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"If It Matters, I Can Explain It": Social Desirability of Knowledge Increases the Illusion of Explanatory Depth

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Abstract

This paper explores whether social desirability affects the illusion of explanatory depth (IEOD) by comparing the magnitude of this illusion in topics with different levels of social desirability within several domains. This question was chosen because prior literature shows that social expectations about how much a person should know about a certain topic affect the magnitude of the IOED. Previous research shows also that social desirability has an effect on a similar illusion related to argumentation, and that the IOED is affected by the way a person thinks knowledge is distributed in his or her social group. In order to do so, 184 participants were assigned randomly to three knowledge domains (history, economics, and devices) and in each domain they rated their understanding of a high-desirability and a low-desirability topic following a standard IOED procedure. Results show that social desirability has an effect on the IOED magnitude and that overestimation of understanding varies among domains. Particularly, participants tend to overestimate their understanding of high desirability topics only. This effect was stronger in the historical domain.

Keywords: Illusion of explanatory depth; social desirability of knowledge; feeling of knowing; metacognition; motivated cognition.

Introduction

There is extensive evidence that people are often overconfident regarding the quality and accuracy of their knowledge (Moore & Healy, 2008; Zell & Krizan, 2014). This metacognitive bias has been consistently found in the context of tasks as diverse as recalling memorized information (e.g., Koriat, Lichtenstein, & Fischhoff, 1980), solving general-knowledge questions (e.g., Atir, Rosenzweig & Dunning, 2015), evaluating text comprehension (e.g., Jaeger & Wiley, 2015), and making consumer decisions (e.g., Alba & Hutchinson, 2000).

The discrepancy between what people think they know and what they really know seems to be more conspicuous in certain kinds of knowledge. Thus, Rozenblit and Keil (2002) found that college students are prone to overestimate their ability to explain the mechanisms of devices or natural processes, but not their understanding of facts, narratives or procedures. This "Illusion of Explanatory Depth" (IOED), have been robustly documented in recent years, both in experts and non-experts (Lawson, 2006; Fisher & Keil, 2015) as in young children (Mills & Keil, 2004). The IOED

has also been found in both physical (Lawson, 2006; Fernbach, Sloman, St. Louis & Shube, 2013; Fisher & Keil, 2015) and social mechanisms (Alter, Oppenheimer & Zemla, 2010; Fernbach, Rogers, Fox & Sloman, 2013). These previous works have focused on demonstrating how pervasive is the IOED in different domains of knowledge and on searching for conceptual properties of objects/topics associated to different degrees of this phenomenon. However, when people evaluate how much they know about a particular topic, it is still possible they do not just keep in mind what they do know, but also the representation of what they *should* know. This representation can be inferred explicitly or implicitly from contextual and motivational cues, such as the perceived social desirability of knowledge. In the following sections, we review some empirical results from research both on IOED and metamemory that are consistent with this interpretation.

IOED and Social Desirability of Knowledge

Fisher and Keil (2015) investigate whether expertise in a given domain of knowledge is associated to a more accurate self-evaluation of the understanding of objects and processes. In order to do so, they distinguish between passive and formal expertise; passive expertise refers to knowledge coming from the "exposure through life experience and the position one occupies in a society or culture" (p.1251; e.g., specific knowledge or skills culturally associated to gender or age), whereas formal expertise is the final outcome of systematic, continued and deliberate training in a specific domain with definite milestones (e.g., academic degrees). Fisher and Keil found that participants with less formal expertise (e.g., with no college major) overestimated more their understanding of topics related to their passive expertise than they did regarding their understanding of other topics. This difference was not replicated in the group with more formal expertise. In this group, participants overestimated their understanding of topics related to their area of formal expertise more than of other topics. These results suggest that people tend to overestimate their ability to explain topics related to their area of expertise. In the case of people with formal education, it happens with topics related to their formal expertise; in the case of people with no formal training, it happens with topics related to their passive one. In both cases, a critical factor affecting the IOED magnitude

seems to be the participants' beliefs about how much they should know about certain topics because of his or her type of expertise, regardless of how that knowledge was acquired.

In the same vein, Fisher and Keil (2014) asked their participants to write their arguments supporting their position about controversial topics. Before and after this task, they were asked to evaluate how well they could support their own positions. Additionally, participants judged how important the topics were for them. Using an experimental paradigm quite similar to that of the IOED research, they found evidence of an "Illusion of Argumentative Justification" (IAJ): participants' ratings of their ability to support their point of view decreased after writing their arguments. Importantly, caring for each topic was positively associated with both previous and posterior evaluations of the ability to rationally justify their own position, and this pattern was not replicated when arguments were rated by a different group of participants. In short, IAJ seems to be stronger in topics that matter to participants.

