Article

The Prototypical Majority Effect Under Social Influence

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Abstract

Majority views are reported with greater confidence and fluency than minority views, with the difference increasing with majority size. This Prototypical Majority Effect (PME) was attributed generally to conformity pressure, but Koriat et al. showed that it can arise from the processes underlying decision and confidence independent of social influence. Here we examined the PME under conditions that differ in social influence. In Experiment 1, a robust PME emerged in the absence of information about the majority views, but the provision of that information increased the choice of the majority view and magnified the PME. In Experiment 2, a PME emerged in a minority-biased condition that misled participants to believe that the majority view was the minority view, but the PME was stronger in a majority-biased condition. The results were discussed in terms of a dual-process view: The PME observed under social influence may contain externally driven and internally driven components.

Keywords

majority effect, social influence, subjective confidence, response latency

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The classic conformity studies of Asch (1951, 1955) demonstrated dramatic effects of group consensus on the judgments of individual members. Ever since these studies, majority opinions have been found to exert direct influence on individual judgments in many domains, including beliefs (Stangor, Sechrist, & Jost, 2001), attitudes (Cialdini & Trost, 1998; Wood, 2000), opinions (Glynn, Hayes, & Shanahan, 1997), preferences (White & Dahl, 2006), and behavior (Thompson & Fine, 1999).

Although most social influence studies have focused on individuals' tendency to make the same responses as others, several studies examined the effects of social influence on two subtle, metalevel indicators—subjective confidence and response latency. Both indicators have been subsumed under the rubric of attitude strength, which is assumed to affect the attitude-behavior consistency (Briñol, Tormala, & Petty, 2013; Krosnick & Petty, 1995). With regard to subjective confidence, it has been proposed that deviations from group opinions create tension and uncertainty (Stasser & Davis, 1981; Yaniv, Choshen-Hillel, & Milyavsky, 2009), whereas agreement with the group enhances individuals' confidence in their judgments (Festinger, 1954). Indeed, group consensus was found to increase confidence in one's own judgments (Erb & Bohner, 2001; Prislin & Wood, 2005; see Crano & Prislin, 2006, for a review): Participants expressed greater confidence in their views when they learned that others hold the same views (e.g., Clarkson, Tormala, DeSensi, & Wheeler, 2009; Luus & Wells, 1994; Orive, 1988b; Petrocelli, Tormala, & Rucker, 2007; Visser & Mirabile, 2004). Confidence in an attitude was also found to increase as a function of the proportion of other members of the group who hold that attitude (Sniezek, 1992). Dyadic interaction was found to enhance confidence in the joint decision even when that decision was less accurate than the decisions made individually by each member (Koriat, 2015).

Turning next to response latency, several studies demonstrated a Minority Slowness Effect (Bassili, 2003; Huge & Glynn, 2013): People report minority opinions less quickly than majority opinions. Bassili (2003) attributed this effect to the social inhibition that people experience when they express an opinion that departs from what they assume to be the majority opinion. Expression hesitation was seen to reflect an internal conflict that occurs automatically and below consciousness so that people hesitate to offer

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unpopular opinions even when they respond privately to questions about mundane attitudes. Similar to confidence, the majority–minority difference in response speed was found to increase with majority size (Bassili, 2003; Huge & Glynn, 2013).

In sum, studies that examined the effects of social influence on confidence and response latency have documented what Koriat, Adiv, and Schwarz (2016) termed a *Prototypical Majority Effect* (PME):

1. Majority responses are endorsed with greater confidence, and are expressed with shorter latencies than minority responses.
2. The difference between majority and minority responses in both confidence and response speed increases as a function of the size of the majority.

The PME may derive from several different processes. First, it may stem from the direct influence of social consensus: Agreement with the group can play a causal role in enhancing confidence in one's opinions and in facilitating the expression of these opinions. This has been the dominant interpretation of the PME. This interpretation is consistent with the results of studies in which the effects of group consensus on confidence were demonstrated by manipulating perceived consensus experimentally (Bovard, 1951; Clarkson et al., 2009; Luus & Wells, 1994; Orive, 1988a).

Second, the PME can stem from cognitive and metacognitive processes that mediate the effects of public consensus on confidence and ease of expression. For example, studies of the illusory-truth effect indicate that the mere familiarity of a statement that is caused by its repetition can influence the perceived truth of that statement (Arkes, Hackett, & Boehm, 1989; Bacon, 1979; Hasher, Goldstein, & Toppino, 1977). How often people are exposed to an opinion depends, in part, on how many others hold that opinion. Therefore, we may expect the consensually held attitudes to be endorsed with greater confidence and greater fluency. Indeed, marketing studies indicated that exposure to repeated advertisements enhances the accessibility of attitudes and the confidence in these attitudes (Berger & Mitchell, 1989; Fazio, 1995; Petty, Briñol, Tormala, & Wegener, 2007; Schwarz, 2015). In addition, increased information enhances confidence in people's judgments even when that information does not improve the accuracy of these judgments (e.g., Gill, Swann, & Silvera, 1998). Postevent questioning has also been found to increase witnesses' confidence without affecting accuracy (Shaw, 1996).

A third process, finally, is the subject of the present study. We propose that the PME can result from the very process underlying choice and confidence independent of direct or indirect social influence (Koriat et al., 2016). According to Koriat's (2012) self-consistency model (SCM), when people are required to choose between two response options, for example, to make a *for* or *against* response to an attitude statement, they construct their response on the spot (Schwarz, 2007) by retrieving a small sample of cues sequentially from a population of cues associated with the item. This population is largely shared by participants with the same background, and constitutes the distributed wisdom of crowds (Koriat, 2015; Koriat & Sorka, 2015, see Surowiecki, 2005). The choice of a response is determined by the balance of evidence in favor of the two response options (see Baranski & Petrusic, 1998), and confidence in that choice is based on the consistency with which the choice reached is supported across the retrieved cues (see Alba & Marmorstein, 1987; Armelius, 1979; Brewer & Sampaio, 2012; Slovic, 1966). In addition, because the sampling of cues is terminated when several cues in a row support the same decision, responses become faster as self-consistency increases.

A simulation experiment incorporating these assumptions yielded a PME pattern for confidence and latency without assuming any social influence (Koriat, 2012). The implication is that people need not know what other people's choices are to behave as if they are influenced by them. Rather, people can make the same choices as others, and feel more confident when they make these choices, because they base their choices and confidence on cues that are sampled from commonly shared databases. We referred to this internally driven PME as I-PME, in distinction from the externally driven, E-PME, that can stem from direct or indirect social influence.

