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THE EFFECTS OF CHOICE AND EGO-INVOLVEMENT ON CONFIDENCE JUDGMENTS

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Studies on confidence judgments have generally shown that people are overconfident about their abilities or knowledge, and their confidence judgments are not well calibrated. The purpose of this study was to contribute toward a more precise and defensible version of how motivational factors interact with cognitive biases to influence confidence judgments. Review of the effect of choice on confidence judgments suggests an avenue to study the joint effect of motivational factors and cognitive biases on confidence judgments. In particular, the study investigated how motivational factors such as ego-involvement interact with cognitive biases involved in making choices to increase overconfidence in general knowledge questions. In the present study, the degree of ego-involvement was manipulated through information provided about the nature of the task. Participants either assessed confidence judgments on their chosen alternatives (choice condition) or assessed confidence judgments on the precircled alternatives (arbitrary cue condition). Results indicated that arbitrary cue participants were more overconfident than choice participants. The influence of ego-involvement, however, was undetectable. Ego-involvement was found to moderate the effect of choice on confidence judgments, however, in the opposite direction of the prediction. In the high ego-involvement condition, arbitrary cue participants exhibited higher overconfidence than choice participants. There was no significant difference between arbitrary cue participants and

choice participants in the low ego-involvement condition. Implications of the findings

and suggestions for future research are discussed.

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Overview of the Problem

In organizational contexts and in everyday life, the process of judgment and decision making is inherently predicated on one's ability to evaluate evidence and assess confidence in predicting outcomes of future events. Many of the decisions people make are critical. Whether the decision deals with what surgical procedures to perform, whom to hire for a job, or where to invest a million dollars, the outcome of any of these decisions can potentially have a profound impact on an individual or an organization. Moreover, decision makers lacking confidence in their judgments may fail to take necessary actions, resulting in missed opportunities. On the other hand, overconfident judgments can lead to erroneous choice and disastrous outcomes. For instance, strategic planning and decision making are dependent on predictions of what will happen in the relevant environment of a business. Forecasts are some of the important judgments made in organizations. Organizational performance will suffer if overconfidence is observed in forecasts. If managers rely too heavily on the supposed accuracy of a forecast, they may devote fewer resources to monitoring the environment, neglect contingency planning, and even misperceive or ignore signals that the future is evolving contrary to expectations.

Do people have accurate knowledge of what they know, how well they perform, and their ability to make the correct decision? The issue of how to evaluate evidence and assess confidence has been researched experimentally for the past three decades. Studies of judgment under uncertainty have generally indicated that people are overconfident about their abilities or knowledge, and their confidence judgments are not well calibrated (Lichtenstein, Fischhoff, & Phillips, 1982). The implication of the overconfidence

phenomenon is important in two respects (Yates, 1990). First, it implies that "our decisions are plagued by inaccuracy of our judgments" (Yates, 1990, p. 95). A physician, for example, may select the wrong treatment, a manager may select the wrong applicant, or a stockbroker may select the wrong investment if their confidence judgments are inaccurate. Second, it contends that "individuals who exhibit overconfidence in their decisions are less likely to recognize the need to improve their judgments" (Yates, 1990, p. 95). Without realizing the need for improvement in one's decision making process, one will continue to make the same mistake repeatedly. Therefore, it is essential to fully understand this phenomenon of overconfidence to determine how to reduce the probability of making potentially suboptimal, if not disastrous decisions.

The purpose of the study is to examine how motivational factors interact with cognitive biases to influence confidence judgments. Review of the effect of choice on confidence judgments suggests an avenue to study the joint effect of motivational factors and cognitive biases on confidence judgments. In particular, this study deals with the prediction of how motivational factors such as ego-involvement interact with cognitive biases involved in making choices to increase overconfidence in general knowledge questions.

The aspect of judgment accuracy that has received the most attention from research is the area of calibration. Calibration is defined as the ability to use judgments that are "appropriately qualified according to how sure the person is that the target event will happen" (Yates, 1990, p. 57). The following discussion provides an overview of calibration studies and examines the confidence judgment research in the domain of general knowledge questions.

<u>Overview of Calibration Studies</u>

      A typical calibration study requires the participant to answer multiple choice questions that test general knowledge or predict outcomes of future events. The format for almost all of the studies follows a two-stage procedure (Yates, 1990). The participant first indicates which of the two options is correct, then states a probability confidence judgment that the chosen option is indeed correct. The calibration of judgments is measured by grouping each of a set of confidence judgments into categories assigned to the same subjective probabilities. For each category, the experimenter calculates the percentage of the questions that participants answered correctly. In addition, the mean response is plotted against the percentage correct for each category. Calibration simply refers to the extent to which the subjective confidence closely matches the relative frequency of correct answers. Evidence of poor calibration exists when the subjective confidence of a given category differs from the relative frequency of the correct events within that category. The participant is called overconfident for categories in which reported confidence exceeds percentage correct, and underconfident for categories in which reported confidence is less than the percentage correct. Perfect calibration occurs when questions assigned a confidence of 70% are correctly answered 70% of the time and when events assigned a confidence of 90% occur 90% of the time. If this were true, we say that the individual's probability judgments are well calibrated. The conclusions drawn from the calibration studies have shown that confidence often exceeds accuracy. This phenomenon has been observed in a wide range of conditions and in many different domains (Fischhoff, Slovic, & Lichtenstein, 1977; Lichtenstein, Fischhoff, & Phillips, 1982; Oskamp, 1965; Winkler & Murphy, 1968;). The following section reviews in

greater detail the existing empirical evidence of the overconfidence phenomenon. In particular, we will note the parameters and implications of overconfidence in general knowledge studies.

Overconfidence in General Knowledge Questions

The most consistent evidence of overconfidence has emerged in general knowledge, almanac question studies. Examples of a general knowledge question would be "Which City is farther south: (a) Rome or (b) New York?" or "Which city has more people: (a) Des Moines or (b) Santa Barbara?" Participants then pick one of the answers and assess the probability of that chosen answer being correct. Numerous studies using general knowledge questions have shown the effect of overconfidence (Fischhoff, Slovic & Lichtenstein, 1977; Lichtenstein & Fischhoff, 1977; Yates, Lee, & Shinotsuka, 1996). Lichtenstein and Fishhoff (1977) found participants' probability judgments are prone to systematic biases, especially overconfidence. Fischhoff et al. (1977) studied the appropriateness of the expressions of confidence and found participants were consistently overconfident across various response formats and questions. Overconfidence regarding general knowledge has been observed across various response formats and elicitation techniques (Alpert & Raiffa, 1982; Fischhoff et al., 1977; Ronis & Yates, 1987).

