believe that a more appropriate interpretation of our findings is that perceived responsiveness fosters an intellectually humble, rather than an enhancement-oriented, view of the self.

Our reasoning about openness to alternative perspectives suggests an intriguing confluence with research on attitude correctness (Petrocelli et al., 2007). That research indicates, for example, that people who were more convinced about the "rightness" of their beliefs made more attempts to persuade others, sought out attitude-inconsistent information less often, and sent more competitive and fewer cooperative messages to disagreeing others with whom they anticipated a debate (Hall & Raimi, 2018; Petrocelli et al., 2007; Rios et al., 2014). The present research suggests that these downstream effects of attitude correctness may be a reflection of a lack of responsiveness in one's social environment. That is, if perceived responsiveness encourages people to be open to the possibility that their knowledge is limited and their beliefs might be erroneous, they should be better able to evaluate the informational quality of persuasive messages, more likely to hold inconsistent bits of information in memory simultaneously, less subject to confirmation bias, and more effective in reaching integrative solutions with team partners. This logic suggests the intriguing possibility that perceived partner responsiveness, a form of affirmative social feedback, may actually *lessen* people's subjective sense of the correctness of their beliefs. These are all potentially informative topics for future research.

9.1. Limitations

Several limitations of this research bear note. For one, our manipulations were likely short-lived and transitory in their impact and it is unknown how long their impact might extend. Although the diary study identified effects that lasted through the day, future research is needed to determine the extent and duration for which fluctuations in responsiveness may exert influence on ego-defensiveness and receptivity to input from others. A second limitation is that our four experiments examined self-reports or behaviors that were inconsequential for these participants. Although the diary study documents comparable effects in actual experiences, it remains to be shown whether responsiveness and unresponsiveness would have similar effects on more personally meaningful endeavors—for example, hindsight about important failures or blunders, or openness to a romantic partner's requests for change.

We also did not examine individual differences in the strength of these effects, nor, for that matter, did we directly examine intellectual humility (e.g., with a self-report measure such as that developed by Krumrei-Mancuso and Rouse (2016) or by Leary et al. (2017)). Another direction for future research would consider people's relative sensitivity to interpersonal responsiveness feedback. Some people are likely to be more reactive to others' responsiveness and unresponsiveness—for example, persons high in communal orientation or anxious attachment—whereas others may be less reactive to these cues—for example, persons high in attachment avoidance or autonomy motives. This logic also suggests the possibility that responsiveness feedback might have greater impact in less individualistic, more collectivistic cultures, especially if that feedback comes from ingroup members. It seems plausible that intellectual humility may have stronger interpersonal roots in more collectivistic cultures, and this might be examined in future research.

10. Conclusion

It seems natural to think of intellectual humility as a property of individuals, inasmuch as it refers to a cognitive style characterizing how individuals approach and respond to the personal implications of information and events in their environment. This perspective notwithstanding, our research indicates that recognizing others' valuation and care for oneself can lessen the need to prioritize the self over peers and to resist being influenced by others' points of view. Like most social-cognitive processes, then, it may be most fruitful to conceptualize intellectual humility as a reflection of the mechanisms by which people relate to their social world.

Open practices

Materials and data for these studies are available at https://dataverse.harvard.edu/privateurl.xhtml?token=f8d2d590-6a8e-4df2-9dca-7e3f3813c78c.

Appendix A–E. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesp.2018.05.006.

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