RUNNING HEAD: NAÏVE REALISM AND THE "WISDOM OF DYADS"

Naïve realism and capturing the "wisdom of dyads"

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Abstract

Two studies provided evidence for the role of naïve realism in the failure of individuals to give adequate weight to peer input, and explored two strategies for reducing the impact of this inferential bias. Study 1 demonstrated that dyad members see their own estimates as more "objective" than those of their partners and that this difference in perceived objectivity predicts the degree of underweighting. Compelling participants to assess their own versus their partners' objectivity prior to revising estimates decreased underweighting, an effect that was mediated by differences in perceived objectivity. Study 2 showed that the increase in accuracy that results from requiring dyad members to offer joint estimates via discussion is largely retained in subsequent individual estimates. Both studies showed that underweighting is greater when dyad members disagree on the issue about which they are making consensus estimates—a finding that further supports a "naïve realism" interpretation of the phenomenon. (150 words)

Keywords: Naïve realism; aggregating judgments; dyadic collaboration; underweighting of peer input; attributional bias.

In making important life decisions people are often required to decide how much weight to give to the input of colleagues, friends, or family members. However, there is mounting evidence that individuals typically fail to give due weight to the input of others, and consequently fail to reap the full benefits of collaboration (for a recent review see Bonnacio and Dalal, 2006). The present studies were designed to explore the role of "naïve realism" (Ross and Ward, 1995, 1996; Pronin, Gilovich and Ross, 2004)—the conviction that we see matters "objectively" and that insofar as others disagree, it is due to error or "bias"—in producing this underweighting phenomenon. We propose that the fundamental belief in our own objectivity is one of the reasons why individuals consistently give too much weight to their own judgments relative to the weight that they give to the judgments of others.

Prior Research on Use of Peer Input in Numerical Judgment

The history of work on individual versus aggregated numerical judgments is a long one. Early studies, reviewed by Lorge, Fox, Davitz, and Brenner (1958), showed that the error associated with the average of a large number of estimates (whether of room temperature, the number of jelly beans in a jar, or the date of the forthcoming World War II armistice), was inevitably smaller than the average individual error. It was these findings, and the underlying statistical insight, that were rediscovered by Surowiecki (2004) in *The Wisdom of Crowds*.

Despite the well-documented benefits of judgment aggregation, recent research on the Judge Advisor System (JAS) has demonstrated that individuals characteristically fail to average their own estimates with the input of "advisors" and consequently make larger errors than they would have had they done so (see review by Bonaccio and Dalal, 2006; also Harvey and Fisher, 1997; Larrick and Soll, 2006; Soll and Larrick, 2009; Yaniv, 2004). Several explanations have been offered for this phenomenon. Some researchers have proposed that individuals overweigh

own judgments because of their greater access to the reasons behind those judgments (Yaniv, 2004; Yaniv and Kleinberger, 2000). Others have suggested the role of overconfidence in one's estimation abilities (e.g., Krueger, 2003). However, when empirically tested by Soll and Mannes (2011) neither of these explanations adequately accounted for the phenomenon. Anchoring and insufficient adjustment (Tversky and Kahneman, 1974) has also been suggested as the source of such underweighting (Lim and O'Connor, 1995), although the effect of own prior judgments on revised ones appear to be more long-lasting than the effects typically associated with anchoring (see Harvey and Harries, 2004).

Naïve Realism, False Consensus, and Attributions regarding Disagreement

Prior research has demonstrated the phenomenon of naïve realism by showing that people, considering their own perceptions and judgments to be objective reflections of reality (Ross and Ward, 1995, 1996; see also Ichheiser, 1951), expect "reasonable" peers to share their views (see Ross, Greene and House, 1977; see also Marks and Miller, 1987; Mullen, et al., 1985). Moreover, to the extent that individuals see a given social or political position as discrepant from their own, they see the holder of that position as more influenced by a variety of cognitive and motivational biases and less by normatively defensible considerations than themselves (Pronin et al., 2004).