The overconfidence phenomenon, although relatively robust, is not universal in all tasks and for all items. A substantial amount of research has shown that overconfidence is subject to a number of factors. The most commonly discussed moderator of overconfidence is item difficulty. In most cases, difficulty is defined on the basis of the performance of participants. Analysis has revealed that overconfidence and poor calibration are exaggerated for difficult tasks and items, ones that are answered

correctly by relatively few people. In fact, the overconfidence effect is minimized and even turned into systematic underconfidence for easy tasks and items, questions that almost everyone answers correctly. This result is termed the hard/easy effect (Lichtenstein & Fischhoff, 1977). In a study of discriminating between European and American handwriting, Asian and European children's drawings, and rising and falling stock prices, Lichtenstein and Fishhoff (1977) observed that overconfidence was drastically reduced as tasks get easier. Additional analyses revealed that individuals who answered more items correctly exhibited less overconfidence in general. In other words, they found a systematic decrease in overconfidence as the percentage correct increased. Other studies have also replicated the finding to show that participants who are more accurate exhibit better calibration and less overconfidence than those who are not as accurate.

In addition to item difficulty, overconfidence is also moderated by the expertise of the individual (Keren, 1987; Murphy & Winkler, 1984). Keren (1987) conducted a study involving a group of expert and nonexpert bridge players in a natural environment of a bridge tournament. After the bidding phase of each game, but prior to when the actual play began, players were asked to assess the likelihood of the final contract being made at each round. The two groups showed significantly different results in regard to their probability judgments. The calibration of the expert group was clearly superior to the calibration of the nonexpert group. The nonexpert group showed overconfidence in their probability judgments. Murphy and Winkler (1984) replicated the finding when they observed that professional weather forecasters exhibit much better calibration and less overconfidence than laypersons in making weather forecasts. In summary, there are clear

circumstances where overconfidence in judgments consistently occurs. On the other hand, there are also situations where overconfidence is hardly ever observed (Keren, 1987; Murphy & Winkler, 1984). Therefore, the extent to which overconfidence is likely to occur and under what specific circumstances is worthy of examination.

Plausible Causes of Overconfidence

In examining the overconfidence literature, the essential question with respect to the causes of confidence errors has received very little attention. Lichtenstein, Fischhoff, and Phillips (1982) criticized overconfidence studies, portraying them as examples of "dust-bowl empiricism" (p. 333). They contend that psychological theories and explanations for results were often absent in most overconfidence research. In reference to the current research, there are at least two plausible explanations of overconfidence. Cognitive biases are commonly offered explanations of overconfidence. The overconfidence phenomenon has been explained as a characteristic of human information processing (Koriat, Lichtenstein, & Fischhoff, 1980). An alternative explanation is a motivational one. An extensive literature on self has suggested a motivation factor that drives many self-processes and underlies a variety of cognitive and behavioral responses, the drive for favorability. People generally tend to hold positive and somewhat inflated views of themselves whenever possible. It is plausible that this drive for favorability may have accounted for the observed overconfidence phenomenon (Yates, Lee & Shinotsuka, 1996).

Cognitive biases. People generally have the tendency to discredit and explain away information that may disconfirm a hypothesis they hold, or they may simply engage in a biased information search for confirming evidence for their hypothesis. The

phenomenon of cognitive bolstering of the chosen course of action has been intensively investigated by social psychologists. According to Janis and Mann (1977), not only does this cognitive bolstering phenomenon occur after commitment is made, but is also at work in people who are trying to make a personal decision before the commitment phase. The characteristic manifestations of bolstering (oversimplifying, distorting, evading, and omitting major considerations bearing on the less acceptable alternatives) are exhibited by those who are in the process of making decisions (Janis & Mann, 1977). These types of bolstering characteristics are likely to become sources for overconfidence. Research on reducing overconfidence in decision making has shown that requiring participants to justify their answers to a group of other participants significantly reduced the amount of overconfidence in judgments (Arkes, Christensen, Lai, & Blumer, 1987; Koriat et al., 1980). As suggested by Koriat et al. (1980), biased search for confirming evidence prior to choice as well as biased search after choice may contribute to this phenomenon of overconfidence. In their study, overconfidence was drastically reduced for participants who were asked to write down all the reasons they could think of that would support or contradict either of the two possible answers before they recorded their selection and assessed the probability. The same finding was replicated in Arkes et al.'s (1987) study in which requiring participants to justify their choice of alternatives to a group of other participants significantly reduced the amount of overconfidence in judgments. Overall, the appropriateness of confidence is determined in part by the extent to which an individual searches for confirming and disconfirming evidence for each of the alternatives.

Motivational factors. There is no doubt that people seek to find some positive basis for self-esteem, to think well of themselves. Self-esteem theories contend that people desire to enhance the positivity of their self-conceptions or protect the self from negative information (Baumeister, 1995). For example, people will seek out and focus on information that has favorable implications for the self and avoid information that has unfavorable implications to the self. The bias toward overly positive self-evaluation has been replicated across a wide range of research tasks and conditions. In a review, Taylor and Brown (1988) contend that the three phenomena that have consistently emerged from numerous studies of self are unrealistically positive views of the self, exaggerated perceptions of personal control, and unrealistic optimism. It is quite possible that these very biases of overly positive self-evaluations are present in evaluations of one's performance in decision-making tasks.

In the following section, I will review overconfidence studies that specifically dealt with the prediction of how motivational factors such as self esteem/ego involvement interact with cognitive biases to increase overconfidence in general knowledge questions. The inconsistency in this line of research is noted.

Effect of Choosing on Confidence

The discussion which follows begins with the review of three studies that directly examine the effect pf choice on confidence judgments. In the first study, Sniezek, Paese, and Switzer (1990) investigated the effects of choice and framing techniques on confidence judgments. The second study conducted by Ronis and Yates (1987) dealt with consistency and effects of subject matters and assessment method on confidence judgments. Finally, in an attempt to provide an alternative explanation for the

aforementioned studies, Scherer and De La Castro (1998) examined the interactive effect of choice and responsibility on confidence judgments.