In apparent contradiction with these more recent findings, Rozenblit and Keil (2002, study 11) reported that perceived social desirability of explanations was not associated with the magnitude of overconfidence in any domain of knowledge (facts, procedures, narratives, or explanations). They even claim that "if anything, high desirability may cause people to more carefully assess their self-knowledge in a domain and, therefore, be more accurate." (p. 547). However, at least one important difference between Rozenblit and Keil (2002) and Fisher and Keil (2014) studies can account for this discrepancy: whereas Rozenblit and Keil compare differences in overconfidence between *kinds* of knowledge (e.g., facts, procedures, narratives, and explanations), Fisher and Keil contrast the IAJ magnitude between topics with different degrees of personal significance, within a same kind of knowledge (e.g., arguments). From a methodological point of view, comparing between kinds of knowledge could be not the optimal strategy to establish whether social desirability and IOED are related, as far as the latter is a phenomenon essentially linked to explanations. In this context, comparing the IOED magnitude between more or less socially desirable topics or explanatory domains might be more informative than contrasting the effect of social desirability between explanations and other kinds of knowledge (e.g., arguments). Exploring this alternative is the main purpose of this study.

The influence of social cues in the process of knowledge self-assessment is not an exclusive finding of the IOED paradigm. In the next section, we review some evidence from metamemory research suggesting the inferential nature of such process, and identifying a number of contextual factors affecting perceptions about how likely some specific content is to be recalled from memory.

Social Desirability and the Feeling of Knowing

The research on metacognitive judgments in memory tasks has inquired about the sources of information people use to infer whether a particular content can be learned or recalled. Specifically, the "feeling of knowing" (FOK) has been extensively investigated. In general, this feeling is experienced by an individual when he or she thinks to have certain items stored in memory and the ability to recall or recognize them in the future, even when they cannot do it at the present (Hart, 1965).

In order to elucidate the metacognitive mechanism underlying to FOK, researchers have explored factors associated to the accuracy of these judgments. Consistently, it has been found that FOK is not the output of a unique mechanism. Instead, diverse factors can affect the metacognitive processes driving to it, depending on both recovery timing and task restrictions (for review, see Thomas, Lee & Hughes, 2016). For example, whereas perceived familiarity with items can increase the FOK before the recall phase, related information accessibility has a major role when recalling is not successful (Koriat & Levy-Sadot, 2001). These findings support the hypothesis that the FOK mechanism is not an encapsulated direct-access module (Hart, 1965), but the result from multiple inferential processes, working with information derived from cues previously or simultaneously generated along with the recall process (Thomas et al., 2016).

Supporting this hypothesis, Costermans, Lories and Ansay, (1992, exp. 2) explore several cues related to the magnitude of FOK judgments. In particular, they find that confidence is a better predictor of answers accuracy than FOK. Interestingly, both question familiarity and the estimated amount of people knowing the correct answer were positively associated with the FOK magnitude. In the same vein, De Carvalho and Yuzawa (2001) report that the FOK magnitude in college students with low levels of metacognitive ability increases when they are provided with information about fictitious students having high performances in a similar task and, correspondingly, diminishes it when these fictitious performances were presented as low. These results are compatible with the Self Consistency Model of Subjective Confidence (SCM; Koriat, 2012), which postulates that correlation between confidence and accuracy in FOK judgments is positive when people agree on the correct answer. In contrast, the confidence-accuracy correlation is negative when there is a similar level of consensus about an answer that is ultimately wrong. Once again, these results confirm that FOK is not directly computed, but inferred from internal cues such as familiarity, processing fluency, and the perceived distribution of knowledge in the population.

Although the effect of social desirability of knowing the correct answer has not been directly tested on the FOK paradigm, there are reasons to think it might well be an informative cue about how likely a content in memory is to be recalled (Gruneberg, Monks & Sykes, 1977). In a related area of research, Soderstrom and McCabe (2011) found that

college students judge that they will be more able to learn items whose successful recall is better rewarded in the experimental setting. In the same vein, the predicted grades of college students in a course exam are biased by their desired level of performance (Serra & Demarree, 2016).

