Making probability judgments of future product failures: The role of mental unpacking

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Abstract

When consumers mentally unpack (i.e., imagine) the reasons for product failure, their probability judgments of future product failures are higher than when no mental unpacking is undertaken. However, increasing the level of mental unpacking does not lead to monotonically increasing effects on probability judgments but results in inverted U-shaped relationships. Using a two-factor structure, we propose that when consumers undertake mental unpacking, there will be two conflicting processes; while imagining causes for an event will lead to greater perceived probability, the greater difficulty in generating reasons for an event will lead to lower perceived probability.

Keywords: Mental unpacking; Probability judgment; Product failure; Metacognition

Suppose a consumer bought a used Volkswagen car (say, a 2006 model) about six months ago. What would be the consumer’s probability judgment that this car would have some starting problems sometime in the near future (say, within the next one year)? Also, would the consumer’s probability judgment of future product failure (e.g., the car’s starting problem) be influenced by whether the consumer first thinks about some of the possible causes of the product’s failure (e.g., starting problem due to ignition, battery and electrical problems)? Using a two-factor structure, we propose that the effect of the number of causes of product failure imagined on probability judgments of future product failures is not a monotonically increasing function but instead is in an inverted U-shaped relationship. Specifically, when consumers undertake mental unpacking (that is, think about the possible causes of product failure), there will be two conflicting processes, regarding the direction of probability judgments vis-à-vis the level of mental unpacking. While imagining causes for an event will lead to higher perceived probability of that event, the greater difficulty in generating reasons for an event will lead to lower perceived probability of that event. This two-factor structure of probability judgment is discussed in further detail later. We also find that the relationship between mental unpacking and probability judgments is moderated by consumers’ need for closure, as well as their prior experience with the product. It might be noted that mental unpacking is conceptually similar to the accessibility manipulation undertaken by Schwarz et al. (e.g., Schwarz et al., 1991; Sanna & Schwarz, 2003); this issue will be discussed in further detail in a later section.

From a practical standpoint, while making product purchase or use decisions, consumers might make explicit or implicit judgments regarding potential future product failures. Through advertisements and other actions, managers and regulators potentially have the flexibility to influence what types of
information are presented to consumers, and can sometimes even provoke consumer thoughts and imagination (Forehand, Perkins, & Reed II, 2011; Hung & Wyer, 2009; Petrova & Cialdini, 2005). For instance, in several of their commercials, Allstate auto insurance reminds consumers about the different possible ways of getting into an accident (see for example, www.allstate.com/national-sponsorships/our-stand-ads.aspx, for sample AllState commercials). Similarly, in one of their print advertisements, Liberty Life Insurance asks readers to think about all the possible causes of death, and then lists all the possible causes of death that a reader might have overlooked (e.g., bicycle accidents, choking, falling from a ladder and electrocution).

From a theoretical perspective, our research contributes to the growing literature on the effects of accessibility experiences on judgments (e.g., Sanna & Schwarz, 2003; Schwarz et al., 1991). While prior studies on accessibility experiences have shown that difficulty in thought generation leads to reduced estimates regarding event outcomes, none of these studies has been conducted in the context of mental unpacking related to imagining causes of product failure. More importantly, none of these studies has examined the moderating effects of need for closure or prior experience with the product. As will be discussed in detail in the next section, we are proposing a two-factor structure for the effects of mental unpacking, and hence examining these moderators provides insight into the underlying process; prior research on accessibility experiences did not examine these moderators probably because they were not relevant for the scenarios examined.

It might be noted that the concept of mental unpacking differs from prior studies conducted in the domains of category split effects and unpacking in the context of Support theory (e.g., Fischhoff, Slovic, & Lichtenstein, 1978; Fiedler & Armbruster, 1994; Fox & Clemen, 2005; Menon, 1997; Rottenstreich & Tversky, 1997; Teigen, 1974; Tversky & Koehler, 1994). These studies used scenarios where participants were explicitly asked a series of questions pertaining to the unpacking variables. That is, in the “packed” condition, participants responded to one probability judgment question (e.g., “What is the probability of a car accident?”), and in the “unpacked” condition, participants responded to multiple questions, each representing an unpacking variable (e.g., “What is the probability of a car accident due to talking on the phone?” and “What is the probability of a car accident due to poor visibility?”). In contrast to this approach of recording participants’ responses to several unpacking questions, we employed a priming task. That is, participants were first asked to mentally generate (i.e., imagine) the unpacking variables themselves before answering the probability judgment measure. We then used a single item probability judgment measure to record participant responses. In this paper, this type of priming-based unpacking is referred to as “mental unpacking” and it can be done at different levels. For instance, when participants are asked to mentally generate four reasons for a car to have starting problems, it is referred to as a 4-level mental unpacking. Similarly, when asked to mentally generate twelve reasons for a car to have starting problems, it is referred to as a 12-level mental unpacking.

In sum, the present research focuses on consumer probability judgments of future product failures, and the related effects of mental unpacking at various levels (e.g., 4-level vs. 12-level). In Study 1, we examine the effects of mental unpacking on probability judgments of future product failure, and the underlying two-factor structure of conflicting processes. After that, in Study 2, we examine the moderating effects of consumers’ need for closure to verify a theoretical claim made in Study 1. Then in Study 3, we examine the moderating effects of consumers’ prior experience with the product on the effects of mental unpacking, and show that the key effects observed in Study 1 are reversed when a consumer has had prior negative experience with the product. Finally, in Study 4, we test additional process measures using an error correction manipulation, whereby participants are told about the effects of perceived difficulty in the mental unpacking task on probability judgments.

Background

Mental unpacking

We are proposing that when consumers undertake mental unpacking, there will be two conflicting processes regarding the direction of probability judgments vis-à-vis the level of mental unpacking. While imagining the reasons for an event will have a positive effect on perceived probability regarding the likelihood of the event, the difficulty in imagining a very high number of plausible reasons will have a negative effect on perceived probability. This two-factor process of probability judgment is discussed in further detail below.