Sniezek et al. (1990) examined the effects of choosing an alternative and framing on formation of confidence in choice. Participants were 104 undergraduate students. Participants in the choice condition were asked to choose between two alternatives in a general knowledge questionnaire. Then participants stated a probability confidence judgment from .50-1.00, that the chosen alternative was correct. The same procedure was repeated in both the arbitrary cue condition and uncued condition with the following exceptions. In the arbitrary cue condition, participants read each item and rated the probability that the arbitrarily precircled alternative was correct (alternatives were arbitrarily precircled in an alternating sequence). In the uncued condition, participants were instructed to read the item and then rate the probability of answering the item correctly without actually answering the question. These researchers predicted that explicit choice between alternatives would lead to greater confidence in choice. Specifically, going back to the proposition of Koriat, et al. (1980), information search is biased toward the evidence supporting one's preferred alternative. With respect to this proposition, the explicit selection of an alternative would bias information search, and as a result, lead to overconfidence. In addition, an overt choice is likely to promote personal commitment to the selected alternative as opposed to passively judging the probability of an arbitrarily preselected alternative. As personal commitment increases with explicit choice, individuals will be more motivated to seek out confirming evidence in support of their overt choice. It is assumed that the search for and the evaluation of evidence following an explicit choice would be biased by personal commitments to one's choice.

To summarize, when self is the agent of selection, as in the case of choice condition, the motivational factors of self should interfere with normal cognitive processing of information, thereby resulting in greater overconfidence.

In addition to choice, these authors examined the effect of framing on confidence. Two versions of elicitation statement were employed in this study to manipulate the effect of framing. Participants were instructed to estimate the probability of being correct in the positive elicitation frame condition, and the probability of being wrong in the negative elicitation frame condition. According to these authors, framing could lead to overconfidence through two routes. First, positive elicitation statement could induce participants to agree with the proposition, and this would ultimately lead to overconfidence. Second, framing could lead to overconfidence through biased generation of evidence prior to choice or selective attention to confirming evidence after choice. Emphasis on the probability of a chosen answer being wrong has the potential effect of reducing biases toward generating confirming evidence prior to choice and evaluating evidence following choice. Therefore, confidence was predicted to be lower in negative elicitation condition due to reduction of cognitive biases.

The Sniezek et al (1990) study, however, found the opposite results. Contrary to the prediction that choice contributes to overconfidence, the effect of selection was found to be significant for the overconfidence measure in the reverse direction. Participants in the choice condition were less overconfident than participants in the two no-choice conditions. Arbitrary cue participants showed more overconfidence than the other two conditions. Although all three conditions exhibited overconfidence, confidence ratings were more appropriate and accurate for participants who explicitly selected an

alternative. Additional analyses also revealed that participants who made explicit choices exhibited better calibration and answered a higher proportion of items correctly. The prediction that overconfidence is in part due to elicitation instruction was not supported in the study. The observed confidence ratings were invariant to elicitation framing conditions. In other words, participants in the negative framing condition were equally likely to underestimate the probability as those that overestimated the probability in the positive framing condition.

Sneizek, et al. (1990) developed post hoc explanations for their unexpected results. These authors proposed a cognitive heuristic process model that expands the propositions of Koriat, et al. (1980) to justify the unexpected results. They posited that the appropriateness of confidence depends on the extent to which unbiased search of both confirming and disconfirming evidence is engaged for all alternatives. These authors speculated that in the choice condition, participants may have searched for both confirming and disconfirming evidence regarding both alternatives. This may have resulted, according to the authors, in greater depth of processing of information of the less preferred alternative, thereby reducing the confidence for the initial preferred alternative. For the arbitrary cue condition, seeing a circled alternative may have focused participants' attention on the preselected alternative. As a result, participants searched their memories only for confirming evidence of the preselected alternative and thereby increased the perceived likelihood of that alternative being correct. Furthermore, it is likely that focusing attention on one alternative may decrease the likelihood for consideration of pros and cons of the other alternative. In essence, these authors argue that cueing an alternative increases biased information search on the preselected

alternative and decreases the amount of information search on the unchosen alternative, and in consequence, overconfidence occurs in the direction of the preselected alternative.

In summary, contrary to these authors' initial prediction of the effect of choice on confidence judgments, choice did not increase overconfidence. In fact, the results indicated that it weakened the phenomenon. A study by Ronis and Yates (1987) also investigated the effect of choice on confidence judgments. These authors also made the same prediction as Sniezek et al (1990) regarding the effect of choice on confidence judgments, and they also obtained similar findings.

Ronis and Yates (1987) investigated the effects of subject matters and assessment method on confidence. The purpose of the study was to determine the generalizability of overconfidence within the general knowledge domain to the realm of forecasting and the extent to which different confidence assessment methods contribute to probability judgment accuracy. These authors suggest that perhaps the mere act of choosing an answer may influence the probability judgment process. In support of this view, these authors borrowed the propositions made from the self-perception theory (Bem 1967, cited in Ronis & Yates, 1987) and an early version of the theory of cognitive dissonance (Brehm & Cohen, 1962, cited in Ronis & Yates, 1987; Festinger, 1957, cited in Ronis & Yates, 1987). Both theories, according to these authors, posit that the mere act of choosing a course of action will increase attractiveness of the chosen action and decrease attractiveness of the other alternatives. In other words, the perception of an attractive course of action increases as the result of having been personally involved in making that choice. When self is the agent of selection, the cognitive perception of attractiveness is biased toward one's choice of action. These authors argue that this difference between

two-step (choose then judge) and one-step (judge) methods may account for the discrepancy between tasks requiring general knowledge questions and those tasks requiring the prediction of future events. Explicitly choosing an alternative prior to assigning a probability for that choice increases the attractiveness of the chosen alternative, and may have inadvertently contributed to the observed overconfidence in the laboratory.

In sum, these authors examined the consistency of probability judgments across different subject matter contexts and assessment methods. Specifically, they predicted that participants in the two-step method condition (choose then judge) would exhibit higher overconfidence than those in the one-step method condition (judge) because of the increasing attractiveness of the chosen alternative.

To test this hypothesis, participants were instructed to answer 51 questions in two domains: general knowledge and outcomes of upcoming professional basketball games. Participants were 128 students from a local community university. The three probability assessment methods used in the study were choice-50 method, no choice-100 method, and choice-100 method. In the choice-50 method, participants first selected one of the two possible alternatives and then assigned a probability from .50 to 1.00 that the chosen alternative was correct. In the no choice-100 method, one of the two possible alternatives was precircled. Participants were informed with that the precircled alternative was determined randomly by a coin toss. Participants in the no choice-100 method condition simply rated the probability from 0.00 to 1.00 that the precircled alternative was correct. Finally, in the choice-100 method, participants first selected one of the two possible alternatives and then assigned a probability from 0.00 to 1.00 that the chosen alternative

was correct. To compare across data from no-choice 100 method and the other assessment methods, data from the no-choice method were recoded by the computer based on the following rules: If the probability assigned was greater than .50, the participant was coded with choosing the precircled alternative and assigning the probability. If the probability assigned was below .50, the participant was coded with choosing the alternative that was not precircled, and the new assigned probability is determined by subtracting the indicated probability from 1.00.

