Journal of Experimental Psychology: Learning, Memory, and Cognition

In a Year, Memory Will Benefit From Learning, Tomorrow It Won't: Distance and Construal Level Effects on the Basis of Metamemory Judgments

Vered Halamish, Ravit Nussinson, and Liat Ben-Ari

RESEARCH REPORT

In a Year, Memory Will Benefit From Learning, Tomorrow It Won't: Distance and Construal Level Effects on the Basis of Metamemory Judgments

Vered Halamish
University of Haifa

Ravit Nussinson and Liat Ben-Ari
The Open University of Israel

Metamemory judgments may rely on 2 bases of information: subjective experience and abstract theories about memory. On the basis of construal level theory, we predicted that psychological distance and construal level (i.e., concrete vs. abstract thinking) would have a qualitative impact on the relative reliance on these 2 bases: When considering learning from proximity or under a low-construal mindset, learners would rely more heavily on their experience, whereas when considering learning from a distance or under a high-construal mindset, they would rely more heavily on their abstract theories. Consistent with this prediction, results of 2 experiments revealed that temporal distance (Experiment 1) and construal level (Experiment 2) affected the stability bias—the failure to predict the benefits of learning. When considering learning from proximity or using a low-construal mindset, participants relied less heavily on their theory regarding the benefits of learning and were therefore insensitive to future learning. However, when considering learning from temporal distance or using a high-construal mindset, participants relied more heavily on their theory and were therefore better able to predict the benefits of future learning, thus overcoming the stability bias.

Keywords: metamemory, metacognition, construal level theory, stability bias, ease of processing

To self-regulate one's learning effectively, learners should make the right decisions about what materials to study, how to study, and how much to study. To do so, they should be able to accurately monitor their current state of knowledge (e.g., Am I ready for the test tomorrow?). They should also understand and take into account the impact that different actions or conditions will have on their future learning (e.g., Will I be ready if I study the material one more time?). How do learners assess their chance to remember studied information?

Much like when making other types of judgments, learners may rely on two sources of information to assess their memory: subjective experience (i.e., the ease with which they learn the material) and their abstract theories about memory and how it works. Research has suggested that learners commonly rely more heavily on subjective experience to assess memory (Koriat, 1997) and tend to underweight their own relevant and sometimes valid abstract

theories (e.g., Kornell, Rhodes, Castel, & Tauber, 2011). The degree to which judgments rely on subjective experience versus on theory often has implications for metamemory accuracy and hence for the effectiveness of self-regulated learning. It is therefore important to understand *when* learners rely more heavily on their experience versus on their theories in order to assess their memory.

The aim of the current research was to examine the conditions under which learners would tend to rely on their experience versus on their theories when assessing their memory. To preview, we suggest that psychological distance and level of construal (i.e., concrete vs. abstract thinking; Trope & Liberman, 2010) differentially affect the relative reliance on experience versus on theory as a basis for metamemory judgments.

The Dual Basis of Metamemory Judgments

A large number of studies have examined learners' metamemory during learning. In a typical experiment, after studying some material (usually word pairs), participants are asked to provide judgments of learning, that is, to predict the likelihood that they will remember the studied material on a future test (e.g., Koriat, 1997). Using this paradigm, studies have repeatedly documented dissociations between actual and assessed memory (e.g., Begg, Duft, Lalonde, Melnick, & Sanvito, 1989; Simon & Bjork, 2001). For example, font size of to-be-recalled words was found to affect predicted but not actual memory (Rhodes & Castel, 2008), whereas upside down inversion of to-be-recalled words was found to affect actual but not predicted memory (Sungkhasettee, Friedman, & Castel, 2011).

Vered Halamish, Department of Psychology, University of Haifa, Haifa, Israel; Ravit Nussinson and Liat Ben-Ari, Department of Psychology, The Open University of Israel, Raanana, Israel.