Three sets of observations were reported by Koriat et al. (2016) in support of the I-PME. First, a PME was observed for several socially neutral tasks for which we would expect little influence of the group (see Koriat & Adiv, 2016). For example, when participants decided which of two geometric shapes had a larger surface area, majority responses were associated with higher confidence and shorter latencies than minority responses, with the difference increasing with majority size (Koriat, 2011). A similar pattern was observed when participants decided whether a given object (e.g., *olive*) belongs to a certain category (*fruit*; Koriat & Sorka, 2015). In fact, Bassili (2003) and Huge and Glynn (2013) have also documented a Minority Slowness Effect for mundane tasks that were performed individually, but they attributed the effect to social inhibition.

Second, a PME was observed even within individuals. When participants were presented with the same task several times, their more frequent responses across presentations were associated with higher confidence and shorter response times than their less frequent responses (Koriat, 2011, 2013; Koriat & Adiv, 2011, 2012), with the differences increasing with the number of times that the more frequent response was endorsed. These results are difficult to account for in terms of social influence. They shift the theoretical focus of the I-PME from agreement with others to agreement with oneself, as postulated by SCM (Koriat, 2012).

Finally, a PME was obtained even for the prediction of others' responses. Presumably, in making such predictions,

participants should be influenced by group norms (if known) to a lesser extent than when they have to indicate their own responses. In several experiments (Koriat, 2012; Koriat et al., 2016), participants were more confident and responded faster when their predictions agreed with those of others than when their predictions deviated from the consensual predictions. This was true independent of the accuracy of these predictions (Koriat, 2013). Taken together, the results argue for the idea that the PME can ensue from the process underlying the construction of people's responses to two-alternative forced-choice (2AFC) items independent of social influence.

In this study, we attempted to tease apart the contribution of social influence to the PME from that due to the internal process underlying choice and confidence. The data reported in Koriat et al. (2016) did not allow us to separate the relative contributions of the I-PME and E-PME components under conditions where both may operate. The present study attempted to fill this gap by comparing the size of PME under conditions that differ in social influence.

Experiment 1

Experiment 1 used 2AFC items measuring social attitudes and social beliefs taken from Koriat and Adiv (2011, 2012). Participants' task was ostensibly to predict the majority response to each item. For half of the items, after making their predictions, participants were given correct feedback about the actual majority response, whereas for the other items they were told that others' response is unknown. These two conditions will be referred to as the Consensus Information (CI) and the No Consensus Information (NI) conditions, respectively. Of interest is whether consensus information in the CI condition exerts an added effect, over and above the I-PME effect that is expected to obtain in the NI condition.

Method

Participants. Participants were 100 Hebrew-speaking undergraduates from the University of Haifa (69 females and 31 males); 95 participants were paid, and five performed the experiment for course credit. The determination of sample size followed the sample sizes of previous experiments testing Koriat's (2012) SCM. A posteriori power analyses using the *R* package SIMR (Green & MacLeod, 2016; see below) indicated that the power to detect effects of consensus information on confidence judgments and response latencies was excellent.

Stimulus materials. The materials for the first, attitudes part of the experiment consisted of a 50-item Conservatism Scale (Wilson & Patterson, 1970). Each item describes a controversial issue or concept (e.g., death penalty, legalized abortion). We used a Hebrew version with a *yes*/*no* response format that was adapted to the Israeli population (see Koriat & Adiv, 2011). For half of the items, *yes* indicated higher conservatism, and for the other half, *yes* indicated lower conservatism.

For the second, beliefs part, the materials consisted of a 60-item Hebrew version of the Social Axioms Survey (SAS; Leung et al., 2002), prepared by Kurman and Ronen-Eilon (2004). Each item described a general belief (e.g., "Powerful people tend to exploit others"). A *yes*/*no* format was used (see Koriat & Adiv, 2012).

Five self-report personality questionnaires were administered but the results from these tests will not be presented in this article.

Apparatus and procedure. The experiment was conducted individually on a personal computer in a laboratory room. In Block 1 (attitudes), participants were told that in an earlier round of the project, students had been asked to indicate their opinions about various issues. The present study is the second round. Its aims are first, to examine participants' ability to predict the results obtained in the first round and second, to collect information about new issues not included in the first round. The old and new items would be mixed. For each item, participants' task would be to predict which of two responses (*yes* or *no*) had been endorsed (in the first round) or would be endorsed (in the present round) by the majority of students. They would then be given information whether the majority response was *yes* or *no* (for first-round items), or *unknown* (for second-round items), and would be asked to indicate their own opinion about the issue. To enhance the credibility of the cover story, participants were asked to mark whether they had participated in the first round.

In each trial, an attitude statement was presented. Participants clicked a *continue* box when they finished reading it. The phrase, *The majority response according to your judgment*, was then added, with *yes*/*no* next to it. Participants indicated their prediction, and then clicked *confirm* (they could change their response but not after clicking *confirm*). Then the statement, *the majority response is yes*/*no*/*unknown*, was added.

After clicking *continue*, the statement, *my own opinion: yes*/*no*, appeared. Participants clicked one of the two options and then clicked *confirm* (they could change their response but not after clicking *confirm*). Response latency between *my own opinion* and the *confirm* press was measured.

A confidence scale was then added. Participants marked their confidence by sliding a pointer on a scale using the mouse (a number in the range 0-100 corresponding to the location of the pointer appeared in a box), and then clicked *confirm*. They were encouraged to make use of the full range of the confidence scale.

In Block 2 (beliefs), participants were told that they would be presented with 60 belief items. The procedure was the same as that used for the attitudes task.

Table 1. Mean Confidence Judgments for Majority and Minority Responses for the Consensus Information Condition and the No Information Condition.

	Consensus information		No consensus information	
	Majority responses	Minority responses	Majority responses	Minority responses
Attitudes	85.78 (8.79)	69.03 (17.86)	82.88 (8.64)	69.17 (16.40)
Beliefs	84.60 (8.49)	70.95 (14.38)	81.26 (9.42)	72.00 (15.71)
Both	85.19 (8.64)	69.99 (16.19)	82.07 (9.05)	70.59 (16.08)

Note. The results are presented for the attitudes and beliefs tasks and across both tasks (Experiment 1). *SD*s in parentheses.

For each block, half of the items were slated to the CI condition, and half to the NI condition, with the assignment counterbalanced across participants. For the CI condition, the feedback about the majority response was the majority answer in Koriat and Adiv (2011) for the attitude items, and in Koriat and Adiv (2012) for the belief items. Order of presentation was random for each participant and block, and each block began with two warm-up items. When the experiment was over, participants were debriefed. The materials and raw data for Experiments 1 and 2 are available for download at https://osf.io/dv2ah.