Ronis and Yates (1987) obtained similar results as to Sniezek et al. (1990) in their study regarding the effect of choice on confidence. Contrary to these authors' initial expectation, confidence and overconfidence measures were highest with the no-choice-100 method, lowest with the choice-100 method, and choice-50 was somewhere in between the two irrespective of topic effect. Although probability judgments exceeded proportions correct by 9.8% in the choice-100 method condition, the difference was almost double that amount (16.5%) in the no-choice-100 method condition. In addition, participants in both choice method conditions demonstrated better calibration and higher accuracy than participants in the no-choice-100 method condition. Further analyses revealed that participants in the no-choice-100 method condition were more likely to agree with the precircled alternatives. They assigned higher probability to the precircled alternatives than did participants in both choice conditions. This particular finding suggest a possibility of cueing effect from the precircled alternatives.

In an attempt to reconcile the inconsistency between their initial prediction and their empirical data, Ronis and Yates (1987) offered two plausible explanations. First, the methodological artifacts could have partially accounted for the observed outcome. It is

possible that the precircled alternatives had a cueing effect even though participants were informed that the decision about which answer was circled was derived by chance. From that perspective, participants in the no-choice condition may have suspected that the preselected alternatives were not circled arbitrarily. This cueing effect could lead to increases in overconfidence observed in this study. The second explanation is similar to that provided by Sniezek et al. (1987). The precircled alternatives may have led to selective attention on one alternative which reduces the likelihood of considering confirming and disconfirming evidence for the other alternative. In addition, focusing attention on one alternative would bias the direction of information search on the alternative such that one would tend to generate confirming evidence in support of that alternative.

In summary, Sniezek et al. (1990) and Ronis and Yates (1987) investigated the effect of choosing on confidence judgments. The two studies made the same initial prediction that choosing would increase overconfidence in choice. Sniezek et al. (1990) suggest that the search and evaluation of evidence following an explicit choice would be biased by a personal commitment to one's choices, and therefore, overconfidence should occur when self is the agent of selection. Ronis and Yates (1987) argue on the basis of self-perception theory and cognitive dissonance theory that freely choosing a course of action should increase the attractiveness of that chosen action and decrease the attractiveness of the alternative action. Contrary to the predictions these authors had made, the data were in the opposite direction. Both authors developed post-hoc explanations in an attempt to explain why arbitrary cue condition resulted in more overconfidence. Both authors argued that the circled alternative focused participants'

attention and memory search on the preselected alternative. As a result, they speculated that participants searched their memories only for confirming evidence of the preselected alternative and thereby increased the perceived likelihood of that alternative being correct. Furthermore, focusing attention on one alternative decreases the likelihood for considering pros and cons of the other alternative. In essence, these authors argue that cueing an alternative increases biased information search on the preselected alternative and decreases the amount of information search for the unchosen alternative, and in consequence, overconfidence occurs in the direction of the preselected alternative. Therefore, these authors ruled out their initial hypothesis that choice evoked more ego concerns and therefore the overconfidence bias.

In a more recent study, Yates, Lee, and Shinotsuka (1996) quoted the two studies above as evidence against using a self-esteem mechanism as an explanation of overconfidence in general knowledge. Yates et al. (1996) claimed that a self-esteem account for overconfidence should result in weaker overconfidence in the single-stage, no choice condition than in the standard two-stage condition. They argued that if self-esteem was the explanatory mechanism for overconfidence, choice between alternatives should "induce ego-involvement that would be threatened if the choice turned out to be wrong" (p.145). The fact that choice does not increase overconfidence, according to Yates et al. (1996), is direct evidence against the self-esteem account of overconfidence.

Despite relatively consistent findings, there are some limitations to the studies reported by Ronis and Yates (1987) and Sniezek et al. (1990). One note of criticism toward these two studies was the manner in which their studies treated choice as synonymous with ego-involvement, and subsequently, personal commitment. Choice

served as a proxy for ego-involvement and personal commitment in their studies. Authors from both studies recognized the potential mediating effect of self-esteem/ego involvement between choice and confidence judgments in their initial hypotheses. Sniezek et al (1990) directly included the term "personal commitment" in their hypothesis. With Ronis and Yates (1987), the term "personal commitment" is applied from self-perception theory and cognitive dissonance theory. Cognitive dissonance theory, for example, is indistinguishable from motivation to maintain consistent and favorable self-evaluation. Festinger (1957), as well as Brehm & Cohen (1962), made the claim that the essential conditions for arousal of cognitive dissonance are nothing more than those three concepts: ego-involvement, personal importance, and personal commitment (cited in Greenwald, 1982). In a review of the ego-involvement literature, Greenwald (1982) claims that ego-involvement is closely related to personal importance and personal commitment. A careful examination of Ronis and Yates (1987) and Sniezek et al.'s (1990) rationale for their designs reveals that choice per se could not lead to an increase in confidence judgments, but rather the commitment to the chosen course of action will determine the extent to which choice will lead to increase in overconfidence. Ronis and Yates (1987) and Sniezek et al. (1990) both indirectly tested their hypothesis assuming that choice will always lead to ego-involvement and thereby increase commitment to the choice.

The premise that choice leads to increases in ego-involvement, and ego involvement influences personal commitment to the chosen course of action warrants further attention. This premise is not always true and is contingent upon the context in which the choice is made. One could reasonably argue that ego involvement is low

regardless of choice condition under the context of general knowledge questions. Does making a choice on a general knowledge question task sufficiently involve participants enough to trigger ego involvement? One needs to examine the context as well as the process to fully understand the picture. Both authors made the speculative attempt to rule out motivational factors from their initial predictions when data contradicted their predictions. The authors of both studies argued that a pure cognitive process model was adequate in explaining their results, and both authors opted for that route. Can one be sure that a pure cognitive process model is sufficient to capture the true relationship between choice and confidence judgments?

Another problem with the above two studies has to do with the assumption about depth of processing. Is a high degree of processing indicative of unbiased generation and evaluation of evidence for both alternatives or just the preferred alternative? Authors from both studies argued that cueing an alternative reduces the amount of cognitive processing for both alternatives, and thereby increases overconfidence. This is mere speculation because the amount of cognitive processing was not measured in their studies. There is no evidence that participants in the choice condition took more time to complete the task compared to those in the arbitrary cue condition. However, the next study to be discussed specifically addressed this issue of depth of processing.