Correspondence concerning this article should be addressed to Vered Halamish, Department of Psychology, University of Haifa, Haifa 31905, Israel. E-mail: halamish@research.haifa.ac.il

These dissociations have been taken to suggest that people do not have direct access to memory traces. Rather, most researchers subscribe to the view that memory predictions are based on inferences from a variety of cues that may or may not be valid in predicting memory (Benjamin & Bjork, 1996). What cues do people use to assess their memory?

According to Koriat's influential cue-utilization theory (Kelley & Jacoby, 1996; Koriat, 1997, 2007), metamemory judgments have a dual basis, relying both on theory and on experience as cues. *Theory-based processes* reflect the use of theories or beliefs about memory to reach an estimate of learning. These theories may refer to the a priori difficulty of the material studied, to the conditions of learning and the learning strategies applied by the learner, or to perceived self-efficacy. In *experience-based processes*, in contrast, people lean on the subjective feelings that accompany learning. The literature suggests that metamemory judgments rely predominately on experience-based processes and, more specifically, on the subjective experience of ease of processing: Information that is easier to encode is assessed as more likely to be remembered (Kelley & Rhodes, 2002; Koriat, 2008; Kornell et al., 2011).

For example, in a pioneering work by Koriat, Bjork, Sheffer, and Bar (2004), participants' memory predictions were shown to be insensitive to the expected retention interval (10 min, 1 day, 1 week, 1 month, or 1 year), though participants probably believed that memory declines over time. Koriat et al. argued that this insensitivity is the product of a default reliance on the experienced ease of processing during learning—which clearly does not reflect the effect of the future retention interval. Indeed, participants were perfectly sensitive in predicting better memory for easy than difficult items. Koriat et al. have hypothesized further that participants hold an accurate theory about forgetting over time and that eliciting theory-based processes would result in accurate metamemory predictions. Consistent with this prediction, when this theory was activated by asking each participant to make predictions for several different retention intervals, or by asking specifically about forgetting rather than about remembering (but see Serra & England, in press), participants did predict forgetting over time.

The results of Koriat et al. (2004) are in line with other research in social and cognitive psychology suggesting that the prevailing mode of construing a judgment is to rely heuristically on subjective experience (Jacoby & Kelley, 1987; Nussinson & Koriat, 2008; Strack, 1992). These results further suggest that when a relevant theory is activated by an external factor (i.e., the experimental manipulation), people may rely more heavily on theory-based processes and less heavily on experience-based processes to construe their metamemory judgments. Little is known, however, about the conditions under which people spontaneously rely more heavily on theory-based versus experience-based processes. The current research was targeted at filling this gap, capitalizing on lessons from construal level theory (CLT).

Distance and Construal Level Effects on the Basis of Metamemory Judgments: Experience Tomorrow, Theory in a Year

People can directly experience only the here and now. They can nevertheless think about distal entities (e.g., remember the past,

understand other people's point of view) by forming abstract mental construals. According to CLT (Trope & Liberman, 2010), as the psychological (i.e., temporal, spatial, social, hypothetical) distance from an object increases, people use increasingly more abstract, schematic, and decontextualized representations (i.e., high-construal level), and increasingly less concrete, detailed, and contextualized representations (i.e., low-construal level). In one study, for example, when describing a future activity (e.g., studying), people used higher level terms (e.g., "doing well in school") when considering that activity in the distant future (in a year) and lower level terms (e.g., "reading a textbook") when considering that activity in the near future (tomorrow) (Liberman & Trope, 1998).

On the basis of CLT, we assume that psychological distance and level of construal qualitatively affect the basis for metamemory judgments. Experiences are the immediate, ongoing perceptions of processes in the here and now. When considering learning from a distance (e.g., when thinking about learning in a year), people are better able to detach from their immediate experience than when considering learning from proximity (e.g., when thinking about learning tomorrow). Therefore, they rely less heavily on ease of processing as a cue to assess future memory performance (cf. Alter & Oppenheimer, 2008). Furthermore, we assume that when considering learning from a distance, people are more sensitive to higher level abstract information, and hence are more sensitive to their relevant abstract knowledge about memory than when considering learning from proximity (Johnson, Smeesters, & Wheeler, 2012; Liberman, Trope, & Rim, 2011; Nussbaum, Liberman, & Trope, 2006). They should therefore rely more heavily on theory-based processes to assess future memory performance. Metamemory predictions are therefore expected to be relatively more experience-based from proximity, and more theory-based from a distance. If, as we assume, these effects are mediated by construal level, then a similar pattern is expected when construal level is manipulated directly.