On the other hand, though experimental paradigms of FOK differ from IOED in that they had used pieces of non-explanatory knowledge (e.g., historical events, dates, names, places, etc.), this fact does not rule out the possibility that both IOED and FOK engage analogous or common metacognitive mechanisms. If that is the case, factors related to the FOK magnitude might be responsible of differences in the IOED magnitude between topics and domains. Examining the influence of inferential cues such as social desirability on the IOED will allow us to identify the conditions that lead to the overestimation of the explanatory knowledge about a certain topic. In turn, this information would be useful in creating cognitive strategies to help people to re-calibrate their understanding and monitoring their own learning processes of specific contents in more accurate and effective ways (Dunlosky & Thiede, 2013). In this context, the aim of this study is to determine whether social desirability of knowledge is used by participants as an informative cue when they are assessing their understanding of mechanisms in different domains of explanatory knowledge.

Method

The experiment has two goals: First, we intend to establish whether social desirability of knowledge about a specific topic predicts the IOED magnitude. Second, we want to know whether the relationship between IOED magnitude and social desirability differs among explanatory domains (e.g., historical, economic, and devices).

Participants
In this study participated one hundred and eighty-four students from a large research university (88 women) attending different undergraduate programs, with ages ranging from 18 to 42 years ($M = 20.7$, $SD = 2.04$). Most of them received academic extra-credit for their participation in this study.

Design
A mixed experimental design, 3x2x2, was used, with explanatory domain (historical, economic and devices) as the between-subjects factor, and social desirability of topics (high and low), and pre-post measures as within-subjects factors. The dependent variable was the IOED magnitude, measured as the rating of understanding of each topic.

Materials and Procedure
The same procedure used by Rozenblit and Keil (2002, study 11) was used to select high and low desirability topics for each domain. In a preliminary study, one hundred and ninety-four participants (117 women) evaluated the

perceived social desirability of knowledge about 21 topics (seven in each domain). Specifically, they reported how embarrassed they would feel if they did not have a good understanding on each topic in a 7-point scale, ranging from 1 ("If someone asked me to explain this topic and I had a poor understanding of that item, I would not feel embarrassed at all") to 7 ("If someone asked me to explain this topic and I had a poor understanding of that item, I would feel very embarrassed"). Six items -the two topics showing greater difference in the desirability scale within each domain- were selected for the main study (see Table 1).

Table 1: Means of social desirability of each topic in the preliminary study

Domain	Topic	M	SE	95% CI Lower bound	95% CI Upper bound
Historical	Long duration of the Colombian armed conflict	5.02[a]	.135	4.76	5.29
	Creation of the FARC-EP guerilla	4.58[b]	.132	4.32	4.84
Economic	Why inflation rises in Colombia	4.37[b]	.133	4.11	4.63
	How the stock market works	3.65[c]	.128	3.39	3.90
Devices	How a fishing rod works	3.40[c]	.151	3.10	3.70
	How a jet engine works	2.43[d]	.130	2.18	2.69

Note: M = mean; SE = standard error; CI = Confidence interval; Means marked with different letters differed significantly from each other ($p < .01$)

In an isolated and noise-free room, participants did the experimental task at their own pace in individual cubicles. For task presentation and response recording, the Qualtrics web-based survey software was used. During the session, it was verified that participants did not check other websites. After registering their demographic information, participants completed an instructional manipulation check (Oppenheimer, Meyvis & Davidenko, 2009) to ensure the careful reading of the instructions. The following phases were aligned with the IOED experimental paradigm: initially, participants evaluated their knowledge about twelve topics (six of which were not part of the design), using a 7-point scale, with 1 meaning "vague or poor understanding" and 7 "detailed and fine-grained

understanding". The instructions to use this rating scale were adapted from Rozenblit and Keil (2002) and Fernbach, Rogers, et al. (2013). Next, participants were randomly assigned to one of the three domains (historical, economic, and devices), and they were asked to explain in a step-by-step way the causal mechanism of one of the object/topic in this domain (explanation phase). In particular, they were provided with the following instruction:

"We want to know your explanation of some topics. The aim of this explanation is to show clearly how each step causes the next one, placing them in a sequence from the emergence of the causes until the moment when the phenomenon occurs. In other words, try to tell a story as complete as you can (with no plot holes) that might be understood by anyone."

When the explanation was completed, participants evaluated again their understanding of the object/topic they had previously explained (post-evaluation phase). The sequence explanation-post evaluation was then repeated for the second object/topic. The presentation order of high and low desirability topics within each domain was randomly assigned.

Results

A mixed ANOVA was conducted as the main analysis, with judgment timing (pre and post explanation) and perceived social desirability of knowledge on the topic (high and low) as within-subject factors, and both domain of knowledge and presentation order as the between-subjects factors. The dependent variable was the rating in the 7-point understanding scale.