Two-factor process of mental unpacking

With mental unpacking, when consumers are asked to mentally generate the unpacking variables (e.g., Keller & Ho, 1988), through a priming task, they should have higher probability judgments than if no such mental unpacking is undertaken. For instance, a consumer would have a higher probability judgment of a car likely to have starting problems in the future when s/he mentally generates possible reasons for a car to have starting problems (i.e., mental unpacking condition) than not going through such a priming task (i.e., packed condition). This is because going through the task of mentally generating possible reasons of product failure, and imagining the possible reasons, would more strongly remind a consumer of possible causes of product failure, than when no such priming task is undertaken (e.g., Tversky & Koehler, 1994). Hence, mental unpacking will have a positive effect on probability judgment.

However, there will also be a conflicting process regarding the effects of mental unpacking due to the greater difficulty in generating a higher number of reasons. That is, consistent with research on accessibility effects (e.g., Schwarz & Vaughn, 2002; Schwarz et al., 1991, 2007; Schwarz, Sanna, Skunik, & Yoon, 2007), we are proposing that when the generation of unpacking variables is perceived to be difficult, consumers are likely to conclude that few, if any, plausible variables exist.

Due to the conflicting processes of this two-factor structure, the effects of mental unpacking on probability judgments would depend on whether the positive effects (due to imagining the
reasons of the event) or the negative effects (due to greater difficulty in generating reasons of the event) are dominant. For instance, when asked to generate an extremely high number of reasons (say 12 reasons) for a car to have starting problems, consumers’ difficulty in generating such a high number of valid reasons would be the dominant process. Hence, due to the task difficulty and the inability to generate the required number of high reasons, consumers are likely to conclude that there are few plausible reasons for a car to have starting problems, and their probability judgment of future product failure is likely to be reduced. In contrast, when asked to generate a lower number (say four) of reasons for a car to have starting problems, consumers should be able to generate the fewer number of reasons without much difficulty; instead, the positive effects of imagining the reasons for starting problems would be the dominant process. As a result, consumers would have higher probability judgment of future product failure when asked to mentally generate a lower number of reasons.

Our propositions are consistent with work in the domain of consumer metacognition and accessibility experiences (Sanna & Schwarz, 2003; Schwarz, 2004; Schwarz et al., 2007). However, these studies did not examine a potential two-factor structure process; instead, they focused only on the negative effects on judgments due to metacognition and accessibility experiences related to task difficulty. Specifically, prior research has proposed that metacognitive experiences are informative in their own right as they can serve as a basis for judgment (Schwarz, 2004). From a metacognition perspective, when asked to generate a very high number (e.g., 12) of reasons for a car to have starting problems, consumers would realize that they are unable to generate such a high number of reasons of product failure. This in turn would make them conclude that there are relatively fewer plausible reasons for a car to have starting problems, and as a result their probability judgments of future product failure would be adversely affected. For instance, Schwarz et al. (1991) found that when participants are asked to recall examples of self-assertiveness behaviors, their self-judgments are not solely based on the content of what they recalled but also influenced by the perceived ease/difficulty of recall. For example, subjects rated themselves as more assertive when asked for six (vs. twelve) examples of assertive behavior. If judgment process was content-based only then a higher number of recalled examples would have increased subjects’ self-attributions. Instead, they found results to the contrary, whereby a higher number of recalled examples decreased self-attribution levels. They propose that their findings indicate that people not only consider what they recall but also use the experience of ease or difficulty of recall as an additional source of information. That is, ease of recall increases the judgments of frequency or probability while difficulty in recall can decrease these judgments.

In sum, in the context of the present research, if consumers are finding it difficult to mentally generate the sufficient number of unpacking variables (e.g., plausible reasons for a car to have starting problems), they are likely to conclude that there might not be enough such variables (e.g., high enough number of reasons for starting problems). Such a negative mental accessibility experience would lead consumers to have lower probability judgments of the outcome of the event (Hirt, Kardes, & Markman, 2004; Sanna & Schwarz, 2003; Schwarz, 2006; Schwarz et al., 2007). In contrast, when participants are able to mentally generate the unpacking variables without the negative effects of task difficulty, the perceived probability judgment of the outcome would be enhanced. As a result, for a very high level of mental unpacking, consumers’ probability judgments of future product failure are actually likely to be lower than for a lower level of mental unpacking. Therefore we propose:

**H1.** Consumers will have higher probability judgments of future product failure when they mentally unpack the potential reasons for product failure, but only if the mental unpacking involves generating relatively lower (vs. very high) number of reasons for product failure.

**H2.** When consumers are asked to mentally generate very high (vs. relatively lower) number of plausible reasons for product failure, probability judgments of future product failure would be lower, due to the negative effects of perceived difficulty related to the mental unpacking task.

**Study 1: Method**

The product used in Study 1 was a car, with starting problem identified as a specific product-related failure (e.g., Fischhoff et al., 1978; Fox & Clemen, 2005).

**Pretest**

A pretest (N=69) was conducted to determine the appropriate number of reasons for product failure that would be considered easy vs. difficult to mentally generate. In the pretest, participants were asked to generate all the possible reasons for a car to have starting problems. The mean response in terms of the number of reasons generated was 4.7, and practically all the participants were able to generate at least 4 reasons. Hence, in the easy-generation condition (i.e., low level of mental unpacking), participants were asked to generate 4 reasons for a car to have starting problems. The highest number of reasons generated by anyone in that pretest was 10. Hence, a 12-reason unpacking was deemed a sufficiently high number for the difficult-generation condition (i.e., high level mental unpacking). Also, based on the results of a pretest, Volkswagen was chosen as the specific brand, since it did not have floor or ceiling effects regarding its perceived performance, unlike some other makes.