On the basis of a different rationale, Tsai and Thomas (2011) have recently made a somewhat related claim. They have focused on a subjective experience that is evoked by factors that are incidental (irrelevant) for the judged property. They presented participants with an advertisement for a chocolate brand in either a clear or an unclear font, and then asked them to judge how much they desire the chocolate. In this case, the ease or difficulty of processing that is evoked by the font clarity is only incidental to the judgment, whereas the content of the ad is central to it. Tsai and Thomas have predicted that under a high-construal mindset, people focus on the big picture (cf. Liberman & Förster, 2009), and are therefore better able to distinguish between central and incidental information. In contrast, under a low-construal mindset, people focus on the details and are therefore unable to distinguish between central and incidental information. They therefore predicted that judgments would rely on the incidental ease of processing created by the font clarity manipulation under a low-construal mindset, but not under a high-construal mindset. Indeed, their results supported this prediction.

Sometimes, however, subjective experience is more central to the judgment than it is incidental to it. Certainly, in the context of judgments of learning, the difficulty of the studied material creates an experience of ease or difficulty of learning that is predictive of subsequent memory (e.g., Koriat, 1997). Importantly, even when

subjective experience is predictive of future memory, theory-based factors that do not express themselves in subjective experience (e.g., retention interval) can be predictive as well. Our rationale suggests that even when both bases provide central information, psychological distance and construal level will affect the relative reliance on experience versus theory.

In the current research, we examined the effect of distance and construal level on the basis of metamemory judgments. Of most interest for this aim are cases in which relying more or less heavily on an abstract theory results in accurate versus inaccurate metamemory judgments. The failure to predict the benefits of future learning serves as such a case study.

The Failure to Predict the Benefits of Future Learning

It is universally recognized that studying enhances learning. Reading material twice when studying results in better memory for this material than reading it once (Ebbinghaus, 1885/1964). Recent studies, however, suggest that learners fail to appreciate the benefits of future learning (Kornell, 2011; Kornell & Bjork, 2009; Kornell et al., 2011). In a typical experiment, participants studied a list of word pairs one to four times (manipulated either between or within participants) for a subsequent memory test. During learning, they were asked to predict their performance on the test on an item-by-item basis given that they would have zero to three additional study opportunities. Surprisingly, predictions did not increase with the number of expected repetitions, whereas actual recall obviously did. Similar results were obtained when participants only read a description of the basic experiment and the list of word pairs and were asked to make a single aggregated judgment as to how they would perform on the test if they would participate in such an experiment (Kornell & Bjork, 2009, Experiments 3–4). This tendency of participants to predict that memory would be stable regardless of the amount of future learning (and regardless of the retention interval; Koriat et al., 2004) has been termed by Kornell and Bjork the "stability bias."

Why do learners underappreciate the benefits of future learning when predicting subsequent memory performance? It is reasonable to assume that people hold the accurate belief that learning enhances memory. Kornell and colleagues (2011, Experiment 3) provided strong evidence that this is indeed the case. Nevertheless, people fail to predict the benefits of learning because they base their predictions more on their experience of ease of processing (Kornell & Bjork, 2009; Kornell et al., 2011 cf. Begg et al., 1989; Koriat, 2008) than on their theory. Indeed, participants were perfectly accurate in predicting the memory benefit for easy-to-process items over difficult-to-process items. Obviously, however, the amount of *future* learning does not affect the experienced ease of processing during learning. If, however, participants were led to rely more heavily on their (accurate) theory and less on their experience, their metamemory judgments should be more sensitive to the benefits of learning.

