

Prior Knowledge and Complacency in New Product Learning

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Our research examines the role of prior knowledge in learning new product information. Three studies demonstrate that, compared to consumers with lower prior knowledge, those with higher prior knowledge learn less about a new product. Further, higher knowledge consumers are able to learn more but learn less due to motivational deficits; inferior learning of new product information by those with higher prior knowledge is caused by inattention at encoding rather than reconstructive errors at retrieval. These results hold both when prior knowledge is manipulated experimentally (studies 1 and 2) and when it is an individual difference factor (study 3).

Most practitioners see consumer knowledge as an advantage, targeting many new products at expert heavy users. This strategy seems intuitively appealing when based on the assumption that experts have a learning or information processing advantage, proportionately higher levels of interest or involvement, and a greater likelihood of opinion-leadership. As Rogers (1995, p. 166) states, "When an adequate level of how-to knowledge is not obtained prior to the trial and adoption of an innovation, rejection and discontinuance are likely to result. To date, few diffusion investigations are available that deal with how-to knowledge."

But are those with higher prior knowledge better able to learn about a new product offering? Fifty years of expertise research have culminated in two conflicting pictures (Camerer and Johnson 1991; Shanteau 1992). Cognitive science supports the superiority of experts in a myriad of decision processes. In contrast, behavioral decision research paints a bleak picture of experts' performance, demonstrating poor judgments, inaccurate decisions, and overconfidence.

Our research examines the role of prior knowledge in learning about new products in situations where new information makes existing product knowledge obsolete. We posit that, compared to consumers with lower prior knowledge, those with higher prior knowledge may learn less about the new

product. More important, we present evidence that this inferior learning is due to motivation at encoding rather than to retrieval errors. Those with higher prior knowledge incorrectly generalize from knowledge of existing products and assume that they already know how to use the new product properly. With the presence of certain cues at encoding, those with higher prior knowledge learn more. We demonstrate this result both when prior knowledge is manipulated experimentally and when it is a measured individual difference factor.

There are almost as many definitions of "expertise" as researchers who study it (Shanteau 1992). Similar to Spence and Brucks (1997), we define degree of expertise as a function of the amount of domain-specific knowledge acquired through experience or training. This definition is not materially different from the concept of prior knowledge (PK). Thus, we first test our hypotheses by comparing consumers with experimentally induced levels of PK to avoid confounding with correlated constructs of involvement or self-perception of goals. We then replicate these results when real prior experience is measured, allowing us to tie our findings back to experience-based definitions in the expertise literature (e.g., Alba and Hutchinson 1987).

HYPOTHESIS DEVELOPMENT

Advantages of High Prior Knowledge

Cognitive science provides many examples of advantage in learning due to high PK (Alba and Hutchinson 1987). Experts use more automated thinking processes than novices (Larkin et al. 1980; Shiffrin and Schneider 1977). Automaticity often speeds up a process without a subsequent loss in the quality of performance and, thus, may free up resources that can be delegated to other cognitive tasks such

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as the learning of new information (Chi, Glaser, and Rees 1982). Experts also categorize more information at sublevels and thus may attend to more subtle perceptual factors in discriminating between category members than do novices (Johnson and Mervis 1997). A complex structure of PK allows for the development of abstract schemata (Chi et al. 1982; Prerau, Adler, and Gunderson 1992) that promote rapid problem recognition and reduce memory search for experts, compared to the more data-driven processing of novices (Chi et al. 1982; Lamberti and Newsome 1989). Further, more knowledgeable consumers may search for more information prior to problem solving because they are aware of existing attributes (Brucks 1985), ask effective questions (Miyake and Norman 1979), and can identify relevant information (Johnson and Russo 1984; Punj and Staelin 1983).

Disadvantages of High Prior Knowledge

Experts often fail to perform in accord with these process-oriented advantages (Camerer and Johnson 1991). They may be influenced by overconfidence, the “feeling-of-knowing” (FOK) phenomenon, and the use of inappropriate inference rules either at encoding or retrieval.

Overconfidence is a prevalent bias (Fischhoff, Slovic, and Lichtenstein 1977); typically people assume that they know more than they do (e.g., Moorman 1999). One might expect that consumers with higher PK would be more overconfident (cf. Keren 1987). Oskamp (1965) found that as the amount of given information increases, a decision-maker’s confidence in his/her performance increases, but actual accuracy in performance does not. We expect that overconfidence inhibits information search motivated by a goal of reducing knowledge uncertainty (Alba and Hutchinson 2000) or curiosity (Menon and Soman 1999). Confidence in one’s ability to learn may motivate learning efforts, as in Bandura’s (1977) work on self-efficacy, but confidence in one’s existing knowledge may retard such efforts. If more knowledgeable consumers have undue confidence that new product information will be redundant with what they know already, they may process less extensively than their capabilities and learn less than those who think they know less.