Results

The studies of Koriat and Adiv (2011, 2012) had been conducted about five years before this study. Because normative responses may have changed over this period, it was important to delete the items for which the normative response in this study differed from that in the earlier studies. To do so, we determined the majority response for each item in participants' personal responses in the NI condition (with $n = 50$ for each item). For two items (one attitude and one belief) the two response options were chosen equally often. Of the remaining 108 items, for 95 items, the majority response in the NI condition was the same as that in Koriat and Adiv (2011, 2012). All the analyses were therefore based on these items, which included 45 attitude items and 50 belief items. Thus, for these items, the majority response provided to participants in the CI condition was the same as that exhibited by the NI participants.

Our primary method of analysis was hierarchical linear modeling (HLM). This method has several advantages over repeated measures ANOVA, including the simultaneous estimation of within-subject and between-subjects variance, and the robustness against missing data (see Quené & van den Bergh, 2004). Models were fit using the *R* packages lme4 and lmerTest (Bates, Maechler, & Bolker, 2015; Kuznetsova, Brockhoff, & Christensen, 2016). In all models, random intercepts for participants and items were specified. Consensus information (effect coded: –1 = *no consensus information*, 1 = *consensus information*), task (effect coded: –1 = *attitudes*, 1 = *beliefs*), response status (effect coded: –1 = *minority*, 1 = *majority*), and standardized majority size were treated as fixed effects. For ease of exposition, the figures below present items grouped into five categories in terms of majority size: 51% to 59%, 60% to 69%, 70% to 79%, 80% to 89%, and 90% to 100%.[1] However, majority size was included as a continuous variable in all analyses.

The accuracy of participants' predictions. The percentage of correct predictions across the CI and NI conditions averaged 81.93 for the attitudes task and 80.90 for the beliefs task. Thus, participants were largely accurate in predicting the majority response.

The effect of consensus information on participants' choices. On a priori grounds, we expect that the influence of consensus information on participant's own responses should be small: The prediction task drew participants' attention to the majority response and the accuracy of their predictions implies that participants in the NI and CI conditions had similar perceptions of the majority. What differs is whether these perceptions were explicitly confirmed (CI) or not (NI).

For the attitude task, percentage agreement across participants averaged 83.47 for the CI condition and 80.40 for the NI condition. Disclosing consensus information increased the probability of agreement by 3%, $b = 0.12$, $z = 2.85$, $p < .005$. For the belief task, percentage agreement averaged 81.90 for the CI condition, and 79.92 for the NI condition, and the effect was only marginally significant, $b = 0.07$, $z = 1.94$, $p = .053$. Across the two tasks, percentage agreement averaged 82.65 for the CI condition, and 80.14 for the NI condition. Disclosing consensus information increased the probability of agreement by 2%, $b = 0.09$, $z = 3.35$, $p < .001$.

Confidence in majority and minority responses. We compared confidence in one's majority and minority responses for the CI and NI conditions. The means and their *SD*s are presented in Table 1. The results were largely similar across the two tasks.

Confidence was higher by 1% when consensus information was disclosed than when it was not disclosed, $b = 0.66$ ($SE = 0.22$), $t(9317) = 2.99$, $p < .005$. In addition, confidence was markedly higher (5%) for majority responses than for minority responses, $b = 5.25$ ($SE = 0.23$), $t(9404) = 22.55$, $p < .0001$. A significant interaction suggested that the majority–minority difference in confidence was stronger for the CI than

for the NI condition, $b = 0.90$ ($SE = 0.22$), $t(9329) = 4.03$, $p < .0001$. No other effects were significant, all ts < 1.30. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of consensus information of 1.5%.

Note that the CI-NI difference was due primarily to majority responses. Separate models for minority and majority responses revealed that consensus information affected confidence only when the participant's response was the majority response, $b = 1.55$ ($SE = 0.18$), $t(7546) = 8.71$, $p < .0001$, but not when the participant's response was the minority response, $b = -0.42$ ($SE = 0.48$), $t(1649) = 0.87$, $p > .05$.

In sum, (a) majority responses were endorsed with greater confidence than minority responses, replicating the familiar PME pattern. This PME (b) did not require explicit consensus information and was observed in the NI as well as the CI condition. However, (c) it was more pronounced when CI was made explicit. This pattern indicates that internal processes (resulting in an I-PME) and external processes (resulting in an E-PME) contribute to the overall PME commonly observed in the social influence literature. Finally, (d) the contribution of explicit consensus information is asymmetric—it increased confidence in the majority response without decreasing confidence in the minority response.

Confidence for majority and minority responses as a function of majority size. We turn to the second aspect of the PME—whether the majority–minority difference increases with majority size. For each of the two conditions, Figure 1 presents mean confidence for the majority and minority responses as a function of majority size. The figure suggests that indeed the majority–minority difference in confidence increased with majority size for both the CI and NI conditions.

An HLM tested whether consensus information, response status, task, majority size, and their interactions affected confidence. Main effects of consensus information, $b = 0.97$ ($SE = 0.26$), $t(9329) = 3.69$, $p < .0005$, response status, $b = 6.63$ ($SE = 0.27$), $t(9416) = 24.72$, $p < .0001$, and a Consensus information × Response status interaction, $b = 0.64$ ($SE = 0.26$), $t(9344) = 2.41$, $p < .05$, echoed the findings reported above. A significant effect of majority size indicated that each one-unit increase in majority size increased confidence by 1%, $b = 0.88$ ($SE = 0.40$), $t(154) = 2.20$, $p < .05$, and a significant Majority size × Task interaction indicated a stronger effect of majority size for attitudes than for beliefs, $b = -0.96$ ($SE = 0.40$), $t(154) = 2.40$, $p < .05$. More important, a significant Majority size × Response status interaction revealed that the majority–minority difference increased with majority size, $b = 2.98$ ($SE = 0.26$), $t(8997) = 11.41$, $p < .0001$. Finally, a significant three-way interaction revealed that the increase in the majority–minority difference with majority size was slightly less pronounced in the CI condition than in the NI condition, $b = -0.51$ ($SE = 0.25$), $t(9338) = 2.06$, $p < .05$. No other effects were significant, all ts < 1.28. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of consensus information of 1.5%.