Naïve realism is conceptually related to other mechanisms proposed as sources of the underweighting of peer input insofar as one's own perceptions and assessments of "reality" are more salient to one than those of others, and provide the "anchor" from which one adjusts toward others' input. And the assumption that one's perceptions mirror objective reality is an obvious source of overconfidence. Indeed, Ross, Lepper, and Ward (2010) argued that naïve realism is

fundamental to a wide range of phenomena that give rise to disagreement and distrust of those with whom one disagrees.

In the present research we focus on the role played by naïve realism in the failure of individuals to give due weight to peer input, especially when faced with disagreement. Research on naïve realism shows that the tendency to impute bias to another's views is directly proportional to the extent to which those views differ from one's own (Pronin et al., 2004). Yet when large discrepancies in initial assessments reflect differences in the sources of information prompting those assessments, the benefits of taking those assessments into account are likely to be greatest (Larrick and Soll, 2006; Soll and Larrick, 2009; Surowiecki, 2004). Thus, to the extent that attributions of bias exacerbate underweighting, they are also likely to increase estimation error and reduce the benefits of collaboration.

Overview of Research

In two studies participants first stated their own opinion regarding various socio-political issues and then estimated the percentage of peers sharing those opinions both before and after learning their partners' views and estimates. Study 1 directly measured participants' attributions regarding the objectivity of their own and their partners' estimates and featured a manipulation involving the order of these tasks. Prior work has demonstrated that people subject the judgments of disagreeing others to greater critical scrutiny than their own, and as a result see the latter as more objective (Lord, Lepper and Ross, 1979; Pronin, Lin and Ross, 2004; Pronin et al., 2004). Our order manipulation allowed us to determine both whether explicit prior consideration of bias promotes more equal weighting and whether the reduction in underweighting of peer input is mediated by naïve realism. We also tested the prediction that disagreement about a given political issue would reduce weight given to a partner's estimate.

Study 2 again tested the effect of disagreement about an issue on weighting of own versus partner's estimates of peer consensus. It also explored the gains in accuracy that result when dyad members are subsequently required to reach a single shared estimate for each item through discussion, and the extent to which such gains are maintained when dyad members are free to make a final set of individual estimates. The design of our studies also allowed us to explore the impact of exposure to partner's estimates on the false consensus phenomenon.

Study 1: Underweighting of peer estimates and naïve realism

Method

Participants. Eighty two participants (60% female) from a research pool at a private U.S. university were paid $10 for their participation. Participants began with a bonus of $30, which was reduced by $1 for each percentage point error during the two rounds of the study.

Procedure. Dyad members indicated their own "yes" versus "no" views regarding ten issues (e.g., "*Should the words* "*under God*" *be removed from the Pledge of Allegiance?*") and then estimated the percentage of participant pool members answering "yes" versus "no" to each question during a recent survey (see Table 1). After exchanging both these estimates and their personal *yes/no* responses with their dyad partner, but before making a new round of revised estimates, participants in 21 of the dyads indicated the extent to which they thought each of three normative considerations (*useful information sources; understanding of underlying issues and concerns; objective evaluation of facts*) and three potential sources of bias (*wishful thinking; own view on issue; agenda of political party, community or peer group*) had influenced each of their own initial estimates and those of their partners. They did so using a scale anchored at *0* – "*Not at All*" and *3* – "*Very Much.*" Participants in the other 20 dyads made the relevant attribution ratings *after* their second-round estimates.

Dependent measures and analyses. Several different approaches, each with advantages and disadvantages, can be used to analyze the influence of peer input (Bonaccio and Dalal, 2006). We opted for a regression-based approach because it makes full use of the sample and because (in contrast to ratio measures of influence) the dependent measure is not truncated at 0 and 1. In testing our hypotheses, we regressed participants' revised estimates on their own initial estimates, on their partners' initial estimates, and on the interactions of each of these two variables with our measure of naïve realism and with the order manipulation.