Replicating the IOED phenomenon, a main effect of evaluation time was found. Ratings of understanding before the elaboration of explanations ($M = 3.42$, $SE = .105$) were higher than those produced after explanations ($M = 2.81$, $SE= .10$), $F (1, 178) = 52.43$, $p < .001$, $\eta^2_p = .23$. Additionally, there was a significant interaction between judgment timing and domain of knowledge, $F (2, 178) = 3.33$, $p < .05$, $\eta^2_p = .03$. *Post hoc* analysis (Tukey's HSD) revealed that the decrease of understanding ratings was higher for the historical domain, $p < .01$ (see Table 2).

Additionally, social desirability of knowledge interacted with judgment timing, $F (2, 178) = 56.27$, $p < .001$, $\eta^2_p=.24$. In particular, it was found a decrease on understanding ratings between judgments before and after the elaboration of explanations, only for high desirability topics (see Figure 1).

It was also found a marginally significant three-way interaction between judgment timing, social desirability and domain of knowledge, $F (2, 178) = 3.06$, $p = .049$, $\eta^2_p = .03$. Specifically, the reduction of understanding after generating explanations in low social desirability topics is slightly greater in the historical domain (why FARC-EP guerrilla was created), than both in devices (how a jet engine works) and economic topics (how stock markets work; see Figures 2 and 3).

Table 2: Means of understanding in each domain of knowledge by judgment timing.

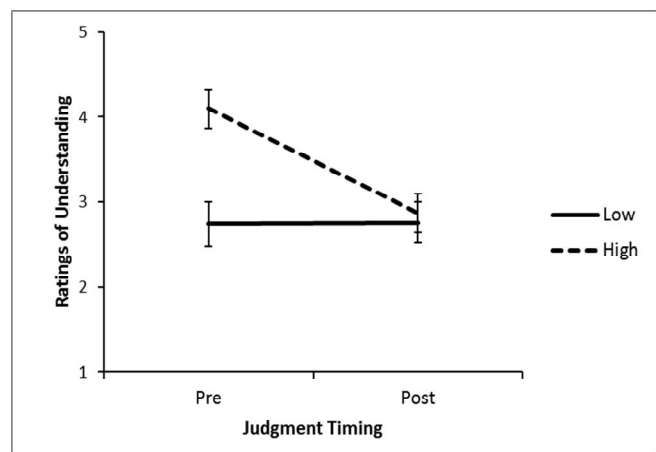| Domain	Time	M (SE)	95% CI Lower bound	95% CI Upper bound
Historical	Pre	4.20 (.182) **	3.84	4.56
	Post	3.35 (.171) **	3.01	3.68
Economic	Pre	2.90 (.182)	2.54	3.26
	Post	2.26 (.171)	1.92	2.59
Devices	Pre	3.16 (.185)	2.79	3.52
	Post	2.83 (.174)	2.48	3.17

** $p < .01$

Figure 1. Means of understanding in high and low social desirability topics by judgment timing. Bars represent 95% confidence intervals.
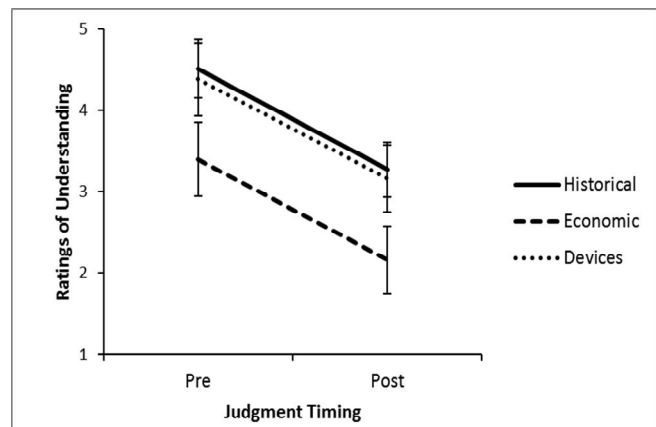

Figure 2. Means of understanding in each domain on high social desirability topics) by judgment timing. Bars represent 95% confidence intervals.
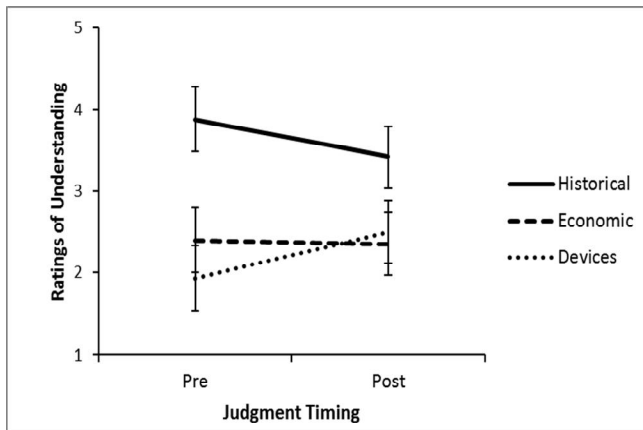
Figure 3. Means of understanding in each domain on low social desirability topics by judgment timing. Bars represent 95% confidence intervals.