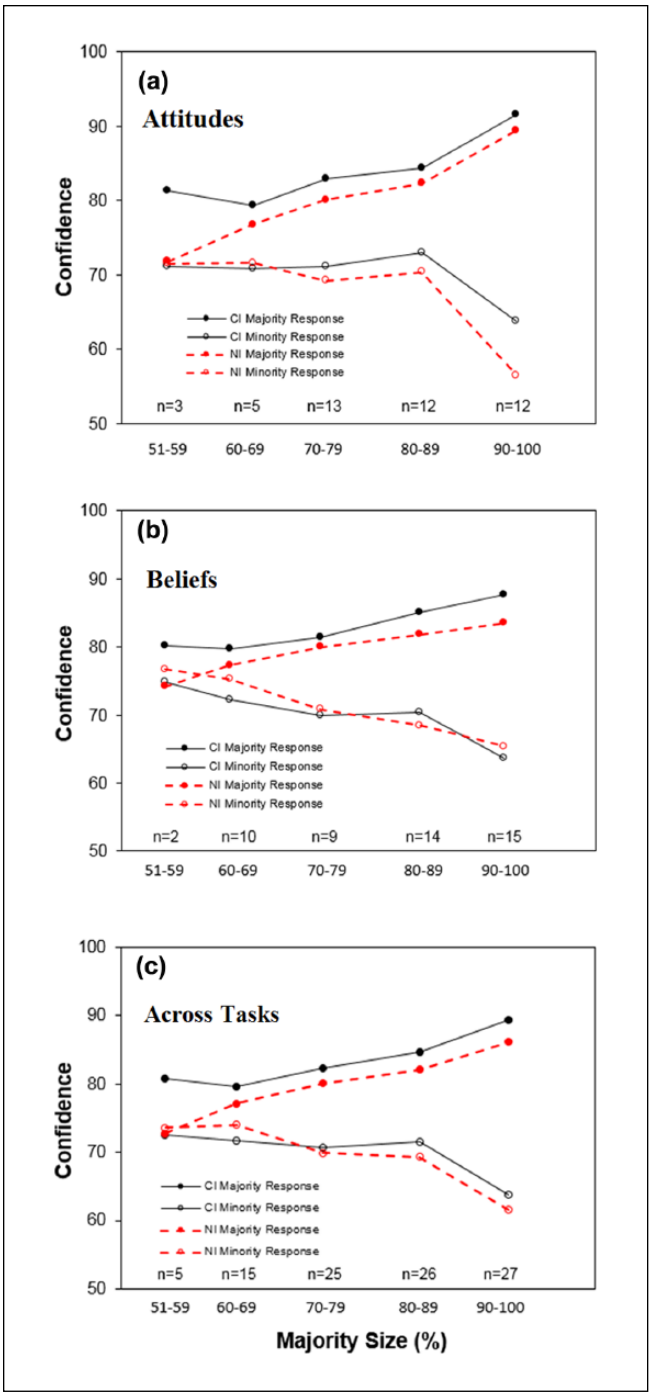

Figure 1. Mean confidence for majority and minority responses for the CI and NI conditions as a function of majority size.
Note. The results are presented for the attitudes task (a), the beliefs task (b), and across both tasks (c). Also indicated in each panel is the number of items contributing to each category of majority size (Experiment 1). CI = consensus information; NI = no consensus information.

Table 2. Mean Response Latency (in Seconds) for Majority and Minority Responses for the Consensus Information Condition and the No Consensus Information Condition.

	Consensus information		No consensus information	
	Majority responses	Minority responses	Majority responses	Minority responses
Attitudes	2.25 (0.46)	2.79 (1.24)	2.30 (0.51)	2.73 (1.02)
Beliefs	2.05 (0.50)	2.23 (0.57)	2.13 (0.55)	2.20 (0.76)
Both	2.15 (0.48)	2.52 (1.02)	2.22 (0.53)	2.46 (0.93)

Note. The results are presented for the attitudes and beliefs tasks and across both tasks (Experiment 1). *SD*s in parentheses.

In separate models for the two conditions, significant Majority size × Response status interactions revealed that the majority–minority differences increased with majority size in each condition, CI condition: $b = 2.56$ ($SE = 0.36$), $t(4301) = 7.14$, $p < .0001$, NI condition: $b = 3.61$ ($SE = 0.38$), $t(4500) = 9.58$, $p < .0001$.

In sum, the majority–minority difference increased with majority size. More important, this increase was observed in the CI as well as the NI condition.

Response latency for majority and minority responses. We turn next to the results for response latency, which are relevant to the Minority Slowness Effect (Bassili, 2003; Huge & Glynn, 2013). Latencies below or above 2.5 *SD*s from each participant's mean in each task were eliminated (3.69% for attitudes, and 3.38% for beliefs).

Table 2 presents the pertinent results. An HLM tested whether consensus information, response status, task, and their interactions affected response latency. Somewhat surprisingly, consensus information yielded a nonsignificant effect, $b = 0.01$ ($SE = 0.01$), $t(9005) = 1.11$, $p > .05$. Response status, in contrast, produced a highly significant effect, $b = -0.15$ ($SE = 0.01$), $t(7760) = 10.77$, $p < .0001$, indicating that response time was shorter by 145 ms for majority responses than for minority responses. Task yielded a significant effect, $b = -0.17$ ($SE = 0.02$), $t(166) = 9.99$, $p < .0001$, indicating that response time for beliefs was shorter by 167 ms than for attitudes. No other effects were significant, all ts < 1.28. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of consensus information of 150 ms.

In separate models for the CI and NI conditions, significant effects of response status revealed shorter response latency for majority responses than for minority responses in the CI condition, $b = -0.16$ ($SE = 0.02$), $t(3752) = 8.65$, $p < .0001$, and in the NI condition, $b = -0.14$ ($SE = 0.02$), $t(3987) = 7.12$, $p < .0001$. Thus, consensus information failed to enhance response speed, but in both conditions, majority responses were ventured with shorter response latencies than minority responses.

We also examined the effects of majority size on response latency. Figure 2 presents the results in the same format as for confidence judgments. A similar analysis as that used for confidence yielded significant effects for response status, $b = -0.16$ ($SE = 0.02$), $t(9000) = 9.99$, $p < .0001$, and task, $b = -0.16$ ($SE = 0.02$), $t(295) = 8.52$, $p < .0001$, echoing the findings reported earlier. The majority–minority difference in response latency increased with majority size, $b = -0.04$ ($SE = 0.02$), $t(6603) = 2.77$, $p < .01$. Separate models for majority and minority responses indicated that response latency decreased with majority size for majority responses, $b = -0.04$ ($SE = 0.01$), $t(100) = 3.84$, $p < .0005$, but not for minority responses, $b = 0.05$ ($SE = 0.03$), $t(83) = 1.56$, $p > .05$. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of consensus information of 150 ms. In sum, the majority–minority difference in response latency increased with majority size. This result was observed in the CI as well as the NI condition.