Repeated problem-solution patterns facilitate the formation of possibly inappropriate inference heuristics, which can subsequently lead to systematic biases (Kahneman, Slovic, and Tversky 1982; Shanteau 1992). Higher PK consumers may make inferences about product attributes or usage when relevant product information is unavailable or ignored. Obviously, such inferences will be accurate only insofar as PK is applicable (Alba and Hutchinson 1987). Inaccurate inferences may cause knowledgeable consumers to misuse a radically new product. Automatic reliance on PK structures may hinder information processing in new environments when new information renders old information, and thus old inference rules, obsolete. Although experts should be aided in their identification of relevant information due to an increased sensitivity to information incongruent

with PK (Sujan 1985), reliance on abstract principles may inhibit attention to incongruencies due to obsolescence. Some qualitative evidence suggests that expert computer programmers can be hampered by their tendency to reason analogically from old (and inappropriate) exemplars (Campbell et al. 1992).

The feeling-of-knowing phenomenon (Hart 1965) provides a further reason to expect poor performance by experts. Feeling-of-knowing is a metacognitive preretrieval process in which one assesses one’s memory for a memory (Reder and Ritter 1992). When a problem solver or decision maker must choose either to retrieve a previously computed solution or to compute the solution anew, she may judge the likelihood that she possesses the correct answer in memory by assessing her feeling of knowing it. Familiarity drives the FOK judgment; increased familiarity will lead to an increased probability that an individual will choose to recall an answer rather than recompute it. Increased familiarity with the problem cues (e.g., Schwartz and Metcalfe 1992) and with the problem terminology (Reder and Ritter 1992) leads to a stronger judgment of feeling-of-knowing and subsequently to a greater probability of a recall versus a re-solve strategy. People with PK may be more likely to try to recall problem solutions rather than recompute them based on given information. If the problem changes (e.g., new attributes are introduced to a product class or importance weights change) but its terminology does not, higher PK people may misjudge their ability to recall an accurate solution. In other words, people with higher PK may not realize when they need to recompute rather than recall answers.

Thus, overconfidence, use of heuristics, or FOK effects may cause knowledgeable consumers to inappropriately rely on self-generated inferences. Poor performance in this context could arise due to inference making at encoding of new information or at retrieval. For example, overconfidence might cause encoding errors due to superficial processing of new information or cause retrieval errors based on insufficient effort to retrieve new product information.

Prior Knowledge Effects and New Product Innovation

Little expertise research has examined reactions to product innovations. Will those with prior product category information be better able to learn how to use new products? Research in other domains has shown that expert superiority in learning or problem solving is strongly impacted by the external characteristics of the given task (e.g., Shanteau 1992).

With a cognitive science approach, one might expect that consumers with a high degree of product category knowledge would be best able to learn about and use new products in that category. Behavioral decision researchers have reported results that seem on the surface to conflict. It is unclear, though, whether classic findings of expert disadvantage in consumer research should be viewed as reflecting a curse of expertise or completely adaptive behavior on the part of more knowledgeable consumers. Johnson and Russo (1984) showed that familiarity facilitates learning when the task is to rate all alter-

natives; when consumers were asked to make a single choice, they found an inverted-U relationship between familiarity and memory. They explained poorer learning by high familiarity consumers than by moderate familiarity consumers in terms of selective processing. In choice decisions, high PK consumers process information selectively, weeding out dominated alternatives early. Although this behavior leads to a poor test score in the lab, such behavior may be effective and efficient in the real world.

A similar argument can be made for Bettman and Park's (1980) result that search is lower for high PK than for moderate PK consumers. Punj and Staelin (1983) and Urbany, Dickson, and Wilkie (1989) find that higher PK of specific alternatives available for consideration depresses search, despite the fact that high PK of the product category increases search. Brucks (1985) shows that experts exhibit higher selectivity in search. All of these behaviors are efficient and thus do not demonstrate a curse of expertise. In the research to be reported here, proper assimilation of usage instructions for the new product has a great impact on product efficacy and subsequent evaluation. We will examine conditions under which PK deters learning in a clearly dysfunctional way.

Several of the disadvantages of PK noted are based on the knowledgeable consumers' complacency in reliance on old knowledge. Higher PK may lead to overconfidence (e.g., "I will learn this new software program in one night"), and this may abbreviate search or processing in a dysfunctional, superficial way. Similarly, the use of inappropriate schemas may be exacerbated by a strong familiarity-induced FOK. Thus, we hypothesize:

- H1:** When obsolescence of PK is not cued explicitly, higher PK may lead to lower scores for new product learning compared to those consumers with lower PK.

The argument that PK is not detrimental to learning when change is explicitly cued assumes that the negative effect of PK on learning new product information is due to shallow processing at encoding. In other words, when consumers with higher PK do not recognize that the new product represents a substantial change within the product category (i.e., PK has become obsolete or does not apply to the new product), they may not devote sufficient attentional resources to the learning task. This is in accord with Kardes et al. (1993) who demonstrate that pioneering advantage may be due, in part, to consumers' decreased motivation to devote learning effort to later category entrants.