**Procedure, design, and participants**

To test H1 and H2, we used a single-factor (mental unpacking: packed condition — no mental unpacking vs. 4-level mental unpacking vs. 12-level mental unpacking) between-subjects design experiment. To manipulate mental unpacking (4-level vs. 12-level), participants were given a priming task at the beginning, whereby they were asked to write down the possible reasons (4 vs. 12) for which a car might have starting problems. In the control group of the packed condition, participants did not undertake any such mental unpacking.
priming task. Sixty one university students participated in exchange for course credit (average age 22 years, 47% females).

**Dependent measures**

To measure their probability judgment of future product failure, participants were asked to state the probability on a 100-point percentile scale. They were asked: “What is the probability that a 5-year old used Volkswagen car might fail to start anytime within the next 6 months (due to any reason whatsoever)?” (0=extremely low probability and 100=extremely high probability).

As a process measure to test our theorizing that greater difficulty in generating a very high number of reasons for product failure would have a negative effect on probability judgments, participants were asked two questions regarding perceived difficulty in generating the reasons for product failure: “(1) How easy or difficult was it to generate the 4 [12] possible reasons?” (1=extremely easy and 7=extremely difficult), and “(2) Was it very difficult to list the 4 [12] possible reasons?” (1=no, not at all and 7=yes, very much). Coefficient alpha for these two measures was .92.

**Results**

In the 4-level mental unpacking condition, the average number of variables generated was 3.75, with 80% of the participants (i.e., 16 out of 20 participants) being able to generate 4 plausible reasons for car starting problems. In the 12-level condition, the average number of variables generated was 7.30, with only 5% of the participants (which equated to only 1 participant out of 20) being able to generate 12 plausible reasons for starting problems. These results are consistent with our expectations and the results of our pretest.

**Main tests**

As hypothesized, there was a main effect of mental unpacking on probability judgments of future product failure (F(2,58)=4.75, p<.05). Consistent with H1, participants in the 4-level mental unpacking condition had the highest level of probability judgment of potential future product failure (M=37.10), which was higher than for both the 12-level mental unpacking condition (M=37.10), which was higher than for both the 12-level mental unpacking condition (M=25.24, F(1,39)=6.82, p<.05) and the control group of the packed condition (M=27.85, F(1,39)=6.42, p<.05). There were no differences in the probability judgments of future product failure for the packed vs. 12-level mental unpacking conditions (F(1,39)=.46, p=.50). Fig. 1 graphically represents this phenomenon whereby probability judgment increased from the packed to the 4-level mental unpacking condition, but decreased at the 12-level mental unpacking condition.

**Process results**

H2 predicted that the effects of different levels (4 vs. 12) of mental unpacking would be mediated by the perceived difficulty in generating a high number of reasons for product failure. A Sobel (1982) test of mediation supported H2 (z=2.42, p<.05), whereby perceived difficulty in generating the reasons for product failure completely mediated the effects of mental unpacking levels on probability judgments of future product failure. Specifically, there was a main effect of mental unpacking (4-level vs. 12-level) on both probability judgment of product failure (F(1,39)=6.82, p<.05) and on the perceived difficulty of generating the reasons for product failure (F(1,39)=6.74, p<.05). Also, the results of a regression revealed a significant effect of perceived difficulty on probability judgment of product failure (F(1,39)=41.07, p<.01). Finally, when perceived difficulty was introduced as a covariate, the results of an ANCOVA showed that the effects of mental unpacking on probability judgments of product failure became non-significant (F(1,38)=1.16, p=.29). These results support H2.

**Discussion**

The results of Study 1 showed that when participants first go through a priming task of mental unpacking, by listing the probable reasons/causes of product failures, their probability judgments of future product failures are higher than when they are not required to go through any such mental unpacking. However, this result holds only when they are asked to generate four reasons of product failure, which they seem to be able to do without much difficulty; when the mental unpacking involved generating twelve reasons of product failure, a task which was seemingly difficult for almost all participants, the probability judgments of product failure was not different from when they were not asked to go through any such mental unpacking task. The results of Study 1 imply a two-factor structure of conflicting processes whereby imagining reasons for product failure led to higher probability judgments (e.g., between the packed and 4-level mental unpacking conditions); however, greater difficulty in generating a very high number of reasons for product failure led to lower probability judgments (e.g., between the 4-level and 12-level mental unpacking conditions). We further test the theoretical claims of this two-factor structure, regarding the effects of mental unpacking, in the next two studies.
Study 2: Moderating effects of need for closure

In Study 2, the moderating effects of need for closure (Kardes et al., 2007; Lalwani, 2009; Webster & Kruglanski, 1994, 1998) were examined to gain greater insight into the effects of different levels of mental unpacking, and provide additional empirical evidence for our theoretical claims related to the two-factor process. Need for closure is the desire/urge to quickly arrive at firm and specific answers that provide epistemic closure (Lalwani, 2009). Prior research (e.g., Lalwani, 2009; Tetlock, 1998) has found that individuals with a high need for closure tend to have urgency in bringing a closure to a task. Hence, in the context of our research, when asked to mentally generate the unpacking variables, high need for closure individuals would tend to be comfortable in bringing to closure the variable generation task. In our previous study, H1 proposed that when generating a greater required number of plausible causes of future product failure, participants would tend to have reduced probability judgments than when generating a relatively fewer number of such causes. Using a two-factor structure, we argued that when asked to generate fewer reasons, the dominant process will be the positive effects on probability judgments due to imagining the reasons; however, when asked to generate a very high number of reasons, the dominant process will be the negative effects on probability judgments due to greater difficulty in generating the reasons. Moreover, participants are likely to conclude that fewer plausible causes of product failure exist when they find it difficult to generate the required number (Hirt et al., 2004). Hence, participants with a high need for closure should have a further reduction in probability judgments, since not being able to generate sufficient valid unpacking variables would lead to a greater degree of perceived difficulty. Specifically, in the high-level mental unpacking condition, a high level of need for closure would lead to an urge for completion of the reason-generating task. Hence participants are likely to have enhanced perceptions regarding existence of fewer plausible number of reasons of product failure. This in turn, would lead to reduced probability judgments of future product failure. Formally stated:

**H3.** The effects predicted by H1 would become stronger under high (vs. low) need for closure.

Specifically, consumers will have a higher probability judgment of future product failure when mental unpacking involves generating a relatively fewer (than very high) number of causes of product failure, with the effects getting stronger for high (vs. low) need-for-closure consumers.