Majority–minority differences in confidence for wrong predictions. We examined whether the stronger confidence in majority responses would be found even when participants' prediction of the consensual response is wrong. We focused on 47 items with above median majority size in the NI condition (over 80%). For these items, we calculated confidence in one's own choice for majority and minority responses using for each participant only the items for which his or her prediction of the majority response was wrong. Confidence for majority and minority responses (across the CI and NI conditions) averaged 76.33 and 69.57, respectively. An HLM predicting confidence from response status revealed a significant main effect of response, $b = 3.43$ ($SE = 1.07$), $t(395) = 3.20$, $p < .005$. For the CI condition, the respective means were 76.30 and 69.56, and an HLM revealed a significant main effect of response, $b = 3.09$ ($SE = 1.46$), $t(201) = 2.11$, $p < .05$. For the NI condition, the respective means were 78.27 and 69.98, and an HLM revealed a significant main effect of response, $b = 3.79$ ($SE = 1.64$), $t(190) = 2.31$, $p < .05$. For the remaining 48 items, with majority size below or equal to 80%, confidence for majority and minority responses (across the CI and NI conditions) averaged 72.53 and 72.78, respectively. Thus, for items that had a clear majority opinion, when participants were wrong in their prediction of the majority opinion, they still endorsed the actual majority opinion with greater confidence than the minority opinion.

Discussion

Experiment 1 attempted to tease apart the component of PME that is due to social influence and that which is due to the

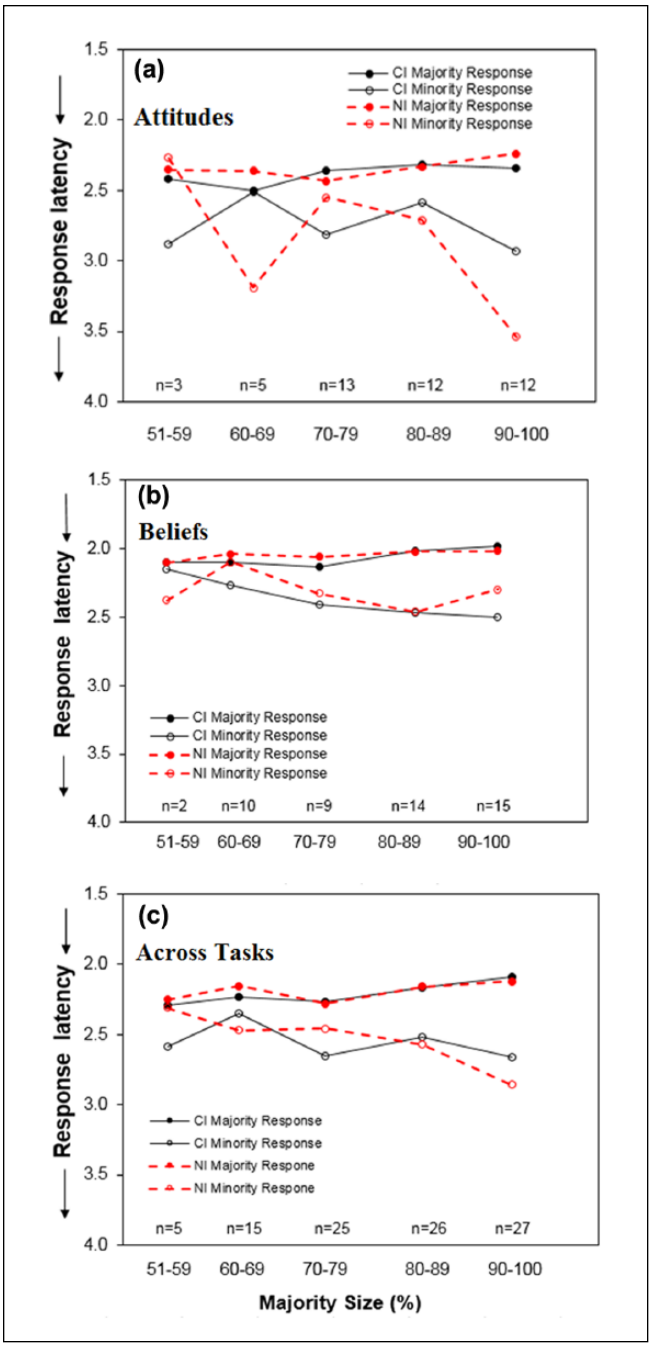

Figure 2. Mean response latency for majority and minority responses for the CI and NI conditions as a function of majority size.

Note. The results are presented for the attitudes task (a), the beliefs task (b), and across both tasks (c). Also indicated in each panel is the number of items contributing to each category of majority size (Experiment 1). To make the plots compatible with those for subjective confidence, the response latency values increase downward (faster responses appear at the top). CI = consensus information; NI = no consensus information.

internal processes underlying choice and confidence. Replicating previous findings, a PME emerged in the absence of explicit consensus information (NI): Participants were more confident when they selected the majority than when they selected the minority response.

Providing participants with consensus information strengthened this pattern by increasing endorsement of the majority response and confidence in it. The effect was asymmetric: Consensus information increased confidence in the majority response when it was chosen, but did not lower confidence in the minority response. However, the added effect of consensus information on the majority–minority difference in confidence was relatively small: Confidence was higher for majority than for minority responses by 15% when consensus information was offered and by 11% when it was not (NI). In addition, for both the CI and NI conditions, the majority–minority difference increased with majority size. Thus, overall, the results suggest that the effects of social influence are additive over the I-PME.

The results for response latency were somewhat less clear. Unexpectedly, consensus information did not enhance response speed. However, for both the CI and NI conditions, majority responses were faster than minority responses, with little difference between the two conditions. In addition, for both conditions, the majority–minority difference in response time increased with majority size.

What are the implications of these results regarding the distinction between I-PME and E-PME? Most notably, a robust PME observed in the NI condition was only slightly enhanced by explicitly providing consensus information in the CI condition. This observation might be taken to suggest that the bulk of the observed PME was driven by the internal processes underlying decision and confidence judgments (Koriat et al., 2016). Consensus information added a small E-PME component to this I-PME component.

However, caution is advised. The CI-NI differences may have been small because of either or both of two factors. First, the manipulation of consensus information might have been too weak because participants' perception of consensus was quite accurate. Second, the PME observed in the NI condition may actually contain a substantial social component. Participants predicted what the majority response would be, and most of them were accurate in making this prediction. As a result, the extent to which others agree was presumably on participants' mind in both conditions independent of whether the majority response was explicitly confirmed or not.

Note, however, that proponents of social projection theory have maintained that the similarity between self-judgments and other judgments is not necessarily the result of social conformity. Rather, it may derive primarily from the tendency to project one's own beliefs on others, assuming that others behave and believe like oneself. Indeed, results suggest that the impact of social projection on the similarity between self-judgments and judgments about other in-group members is much stronger than that of conformity (Clement & Krueger, 2000; Krueger, Acevedo, & Robbins, 2005, see Krueger, 1998, 2007, for reviews).