We reason that, when motivated by recognition of change, higher PK consumers may devote the necessary resources to benefit from their enriched cognitive resources. Johnson and Russo (1984) find that when consumers are asked to evaluate all alternatives rather than to choose among them, memory for new information is positively related to PK—presumably because an evaluation task did not create motives to process as selectively as did a choice task. In Johnson and Russo's work, experts did not know the facts they were asked to learn. However, the new information was consistent with known

attribute patterns (what Rogers [1995, p. 165] calls "principles knowledge") because it was real attribute information for existing cars in a mature category. Thus, in their study, experts might have benefited from an ability to infer attributes ignored or forgotten from those attended and remembered. The accuracy of such inferences will depend on the validity of those inferential rules and the completeness of information on the predictor variables in those rules. New product innovations often make old knowledge and inferential rules obsolete. Thus, will experts still benefit from enrichment? We postulate:

- H2:** When obsolescence of PK is explicitly cued at the time of new product information exposure, higher PK consumers' scores for new product learning will improve relative to uncued scores more than is true for lower PK consumers.

This motivation to process new information may occur naturally via the change cues. Moreau, Lehmann, and Markman (2001) suggest that new products are frequently assessed relative to their similarity/dissimilarity to existing exemplars and that this can influence consumers' perceptions of their comprehension of the new product. If high PK consumers' poor learning performance is due to shallow processing (and not inferential intrusion or proactive interference), then they should be able to outperform low PK consumers when motivated prior to, but not after, encoding. Thus, we posit:

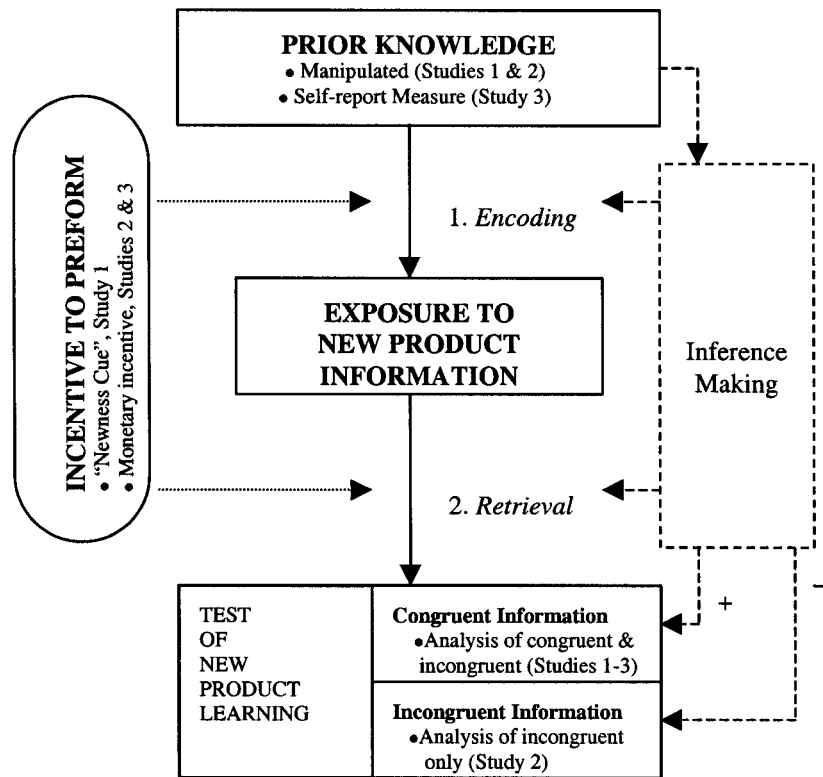
- H3:** When motivation to learn is low at the time of new product information exposure, higher PK will lead to lower scores for new product learning compared to those consumers with lower PK. When motivation to learn is high at the time of new product exposure, higher PK leads to higher learning scores.

In real innovation adoption contexts, expert consumers may be affected by the correlated constructs of prior domain knowledge and increased product category involvement (Celsi and Olson 1988). In order to avoid potential confounds caused by involvement, the above hypotheses are tested in studies 1 and 2 based on strict "PK-only" manipulations. Laboratory manipulations of PK are necessarily weak compared to the variations created by practice in the real world. In study 3, we test our conjecture that hypotheses 1–3 will replicate with measured experience (i.e., when knowledge is created by prior product category usage). Figure 1 illustrates the conceptual and procedural elements of these three studies.

STUDY 1: PRIOR KNOWLEDGE AND NEW PRODUCT LEARNING

The goal of the first study was to test the influence of PK about allergy medications on the learning of information about a new allergy remedy (hypotheses 1 and 2). To avoid confounds with involvement, we chose to manipulate PK. We

FIGURE 1
CONCEPTUAL-PROCEDURAL DIAGRAM



NOTE.—The dotted arrows indicate that incentive timing differed by study. Motivational incentives occurred only at encoding in study 1 and either before or after encoding in studies 2 and 3. The dashed arrows represent conceptual influence of prior knowledge on new product learning.

chose a product category about which our respondents would have low PK and administered a training exercise to the high PK group prior to receipt of new product information.

We manipulated the observable newness of the new product by altering superficial similarity of the new product to the old product. The purpose of this manipulation was to determine if a salient newness cue would promote more careful processing by higher PK participants. If higher PK participants make inappropriate inferences or use shallow processing because they are unaware of substantive changes in the product category, this newness cue might trigger better performance by higher PK than by lower PK participants. Without the cue, we expected experts to learn less new product information than novices.