Study 2: Method

As in Study 1, Study 2 also used a car as a product, with starting problem identified as the specific product related failure.

Design, subjects, and procedure

H1 and H3 were tested by a between-subjects experiment with three manipulated levels for mental unpacking (packed condition — no mental unpacking vs. 4-level mental unpacking vs. 12-level mental unpacking) and need for closure was measured. More specifically, the first factor was manipulated between-subjects, in the exact same manner as in Study 1. Need for closure was measured by using representative items from scales used in prior research (e.g., Kardes et al., 2007; Lalwani, 2009; Tetlock, 1998). One hundred and fourteen university students participated in exchange for course credit (average age 22 years, 45% females). The dependent measure of probability judgment of future product failure was measured in the exact same way as in Study 1.

Results

Main tests

Consistent with H1, participants asked to generate 4 reasons for a car’s starting failure had the highest level of probability judgment of potential future product failure (M = 44.91), which was higher than for both the 12-level mental unpacking condition (M = 35.07, F(1,74) = 5.64, p < .05) and the control group of packed condition (M = 32.68, F(1,70) = 7.58, p < .01). There were no differences in the probability judgments for the packed vs. 12-level mental unpacking conditions (F(1,78) = .39, p = .54).

H3 predicted an interaction effect, whereby the effects of H1 would get magnified for high need-for-closure consumers. That is, when asked to generate a very high number of plausible reasons for product failure in the priming task, participants with high need for closure would have even lower probability judgments than individuals with low need for closure. The level of need for closure was not expected to influence judgments in the 4-level mental unpacking condition, since there is not much difficulty in generating reasons for failure in the 4-level condition. Consistent with the predictions made by H3, an ANCOVA, with mental unpacking (packed vs. 4-level vs. 12-level) as an independent variable and need for closure as a covariate, showed a significant interaction effect on probability judgments of future product failure (F(2, 108) = 3.39, p < .05). A median split was done for the need for closure measurements to denote high vs. low levels, in order to test the specific aspects of H3. Follow-up tests show that in the 12-level mental unpacking condition, high (vs. low) need for closure participants had lower probability judgments of future product failures (M_{high need for closure} = 29.23 vs. M_{low need for closure} = 41.50, F(1,108) = 5.06, p < .05). There were no such differences in probability judgments for high vs. low need-for-closure participants in the 4-level mental unpacking (M_{high need for closure} = 45.62 vs. M_{low need for closure} = 44.28, F(1,108) = .05, p = .83) or the packed (M_{high need for closure} = 36.20 vs. M_{low need for closure} = 28.78, F(1,108) = 1.67, p = .20) conditions.

\(^3\) An ANCOVA (instead of an ANOVA) with need for closure as a covariate, was run in order to analyze need for closure as a continuous independent variable (e.g., Irwin & McClelland, 2003).
In other words, the 12-level mental unpacking lead to lower probability judgments than the 4-level mental unpacking, with the effects getting magnified for high need-for-closure consumers and weakened for low need-for-closure consumers.

Process results

High (vs. low) need-for-closure consumers are likely to have greater urgency to bring closure to the mental unpacking task. As a result, high (vs. low) need-for-closure consumers would end up generating fewer reasons of product failure, thus, leading to reduced probability judgments of product failure. Consistent with such a claim, participants generated a lower number of unpacking reasons of product failure, thus, leading to reduced result, high (vs. low) need-for-closure consumers would end up having greater urgency to bring closure to the mental unpacking task. As a result, high (vs. low) need-for-closure consumers would end up generating fewer reasons of product failure, thus, leading to reduced probability judgments of product failure. Consistent with such a claim, participants generated a lower number of unpacking reasons of product failure, thus, leading to reduced probability judgments of product failure. Consistent with such a claim, participants generated a lower number of unpacking variables (i.e., reasons of product failure) under high (vs. low) need for closure (M\text{high need for closure} = 5.39 vs. M\text{low need for closure} = 7.02, F(1,74)=4.49, p<.05). These effects were stronger in the 12-level unpacking condition (M\text{high need for closure} = 6.59 vs. M\text{low need for closure} = 9.80, F(1,40)=10.07, p<.01) but were diminished in the 4-level mental unpacking condition (M\text{high need for closure} = 3.75 vs. M\text{low need for closure} = 3.94, F(1,32)=1.72, p=.20); this is expected since in the 4-level mental unpacking condition, almost all participants were able to generate the required number of reasons and hence need for closure did not matter.

Also, as expected, perceived difficulty was higher for the 12-level (vs. 4-level) mental unpacking (Means=5.19 vs. 3.18, F(1,74)=42.75, p<.01). Consistent with our theorizing, in the 4-level mental unpacking condition, high (vs. low) need for closure did not impact perceived difficulty (Means=2.97 vs. 3.36, F(1,32)=.58, p=.45); in contrast, in the 12-level mental unpacking condition, participants’ perceived difficulty was higher for the high (vs. low) need for closure condition (Means=5.55 vs. 4.80, F(1,40)=4.38, p<.05).

We posited that the metacognitive experience related to perceived difficulty will be enhanced under high need for closure. That is, perceived difficulty will mediate the interaction effects between mental unpacking and need for closure on probability judgments. A test of mediated moderation was undertaken; a Sobel test of mediated moderation showed that perceived difficulty mediated the interaction effects between mental unpacking and need-for-closure on probability judgments of future product failures (z=2.05, p<.05). In essence, there was a significant interaction effect between mental unpacking (4-level vs. 12-level) and need for closure on probability judgments of future product failure (F(1, 73)=5.68, p<.05) and on perceived difficulty (F(1, 73)=41.98, p<.01). In addition, the results of a regression showed a significant effect of perceived difficulty on probability judgment of product failure (F(1, 74)=14.86, p<.01). Finally, when perceived difficulty was introduced as a covariate, the interaction effects between mental unpacking and need for closure on probability judgments became non-significant (F(1, 72)=.05, p=.82).