The Current Research

The current research was designed to examine the hypothesis that when considering learning from proximity, or under a low-construal mindset, learners would be more inclined to base their metamemory judgments on their experienced ease of processing

and therefore would be insensitive to the amount of future learning, replicating previous results. In contrast, when considering learning from a distance, or under a high-construal mindset, learners would be more inclined to base their metamemory judgments on their theory regarding the benefits of learning, and therefore would be more sensitive to the amount of future learning.

In two experiments, we manipulated temporal distance (Experiment 1) or construal level (Experiment 2) and solicited metamemory predictions. The general procedure followed that of Kornell and Bjork (2009, Experiments 3–4). Participants read a list of easy and difficult word pairs and were asked to imagine that they would participate in an experiment in which they need to study that list for a subsequent memory test. Half the participants were asked to imagine that they would study the list once, whereas the other half were asked to imagine that they would study the list four times. Participants were then asked to estimate how many word pairs they would remember on the test if they were to participate in such an experiment.[1]

Experiment 1

In Experiment 1, we manipulated temporal distance from the to-be-imagined experience, a highly researched aspect of psychological distance. Half the participants were asked to imagine that they participate in the described experiment (including a study phase, 5-min break, and a test phase) tomorrow (near condition), whereas the other half were asked to imagine that they participate in the experiment in a year (distant condition).

Method

Participants and design. Participants were 60 undergraduates from the Open University of Israel. The design was a 2 (number of study cycles, one vs. four) × 2 (temporal distance, near vs. distant) between-participants design, and participants were randomly assigned to the different conditions.

Materials. A list of 12 easy and 12 difficult word pairs was constructed. Easy pairs (e.g., *kite–wind*) were weakly related word pairs taken from Bergerbest and Goshen-Gottstein (2005), with a forward associative strength of .06 (i.e., the percentage of people providing the target as their first association to the cue was 6%). Difficult pairs (e.g., *layer–proverb*) were based on a random pairing of unrelated words selected from Drori and Henik (2005), with concreteness scores between 1 and 4 (on a 1–7 scale). Mean number of letters for cues and targets was equated between easy and difficult pairs.

Procedure. Participants were asked to read and imagine the following scenario. In the near/four study cycles condition, it read:

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[1] In line with the rich literature on the benefits of repetitions for memory, when actually conducting the experiment that we asked our participants to imagine, Kornell and Bjork (2009, Experiment 2) have obtained a significant benefit of repetitions on memory. Data extracted from their Figure 2 show that in that experiment, when comparing recall rates for one versus four study cycles, recall rates increased from just under 10% to over 45% for difficult items, and from just under 80% to around 90% for easy items. We have replicated these results in our lab, using the same materials used in the experiments reported here (Hebrew word pairs): When comparing recall rates for one versus four study cycles, recall rates increased from 50% to 70% for difficult items and from 75% to 96% for easy items. Detailed method and results are available from the authors upon request.

Imagine that **tomorrow,** you are about to participate in a memory experiment. In this experiment, you will be asked to study the following 24 word pairs for a later memory test. Please read the list of pairs.

The full list of pairs, randomly intermixed, appeared below. The text then continued:

> In the study phase of the experiment, the pairs will be presented one by one on a computer screen for 3 sec each. The study phase will repeat itself 4 times. Five min after the study phase, the test phase will begin. In the test, you will see the first words from the pairs one by one and will be asked to recall the second words. Therefore, the structure of the experiment will be: study – study – study – study – (5 min break) – test. We ask you to estimate how many of the 24 word pairs you will be able to recall in the test. Please complete: In the experiment (study – study – study – study – 5 min break – test) that will take place tomorrow, I estimate that I will recall ___ out of the 24 word pairs in the list.

In the near/one study cycle condition, the sentence "The study phase will repeat itself four times" was omitted, and the structure of the experiment was presented as "study – (5 min break) – test." In the respective distant conditions, the word *tomorrow* was replaced with the phrase "in a year from today."