We chose allergy medications because there is a clear relationship between proper use and efficacy with pharmaceutical products. If a drug that should be taken on an empty stomach is taken with food, it may not work effectively, or it may cause unexpected side effects. Thus, if subjects score poorly on a test of usage instructions (and this is indicative of their actual behavior), we can plausibly assume that these subjects risk subpar product performance and perhaps even severe illness or death. For ethical reasons, the new product

we introduced was fictional at the time of the studies, but it is similar to Claritin (loratadine), introduced in 1994.

Method

Design. A 2 (Higher versus Lower Prior Knowledge) × 2 (Drug Form) × 2 (Side Effects) between-subjects design tested the influence of expertise on learning and intended usage. Subjects were randomly assigned to one of eight conditions. To manipulate PK, participants read an information booklet on either allergy medications or tooth-whitening processes. Those who read about allergy medications were designated as higher PK, while those who read about tooth-whitening processes were lower PK.

The new product introduced later in the session was a new hybrid antihistamine. Two newness cue factors, Drug Form and Side Effects, manipulated the superficial similarity of the new medicines to existing medicines. For Drug Form, the new product was shown to be either a pill (similar to existing products, thus no newness cue) or a topical patch (dissimilar to existing products, providing a newness cue). For Side Effects, the new medicine was reported to have

few side effects (similar to existing products, thus no newness cue) or no side effects (dissimilar to existing products, providing a newness cue). Drug Form produced no effects on any dependent variable, so the results reported below collapse across this factor.

One hundred and eighty-eight students at the University of South Carolina participated in the experiment for course credit. Sixty-five subjects who indicated that they had suffered from allergies in the past were eliminated from the data analysis. Mean responses for both the eliminated sufferers and the remaining subjects will be reported in the results section. Results of reported analyses replicate when these sufferers are included, however, we exclude them because, when the training manipulation is layered on existing PK, it is theoretically nonobvious whether the potential resultant increase in knowledge will outweigh the potential increase in overconfidence.

Procedure. Each session lasted one hour and was conducted in groups of two to 12 participants. After a study introduction, participants read general product category information booklets, ostensibly as a warm-up task. Participants in the higher PK condition read about allergy medications. Participants in the lower PK condition read about tooth-whitening processes. Both information booklets were similarly structured and contained similar amounts of information. After this, the booklets were taken from the participants, and the manipulation check—a short general knowledge test on allergies and allergy medications—was administered.

Finally, participants read an information booklet that contained information about a new product, a hybrid antihistamine allergy medication. This information was prefaced with the true statement that most allergies are developed in the early to mid-twenties, and it was hoped that this knowledge would motivate active consideration of the new medication. Participants were given as much time as they desired to read about the new product. The brochure did not differ between conditions except for the picture of the medicine (shown as a pill or a patch) and the description that “Certizol does not interact with known medications and has few (no) side effects.”

The text contained some new product information and usage instructions that were congruent with existing products; however, some information and instructions differed from the PK. This represented the obsolescence of some PK common in product innovation. Then, the product information was removed, and participants responded to a survey about the new product in which items were embedded pertaining to current/past experience with allergy medications, confidence, participants’ purchase intentions if an allergy were later developed, and a quiz concerning proper usage of the new medication. This quiz constituted the important dependent variable to measure new product learning. (See example questions in table 1.) The quiz tested subjects on their knowledge of how to use the new medication properly (i.e., “this medicine should be taken at night”) and only covered information that was similar across all conditions.

TABLE 1
MEASURE OF NEW PRODUCT LEARNING

Question type from new product quiz	Wording from new product quiz
Multiple choice items (3 total)	How many times a day should this medicine be taken? [once, twice . . .] What is Certizol? [antihistamine, decongestant . . .] How expensive is this medicine? [given cost level 1–10]
“Check all that apply” items (3 items, 20 total responses)	Check all of the following that you should avoid using while taking Certizol (as stated by the Certizol information): [alcohol, oral contraceptives . . .] You should not take Certizol if you are: [pregnant, suffer from glaucoma . . .] Check all the following that are side effects of this medicine: [headache, nausea . . .]
Yes/no items (3 total)	Should this medicine be taken at night? [yes, no] Should this medicine be taken with food? [yes, no] Does this medicine require a prescription? [yes, no]

Results

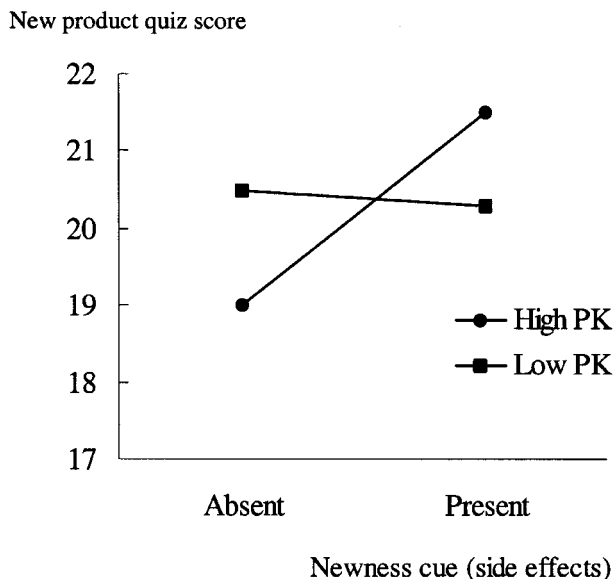
Manipulation Check. We first determined that our training manipulation created differential knowledge between our PK conditions. Recall that we administered a general knowledge test about allergies and allergy medications after the training phase but before the new product introduction. As expected, higher PK participants ($M = 16.3$) scored significantly higher than lower PK participants ($M = 13.5$) on this test ($F(1, 112) = 36.8, p < .0001; \omega^2 = .288$). Results below testing directional hypotheses are shown as one-tailed tests unless otherwise noted.