Discussion

The results of Study 2 again showed that when participants first go through a priming task of mental unpacking, by listing the probable reasons/causes of product failures, their probability judgments of future product failures are higher, than when they are not required to go through any such mental unpacking, but only when they are asked to generate four causes of product failure, which they seem to be able to do comfortably. However, when the mental unpacking involved generating twelve causes of product failure, a task which was seemingly difficult for almost all participants, the probability judgments of product failure were not different from when they were not asked to go through any such mental unpacking task. Also, consistent with our theorizing, consumers’ need for closure moderated the effects of mental unpacking and perceived difficulty mediated this moderation. The results of Study 2 are consistent with the two-factor structure; high need for closure enhanced the negative effects of perceived difficulty. Hence, probability judgments were reduced when asked to generate twelve reasons for product failure under high need for closure condition. Next, Study 3 extends the findings of Studies 1 and 2 by examining the moderating effects of consumers’ prior experience with the product on the effects of mental unpacking.

Study 3: Moderating effects of past experience with product

Study 3 attempted to provide further support for the proposed two-factor structure for the effects of mental unpacking. In the scenarios in Studies 1 and 2, participants did not have any prior experience with the specific product; however, it is reasonable to assume that consumers’ prior experiences with a product might influence their probability judgments of future failures for that product. While the norm is to have positive experiences with most product purchases made in the marketplace (Meyvis & Janiszewski, 2002), occasionally, consumers might have negative experiences with a product due to product performance failures (Folkes, 1984). Hence, Study 3 attempted to examine the potential impact of negative past experiences with a product on the effects of mental unpacking. That is, Study 3 involved actual product ownership and experiences. While Studies 1 and 2 used a car as a product, Study 3 attempted to generalize the robustness of mental unpacking effects across a different type of product — a music CD. Selecting this product also facilitated factoring in actual product ownership and experiences into the experiment.

Effects of prior negative experience and mental unpacking

Past experiences with a product are likely to influence future predictions and judgments about that product (Hertwig et al., 2004; Morewedge et al., 2005; Wyer, 2011). Hence, it is natural to expect that past negative experiences with a product would lead to more unfavorable judgments about future product performances. However, in the present research, a more critical question is whether past experiences would moderate the effects of mental unpacking at different levels. Specifically, would past negative experiences with a product have differential effects for say 4-level vs. 12-level mental unpacking?

The results of Study 1 showed that in the absence of any moderator, consumers have higher probability judgments of future product failures for 4-level than for 12-level mental
unpacking. Using a two-factor structure, we posited that although imagining greater reasons for an event enhances probability judgments about the likelihood of that event, the greater difficulty in generating a higher number of reasons reduces probability judgments. Now, if consumers already have had prior negative experience with the product, then there would be greater reliance on the content of the generated reasons and less reliance on the metacognitions regarding the difficulty of generating those reasons. From the perspective of the two-factor structure, there will be greater domination of the positive effects of imagining the reasons than the negative effects of metacognitive experience related to perceived difficulty in generating the reasons. This implies, that when consumers have had negative prior experience with the product, their probability judgments will be higher for the 12-level (vs. 4-level) mental unpacking condition. In sum, we expect that, consistent with Study 1, in the absence of any prior negative product experience, a 12-level mental unpacking would lead to lower probability judgments of future product failure than a 4-level mental unpacking. However, when a consumer has had negative experience with a product in the past, a 12-level mental unpacking would lead to higher probability judgments of future product failure than a 4-level mental unpacking.

H4. The effects predicted by H1 would hold in the absence of prior negative product experience and get reversed when consumers have had prior negative experience with the product. Specifically, in the absence of prior negative product experience, consumers will have a higher probability judgment of future product failure when mental unpacking involves generating relatively fewer (than very high) number of reasons for product failure. When consumers have had negative experience with the product in the past, they will have a lower probability judgment of future product failure when mental unpacking involves generating relatively fewer (than very high) number of reasons for product failure.

Study 3: Method

Procedure

A music CD was used as the product in this study. To determine the appropriate levels of mental unpacking for a different product (a music CD instead of a car), a pretest (N=44) was conducted. In the pretest, the mean number of valid reasons generated by participants for a music CD to have performance-related problems was 4.84 (with virtually every participant being able to generate at least 4 reasons), and the highest number of valid reasons generated by anyone was 11. Hence, as in Study 1, Study 3 also had 4-level vs. 12-level mental unpacking to represent the easy vs. difficult-to-generate reasons for product failure.

H4 was tested by a 3 (mental unpacking: packed condition — no mental unpacking vs. 4-level mental unpacking vs. 12-level mental unpacking) × 2 (prior experience with product: neutral vs. negative) between-subjects experiment. The first factor, mental unpacking, was manipulated in a similar manner as in Study 1.

That is, before filling out the main survey, participants were asked to list 4 (or 12) likely performance-related problems that any music CD might have. In the control (packed) condition, participants did not have any such task.

For the second factor, prior experience was manipulated through actual product ownership and experiences. That is, about a week prior to the data collection for the study, participants were given a complimentary music CD. Participants were asked to listen to the music CD several times over the week. They were also told that they would be asked about the contents of the music CD the following week. In the negative experience condition, participants were given a new music CD, but it was deliberately damaged electronically so that it would occasionally skip while playing the music. In the control condition of neutral prior experience, participants were given a new undamaged music CD, also about a week prior to the data collection.

To measure their probability judgment of future product failure, participants were asked: “What is the probability that a typical music CD from the same company (as the one you received) might have any performance-related problems anytime within 6 months of purchase (due to any reason whatsoever)?” (0 = extremely low probability; 100 = extremely high probability). One hundred and thirty-nine university students (average age 21 years, 58% females) participated in the experiment in exchange for a complimentary music CD and course credit.