Of particular importance is the observation that for items for which there was a clear majority opinion, participants who were wrong in their prediction of the majority opinion still endorsed the actual majority opinion with greater confidence than the minority opinion. This result is difficult to reconcile with the idea that the PME observed stems from conformity pressures.

Experiment 2

In Experiment 1, consensus information was manipulated by announcing or not announcing the normative majority response prior to soliciting participants' own response. When the majority response was announced, it was always correct. In Experiment 2, in contrast, we used a more subtle manipulation that was intended to bias participants either in favor of the majority response or in favor of the minority response. Participants were presented with two percentages for each item and were asked to guess which of them represents the percentage of other participants who chose a particular response to that item. Previous research showed that participants attend to a source of information, making it likely that the percentages offered would bias their social consensus perceptions (Schwarz, 1994). In the majority-biased condition, both percentages favored the actual majority response (based on the norms for the NI condition in Experiment 1), and both were in fact higher than the actual majority response. For example, if the majority response had been endorsed by 70% of the participants according to the NI norms, the options presented to participants could be 72% and 83%. In the minority-biased condition, in contrast, both percentages (e.g., 28% and 17%) actually misled participants to believe that the target response was the minority response. Following the choice of the majority estimate, participants chose their own response and indicated their confidence in that response. Only the belief items from Experiment 1 were used.

The majority-biased condition is similar to the CI condition in Experiment 1, and is expected to yield the familiar PME pattern. For the minority-biased condition, in contrast, social influence models predict that the information should reduce participants' endorsement of the majority response. The key question is how this manipulation affects the PME. From a conformity perspective, one might expect perhaps a reversal of the PME such that participants report higher confidence when they endorse the alleged majority position, even though it is actually held by a minority. However, if the PME derives primarily from the very process underlying decision and confidence, we might expect the same PME pattern for the minority-biased condition as that expected for the majority-biased condition, although perhaps somewhat attenuated.

Method

Participants. Participants were 64 Hebrew-speaking undergraduates from the University of Haifa (44 females and 20 males), 41 were paid, and 23 performed the experiment for course credit. Like for Experiment 1, the determination of sample size followed the sample sizes of previous experiments (Koriat, 2012). A posteriori power analyses (see below) again indicated that the power to detect effects of biased majority information on confidence judgments and response latencies was excellent.

Stimulus materials. The materials consisted of the 60 belief items used in Experiment 1. Based on the norms obtained in the NI condition in that experiment, the items were divided into two categories, a filler category and an experimental category. We included the filler category to enhance the credibility of the majority estimates presented to participants prior to soliciting their own responses.

The filler category included two sets of items. For one set of 11 items, the majority size in the NI condition was more than 90%. For these items, no attempt was made to mislead participants with regard to the majority response. Rather, the two percentage options favored the actual majority option. The second set consisted of 13 items. For nine of these, the majority response in the NI condition differed from that in Koriat and Adiv's (2012) earlier study, and for four items, the responses in the NI condition were divided almost equally between the two options. For all 13 items, one of the two percentage values was set to be lower than 50% and the other was set to be higher than 50% (e.g., 45% and 58%).

The experimental category included the remaining 36 items. Each item could appear with one of four types of questions that were created by crossing target option and bias. Target option was manipulated by using either the *agree* response or the *disagree* response as the subject in the question (e.g., "What percentage of people *agreed*?" or "What percentage of people *disagreed*?"). Bias was manipulated by the pair of percentages that was offered to participants. In one pair, both percentages favored the actual majority percentage in the NI condition (e.g., 64% and 75%, when the actual majority size was 60%). The other pair consisted of their complements (36% and 25%). In the majority-biased condition, the pair of percentages suggested that the target option had been chosen by the majority of participants, whereas in the minority-biased condition, the pair suggested that the target option had been chosen by the minority of participants.

The assignment of the four types of questions (crossing target option and bias) to each item was done as follows. The 36 experimental items were divided into nine groups of four items each, roughly matched in terms of the actual majority percentage in the NI condition. In each group, the assignment of the items to the four question types formed a Latin-square across each group of four participants. Thus, for each participant, each type of question appeared exactly nine times.

Apparatus and procedure. The apparatus was the same as in Experiment 1, and the procedure was similar. The

Table 3. Mean Confidence Judgments and Response Latency for Majority and Minority Responses for the Majority-Biased and Minority-Biased Conditions (Experiment 2).

	Majority-biased		Minority-biased	
	Majority responses	Minority responses	Majority responses	Minority responses
Confidence	80.55 (9.12)	68.40 (15.40)	77.95 (14.08)	70.37 (14.08)
Response latency	3.27 (1.27)	3.44 (1.76)	3.40 (1.29)	3.56 (1.65)

Note. *SD*s in parentheses.

instructions were also similar: Participants were asked to guess the percentage of participants who had endorsed a certain response in an earlier study, and then to mark their own opinion.

Each trial began with the presentation of the belief statement. Participants pressed *confirm* when they finished reading it, at which time the following question appeared: "What percentage of people *agreed*/*disagreed?*" followed by two percentage options. Participants clicked one of the two options and then clicked *confirm* (they could change their response but not after clicking *confirm*). An instruction soliciting the participants' own opinion then appeared ("*my own opinion*:"). Participant clicked *agree* or *disagree*, and then clicked *confirm*. Response latency was measured (between "*my own opinion*:" and the *confirm* press). A confidence scale (0-100) was then added beneath the alternatives, and participants marked their confidence in their own response as in Experiment 1 and clicked *confirm*. The 60 items were presented in a random order preceded by two warm-up items.

At the end of the experiment, participants were debriefed about the purpose of the experiment. They were told that the study examined the effects of consensus information on participants' own responses. Therefore, the two percentage estimates from which they had to choose did not reflect the percentage of choices of the participants in the earlier study.

Results

All the analyses were based on the 36 experimental items. As in Experiment 1, data were analyzed using HLMs with random intercepts for participants and items. Bias condition (effect coded: –1 = minority-biased condition, 1 = majority-biased condition), response status (effect coded: –1 = minority, 1 = majority), and standardized majority size were treated as fixed effects. Because of the small number of items in this experiment, in the figures to be presented below, the items were divided at the median of majority size in the NI condition into 18 items with small majority size (mean 68.00), and 18 items with large majority size (mean 85.78). Again, however, all analyses treated majority size as a continuous variable.

The effect of biased majority information on participants' chosen response. Were participants influenced by the biasing manipulation? The percentage of responses that agreed with the actual majority response (based on the NI norms, Experiment 1) averaged 76.30 for the majority-biased condition, and 72.22 for the minority-biased condition. The effect of bias was significant, $b = 0.11$, $z = 2.26$, $p < .05$, but the size of the effect was small.