Effects of Prior Knowledge on New Product Learning. As noted above, subjects were asked to complete a quiz on the new product after being asked to carefully study a new product brochure (that contained a product description, usage instructions, side effect information, and a picture of the medicine). The dependent variable was the quiz score (i.e., number of correct responses).

As shown in figure 2, there was a significant two-way interaction between PK and Side Effects as a newness cue ($F(1, 108) = 3.88, p < .05$). Lower PK participants ($M = 20.5$) outperformed higher PK participants ($M = 19.1; t(62) = 2.66, p < .01$; table 2) when the newness cue was absent (few side effects), and higher PK participants ($M = 21.5$) outperformed lower PK participants ($M = 20.3; t(50) = 2.72, p < .01$) when the newness cue was present (no

FIGURE 2

STUDY 1: PRIOR KNOWLEDGE × NEWNESS CUE INTERACTION



side effects). This interaction was driven by differences among participants with high PK. Lower PK participants' test scores did not change significantly based on the presence or absence of newness cues ($t(1,54) = 0.33, p = .49$). However, higher PK participants' scores improved significantly when a newness cue was present (i.e., the medicine was dissimilar to existing medicines; $t(1,58) = 2.20, p = .01$). These results support hypotheses 1 and 2.

Discussion of Study 1

The results of study 1 suggest that PK can have a negative impact on new product learning. We manipulated PK in a product category unfamiliar to our subject pool rather than measuring existing expertise in a more familiar category in order to remove product category involvement as a confound. Even with the relatively small degree of training used in this manipulation, our experts made more mistakes in proper product usage than did those with low PK when a salient cue indicating product change was unavailable. However, this effect was reversed when the new product differed from existing products in the salient aspect of expected side effects. This reversal suggests that high PK participants' poor performance was due in this case to shallow processing based on a presumption of similarity of new to old knowledge. See Lynch and Srull's (1982, pp. 22–23) discussion of Lingle and Ostrom (1979) for a similar argument about reliance on initial judgments in one task when carrying out a subsequent task as a function of apparent similarity between first and second judgments.

Study 1 does not make clear whether the shallow processing is occurring at the time of encoding of information about the new product or if it is due to differences in reliance on prior schemas at the time of test. One possibility is that those with high PK pay less attention to new product information because they believe that they already know what they would find if they examined it carefully. A second possibility is that those with higher PK encoded more information than those with lower PK at the time of learning about the new product, but those with higher PK experienced problems at retrieval. Respondents may have used their (high) PK about allergy medications as a schema for retrieving information during the new product knowledge test unless a newness cue deterred them from doing so.

This would be analogous to classic findings from Hasher and Griffin (1978) in which subjects read an ambiguous passage about a man walking through the woods, titled either "An Escaped Convict" or "Going Hunting." Later they were asked to recall the passage. Half the subjects were given the same title as when they read the passage (same theme condition), and half were told that the title they had been given originally was incorrect and were given the other title when asked to recall (different theme). Subjects whose assumed theme was invalidated showed superior recall to those given the same title at encoding and at test, and the advantage increased with delay (presumably because, with delay, more errors would be due to schema-based reconstructive inference). Arguably, subjects in study 1 given a newness cue had their prior schema invalidated, permitting the higher PK subjects to tap more of what they had learned.

We find an interpretation of our results in terms of encoding failures by higher PK respondents to be more plausible than this explanation in terms of deficits at retrieval. Our dependent variable was recognition, not recall; recognition is less sensitive to retrieval factors than recall. However, to separate more conclusively the "complacency at encoding" from the

TABLE 2

STUDY MEANS FOR REPORTED INTERACTIONS

	Study 1 ^a	Study 1 ^b	Study 2 ^c	Study 3 ^c
High PK:				
Total	20.3	20.4	17.1	20.3
Low motivation to process	19.1	19.7	16.5	18.2
High motivation to process	21.5	21.1	17.7	22.3
Low PK:				
Total	20.4	20.8	17.0	19.8
Low motivation to process	20.5	20.5	17.1	19.4
High motivation to process	20.3	21.0	16.9	20.2

NOTE.—PK = prior knowledge.
^aMotivation to process was manipulated through a newness cue (dissimilarity in side effects).
^bMeans for real sufferers removed from reported analyses.
^cMotivation to process was manipulated through a monetary incentive at the time of learning.

“schematic retrieval” explanation of expert disadvantage, we conducted a second experiment. If consumers with higher PK pay less attention at encoding unless motivated to do otherwise, we should find that high PK respondents learn more than low PK respondents if motivated prior to encoding. The reverse should be true if respondents are motivated after encoding but before test.