Unlike the first two studies, the next study reexamined the effect of choosing on confidence judgments from a motivational perspective by manipulating the amount of responsibility in their study. According to Scherer and De La Castro (1998), the task required for participants in the arbitrary cue condition may have failed to sufficiently involve the participants and may have reduced their sense of responsibility for the

accuracy of the pre-selected alternative. Diffusion of responsibility in the arbitrary cue condition may have resulted in the observed overconfidence in both studies. Therefore, a cognitive heuristic hypothesis alone may not be sufficient to explain the observed findings. In their study, the effect of choosing on confidence in choice was examined while controlling the degree of responsibility for the decision. The prediction was that if choice leads to less overconfidence, irrespective of the responsibility manipulation, the heuristic processing explanation would be supported. If, however, the responsibility manipulation results in no significant difference between choice and arbitrary cue condition, the heuristic processing explanation would not be supported. Furthermore, levels of processing theory (Craik & Lockhart, 1972) suggests that task completion time and recall accuracy are indices of depth of processing, with greater time on task and recall accuracy revealing deeper levels of processing. Thus, in addition to the typical dependent measures of a calibration study, this particular study included time to complete the questionnaire and amount of information recalled as indices for depth of processing, with greater time on task and recall accuracy revealing deeper levels of processing.

Participants were assigned to choice or arbitrary cue conditions as in previous studies. Degree of responsibility was manipulated using a justification procedure similar to the Arkes, et al. (1987) and Koriat, et al. (1980) studies. Participants in the justification condition were instructed to present to the other participants the rationale for their confidence ratings. In the no justification condition, participants received no instructions regarding any requirement to justify their confidence ratings.

The Scherer and De La Castro's (1998) data revealed an interesting pattern of results. Ironically, the overall pattern of results was inconsistent with those reported by

Ronis and Yates (1987) and Sniezk et al. (1990) in two respects. Participants in the choice condition reported significantly higher confidence and overconfidence than participants in the arbitrary cue condition. Participants in the choice condition were also not as well calibrated as arbitrary cue participants. These authors speculated on the basis of these significant but unexpected results that participants in the choice condition may be more likely to feel committed to the chosen alternative and process information in a biased fashion to bolster their decisions. This speculation is identical to the initial reasoning of Sniezek et al. (1990) and Ronis and Yates (1987).

Contrary to expectations, no significant main effect of responsibility was observed. The authors noted that the power of the responsibility manipulation was questionable on the basis of the nonsignificant results obtained from the self-reported on felt responsibility and task involvement. However, results from the task completion time revealed that participants in the high responsibility condition spent significantly more time on the task than those in the low responsibility condition. These authors speculated that participants in the high responsibility condition processed information more deeply than subjects in the no justification condition basing this reasoning on levels of processing theory (Craik & Lockhart, 1972). However, no significant main effect of choice was observed on the task completion time. Task completion time was invariant to choice manipulation. Furthermore, measure of total recall accuracy revealed a significant interaction such that the superior recall performance of participants in the arbitrary cue-justification condition compared to those in the arbitrary cue-no justification condition disappeared in the choice condition. Participants in the choice-justification condition failed to recall significantly more words compared to participants in the choice-no

justification condition. The absence of a responsibility effect in the choice condition is inconsistent with the cognitive processing model Sniezek et al. (1990) proposed. The model predicts that having to choose or having to justify one's decision to others should induce deeper processing. Superior recall performance should be expected as the result of deeper processing. Scherer and De La Castro (1998), however, offered two explanations for such inconsistent finding in the choice-justification condition. They proposed that although choice and justification might independently facilitate deeper processing of information, the type of processing elicited may be different for these two factors. From this viewpoint, the presence of both choice and justification may have led to processing interference, thereby resulting in poor performance. In other words, the two factors may differ qualitatively in terms of the types of processing they elicit. Another possibility is the limited availability of cognitive resources. If choice leads to biased search and evaluation of information while justification produces social pressure to appear objective, the two processes might demand a greater portion of cognitive resources in order to balance each other out. As a result of such a great demand on cognitive resources, there may be very little left to devote to processing information on the specific item level. This could contribute to poor recall in memory task.

This study, as the two mentioned before, has its limitations. First, these authors speculated that their responsibility manipulation may have more closely approximated an accountability manipulation and not necessarily influenced feelings of felt responsibility. Based on an extensive review of the research dealing with responsibility, accountability, and identifiability, Potter and Scherer (1998) made the distinction among these three constructs. The consensus in the literature is that accountability implies giving an account

for or justifying one's opinion whereas responsibility seems to imply "some degree of ownership of result of outcomes that is not necessarily implied by accountability (p. 51)." Identifiability, on the other hand, simply refers to whether or not the response is identifiable or traceable. The construct of interest in the Scherer and De La Castro (1998) study is clearly accountability, rather than responsibility. This erroneous label of the construct could potentially explain the nonsignificant results obtained for the felt responsibility measure and the task involvement measure of self-reported. The felt responsibility measure was not significant mainly because it is not a valid measure of accountability. In addition, not only were participants accounted for their confidence judgments, their confidence judgments were also traceable and identifiable. The interactive effect of accountability and identifiability may have contributed to the observed findings.

Although the accountability manipulation resulted in deeper level of processing, it may or may not have evoked ego-involvement to the extent that these authors were hoping. Scherer and De La Castro (1998) also questioned the strength of their accountability manipulation which required participants to justify their probability estimates to a group of peers who knew each other. They raised the possibility that the manipulation might have been strengthened by requiring justification to someone with power over important outcomes.

The inconsistency and discrepancy in the literature suggests that the relationship between choice and confidence is more complicated than once thought. Scherer and De La Castro (1998) speculated on the basis of unexpected results that participants in the choice condition may be more likely to feel committed to the chosen alternative and

process information in a biased fashion to bolster their decisions. If this explanation is tenable, how can these findings be reconciled with those obtained by Ronis & Yates (1987) and Sniezek et al. (1990)? To fully understand the effect of explicit choice on confidence judgment, one must consider the mechanisms involved when explicit choice is made. Specifically, the extent to which freely choosing a course of action could lead to overconfidence in that chosen action. The author has noted in the criticism of these three studies that the underlying motivational effect of ego-involvement has to be present in order for choice to exert its influence on commitment. Commitment to a choice may ultimately influence confidence judgments through biased generation and evaluation of evidence for that chosen action. Therefore, in the following section, I will review studies on ego involvement to further our understanding of this phenomenon.