Results and Discussion

Results are depicted in Figure 1. As expected, the data yielded a significant interaction between the number of study cycles and temporal distance, $F(1, 56) = 4.84$, $MSE = 17.16$, $p = .032$, $\eta_p^2 = .08$. Results for the near condition replicated those of Kornell and Bjork (2009), yielding a stability bias: Predictions for the one-cycle condition (9.72) and for the four-cycles condition (8.73) did not differ significantly, $t(30) = -0.70$, $p = .506$. For the distant condition, however, predictions were significantly higher for the four-cycles condition (11.79) than for the one-cycle condition (8.04), $t(26) = 2.27$, $p = .033$, $\eta^2 = .17$. As hypothesized, increasing the distance from the predicted outcome (and thus presumably increasing the level of construal) resulted in a tendency to rely more heavily on theory-based processes, as reflected
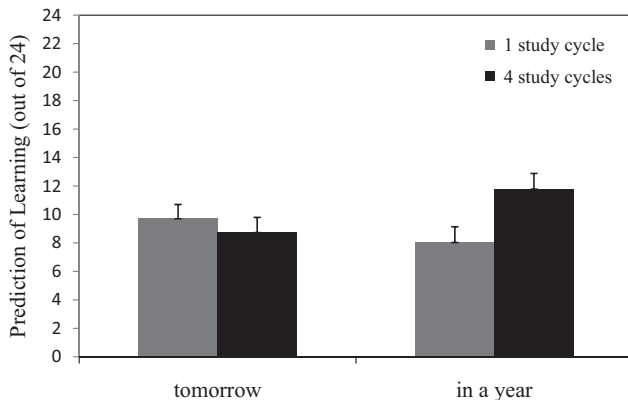
Figure 1. Results from Experiment 1: predicted recall by temporal distance and number of study cycles. Error bars represent 1 standard error of the mean.

in the greater sensitivity to the number of expected learning opportunities.

Experiment 2

We have assumed that the effect of distance observed in Experiment 1 was mediated by changes in the level of construal used by participants. If so, a direct manipulation of construal level should yield similar results. We examined this prediction in Experiment 2. For this aim, we manipulated construal level directly by inducing a mindset that is associated with high or low construal (Freitas, Gollwitzer, & Trope, 2004). Half the participants were procedurally primed to use a high level of construal by considering *why* they engage in certain actions (abstracting the superordinate considerations of implementing a behavior), whereas the other half were procedurally primed to use a low level of construal by considering *how* they engage in certain actions (specifying the subordinate considerations of implementing a behavior).

Method

Participants, design, and materials. Participants were 84 undergraduates from the Open University of Israel. The design was a 2 (number of study cycles, one vs. four) × 2 (construal level, low vs. high) between-participants design, and participants were randomly assigned to the different conditions. Materials were identical to those used in Experiment 1.

Procedure. Participants were informed that they are participating in a research on information processing and were asked to complete several tasks.

First, participants completed a construal level priming manipulation developed by Freitas et al. (2004) that we labeled *activities analysis*. Participants in the high-construal level condition were presented with the question: Why do we do the things we do? They were presented with four activities (engage in volunteer work, save money, get more rest, study for an exam). For each activity (e.g., "to get more rest"), they were first asked to write down *why* they should engage in that activity (e.g., "to have more energy"). Then, they were asked to write down why they should engage in doing this first response (e.g., "to be able to do more things"), and do that again for their second response (e.g., "to feel more satisfied"), providing in total three successive responses for each of the four activities. Participants assigned to the low-construal level condition were presented with the question: How do we do the things we do? with the same four activities as above. The task was similar to that of the high-construal level condition, except that participants were asked to analyze and write down *how* they can do each activity (or their earlier responses) (e.g., "to get more rest" followed by "to better organize the daily schedule," followed by "to make a prioritized daily to-do list," followed by "to buy a calendar").