To test this account and hypotheses 1 and 3, half the subjects in study 2 learned of a monetary reward for accurate recall of information about a new drug before exposure to the new product. The other half learned of the reward after exposure to new product information but before the memory test. Unlike study 1, the salience of the drug’s newness was not manipulated; the medicine was shown in one format only (pill) and described as having few side effects. As in study 1, we manipulated PK by exposing half of the subjects to information about the same product class as the new product, while the other half learned about an unrelated product class. We expected that those with higher PK should outperform those with lower PK when motivated to process new product information more carefully at encoding but for the reverse to be true if motivation comes after new product exposure.

STUDY 2: MOTIVATION TIMING AND NEW PRODUCT LEARNING

Method

Design. A 2 (Prior Knowledge) \times 2 (Motivation Timing) between-subjects design was used. Participants were randomly assigned to one of four conditions. To manipulate PK, participants were asked to read an information booklet on either the target category or a nontarget category. Participants were given a monetary incentive for accurately remembering the new product information. Those in the Motivation before Encoding condition were told about the incentive prior to new product exposure; Motivation after Encoding subjects learned of the monetary incentive after exposure but before the memory test.

Procedure. One hundred and forty-seven students at the University of South Carolina participated for course credit. Each session lasted one hour and was conducted in groups of two to 12 participants. Participants were told that they would be evaluating a new product. We invented the fictional condition “optic migraines” for the purposes of this research in order to remove the possibility of previous exposure to or experience with the product category. The fictional information presented for the optic migraine and its current brands of available medication was similar in scope to the information on allergies presented in study 1.

After a basic introduction to the purposes of the study, participants read a “general product category information” booklet, purportedly as a warm-up task that featured products in a similar genre to the subsequently featured new product. Participants read about optic migraine medications (higher PK) or tooth-whitening processes (lower PK). Both infor-

mation booklets were similarly structured and contained similar amounts of information to prevent differential cognitive fatigue. After this, the information booklets were taken from the participants and a new booklet, quite dissimilar in structure and visual appearance, informed the participants that the current study was about a new product innovation in the optic migraine category. Participants were told that, to assess their current knowledge of this category, a short test on optic migraines would be administered to all participants; this served as a manipulation check for PK.

Next, subjects received the “new product information” pamphlet. Motivation was manipulated by a performance-based monetary incentive. The new product pamphlets were prefaced by a cover sheet. The cover sheet in the Motivation before Encoding condition contained an additional paragraph not present for the Motivation after Encoding condition; it stated that participants who scored 75% or higher on the subsequent questions about the new medicine would be entered for a drawing for one of four prizes of \$50. In the Motivation after Encoding condition, this notification of the cash drawing occurred after exposure to the new product information but before the quiz for new product usage. Thus, participants were equally motivated to do well on the quiz, but potentially not equally prepared. Except for the cover sheets, the pamphlets were the same for all conditions. Then, the pamphlets were removed and participants responded to a questionnaire concerning the new product. As a part of this questionnaire, there was a quiz testing participants’ knowledge about the new product and its proper usage—a key dependent measure of new product learning. The quiz, similar in structure and style to the quiz used in study 1, tested subjects on their knowledge of how to use the new medication. After the quiz, participants were debriefed, thanked, and dismissed.

Results and Discussion

Manipulation Check. We first determined that our training manipulation created differential knowledge between our PK conditions. Recall that we administered a general knowledge test after the training phase but before the new product introduction. As expected, higher PK participants ($M = 13.9$) scored significantly higher than lower PK participants ($M = 8.9$, $F(1, 140) = 2,236.04$, $p < .01$; $\omega^2 = .994$) on this test.

Effects of Motivation Timing on New Product Learning. Study 2 tested whether higher PK participants would learn more new product information relative to that of participants with lower PK when motivated before rather than after encoding. New product learning was measured by performance on the postexposure quiz on new product information.

Consistent with an encoding rather than a retrieval interpretation of the findings from study 1, there was a significant Prior Knowledge \times Motivation Timing interaction for quiz score ($F(1, 142) = 3.92$, $p < .025$, table 2). Lower PK participants ($M = 17.1$) performed directionally, but not sig-

nificantly, better than higher PK participants ($M = 16.5$) on the new product quiz in the Motivation after Encoding condition ($t(73) = 1.07, p = .14$). However, in the Motivation before Encoding condition, higher PK participants ($M = 17.7$) significantly outscored lower PK participants ($M = 16.9; t(68) = 1.73, p = .04$). Further, motivation influenced higher PK participants' performance but not that of lower PK participants. With motivation before rather than after encoding, higher PK participants' scores increased significantly ($t(74) = 2.41, p < .01$), but lower PK participants' scores did not ($t(69) = .12, p = .45$). This interaction is similar to the study 1 interaction shown in figure 2.