Finally, there was a robust and unexpected three-way interaction between judgment timing, social desirability, and topic order, $F(2, 178) = 31.03$, $p < .001$, $\eta^2_p = .14$. Particularly, when low social desirability topics were evaluated first, the understanding ratings for the second (high desirability) topic showed a lower IOED ($M_{pre} = 3.85$, $SE=.186$; $M_{post} = 3.05$, $SE=.171$) than when high desirability topics were evaluated first ($M_{pre}= 4.35$, $SE=.187$; $M_{post}=2.68$, $SE=.172$)

Discussion

In the present study, we examined the relationship between IOED magnitude and social desirability of knowledge about specific topics in three different domains. Our results show that people overestimate their knowledge about causal mechanisms related to physical devices, as well as to economic and historical phenomena. Furthermore, the IOED seems to be stronger in the historical domain and that difference might be related to the higher social desirability of this domain.

Within each domain, the IOED was exhibited for the highly desirable but not for the less desirable topics. This finding confirms that perceived social desirability of knowledge is a relevant cue in the processes of knowledge self-assessment, as it is suggested by previous research on metamemory judgments. It is possible however that other factors like familiarity, accessibility or perceived distribution of information about topics play a role moderating the IOED effect. This could explain, for instance, why the initial understanding of unfamiliar and non-accessible topics (like the low desirability topic in the domain of devices) could be underrated rather than overrated. In this vein, future studies should separate the effect of social desirability from that of potential confounds as far as possible. Even if the influence of other informative cues is demonstrated, it would support the idea that the IOED is not only a consequence of the coarseness of intuitive theories (Rozenblit & Keil, 2002), but also a by-

product of the inferential nature of metacognitive mechanisms. In other words, people overestimate their ability to explain objects and phenomena because they use multiple cues to assess how well they know them (including social desirability of that knowledge), and not only because they confuse their skeletal understanding with full-detailed representations of mechanistic knowledge.

Fernbach, Rogers, et al. (2013) found that the IOED magnitude correlated positively with the moderation of extreme political attitudes on controversial issues. Accordingly, if the social desirability of knowledge about a political issue enhances the related IOED, it is possible that extreme attitudes about more desirable topics to be also more likely to be moderated after trying to explain them. However, if an individual holds an extreme position about a socially relevant topic (e.g., abortion, gay marriage, gun control, etc.) and this position is relevant to his or her identity, previous evidence suggests that he or she will engage in a form of ideologically motivated cognition, making the related attitude more resistant to change (Kahan 2013). Eventually, this motivational bias could affect the metacognitive processes involved on the IOED. Thus, in some cases, social desirability of knowledge and motivated cognition could influence the IOED magnitude in opposed directions, depending on the personal relevance of topics related to extreme political attitudes. Testing empirically this potential interaction would shed light on the motivational mechanisms involved in the self-assessment of explanatory knowledge. This is important not only in theoretical terms, but also in applied situations like the decision making on complex policies in core political moments (e.g., Brexit referendum or Colombia's peace plebiscite).

Finding that highly desirable knowledge about relevant topics is more likely to be overestimated is not encouraging for deliberative democracies. However, our results suggest that asking participants to explain less desirable topics first can make them less willing to re-calibrate their initial ratings of knowledge about highly desirable topics. Further studies manipulating social desirability of topics between- rather than within-subjects- would be useful to determine whether previous exposure to low IOED magnitudes can improve the accuracy of understanding estimation about socially desirable topics.

Our purpose in this paper is to bring together the FOK and IOED literatures in order to identify social desirability as an inferential cue in the process of understanding self-assessment. Exploring other interactions between cognitive, motivational and pragmatic factors in metacognitive processes can provide us with a more comprehensive picture of how we know that we know. Although social desirability cannot be randomly assigned, this study shows how it relates to the IEOD in natural settings. Separating social desirability from other factors might be impossible in natural settings and non-ecological in experimental ones. To give an extreme example, separating social desirability from social relevance be done if the former depends intrinsically

of the latter. So we consider that the manipulation here exposed is enough for to establish the relationship between both variables. Further experimental research is required to check if the relationship stands in experimental environments.

Acknowledgments

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