The relevant interaction effects are the predictors of interest. In particular, to the extent that naïve realism affects the weight placed on own versus others' estimates, the regression coefficients for the interaction between the measure of naïve realism and own estimate and that of naïve realism and partner's estimate should be significantly different from zero. All regression analyses reported used hierarchical fixed effects modeling in Stata to control for participant and question-level sources of non-independence.

Results

Participants' second round estimates were significantly influenced both by their own initial estimates ($B = .567$, $t = 33.37$, $p < .001$) and those of their partners ($B = .386$, $t = 22.87$, $p < .001$). However, as expected, the influence of own initial estimates was significantly stronger than that of partners' estimates, $t = 6.20$, $p < .001$. To help the reader appreciate the nature of this difference, we note that while equal weighting of own and partners' estimates requires that participants on average go 50% of the distance toward each other's initial estimates, our dyad members moved only 28.6% of that distance.

To examine perceptions of objectivity, for each estimate, we subtracted mean ratings for influence of biases from mean ratings for influence of normatively appropriate considerations. In accord with our theorizing about the role of naïve realism, dyad members rated their own estimates as significantly more objective (M = + 0.14, SD = 0.46) than those of their partners (M = - 0.13, SD = 0.45), $t(81) = 5.67$, $p < .001$. This item-level difference between rated objectivity of self and other served as our measure of naïve realism in subsequent analyses.

Naïve realism and use of peer input. When we performed the regression analysis described above we found a significant positive regression coefficient for the interaction between our measure of naïve realism and dyad members' own initial estimates (B = .038, t = 2.25, p < .03). That is, naïve realism was associated with greater weight given to own initial estimates in producing revised estimates. Conversely, the interaction between naïve realism and *partners*' initial estimates yielded a significant and *negative* regression coefficient (B = .067, t = - 4.02, p < .001), reflecting an association of naïve realism with discounting of partners' estimates.

Effect of order manipulation on use of peer input. We tested a model predicting second-round estimates from own initial estimates, partners' initial estimates, and the interaction of order condition with both own and partners' initial estimates. We entered task order as a participant-level predictor variable (*Attributions after revised estimates*: 0, *Attributions prior to revised estimates*: 1). The model yielded a significant negative coefficient for the interaction between own initial estimates and task order (B = - .138, t = - 4.03, p < .001). It also yielded a significant and positive coefficient for the interaction between partners' initial estimates and the order manipulation (B = .074, z = 2.15, p < .04). Thus, making the relevant attributions prior to estimate revision rather than afterwards decreased the weight given to own initial estimates and increased the weight given to partners' initial estimates.

Mediating role of Naïve Realism. To examine whether naïve realism mediated the relationship between condition and use of peer input we followed the Monte-Carlo procedure for multi-level data developed by Selig and Preacher (2008). Having established that condition affects participants' use of own and partners' initial estimates in arriving at their revised estimates, we next examined the effect of condition on the mediator by testing a model using the order condition as a participant-level predictor variable and our measure of naïve realism as a trial-level dependent variable. This test showed naïve realism to be less evident when participants made attributions regarding the bases of own and partners' estimates *prior* to revising their own estimates rather than afterwards (B = - .21, z = - 2.18, p < .03).

Finally, to test whether naïve realism mediates the effect of condition on use of own and peer estimates we tested a model regressing revised estimates on own initial estimates, partners' initial estimates, condition and naïve realism (see Table 2). We also included interaction terms between own initial estimate as well as partner's initial estimate with both the condition variable and the mediator.

To test for the significance of the indirect effect of condition on use of own initial estimates we used the regression coefficient and the standard error from the regression predicting our mediator (naïve realism), from condition, as well as the coefficient and standard error from the *interaction* of naive realism and use of own initial estimate. This test yielded a 92% confidence interval for the mediation effect that did not include zero (*lower bound:* - .02, *upper bound:* - .00). Thus, naïve realism mediated the effect of condition on use of own initial estimate to a marginally significant extent. When we repeated the Monte Carlo calculation using the coefficient for the interaction between naïve realism and partner's estimate, we observed a significant mediation effect. The test yielded a 95% confidence interval for the indirect effect

that did not include zero (*lower bound:* 0.001, *upper bound:* 0.03). Naïve realism thus significantly mediated the effect of condition on use of partner's initial estimate in arriving at revised estimate.