Overview of Ego-Involvement

In a review of ego-involvement theory and research, Greenwald (1982) posited that the construct of ego-involvement can be understood from three different perspectives. The three conceptual interpretations of ego-involvement are: (a) concern about evaluation by others, (b) concern about self-evaluation, and (c) personal importance. Concern about evaluation by others is similar to what is known as evaluation apprehension in that the participants were instructed that the tasks to be performed were to be scored to measure a skill or ability, usually intelligence. Concern about self-evaluation is similar to constructs of self-esteem threat and achievement orientation. The difference between concern about evaluation by others and concern about self-evaluation is that the evaluator is oneself rather than an observer. However, to the extent that one may consider self-esteem as closely connected with the opinions of others, the distinction

will be minimized. Finally, personal importance can be characterized as a function of the number of personal values and the strength of those values attached to a cognition or belief.

Greenwald (1982) concludes his review by proposing an alternative view of ego-involvement. He argues that the diversity in the conceptual interpretations of ego-involvement can be formulated and integrated into a simple view of ego-involvement as the engagement of an ego task. Ego tasks simply refer to activities aimed at achieving pervasive and enduring personal goals. The three common ego tasks are impression management, self-image management, and value management, which correspond to the three conceptual interpretations respectively. From this viewpoint, it is clear that ego-involvement can be induced in an experiment by transforming an otherwise boring, unimportant task, such as responding to a series of general knowledge questions, into an ego task. Greenwald (1982) noted that this could be achieved by instructing the participant that the items on the task provide a clear measure of intelligence or some other valued traits. The next section will discuss two recent studies on ego-involvement. Specifically, the effect of ego-involvement on cognitive information processing is delineated and implication of ego-involvement on confidence in choice is noted.

Graham and Golan (1991) examined motivational influences on cognition, specifically the effects of task involvement, ego involvement, and depth of information processing on encoding and recall of information. The purpose of the study was to examine how an individual's motivational state influences learning. In the study, 5th and 6th grade children were randomly assigned to an ego-focused condition, task-focused condition, or a control group. Children received 60 three- to five- letter words

manipulated by the level of processing required at encoding and retrieval (shallow vs. deep). Ego-involvement was induced by focusing children's attention on their self-perceived ability or their ability relative to others. Children in the ego-involvement condition were instructed that how well they do on the task provides the researcher information as to how good they are at the task relative to other kids of their age. The study found that ego involvement resulted in poorer recall of information only at deeper levels of processing. These authors discussed the possibility that the amount of mental effort required could result in such finding. They claim that deep processing entails greater elaboration and greater cognitive effort as opposed to shallow processing. From this perspective, it appears that ego involvement may interfere with the cognitive effort needed for deeper levels of information processing. While this tendency may generalize to the adult population, this study was conducted using children. The actual effect may attenuate with an adult population.

The results of this particular study dovetail quite well with the observed results from the Scherer and De La Castro (1998) study and the explanation they provided. Similarly, they observed that participants from the choice-justification condition performed poorly on a recall task. Combining the results from the two studies, it seems plausible that the justification manipulation may have inadvertently transformed an unimportant task of general knowledge questions into an ego task. The resulting ego-involvement on the part of participants in the high justification condition may have interfered with cognitive effort needed to process deeper information, as in the case where participants were asked to make an explicit choice.

Conway and Howell (1989) examined the hypothesis that ego involvement leads to positive self-schema activation and to a positivity bias in information processing. The task involved in the study has a depth of processing task, which required participants to judge words according to cue questions that corresponded to different processing levels. The positive self-schema activation was assessed with a recall task following the depth of processing task. The types of word recall, according to these authors, may reflect the underlying cognitive processes of information. The recall words processed at the self-referent level, for example, would simply reflect the influence of the self-schema. In this study, ego-involvement was induced by having participants anticipate taking a difficult test of intelligence. Participants heard an audio recording of 48 adjectives (27 positive and 27 negative) presented at 5-s intervals. Participants first rated each adjective in terms of its descriptiveness and favorability. A self-favorability score was computed for each objective by multiplying these two ratings. A positive score would be indicative of self-descriptive and favorable or not self-descriptive and unfavorable. In addition, participants judged each adjective using a yes/no scale on either self-referent level (describe you?), semantic level (means the same as/opposite of?), or phonemic level (sounds like?). The prediction was made that ego involved participants would recall a greater number of positive and fewer negative words processed at the level that evokes the affective meaning of the words. Furthermore, the activation of positive self-schema would result in a positivity bias in information processing. The positivity bias was expected to emerge at all levels of processing except the phonemic because it does not evoke affective meaning. The rationale, according to these authors, is that self-schemata can facilitate the

processing and recall of consistent material (self-descriptive and favorable) as well as inconsistent material (not self-descriptive and unfavorable).

The positivity bias hypothesis was supported from the results of recall frequency. Ego-involved participants generally recalled a greater number of positive and a smaller number of negative words than noninvolved participants. Additional analyses revealed that this difference is greatest at the semantic level. Contrary to expectation, the difference was not significant for the self-referent level. In other words, ego-involved participants did not recall a greater number of positive and a smaller number of negative words than noninvolved participants at the self-referent level. The same results were observed for self-favorability score. In general, the data supported the notion that ego-involvement leads to greater activation of positive self-schema and a positivity bias except for negative words processed at the self-referent level. The pattern of means across three levels and across word valence, in terms of self-favorability score, was consistent with the positivity interpretation. In an attempt to address the inconsistency, Conway and Howell (1989) speculated that the ego-involvement manipulation may have increased the salience or accessibility of participants' self-concept. Because people have the tendency to view themselves favorably, an increase in salience of self-concept could account for the unexpected high recall of positive words at the self-referent level. There is another explanation for the unexpected results. The unexpected results at the self-referent level could be products of a serious methodological artifact. With regard to the definition of ego-involvement, Greenwald (1982) noted that the procedure of asking participants to judge the self-relevance of various stimuli has the potential effect of enhancing memory for those stimuli. This procedure in itself has shown to produce ego-

involvement. He even coined this particular ego task as "memory management". From this perspective, it is likely that processing information at the self-referent level evokes ego-involvement. In this case, the manipulation of ego-involvement was contaminated with self-referent level of processing. The results supported this explanation. In general, the study provides empirical evidence in support of the hypothesis that ego-involvement leads to greater activation of positive self-schema and a positivity bias. This particular finding has a profound implication on the effect of choice on confidence judgments. More specifically, this finding provides direct evidence of the underlying processes and mechanisms that maybe involved in confidence judgments.

The Present Investigation

Purpose. The purpose of the study was to examine how motivational factors interact with cognitive biases to influence confidence judgments. Review of the effect of choice on confidence judgments suggests an avenue to study the joint effect of motivational factors and cognitive biases on confidence judgments. In particular, the present study dealt with the prediction of how motivational factors such as ego-involvement interact with cognitive biases involved in making choices to increase overconfidence in general knowledge questions. Inconsistency in the literature on the effect of choice on confidence judgments warrants further examination of the topic.