Results

Manipulation checks

To check if participants faced any performance-related problems while listening to the CD, they were asked: “Were there any problems in playing the CD?” (1 = no problem at all and 7 = several problems). In the negative experience condition, the mean response on this scale was 5.35, which was higher than the scale mid-point (4, on a 1–7 scale; t(85) = 8.42, p < .01). Moreover, participants reported facing performance-related problems to a greater extent in the prior negative (vs. neutral) experience condition (Means = 5.35 vs. 1.26, t(149) = 18.97, p < .01). Participants were also asked (through a “yes/no” question) if there were any defects in the music CD that they received. In the prior negative experience condition, practically all the participants (73 out of 74) indicated that there were some defects in the CD that they received, with only one participant indicating that there were no defects in the received CD. However, retaining or removing this participant did not alter the pattern of results. In the prior neutral experience condition, all the participants indicated that there were no defects in the music CD that they received.

Main tests

The results of a 3 (mental unpacking) × 2 (prior experience) ANOVA showed an interaction effect on probability judgment of future product failure (F(2, 133) = 4.23, p < .05). Consistent with H4, in the absence of any prior negative experience, the results of Study 3 replicated the effects observed in Study 1.
That is, in the prior neutral experience condition, participants had the highest probability judgment of future product failure in the 4-level mental unpacking condition (M = 48.64), which was higher than both the 12-level mental unpacking condition (M = 35.0, F(1, 43) = 4.82, p < .05) and the control group of packed condition (M = 30.0, F(1, 40) = 5.30, p < .05). In contrast, and consistent with H4, when they experienced a negative outcome with the product’s performance in the past, participants had the highest probability judgment of future product failure in the 12-level mental unpacking condition (M = 67.71), which was higher than both the 4-level mental unpacking condition (M = 58.16, F(1, 47) = 4.07, p < .05) and the packed condition (M = 49.80, F(1, 47) = 21.66, p < .01). These results support H4 (see Fig. 2 for a graphical representation of the results).

**Process results**

We expected prior negative experience with the product to reduce the effects of the metacognitive experience related to perceived difficulty in generating the reasons. Consistent with our expectations and theorization, participants had reduced perceived difficulty in generating the reasons when they had prior negative experience with the product (M_{negative-experience} = 3.98 vs. M_{neutral-experience} = 4.67, F(1, 90) = 4.70, p < .05). Also, as expected, this effect was stronger for the 12-level mental unpacking condition (M_{negative-experience} = 4.43 vs. M_{neutral-experience} = 5.33, F(1, 44) = 5.22, p < .05) and weaker for the 4-level condition, since practically all the participants were able to generate 4 reasons for failure (M_{negative-experience} = 3.56 vs. M_{neutral-experience} = 3.95, F(1, 44) = .75, p = .39).

Consistent with a two-factor structure, we theorized that when consumers have had negative prior experience with a product, there will be reduced reliance on the metacognitive experience related to the perceived difficulty in generating the reasons for product failure. That is, the mediating effects of perceived difficulty (as observed in Studies 1 and 2) on the interaction effect between mental unpacking and prior experience on probability judgment, will be weakened. Tests of mediated moderation supported our expectation. There was a significant 2 (mental unpacking: 4-level vs. 12-level) × 2 (prior experience: negative vs. neutral) interaction effect on probability judgment (F(1, 90) = 8.99, p < .01) but the interaction effects were non-significant for perceived difficulty (F(1, 88) = .70, p = .40), indicating a lack of mediating effects (Baron & Kenny, 1986). Sobel’s (1982) test of mediated moderation further confirmed the lack of mediation of perceived difficulty on the interaction effect between mental unpacking and prior experience on probability judgment (z = .82, p = .41).

**Discussion**

The results of Study 3 showed that while in the absence of prior negative experience with a product, consumers have higher probability judgments of future product failure for 4-level mental unpacking than for 12-level mental unpacking, the effects are reversed when they have had negative experience with the product in the past. Specifically, when consumers had negative prior experience with the product, they were able to use their experience to generate concrete reasons of product failure. This in turn reduced consumers’ reliance on metacognitive experience related to perceived difficulty in generating the variables. Hence, with prior negative experience, 12-level mental unpacking led to higher probability judgments of future product failure than 4-level mental unpacking. Next, Study 4 provides additional process evidence through an error correction manipulation whereby the effects of mental unpacking were attributed to perceived difficulty in generating the reasons.

**Study 4: Error correction through difficulty-attribution manipulation**

Study 4 attempted to provide further empirical evidence regarding the underlying process, through an error correction manipulation, whereby participants were told that perceived difficulty in the mental unpacking task might influence probability judgments. Prior research has shown that if decision makers are made aware of the causes (or attributions) for faulty judgments, their judgment errors are debiased (Sanna & Schwarz, 2003). Accordingly, we are proposing that when consumers are made aware of the basis of their judgments being influenced by mental unpacking, their judgment biases due to perceived difficulties will be corrected. From the perspective of the two-factor structure, eliminating the effects of perceived difficulty will lead to greater reliance on the content of the generated reasons and less reliance on the metacognitive experience. As a result, there will be enhanced probability judgments for the higher level mental unpacking when participants attribute the effects of mental unpacking to perceived difficulties. Formally stated:

**H5.** The effects predicted by H1 would hold in the absence of any error correction manipulation, but will be reversed when consumers attribute the basis of their judgments to a source.

Specifically, consumers will have a higher probability judgment of future product failure when mental unpacking involves generating a relatively fewer (than very high) number of causes of product failure, with the effects getting reversed when consumers are made to attribute the effects of mental unpacking to perceived difficulty.
Also, in Study 4, we asked participants (after their probability judgment estimates) how many plausible reasons they think might exist for the product’s failure. This measure should provide a good check on the metacognitive process as to whether greater perceived difficulty of generating reasons for product failure would lead consumers to believe that fewer plausible reasons exist in general. However, we expect these effects to hold only in the absence of any attribution.