The effect of disagreement on use of peer input. To examine the effect of disagreement on the use of peer input we again conducted a regression analysis predicting participants' second round estimates from their initial estimates, their partners' initial estimates, and the interactions between those initial estimates and disagreement regarding the underlying political issue (coded *Agreement*: 0; *Disagreement*: 1). Because we observed a significant between-condition difference in naïve realism, we conducted this analysis separately on the data from each condition.

In the *Attributions after revision* condition disagreement on the underlying political issue had no effect on participants' use of their own initial estimates (B = - .00, t = - .06, *ns*) but a significant and negative effect on participants' use of their partners' initial estimates (B = -.14, t = -3.12, $p < .01$). This pattern reversed in the *Attributions before revision* condition. Disagreement on the socio political issue had a negative effect on use of own initial estimates (B = -.11, t = -2.05, $p < .05$), but no significant effect on use of partners' initial estimates (B = .05, t = -.94, *ns*), See Figure 1.

Discussion

Study 1 provided evidence for the role of naïve realism in the evaluation and weighting of peer input by dyad members estimating social-political consensus. Participants saw their partners' estimates about the views of peers on contentious political issues as less reflective of normative influences and more reflective of biases than their own. These perceptions of superior personal objectivity in turn, were associated with underweighting of their partners' initial

estimates relative to their own. And both of these relationships were moderated, as predicted, by the placement of the attribution task.

We also found that considering the normative and biasing influences on both own and partners' estimates before offering revised estimates decreased naïve realism and increased the weight given to partners' estimates. Furthermore, naïve realism significantly mediated the effect of the manipulation on use of peer input.

Finally, as our naïve realism account would suggest, participants underweighted peer input more when they disagreed with their partner on the underlying political issue than when they agreed. This effect proved to be moderated by condition such that participants considering the sources of own and partners' judgments prior to revision gave relatively less weight to their own initial estimates in cases of disagreement than in cases of agreement.

Beyond providing evidence for the postulated link between naïve realism and the underweighting of peer input, the results of this study have potential implications for individuals and organization that want to encourage more normative and effective use of diverse contributions. They suggest the value of explicitly requiring decision-makers to subject their own judgments to the same critical scrutiny they normally reserve for the judgments of others. They further suggest the value of exchanging the bases for such information and even reaching a mutually acceptable "joint estimate," a procedure that would compel participants to give more weight to peer input than they might otherwise be inclined to do. We test this latter suggestion in Study 2.

Study 2: The effect of discussion and agreement

Study 2 shifted the domain of inquiry to the attitudes and consensus estimates of Israelis about various issue pertaining their conflict with Palestinians. It also was designed to extend our

findings by explicitly addressing the impact of underweighting of peer input on estimation accuracy, and by exploring the potential gain in accuracy produced by requiring participants to reach agreement on joint estimates through discussion. A question of particular interest was the extent to which that gain would be retained when dyad members made a set of final individual estimates.

Study 2 thus featured four estimation rounds. After stating their opinion regarding eight political issues, participants estimated the percentage of their peers sharing their viewpoint, once before learning their partners' estimates (Round 1) and once afterwards (Round 2). In Round 3, dyad members were required to agree on a single set of estimates through discussion, and then, in Round 4, provided a final set of individual estimates. That requirement forced participants to give each other's inputs more weight regardless of their convictions about relative objectivity, and in so doing to better reap the benefits of statistical aggregation. Discussion also gave participants a better basis for evaluating the quality of each other's inputs. The question addressed in Round 4 was the extent to which the predicted Round 3 gains in accuracy would be retained in the participants' final individual estimates. A further question of interest was whether, in their final estimates, participants would again show a greater tendency to discount partners' input in cases of prior disagreement about the issue in question.

Method

Participants. Participants were 130 Israeli business school students, compensated with course credit. They began each round with a bonus of 200 shekels (about $50), which was reduced by 1 shekel for each percentage point error.