No study to date has systematically examined the mediating effects of ego-involvement and commitment on the relationship between choice and confidence judgments. The researcher argues that explicit choice alone does not lead to overconfidence. Choice per se could not have resulted in an increase in confidence judgments, but rather the commitment to the chosen course of action determines the

extent to which choice will lead to increase in overconfidence. The premise that choice leads to increase in ego-involvement, and ego-involvement influences personal commitment (to the choice) is addressed in this study. To the extent that choice leads to increase in ego-involvement, and personal commitment (to the choice), one should observe overconfidence in choice. Therefore, in addition to choice, this study examined the specific effect of ego-involvement and personal commitment on confidence judgments. The inclusion of ego-involvement and personal commitment should provide a theoretical contribution to the existing research on confidence judgments. Moreover, the two constructs may have practical implications for understanding how to minimize overconfidence.

Predictions and rationale. The first objective was to examine the effect of choice on confidence judgments. The researcher predicted that the pure cognitive heuristic model proposed by both Sniezek et al. (1990) and Ronis & Yates (1987) should be at work in the absence of ego-involvement. There is no reason to believe that choice would lead to higher confidence judgments if participants' egos were not involved during the task. Therefore, it is likely that the participants will focus on the precircled alternative and engage in biased generation and evaluation of information. Higher confidence judgments and overconfidence should be expected as the result of selective attention to the precircled alternative.

> *Hypothesis 1: Participants who make an explicit choice before assigning a*
>
> *confidence rating will exhibit lower confidence and lower overconfidence*
>
> *compared to those who do not make an explicit choice before assigning a*
>
> *confidence rating.*

The second goal was to evaluate the lone effect of ego-involvement on confidence judgments. Previous work on ego-involvement has demonstrated how ego-involvement leads to biased information processing. Graham and Golan (1991) observed that ego-involvement resulted in poorer recall of information at deeper levels of processing. Conway and Howell (1991) found that ego-involvement led to greater activation of positive self-schema and a positivity bias. Combining the results from the two studies, the researcher expects ego-involvement to bias the generation and evaluation of confirming and disconfirming evidence. This bias would therefore lead to higher confidence judgments and overconfidence.

> *Hypothesis 2: Participants who are ego-involved will exhibit higher confidence judgments and overconfidence compared to those who are not ego-involved in the task.*

The third objective was to determine whether ego-involvement moderates the relationship between choice and confidence judgments. The inconsistent results on the effect of choice on confidence judgments were reported in the previous discussion. Sniezek et al. (1990) and Ronis and Yates (1987) found that participants in the choice condition assigned lower confidence judgments and exhibited lower overconfidence compared to participants in the arbitrary cue condition. Scherer and De La Castro (1998), however, obtained the opposite results from their study. Participants in the choice condition assigned higher confidence judgments and were more overconfident compared to participants in the arbitrary cue condition. The researcher argues that the inconsistency between these studies may be due to the erroneous assumption of choice in the context of general knowledge questions. Choice was thought to automatically evoke ego-

involvement and personal commitment by those authors under the context of general knowledge questions. However, the researcher suggests that the personal commitment and ego-involvement are not sufficiently aroused in the choice condition under such context. Scherer and De La Castro's (1998) manipulation of accountability, however, may have inadvertently evoked participants' ego-involvement in their study to produce the inconsistent results. Therefore, when ego-involvement is taken into account, the researcher predicts that choice will lead to higher confidence and overconfidence only when ego-involvement is high. High ego-involvement will result in high personal commitment to the choice, and subsequently influence the generation and evaluation of evidence for the choice, resulting in overconfidence.

> *Hypothesis 3: Participants who make an explicit choice will exhibit higher confidence judgments and higher overconfidence only when their ego-involvement is high. Under conditions of low ego involvement, participants who make an explicit choice will exhibit lower confidence judgments and lower overconfidence compared to those who are in the arbitrary cue condition.*

The fourth objective of this study was to determine whether choice alone is predictive of personal commitment. Sniezek et al. (1990) and Ronis and Yates (1987) made the assumption that explicit choice will automatically evoke personal commitment to the choice. However, the researcher argues that the relationship between choice and personal commitment is contingent upon the context within which the choice is made. The premise that choice automatically evokes personal commitment is very questionable in the context of general knowledge questions. The researcher seeks to invalidate the premise that choice in itself is sufficient to evoke personal commitment in the context of

general knowledge questions. Thus, the researcher predicts that in the context of general knowledge questions, personal commitment will be low irrespective of choice.

> *Hypothesis 4: Participants who make explicit choices will exhibit the same degree of personal commitment to the choice compared to those who are in the arbitrary cue conditions.*

The fifth objective was to determine whether ego-involvement is positively related to personal commitment. The notion that ego-involvement is closely related to personal commitment has long been established in the literature on ego-involvement (Rhine & Polowniak; 1971; Greenwald, 1982). From the perspective of self-perception theory and cognitive dissonance theory, the drive to maintain or enhance one's feeling of self-esteem is strongest when the situation is related to the person's self-concept. Ego-involvement is an antecedent of personal commitment. Therefore, when participants are ego-involved in a task, they will exhibit high personal commitment to the task in order to minimize dissonance.

> *Hypothesis 5: Participants who are ego-involved will exhibit higher personal commitment compared to those who are not ego-involved.*

The sixth objective was to examine the interactive effect of choice and ego-involvement on personal commitment in the context of general knowledge questions. Hypothesis 1 states that making a choice on a general knowledge question task will not sufficiently arouse participants to trigger personal commitment to the choice. Hypothesis 2 claims that ego-involvement is an antecedent of personal commitment. Therefore, the researcher predicts that ego-involvement will moderate the effect of choice on personal

commitment. In other words, choice will lead to personal commitment only when participants are ego-involved.

Hypothesis 6: Participants who make an explicit choice will exhibit higher personal commitment compared to those who are in the arbitrary cue condition only when they are ego-involved in the task.

Lastly, the researcher tested the direct relationship between personal commitment and confidence judgments to determine whether personal commitment mediates the relationship between choice and confidence judgments.

Hypothesis 7: It is expected that there will be a positive relationship between personal commitment and confidence judgments and overconfidence, such that participants who are high in personal commitment will engage in biased information search and therefore have higher confidence judgments and overconfidence than those who are low in personal commitment.