**Study 4: Method**

Study 4 used a car as a product, with starting problem identified as the specific product related failure, as in Studies 1 and 2.

**Design, subjects, and procedure**

H5 was tested by a 2 (mental unpacking: 4-level vs. 12-level) × 2 (difficulty-attribution: absent vs. present) between-subjects experiment. The first factor was manipulated in the exact same manner as in Study 1. The difficulty-attribution manipulation was undertaken by informing participants that perceived difficulty in generating the reasons might influence their responses. Specifically, in the “difficulty-attribution present” condition, participants were told that “any thoughts related to perceived difficulty in generating the 4 [or 12] reasons (as to why a used car might have starting problems) might influence your responses to the questions below. Hence, please ignore any such thoughts while answering the questions on this webpage.” No such information was given in the “difficulty-attribution absent” condition. One hundred undergraduate students participated in exchange for course credit (average age 21 years, 44% females). The dependent measure of probability judgment of future product failure was measured in the exact same way as in Study 1. As mentioned earlier, an additional dependent variable was included in Study 4; after indicating their probability judgment, participants were asked to state the total number of plausible reasons for a car to have starting problems. Also, unlike Studies 1–3, perceived difficulty was not measured in Study 4 since the error correction manipulation highlighted the role of perceived difficulty in the decision making process.

**Results**

**Main tests**

A 2 (mental unpacking) × 2 (difficulty-attribution) ANOVA showed an interaction effect on probability judgments of future product failure (F(1, 96) = 8.06, p < .01). Consistent with H5, in the absence of difficulty-attribution manipulation, participants had higher probability judgment of potential future product failure when asked to generate 4 reasons (vs. 12 reasons) for a car's starting failure (M4-reasons = 40.33 vs. M12-reasons = 29.0, F(1,96) = 4.32, p < .05). However, in the presence of the difficulty-attribution manipulation, the effects reversed; that is, participants had (marginally) lower probability judgment of potential future product failure when asked to generate 4 reasons (vs. 12 reasons) for a car’s starting failure, (M_{12-reasons} = 40.24 vs. M_{4-reasons} = 49.59, F(1,96) = 3.75, p < .06). Interestingly, the difficulty-attribution manipulation did not have any effects on probability judgment in the 4-level unpacking condition (F(1,96) = .01, p = .99), but had a strong effect in the 12-level condition (F(1,96) = 16.13, p < .01). This is expected, since it is relatively easier to imagine the required number of concrete reasons in the 4-level, than in the 12-level condition.

**Process results**

Consistent with our expectations, in the absence of difficulty-attribution, participants believed that there were fewer plausible reasons in the 12-level than in the 4-level condition (Mean_{4-level} = 19.90 vs. Mean_{12-level} = 11.43; t(40) = 1.77, p < .05 one-tailed). However, in the presence of difficulty-attribution, participants believed that there were more plausible reasons in the 12-level than in the 4-level condition (Mean_{4-level} = 17.57 vs. Mean_{12-level} = 31.32; t(51) = 2.14, p < .05). Also, participants’ perceived number of plausible reasons for product failure correlated with their probability judgments of future product failure (r = .17, p < .06, one-tailed).

**Discussion**

The results of Study 4 provide further direct empirical evidence for the two-factor process regarding the effects of mental unpacking. Under the difficulty-attribution manipulation, there is reduced reliance on the negative effects of the metacognitive process and instead there is stronger influence of the positive effects of the content of the generated reasons; as a result, probability judgments were higher in the 12-level (than 4-level) mental unpacking condition. Also, asking participants to state the plausible total number of reasons of product failure provided evidence of the metacognitive process. That is, in the absence of any attribution manipulation, when participants had higher perceived difficulty in generating reasons for product failure (e.g., in the 12-level condition), they believed that there were fewer plausible number of reasons of product failure. Interestingly, these results were reversed in the presence of difficulty-attribution. That is, participants believed that there was a higher number of plausible reasons in the 12-level (than 4-level) unpacking. In this case, the role of metacognition, related to perceived difficulty, did not influence probability judgments. Instead, participants associated the higher level of mental unpacking task with a higher plausible number of reasons.

**General discussion**

**Summary and conclusions**

The results of four experiments showed that mentally unpacking the reasons for a product to have failures would influence a consumer’s probability judgment for future product failure. Interestingly, the influence is not in a monotonically increasing fashion, but in an inverted U shape, as highlighted in Fig. 1. That is, compared to the packed condition (where no
mental unpacking is undertaken), mental unpacking involving generating four reasons for a car or music CD to have product failure led to increased probability judgment of future product failure. However, when consumers were asked to mentally generate twelve potential failure reasons (a relatively high number), their probability judgments of future product failure were lower than for those who were asked to mentally generate four reasons for product failure.

We proposed a two-factor structure as the process for this pattern of results. While mental unpacking had a positive effect on probability judgments whereby generating and thinking about the reasons made them more concrete and hence more likely (Koriat et al., 2006; Tversky & Koehler, 1994), the difficulty in generating reasons in the mental unpacking task had a negative effect on probability judgment due to metacognition effects (Sanna & Schwarz, 2003; Schwarz et al., 1991). As a result, participants had a higher judged probability of future product failure under the 4-level mental unpacking than the control group (packed condition). In contrast, in the 12-level mental unpacking condition, while the mental unpacking task reminded the participants of the causes of product failure that they might not have thought of in the packed condition, the perceived difficulty in coming up with such a high number of reasons of product failure apparently led the participants to form lower probability judgments. As a result, in the absence of any moderators, the judged probability of future product failure was highest in the 4-level mental unpacking condition, followed by the 12-level mental unpacking condition and the packed condition, implying an inverted U-shaped relation between levels of mental unpacking and probability judgments.