Procedure. Participants first indicated their own views regarding eight political issues (*e.g.*, "*Should Israel agree to give up the Golan Heights in return for a full peace treaty with*

Syria?") and then estimated the percentage of their peers sharing their views (see Table 2), along with a rating of their confidence that their estimate fell within 5 percentage points of the correct answer. They then exchanged their own views and their initial (Round 1) estimates and confidence ratings with a partner, after which they were invited to revise their estimates to whatever extent they wished (Round 2). Next, they were required to reach, through discussion, a common estimate for each item (Round 3) and again to provide confidence ratings. Dyad members then offered final individual estimates and confidence ratings (Round 4).[1]

Results

Effect of discussion and agreement on estimation accuracy. Mean estimation error made by individuals decreased from Round 1 (M = 18.4 percentage points) to Round 2 (M = 16.8 percentage points), $t(64) = 6.5$, $p < .001$[2], attesting to the benefits of simple exposure to a peer's estimates (see Figure 2). That decrease would have been significantly *greater,* however, (M = 2.5 percentage points), $t(64) = 3.49$, $p < .001$, had all participants simply averaged their own and their partners' Round 1 estimates. Thus, in Round 2 participants overall paid an accuracy cost for their reluctance to give as much weight to their partners' initial estimates as their own. The mean error of dyad members' joint Round 3 estimates further decreased to M = 15.6 percentage points, $t(64) = 4.6$, $p < .001$, an amount slightly, but not significantly, smaller than would have resulted from simple averaging.

Of greater interest is the accuracy of the final individual Round 4 estimates. The mean estimation error per dyad member in Round 4 was 15.9 percentage points—0.9 percentage points lower than in Round 2, $t(129) = 3.93$, $p = .001$. Thus, the benefit of reaching agreement through discussion was largely preserved even when participants were again free to give their partners' inputs as much or as little weight as they wished.

Effect of disagreement on use of peer input. When we regressed participants' Round 2 estimates on their initial estimates, on their partners' initial estimates, and on the interactions between their initial estimates and disagreement regarding the underlying political issue (coded *Agreement*: 0; *Disagreement*: 1), we again found that those revised estimates were more influenced by their own initial estimates (B = .767, t = 51.17, p < .001) than by those of their partners (B = .265, t = 17.67, p < .001), t = 17.88, p < .001. The interaction between disagreement and participants' use of their own initial estimate did not yield a significant coefficient (B = - .002, t = - .10, *ns*). However, as in Study 1, the interaction between disagreement and participants' use of partner estimates yielded a significant and negative coefficient (B = - .051, t = - 1.97, p < 0.05).

When we included differences in own and partner's expressed confidence in our model we found the expected association of this variable with use of peer input. Greater relative confidence led to participants giving greater weight to their own initial estimates (B = 0.02, t = 2.86, p < .02) and less weight to their partners' initial estimates (B = -.02, t = -2.89, p < .01). However, it is noteworthy that even controlling for relative confidence, participants gave less weight to their partners' initial estimates when they disagreed with their partner on the political topic under consideration (B = - .06, t = - 2.46, p < .02).

When we used the same method to examine the use of partner input in individual estimates made after discussion we found that participants' Round 4 estimates were again more influenced by their own initial estimates (B = .663, t = 37.02, p = .001) than those of their partners (B = .432, t = 24.13, p < .001), although this difference was smaller than it had been prior to discussion, t = 6.88, p < .001. Consistent with our theorizing about the fundamental nature of naïve realism, however, we again observed an effect of disagreement on differential use

of own versus partner estimates. Whereas interaction between disagreement and participants' use of partners' estimates yielded a significant negative coefficient (B = - .104, t = - 3.37, p < .002), the interaction between disagreement and participants' use of their own initial estimates did not reach significance (B = - .048, t = - 1.55, *ns*).