Upon completion, participants were asked to complete a second task that was labeled *learning estimation* and essentially measured memory estimates. This task was identical to the one used in Experiment 1, except that no specific indication of when the to-be-imagined experiment would take place was included.

Results and Discussion

To check the construal level manipulation, we adopted the procedure suggested by Fujita, Trope, Liberman, and Levin-Sagi (2006; see also Sanna, Lundberg, Parks, & Chang, 2010). Two judges, blind to the assignment to condition, estimated each participants' level of construal on the basis of their responses on the construal level priming task. Responses that were evaluated as describing "why" the preceding statement should be done (i.e., responses that were evaluated as superordinate to preceding ones, e.g., "to help other people" in response to "engage in volunteer work") were coded 1; responses that were evaluated as describing "how" a preceding statement can be done (i.e., responses that were evaluated as subordinate to preceding ones, e.g., "finding a suitable volunteer work" in response to "engage in volunteer work") were coded −1; statements fitting neither criterion were coded 0. Ratings of each participant's 12 responses (across trials and items) were then summed to create an index of level of construal with a potential range of −12 to + 12; higher scores indicate higher levels of construal. The ratings by the two judges were highly correlated ($r = .738$), with interrater agreement of .72 as assessed by the kappa coefficient (i.e., "substantial agreement"; Landis & Koch, 1977), and were therefore averaged together. As expected, participants assigned to the high-construal condition ("why") generated responses that reflected much higher levels of construal (9.39) than participants assigned to the low-construal condition ("how") (−8.64), $t(82) = 36.27$, $p < .001$, suggesting that the manipulation indeed manipulated participants' level of construal.

Our main interest was in the memory predictions and whether they were affected by an interaction between the number of study cycles and construal level condition. Figure 2 suggests that, as expected, the data yielded such a significant interaction, $F(1, 80) = 5.76$, $MSE = 17.51$, $p = .019$, $\eta_p^2 = .07$. Results of the low-construal condition yielded a stability bias: Predictions for the four-cycles (9.29) and the one-cycle (10.76) conditions did not differ significantly, $t(40) = −0.99$, $p = .328$, $\eta^2 = .02$. For the high-construal condition, however, predictions were significantly higher for the four-cycles condition (11.43) than for the one-cycle condition (8.52), $t(40) = 2.75$, $p = .009$, $\eta^2 = .16$.

To validate and extend these results, we examined the interaction between construal level and number of study cycles, with
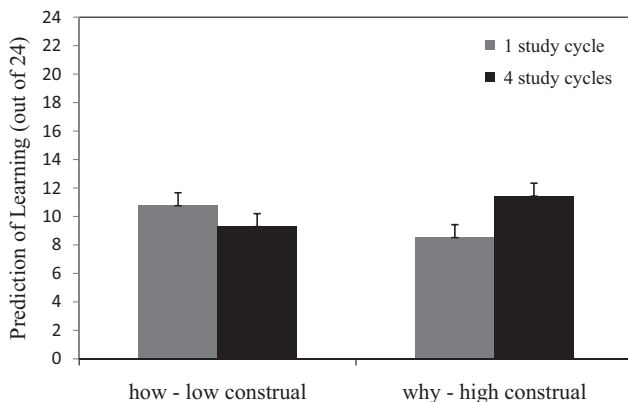

Figure 2. Results from Experiment 2: predicted recall by construal level and number of study cycles. Error bars represent 1 standard error of the mean.

construal level as a continuous variable (on a scale from −12 to +12 as evaluated by the judges, as described above) rather than as a dichotomous variable (assignment to condition). We conducted a hierarchical multiple regression analysis on participants' memory estimates with a standardized continuous level of construal[2] and number of study cycles (dummy coded, with 1 representing the four-cycles condition and 0 representing the one-cycle condition) entered on the first step, and their interaction added on a second step. As expected, this analysis yielded a significant ΔR^2 of 6% for the interaction term ($\beta = .34$, $t = 2.27$, $p = .026$).