Confidence in majority and minority responses. Mean confidence in the majority and minority responses are presented in Table 3. An HLM predicted confidence from bias condition, response status, and their interaction. Choosing the majority response increased confidence by 5%, $b = 4.74$ ($SE = 0.44$), $t(2245) = 10.76$, $p < .0001$. A significant interaction suggested that the majority–minority difference in confidence was stronger in the majority-biased condition than in the minority-biased condition, $b = 1.12$ ($SE = 0.44$), $t(2238) = 2.57$, $p < .05$. The main effect of bias condition was not significant, $t < 1$. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of bias condition of 1.5%.

Separate models for the two bias conditions indicated that, in the majority-biased condition, confidence in majority responses was 6% higher than confidence in minority responses, $b = 5.78$ ($SE = 0.64$), $t(1105) = 9.03$, $p < .0001$. In the minority-biased condition, confidence in majority responses was 4% higher than confidence in minority responses, $b = 3.77$ ($SE = 0.62$), $t(1101) = 6.05$, $p < .0001$.

Like in Experiment 1, the confidence difference between the majority-biased and minority-biased conditions was due to majority responses. In separate HLMs for majority and minority responses, bias information affected confidence when the participant's response was the majority response, $b = 1.28$ ($SE = 0.41$), $t(1624) = 3.11$, $p < .005$, but not when it was the minority response, $b = -0.94$ ($SE = 0.86$), $t(544) = 1.09$, $p > .05$.

In sum, bias about the majority response enhanced confidence in one's own response but only when that response was the majority response. In addition, majority responses were endorsed with higher confidence than minority responses, and this was true for the majority-biased condition as well as for the minority-biased condition, with the difference being stronger for the former condition.

Confidence for majority and minority responses as a function of majority size. Figure 3a plots confidence as a function of

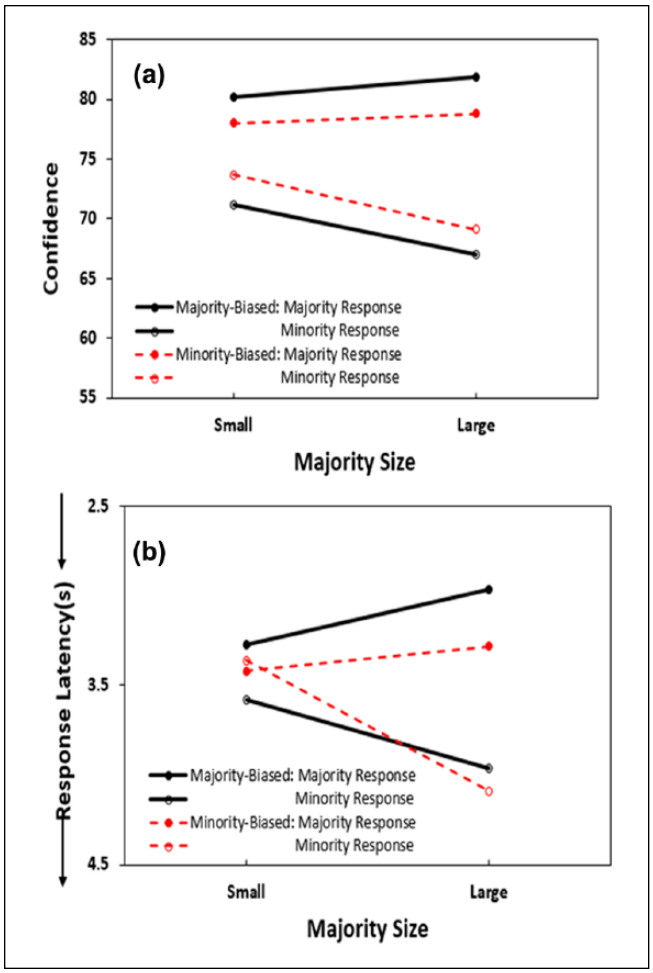

Figure 3. (a) Mean confidence for majority and minority responses for the majority-biased and minority-biased conditions as a function of majority size (small vs. large) and (b) presents the respective results for response latency (Experiment 2).

majority size for the majority and minority responses for the two conditions. An HLM confirmed that choosing the majority response increased confidence, $b = 4.88$ ($SE = 0.45$), $t(2248) = 10.80$, $p < .0001$, and that the majority–minority difference was stronger for the majority-biased condition, $b = 1.12$ ($SE = 0.45$), $t(2238) = 2.48$, $p < .05$. In addition, a significant interaction between response status and majority size, $b = 0.96$ ($SE = 0.44$), $t(2252) = 2.17$, $p < .05$, indicated that the majority–minority difference in confidence increased with majority size. No other effects were significant, all ts < 1. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of bias condition of 1.5%.

Response latency for majority and minority responses. Table 3 presents mean response latency after eliminating latencies that were below or above 2.5 *SD*s from each participant's mean (3.65%). HLM predicting response latency from bias condition, response status, and their interaction revealed that choosing the majority response reduced response latency by 187 ms, $b = -0.19$ ($SE = 0.05$), $t(2161) = 3.52$, $p < .0005$. A significant interaction between bias condition and response status, $b = -0.11$ ($SE = 0.05$), $t(2156) = 2.13$, $p < .05$, suggested that the effect of response status was stronger for the majority-biased condition. The main effect of bias condition was not significant, $t < 1$. A posteriori power analysis revealed a power above .90 to reject an HLM without effects of bias condition of 150 ms.

Separate models for majority and minority responses revealed that bias information affected response latency when the participant's response was the majority response, $b = -0.29$ ($SE = 0.08$), $t(1055) = 3.88$, $p < .0005$, but not when it was the minority response, $b = -0.09$ ($SE = 0.08$), $t(1067) = 1.21$, $p > .05$.

We also examined the effects of majority size on response latency. Figure 3b presents the results in the same format as for confidence judgments. A similar HLM analysis as that used for confidence indicated that majority responses were faster by 229 ms than minority responses, $b = -.23$ ($SE = 0.05$), $t(2168) = 4.21$, $p < .0001$. A significant Response status × Bias condition interaction indicated that the majority–minority difference was larger in the majority-biased than in the minority-biased condition, $b = -0.11$ ($SE = 0.05$), $t(2156) = 2.05$, $p < .05$. A significant Response status × Majority size interaction, $b = -0.17$ ($SE = 0.05$), $t(2169) = 3.17$, $p < .005$, indicated that the majority–minority difference increased with majority size. No other effects were significant, all ts < 1. A posteriori power analysis revealed a power above .95 to reject an HLM without effects of bias condition of 150 ms.