Disagreement, naïve realism and the false consensus effect. The familiar association between participants' own responses and their estimates of peer consensus (Ross, Greene, and House, 1977; also, Marks, and Miller, 1987) was clearly evident in our data. Indeed, on every item, dyad members who personally said *"yes"* in response to a given item estimated the percentage of such *"yes"* responses to be greater than did those who personally said *"no"* (all p-values < .001). What is of greater theoretical interest, following Krueger and Clement (1994), is the finding that when dyad members said *"yes"* and observed their partner say "*no,"* they subsequently persisted in estimating a higher percentage of such *"yes"* responses (Mean for 8 items = 58.0%) than did those who said *"no"* and heard their partner say *"yes"* (M = 47.8%), $t(7) = 4.64$, $p < .01$. Indeed, in Round 4, even after the Round 3 discussion, the relevant asymmetry in estimates remained apparent (Means of 56.4% and 50.6%), $t(7) = 5.9$, $p < .001$.

These data suggest that participants did not simply treat their own response as an "N = 1 sample" of the relevant population, one no better or worse than that provided by the response of another randomly selected individual (see Dawes, 1987). Rather, as a naïve realism interpretation of the false consensus phenomenon would suggest, participants thought their own response to be a better indicator of what their peers *should*, and if they were "reasonable*" would*, think.

Discussion

Study 2 yielded two noteworthy findings. Requiring dyad members to discuss their judgments and reach a joint estimate in Round 3 led to an improvement in accuracy that was

largely retained even in final individual estimates. It is worth noting that in Round 4 roughly half (50.6%) of the Round 3 estimates were retained and roughly half were revised, suggesting that participants did not feel a demand to maintain their joint estimate. Whether reaching agreement through discussion helped participants to identify the more accurate estimate, or whether Round 3 estimates simply provided an anchor for Round 4 estimates, the practical significance of reaching agreement on a joint estimate should be noted, since such agreement led to better final estimates. Despite the persistent nature of naïve realism, indeed perhaps even *because* of it, inducing decision-makers to "negotiate" jointly acceptable judgments with a peer, even when decisions must ultimately be made alone, may prompt wiser decisions.

Study 2 also replicated the Study 1 result demonstrating that participants tended to give less weight to their peers' judgments when they disagreed on the underlying political issue. In other words, it is individuals who hold opposing political views (and thus may bring diverse perspectives and viewpoints to relevant political assessments) who are the least likely to reap the full benefits of each other's inputs. Furthermore, participants continued to show this tendency in their final individual estimates made after discussion. This latter finding is important insofar as it suggests the persistence of naïve realism, and its costs, even when people have had the opportunity to exchange not only their judgments but also the bases for those judgments.

General Discussion

The present studies provided evidence for the role of naïve realism in underweighting of peer input. Study 1 showed that dyad members saw their own initial estimates of peer consensus on political issues as more objective than those of their peers, and that the degree of underweighting was associated with the perceived difference in objectivity. Furthermore, as

predicted, having dyad members make assessments of relative objectivity *prior* to offering new estimates decreased the degree of underweighting, an effect that was mediated by naïve realism.

Study 2 showed that the improvement in accuracy resulting from the requirement to reach joint estimates via discussion was largely retained when the dyad members offered final independent estimates. This requirement to reach agreement serves, in a sense, as an antidote to naïve realism. Both studies also showed that, in accord with the tenets of naïve realism, participants tended to give less weight to the input of partners who disagreed with them about the relevant issue and (in Study 2) that this tendency persisted in final estimates made after discussion.

Were dyad members' assessments of own versus partner objectivity a dissonance reducing consequence (Festinger, 1957) rather than the cause of differential weighting? The results of our order manipulation suggest otherwise. Compelling participants to explicitly consider biasing and normative influences on their own initial estimates as well as on those of their partners actually reduced underweighting of partner input.