Importantly, the difference in higher PK participants' and lower PK participants' performance is a function of the new product information that differed from the current product offerings (i.e., made old product information obsolete). When we compare accuracy for just those questions that differed from current knowledge, higher PK participants' scores improve with the incentive before ($M = 7.7, SD = 1.4$) rather than after ($M = 6.7, SD = 1.7$), and lower PK participants' scores do not ($M_{\text{before}} = 7.6, SD = 1.5; M_{\text{after}} = 7.4, SD = 1.4; F(1, 143) = 5.32; p = .01$). However, when accuracy for questions that did not represent a change (i.e., high PK participants' PK is not obsolete), the Prior Knowledge \times Motivation Timing interaction is not observed ($F(1, 143) = .06; p = .40$). These results offer support for hypotheses 1 and 3.

These results support the account of expert disadvantage in terms of low motivation at encoding rather than in terms of retrieval disadvantages. The motivation before and after encoding should have equally motivated groups to retrieve information at the time of test, but they differed in their motivation at the time of information receipt. When motivation came after encoding, lower PK respondents learned more than higher PK respondents. When motivation came before encoding, the enrichment hypothesis was supported. This suggests that support for hypothesis 1 in both studies 1 and 2 reflects encoding deficits of higher PK consumers rather than their retrieval strategies.

STUDY 3: MEASURED EXPERIENCE AND MOTIVATION TIMING

Study 3 attempts to replicate the findings of study 2 with expertise defined in terms of real experience rather than PK manipulated by in-lab training. As noted earlier, the expertise literature encompasses a range of knowledge-based and experience-based definitions. By using a training manipulation, studies 1 and 2 adopted a knowledge-based view of expertise, thereby removing product category involvement as a possible confound. However, product category involvement and product category expertise are inextricably intertwined in the real world. To assess the generalizability of our findings to conditions more like naturally occurring expertise, study 3 uses measured experience with the product category. We test whether more experienced consumers learn less and whether this performance is motivationally driven.

Method

Design. A 2 (Experience) \times 2 (Motivation Timing) between-subjects design was used. Because real world experience was necessary, we returned to the stimuli from study 1 using allergy medications as the focal new product category. Experience was determined by asking participants if they suffer from allergies. Those who responded yes were designated as "users" and those who responded no were designated as "nonusers" in our analyses. Motivation was manipulated by a performance-based monetary incentive as in study 2; the new product information pamphlet was prefaced by a cover sheet that in the Motivation before Encoding condition informed participants that good performance on a subsequent test of new product information would result in entry to a drawing for two \$50 prizes. In the Motivation After condition, this prize information came after receipt of new product information.

Procedure. Fifty-nine students at the University of Florida participated in the study for course credit. Each session lasted one hour and was conducted in groups of one to six participants. The procedure was largely similar to that of studies 1 and 2; it used the same target product category, allergy medications, as in study 1, but PK was not manipulated. At the beginning of the study, participants reported whether or not they were allergy sufferers. Participants were presented with the new product information pamphlet. Like study 2 and unlike study 1, the salience of the drug's newness was not manipulated. In study 3, the presented medicine was shown in one format only (pill) and was described as having few side effects. Also, except for the cover sheet, the stimuli used in study 3 were identical to those used in study 1 (for the pill/low side effects version) and the same for all conditions. The new product pamphlets had a cover sheet that manipulated motivation by the presence (Motivation Before) or absence (Motivation After) of information about a performance-based monetary incentive.

After the participants indicated that they were finished examining the new product information, the pamphlet was removed and a questionnaire concerning the new product was given. Again, part of this questionnaire constituted a quiz (see table 1) concerning new product information such as proper usage of the medication.

Results and Discussion

Effects of Motivation on New Product Learning. Study 3 tests whether increased motivation to process new product information improves experts' new product learning performance relative to that of novices (in accord with the results from study 2) when expertise was defined in terms of real experience—thus incorporating PK and other elements such as involvement or confidence. New product learning was measured by performance on the quiz administered after exposure to the new product information.

As expected, there was a significant Experience \times Moti-

vation Timing interaction for quiz score ($F(1, 55) = 3.07$, $p < .05$, table 2). Nonusers ($M = 19.4$) performed marginally, but not significantly, better than users ($M = 18.2$) on the new product quiz in the Motivation After condition ($t(30) = 1.25$, $p = .11$). However, in the Motivation Before condition, users ($M = 22.3$) significantly outscored nonusers ($M = 20.2$; $t(25) = 2.13$, $p < .05$). Further, motivation influenced users' performance but not that of nonusers. With higher motivation, users' scores increased significantly ($t(23) = 4.13$, $p < .001$), but nonusers' scores did not differ significantly between motivational conditions ($t(32) = 1.05$, $p = .15$). As with the study 2 results, this interaction is similar to the study 1 interaction (fig. 2). These results extend the support for hypotheses 1 and 3 to a broader (or more ecologically common) definition of PK.

GENERAL DISCUSSION

Study 3 replicated study 2 with assessed experience rather than manipulated PK. We subsequently conducted a similar "real experience" replication of study 1. In this study, real users and nonusers (similar to study 3) were presented with information on a new allergy medication that did or did not contain a newness cue (similar to study 1). Here, the dissimilar (or newness cue present) condition consisted of a medication with no side effects and a topical patch format (a combination of both the dissimilarity cues from study 1), and the similar (or newness cue absent) condition consisted of the same medication except with few side effects and in a pill format (a combination of both the similarity descriptors from study 1). Learning was measured by the same quiz scores as in studies 1 and 3. Although the sample size was small ($n = 30$), the predicted Expertise \times Newness Cue interaction was significant; nonusers ($M = 7.3$) outperformed users ($M = 5.5$) in test accuracy for the incongruent new product questions when the newness cue was absent, but users ($M = 7.4$) outperformed nonusers ($M = 5.3$; $F(1, 26) = 4.40$, $p = .02$) when the newness cue was present.