General Discussion

On the basis of CLT, we predicted that psychological distance would have a qualitative impact on the basis of metamemory judgments. When considering learning from temporal distance (Experiment 1) or under a high-construal mindset (Experiment 2), participants were expected to rely more heavily on their theories about learning (and thus to rely relatively less heavily on their experience of ease of processing). Results of two experiments provided data that are consistent with this prediction. When considering learning from temporal proximity or under a low-construal mindset, participants failed to predict the benefits of future learning, a benefit that does not express itself in online subjective experience. However, when considering learning from a distance or under a high-construal mindset, participants did take into account the benefits of future learning, suggesting that they relied more heavily on their relevant theories (and hence relatively less on their experience).

Although the current research provided data that are in line with the prediction that psychological distance and construal level have a qualitative impact on the basis of metamemory judgments, more research is needed to further establish the mechanism underlying this effect. Specifically, in the current research we examined when participants relied more heavily on their theories by examining when judgments were sensitive to the number of future study cycles—a factor that cannot express itself in online subjective experience but about which people are known to possess a certain (in this case, accurate) theory (Kornell et al., 2011, Experiment 3). We assumed that when participants rely more heavily on this theory, they rely *relatively* less heavily on their experience. To directly examine the assumption that reliance on subject experience decreases with distance and level of construal, however, future research would have to manipulate factors that do express themselves in subjective experience and about which participants hold theories that are inconsistent with this expression. Only manipulation of such factors would allow for the examination of whether judgments are indeed more sensitive to subjective experience from proximity or under a low-construal mindset. At this time, however, more research is needed to clearly identify such factors.

Turning back to the stability bias itself, the failure to predict the benefits of future learning has detrimental consequences for self-regulated learning. As Kornell and Bjork (2009) argued,

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[2] The regression analysis yields essentially the same results when unstandardized construal level scores are used.

Every student believes that studying is useful, or they would not study. But if a student fails to apply that belief, . . . they may choose not to study because of a belief that doing so will have little effect on advancing them toward their goals. (p. 465)

Indeed, Kornell and Bjork (2008) demonstrated that when given control over when to stop relearning, students underperform (compared with a condition in which they are forced to relearn), because they choose to stop learning too early.

On a practical level, the current research suggests that by thinking about learning from a distance, or by adopting a high-construal mindset, when planning one's own learning, learners should overcome their tendency to underappreciate the benefits of future learning (Kornell & Bjork, 2009) and should hence be less inclined to stop learning too early. For example, it should be better to plan one's learning schedule while imagining that it would take place in a year rather than tomorrow. By extension to social distance, it should be better to plan one's learning schedule while taking the perspective of a stranger who reflects on how one is planning his or her studies.

Much like its remediating effect on the stability bias, psychological distance and high-construal mindset may help in remediating other metamemory failures. Importantly, however, we do not argue they would always enhance metamemory accuracy. Rather, they simply shift the basis of the judgment toward relatively more reliance on theory and less reliance on experience. Whether this change would enhance or impair metamemory accuracy in a specific situation depends on the accuracy of the relevant theory that one holds as well as on the validity of the experience as a cue to memory performance in that situation.

A dual-basis view of judgments is prevalent in other domains of cognitive psychology, beyond metacognition, as well as in social psychology (e.g., Begg, Anas, Farinacci, 1992; Jacoby, Kelley, Brown, & Jasechko, 1989; Kahneman, 2003; Kelley & Jacoby, 1996; Strack, 1992; Wänke & Bless, 2000). Usually, a distinction is made between a reliance on experience (e.g., fluency, ease of retrieval) versus a reliance on other sources of information that are considered relevant for the judgment (e.g., values, relevant content, source information). Just as they moderate the basis of metamemory judgments, psychological distance and construal level may moderate the basis of judgments in other domains.

In sum, the current research offers a new perspective on the mechanisms that underlie metamemory judgments, a perspective that capitalizes on the differences in the level in which the judged object or event is construed.

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