Moreover, we found that this inverted U-shaped pattern of effects is moderated by the consumer’s need for closure. Specifically, for consumers with high need for closure, the effects of metacognition related to perceived difficulty became stronger, whereas no such effects were observed for consumers with low need for closure. In addition, we also demonstrated the moderating effects of consumers’ prior experiences with the product; while a very high level of mental unpacking led to reduced probability judgments of future product failures than mental unpacking at relatively lower levels, the effects were reversed for consumers who had prior negative experience with the product. That is, with prior negative experience, 12-level mental unpacking led to higher probability judgments of future product failure than 4-level mental unpacking (see Fig. 2 for a graphical representation of the effects of prior negative experience). This pattern of results emerged because the effects of metacognition, related to perceived difficulty, were diminished when consumers had prior negative experience with the product. In essence, in the negative experience condition, participants relied more on the content of the generated reasons than on their metacognitions about the difficulty of generating those reasons. Similarly, with an error correction manipulation, whereby participants were made aware of the potential effects of perceived difficulty on judgments, there was reduced reliance on the metacognitive experience related to difficulty and enhanced effects of the

reason imagination task. These three moderators provide additional evidence regarding the two-factor structure. In essence, the studies (and the related moderators) offer tests of contingencies that determine which factor (concreteness of generated reasons vs. metacognitions regarding perceived difficulty) will be more diagnostic and dominant in determining the direction of probability judgments.

While there have been several studies in the domain of accessibility experiences on such diverse topics as confidence in judgments (Tormala, Petty, & Brinol, 2002), perceived use of bicycles (Aarts & Dijksterhuis, 1999), product choices (Novemsky et al., 2007), and hindsight biases (Sanna & Schwarz, 2003) (see Schwarz et al., 2007 for a detailed review), the present research is the first one to examine the effects of accessibility experiences in the context of mental unpacking, along with the moderating effects of need for closure and prior experience with a product. Given the two-factor structure process effects of mental unpacking, examining the moderating effects of need for closure and prior product experience becomes both relevant and interesting. For instance, when consumers have high need for closure, they are more strongly influenced by their metacognitive experience, while making probability judgments. In contrast, when consumers have prior negative experience with the product, they have reduced reliance on their metacognitive experience, while making judgments. Similarly, in Study 4, when consumers are made aware of the potential effects of task difficulty on their judgments, there seems to be reduced reliance on metacognitive experiences. These findings have implications for metacognition theory as well as for findings for the classic accessibility effect documented by Schwarz and co-authors. The findings of the present research suggest that a similar inverted-U pattern might emerge in other contexts as well, for instance, when people are told to think of the many reasons for driving a BMW, an initial facilitatory effect is likely to be caused by the content/number of the reasons, but followed by a backlash as metacognitions about perceived difficulty exercise a negative impact on judgments.

The findings of our research might also have practical implications for marketers and regulators. As mentioned earlier, several companies, such as AllState and Liberty Life Insurance, induce consumers to think about possible reasons for product failure (in the case of AllState and Liberty, the failures often relate to human death or serious injuries), since a consumer’s likelihood of buying an insurance policy is presumably influenced by probability judgments regarding future product/life failure. Similarly, consumers’ purchase of warranty or product protection plans for durable products would also presumably be influenced by probability judgments regarding potential future product failures, which in turn can be influenced by mental unpacking. Hence, it is not surprising that sales personnel, while trying to sell such plans after the initial product purchase decision has been made, often try to induce consumers to think about different reasons for product failure or product damages occurring in the future. However, as the results of our studies show, inducing a consumer to imagine a very high number of such reasons might backfire as it is likely to lead to
reduced probability judgments regarding future product failures than when the consumer generates relatively fewer reasons for product failure.

Limitations and future research directions

One key limitation is that our research uses limited data points for the levels of mental unpacking. Specifically, we used only two levels of mental unpacking (i.e., 4-level vs. 12-level mental unpacking). Future research should examine a wider range of levels of mental unpacking. For example, there might be moderately difficult vs. extremely difficult levels in terms of generating reasons for product failure, with corresponding different outcomes for probability judgments. Moreover, having additional levels of mental unpacking can provide a more suitable test of the inverted-U shaped hypothesis of mental unpacking. Currently, the comparisons are between the packed, 4-level and 12-level conditions, where the packed condition is more of a control condition than a form of mental unpacking. Future research might want to extend our findings by examining three or more levels of mental unpacking.

Although we attempted to provide empirical evidence regarding the underlying process, other factors might also be at play (e.g., Rick, 2011). For example, in Study 4, while an error correction in the form of a difficulty-attribution manipulation might have neutralized the effects of negative accessibility and hence led to enhanced probability judgments, it is also possible that being made aware of a potential bias might have induced participants to over-correct. Additional studies might be needed to rule out this alternative explanation.

In addition, it is possible that providing more detailed guidance on mental unpacking might show different results. There might also be potential order effects regarding listing of product attributes (e.g., Biswas, Biswas, & Chatterjee, 2009). Our request to participants was to list reasons for product failures, but we did not prescribe an order to list reasons (such as in order of likelihood, from most likely to least likely), nor did we instruct participants to stop generating reasons once they felt that any additional reason had a very low chance of happening. The work by Gettys, Mele, and Fisher (1986) on hypothesis generation can provide a good starting point to augment the mental unpacking findings observed in our experiments.

Future research should extend our findings on the moderating effects of prior experience with the product, need for closure, and attribution effects, by examining other potential moderators. For instance, a potentially interesting moderator would be the involvement level with the product. It can be speculated that higher levels of involvement with a product might diminish the effects of mental unpacking since consumers are likely to process the information in greater depth under higher involvement. Also, in our experiments, the products used (a car and a music CD) are, in general, expected to perform well, as is the norm for most products being sold in the marketplace (Meyvis & Janiszewski, 2002). However, there can be products, such as certain types of cancer treatments, where the likelihood of success can be extremely low. Would the effects of mental unpacking in terms of product failure, as observed in our experiments, hold for products with very low likelihoods of success? Future research should examine the effects of mental unpacking for such types of products that are generally expected to have low success rates. Finally, the impact of mental unpacking on intentions to purchase, actual purchases, and willingness to pay may also be interesting to investigate.

References