When Is Prior Knowledge a Curse?

As a whole, the results suggest that PK may negatively impact new product learning. Although cognitive science research has identified many ways in which experts possess superior performance or learning capabilities, new product innovations appear to be one arena in which PK may not always be an advantage. Behavioral decision researchers may view this as further evidence that experience is overrated. However, as Shanteau (1992) has argued, expert advantage depends on the characteristics of the task at hand. We do not argue that PK will always lead to poor learning but, rather, that learning will be the net result of opposing forces of ability and motivation.

Our findings may seem, at first blush, to conflict with those observed by Moreau et al. (2001). Moreau et al. (2001) show that when products are perceived as more new, experts rate their comprehension lower than do novices, yet when products are perceived as less new, experts rate their com-

prehension higher. The results from our study 1 suggest that experts may perform better than novices when products are perceived as more new and worse than novices when products are perceived as less new. However, more careful analysis suggests that our findings agree with theirs at a deeper level. They measured subjective knowledge, and we measured objective new product learning. Moreau et al. posit that experts may report lower comprehension because they recognize that a significant change has occurred. In our study 1, we suggest further that this recognition of change may motivate deeper information processing, which results in better learning performance (objective knowledge). It may be that when experts do not recognize change, confidently reporting higher comprehension, they do worse. Thus, the paradox is that when experts feel the best, they may do the worst and vice versa. These findings are also consistent with current marketing research that suggests consumers are poor judges of what they know (Alba and Hutchinson 2000; Moorman 1999). This research suggests that experts may be unaware when their knowledge has become obsolete and may not recognize the effects of information processing errors on product usage.

However, consistent with cognitive science predictions, experts can outperform novices under conditions of high motivation at encoding. This motivation may occur through a recognition of substantive product change (newness cues) or an extrinsic incentive. Thus, marketers of new products should emphasize product changes that diverge from current standards. Jolting experts out of their procedural complacency may require superficial but abundantly clear signals that a new product involves substantial changes, thus communicating that some of their knowledge may be obsolete. Such signals might consist of packaging or even product appearance and design. For example, Zithromax, a new antibiotic product, packages its pills in individual booklets rather than in (less expensive) pharmaceutical bottles to distinguish its new and different pill schedule from prior standard antibiotic schedules.

Directions for Future Research

One limitation of this research is our sole focus on an objective learning measure as the primary dependent variable. These findings could be further expanded by an investigation of differential processes demonstrated by expert and novice consumers. For example, we would expect that eye-tracking methods could detect more rapid scanning by consumers with higher PK, and more skipping ahead, and that this skipping behavior would mediate the effects of a motivation manipulation on later recall. We might further expect that a medium that does not allow such self-paced skipping (e.g., video) might find no expert disadvantage even in the absence of cues that a product is really new or other motivations at encoding.

Further, PK may affect the innovation adoption process beyond the learning of new product information. One avenue for future study would be to examine the influence of PK (or expertise) on consumers' likelihood of trial. We can identify

three reasons experts may be more willing to try a new product. First, the combination of elaborate knowledge structures and analytic tendencies should allow experts to recognize potential benefits or improvements in the new product. Second, experts are also likely to be confident in their ability to correctly use new products or make decisions about new products based on PK (e.g., Brucks 1985), self-efficacy (e.g., Bandura 1977), optimistic knowledge assessment (e.g., Alba and Hutchinson 2000), or FOK (e.g., Reder and Ritter 1992). Experts may be confident in trying novel products even when their confidence is not well calibrated. Third, Shanteau (1992) has noted the need for experts to engage in expertlike behaviors in order to maintain their self-image. Trying new, cutting-edge products and sharing opinions are just such behaviors.

Finally, product trial is only the first step in new product success, and learning effects are likely to have a significant impact on posttrial satisfaction. Consumers must learn about and correctly use a product to realize its benefits. Experts might be the first to try a new product but may also be more likely to use it incorrectly due to overconfidence or misapplied inference rules. If so, consumers with a history of competent use of the product class might be more likely to attribute poor product performance to the product rather than to themselves, similar to the accounts in the literature for why actors attribute success to internal factors and failure to external causes (Miller and Ross 1975; see also Bettman 1979, pp. 272–274). In consumer research, Fournier and Mick (1999) observed that nontechnophiles were more likely than technophiles to blame themselves when technological products broke down. Mistaken attributions should exert a negative influence on product satisfaction evaluations and, subsequently, on product adoption and word of mouth. An investigation of such posttrial phenomena would contribute to current research on innovation categorization and preference learning (e.g., Gregan-Paxton and John 1997; Hoeffler and Ariely 1999) and to the growing interest in the process of disadoption (Fournier and Deighton 1999).

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