Our findings further suggest that the underweighting of peer input is not solely a product of stubbornness or failure to consider the possibility that a peer's assessments may be superior to one's own. Individuals, we found, give insufficient weight to peer input at least in part because *in light* of such consideration they "naïvely" attribute differences in estimates to bias on the part of those whose estimates differ from their own "objective" estimates. Moreover, they are especially inclined to do so when confronted with a partner whose views about the item under consideration differs from their own. Of course disagreement vs. agreement regarding the topic about which assessments of peer consensus were made was not a manipulated variable. However the fact that few dyads showed exceptionally high or exceptionally low rates of disagreement

makes it unlikely that weighting decisions were made on the bases of frequency of disagreement or any inferences that followed from such frequency. However, future researchers could profitably manipulate this variable and explore its effects on weighting decisions.

Revising opinions in light of peer input is a complex interpersonal process that is likely driven by multiple factors. We focused on demonstrating the effect of naïve realism; but future research could gainfully address other mediators and moderators of the underweighting effect. Although previous researchers have focused on revisions of judgment in light of input from an advisor or peer (Rounds 1 and 2 in our studies) it would also be important to address the contexts and types of interactions that might increase the benefits of discussion and agreement that we documented in Rounds 3 and 4 of our second study.

An obvious question raised by our present findings involves their applicability to assessments that are non-numerical, but nevertheless lie on a specifiable continuum—for example, how aggressive a military or investment policy would be optimal in a given situation, where to draw the line between expediency and morality in deciding how much force to use in interrogating prisoners, or, most agonizingly, when to "pull the plug" in the face of suffering. Our findings suggest that better decisions will result if they are the product of dyadic interaction rather than solitary contemplation, ideally one that prompts the individuals to make a thoughtful evaluation of possible biases influencing not only their peers' assessments but their own as well.

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Figure 1: Correlations between own and partners' initial estimates and revised estimates in cases of agreement and disagreement (Study 1).

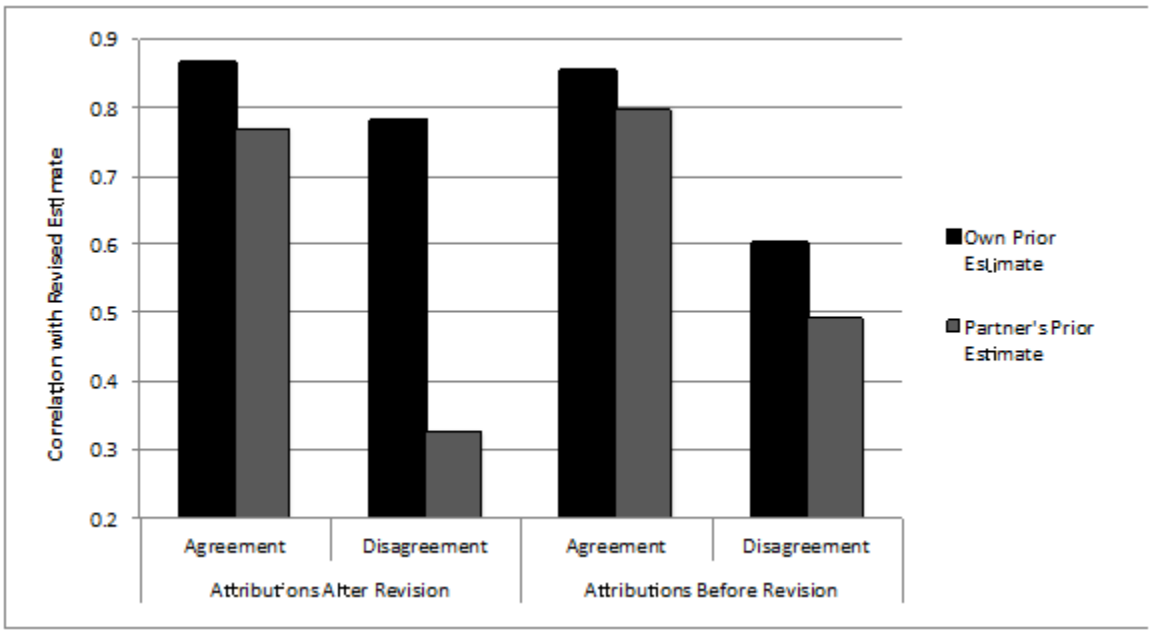

Figure 2: Mean round-by-round estimation errors (Study 2).