Discussion

In Experiment 2, we used a subtle manipulation that was intended to induce participants to endorse either the majority or the minority response. This manipulation was found to affect participants' responses although the effect was small. The results yielded higher confidence and shorter response latencies for majority responses than for minority responses. Importantly, this was true even for the minority-biased condition although the majority–minority difference was somewhat smaller than for the majority-biased condition. As in Experiment 1, the bias in favor of the actual majority response enhanced confidence in one's own response only when that response was the majority response.

The results for the minority-biased condition are surprising. This condition might have been expected to reverse the PME pattern. However, participants endorsed the majority opinion with greater confidence even when they had been misled to believe that that opinion was actually the minority opinion. These results support the occurrence of a PME that is independent of social influence.

General Discussion

The results of the two experiments converge in supporting the PME discussed by Koriat et al. (2016). This effect was observed for each of the two experimental conditions of each

experiment. Participants were more confident and responded faster when they endorsed the majority response than when they endorsed the minority response. The size of the majority–minority difference increased with the size of the majority—the percentage of participants who chose the majority response.

The main aim of the present study, however, was to tease apart the two postulated components of the PME and to confirm the existence of an internal PME component that is independent of social influence. Indeed, in contrast to what the social psychological literature on social influence and conformity would suggest, explicit or implicit information about the consensual responses was not needed to obtain a PME. In Experiment 1, a robust PME emerged in the absence of explicit consensus information (NI condition). Similarly, in Experiment 2, this effect was observed even in the minority-biased condition. Under these conditions, the PME possibly reflects the internal processes underlying response choice and confidence judgment, which we referred to as the I-PME component.

The experimental manipulations that we used in both experiments yielded significant effects, but these effects were relatively weak. In Experiment 1, participant's predictions of the majority response were quite accurate in the NI condition (80% accuracy), so that the consensus information provided in the CI condition mostly acted to confirm these predictions. Nevertheless, this confirmation was found to amplify the PME pattern observed in the NI condition. Importantly, consensus information increased confidence in the majority response when it was chosen, but did not reduce confidence in the minority response.

The effects of the biasing manipulation in Experiment 2 were also small. However, they were similar in pattern to those produced by consensus information in Experiment 1. First, in comparison with the minority-biased condition, the majority-biased condition increased the likelihood of choosing the majority option and enhanced the difference in confidence between the majority and minority choices. Second, the effect was asymmetric: The bias about the majority response enhanced confidence in one' own response only when that response was the majority response.

Of particular importance is the observation that the minority-biased condition yielded the same majority–minority difference in confidence as that observed for the majority-biased condition. The bias in favor of the minority response did not reverse the PME pattern but only attenuated it. Thus, participants endorsed the actual majority response with greater confidence even when they had been induced to believe that it was actually the minority response. This result parallels the observation from Experiment 1 that participants endorsed the actual majority opinion with greater confidence even when they believed that it was the minority opinion.

What are the implications of the results for the dual-process view of the PME? The results are consistent with the idea that the PME observed under conditions of social influence may contain two components. The first is an internal component that derives from the process underlying choice and confidence (I-PME), and the second reflects the effects of social influence (E-PME). The results of both experiments suggest that the I-PME component has the predominant contribution. A PME pattern clearly emerged in the NI condition of Experiment 1 and in the minority-biased condition of Experiment 2. The added effects of the social influence manipulations were relatively small, and these manipulations did not change the overall pattern of the PME for confidence or latency.

However, the conclusion about the relative contribution of the I-PME and the E-PME must be taken with caution because of the difficulty in creating conditions that are devoid of any social influence. For example, it is unclear to what extent did the PME in the NI condition of Experiment 1 derive from social influence. The observation that participants were largely accurate in predicting the majority response raises the possibility that they may have been affected by their perception of the majority response. However, accuracy may also stem from people's tendency to project their views on others (Krueger, 1998, 2007). Nevertheless, what is clear from this study is that the PME is quite pervasive, consistent with the findings reported by Koriat et al. (2016), but that it is also sensitive to social influence.

What are the behavioral and social implications of the results presented in this study? Research in social psychology and metacognition suggests that people's confidence in their beliefs, and the ease with which these beliefs come to mind, affect the likelihood of translating these beliefs to action. In attitude research, subjective confidence and response accessibility have been discussed as components of attitude strength, and both have been shown to affect the attitude-behavior consistency (Briñol et al., 2013; Krosnick & Petty, 1995). Metacognition research also suggests that people rely heavily on their confidence in the regulation of their behavior. For example, in a task that simulated eyewitness testimony, participants were found to rely practically completely on their confidence in their recalled response ($\gamma = .97$) in deciding whether to volunteer or withhold that response under conditions that placed a premium on accurate reporting (Koriat & Goldsmith, 1996).

If conformity pressure enhances the confidence of individuals in the group views and the ease with which these views come to mind, people should be more likely to act on majority views than on minority views. However, the I-PME implies that this should be true regardless of social influence. For example, in Koriat's (2011) study participants were presented individually with perceptual judgments and were asked to wager money on the correctness of their judgments. They were found to place larger wagers on the majority response regardless of its accuracy. Thus, they maximized their earnings when the majority judgment was correct but lost money when it was wrong.

The results of the present study suggest that people need not know what other people's choices are to behave as if they

are influenced by them. Rather, they tend to make the same choices as others, and feel more confident when they make these choices simply because their choices and confidence are based on cues that are sampled from consensually shared databases. In fact, the results of Experiments 1 and 2 suggest that people are more confident when they make a majority choice even when they may believe that that choice is actually the minority choice.

These results also imply that the "spiral of silence" discussed by Noelle-Neumann (1974) should take place regardless of any social pressure. According to Noelle-Neumann, because of social pressure, people who hold a minority opinion tend to inhibit the expression of that opinion (see Bassili, 2003), and as a result, public opinion tends to converge gradually on the commonly shared opinions. However, the I-PME suggests that the drift of public opinion toward the majority views should occur independent of any direct or indirect social influence. This type of drift is suggested by the results of Koriat (2015) on group decisions. In that study, participants working in dyads made their judgments individually and then collaborated to reach a joint decision. The tendency of group decisions to be dominated by the more confident members resulted in the joint decisions amplifying the pattern that was observed for each individual: Group deliberation improved accuracy when individual accuracy was better than chance, but impaired accuracy when individual accuracy was below chance. Thus, the processes underlying the I-PME may have a variety of behavioral and sociological consequences, but of course, more research is needed to examine these potential consequences.

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Note

1. There were only three attitude items and three belief items with 100% consensus.

Supplemental material

Supplementary material is available online with this article.

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