METHOD

Overview of Methodological Strategy

In order to test the hypotheses set forth in the prior chapter and contribute a programmatic study of overconfidence, it was necessary to develop a task similar to that used in prior research: a general knowledge test. To extend this research and effectively manipulate ego involvement, it was necessary to conduct preliminary studies to enhance both the strength and the believability or face validity of the ego-involvement instructions. Further, preliminary testing was needed to ensure the believability and appropriate difficulty of the general knowledge test. The methodology and results for two

preliminary studies are discussed, followed by the methodology employed in the primary study.

<div align="center">Study 1</div>

Purpose

The purpose of the first preliminary study was to determine which type of instructions accompanying the general knowledge test would induce the highest level of ego-involvement. Specifically, the researcher sought to identify an ego-involving name for the test that was seen as predictive of an outcome deemed as most important to participants. The two criteria used to select the high ego-involvement manipulation were: (a) the extent to which the test name or what it was purportedly measuring was ego-involving; and (b) the extent to which performance on the particular test was predictive of a positive future outcome.

Participants

Thirty University of Nebraska at Omaha undergraduate psychology students (17 women and 13 men) volunteered to participate. The age of the participants ranged from 18 to 45 ($M = 22.7$, $SD = 6.73$). Volunteers received extra credit for their participation and were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Stimulus Materials and Procedures

Participants were presented with a set of questions, which measured the level of ego-involvement they experienced if they were to complete a test of intelligence, cultural literacy, literacy IQ, and general knowledge. The ego-involvement scale consisted of a set of five 7-point scale questions (see Appendix A). Example items on the scale were:

"How involved would you be in taking a test of intelligence/cultural literacy/literacy IQ/general knowledge?" and *"To what extent is it important for you to do well on a test of intelligence/cultural literacy/literacy IQ/general knowledge?"*

The second part of the questionnaire required participants to evaluate the extent to which they believed that each term was predictive of the following items: (a) professional success, (b) general success in life, (c) success in college, and (d) interpersonal success. Example items were: *"To what extent is performance on a test of general knowledge predictive of professional success?"* and *"To what extent is performance on a test of general knowledge predictive of general success in life?"*

Results and Discussion

A satisfactory internal consistency reliability estimate of the scale was obtained, (α = .87). The means and standard deviations of the ego-involvement scale for the four terms are presented in Table 1. The two terms that evoked the greatest ego-involvement were general knowledge (M = 5.66, SD = 1.26) and intelligence (M = 5.58, SD = 0.89). A correlated t-test was performed to compare the means for the two terms. No significant difference was observed between the terms general knowledge and intelligence on the ego-involvement scale, t (29) = .55, p = ns. Among the four terms, general knowledge was tentatively chosen due to the fact that the actual test was comprised of general knowledge questions.

The second part of the analysis focused only on the extent to which general knowledge was perceived to be predictive of important outcomes: (a) professional success, (b) general success in life, (c) success in college, and (d) interpersonal success. A one-way analysis of variance (ANOVA) revealed no differences among the terms

Table 1

Means and Standard Deviations of the Ego-Involvement Scale

Measure	M	SD
General Knowledge	5.66	1.26
Intelligence	5.58	0.89
Literacy IQ	5.35	1.16
Cultural Literacy	4.25	1.03

Note. A 7-point scale was used for all measures.

professional success ($\underline{M}$ = 5.33, $\underline{SD}$ = 1.35), general success in life ($\underline{M}$ = 5.46, $\underline{SD}$ = 1.22), success in college ($\underline{M}$ = 5.40, $\underline{SD}$ = 1.28), and interpersonal success ($\underline{M}$ = 4.90, $\underline{SD}$ = 1.35). The results revealed that general knowledge was seen as equally predictive of the four outcomes, $\underline{F}$ (3, 27) = 2.47, $\underline{p}$ = $\underline{ns}$. To determine which outcome to utilize, the researcher relied on post-experimental discussions with participants who generally felt that general success in life was the most important outcome that would be predicted from general knowledge.

The two criteria of generating an ego-involving term that would be predictive of an important future outcome were satisfied using general knowledge. Thus, the instructions to be used in the high ego-involvement condition were as follows: *The following activity is a test of general knowledge. Research has shown that the performance on this test is linked to general success in life.*"

<center>Study 2</center>

Purpose

The two objectives of Study 2 were to: (a) develop a test that was moderate in difficulty, and (b) develop a questionnaire that participants would believe to be a measure of general knowledge. A substantial amount of research has shown that overconfidence is affected by item difficulty. Analyses have revealed that overconfidence and poor calibration are exaggerated for difficult tasks and items, whereas the overconfidence effect is minimized and even turned into systematic underconfidence for easy tasks and items. Therefore, the goal was to develop a questionnaire that would minimize this "hard/easy effect." In addition, Study 2 allowed the researcher to determine whether the average test score was comparable to scores obtained in prior research that utilized a

general knowledge questionnaire. The second objective ensured that the knowledge

categories of the overall general knowledge test were perceived by participants as being

good measures of general knowledge rather than indices of some other construct.

Moreover, the researcher wanted to avoid inadvertently inducing a negative affective

state by including questions that were perceived as offensive. The clarity and wording of

items was also tested in Study 2.

Participants

Fifty-three University of Nebraska at Omaha undergraduate psychology students

(38 women and 15 men) volunteered to participate. The age of the participants ranged

from 18 to 43 ($\underline{M}$ = 23.09, $\underline{SD}$ = 5.24). Volunteers received extra credit for their

participation and were treated in accordance with the "Ethical Principles of Psychologists

and Code of Conduct" (American Psychological Association, 1992).

Stimulus Materials

A 120-item, two-alternative general knowledge questionnaire was developed as

the primary stimulus in Study 2. Using information contained in the Dictionary of

Cultural Literacy (2nd Ed) (Hirsh, Kett, & Trefil, 1993), a set of 120 items was written on

a wide array of general knowledge topics: (a) the bible, (b) mythology and folklore, (c)

proverbs, (d) idioms, (e) world literature, (f) philosophy and religion, (g) literature in

English, (h) conventions of written English, (i) fine arts, (j) world history to 1550, (k)

world history since 1550, (l) American history to 1865, (m) American history since 1865,

(n) world politics, (o) American politics, (p) world geography, (q) American geography,

(r) anthropology, psychology, and sociology, (s) business and economics, (t) physical

sciences and mathematics, (u) earth sciences, (v) life sciences, (w) medicine and health,

and (x) technology. Ten topics were randomly selected from this pool of topics. The selected ten topics were: (a) the bible, (b) idioms, (c) philosophy and religion, (d) literature, (e) fine arts, (f) American politics, (g) anthropology, psychology, and sociology, (h) business and economics, (i) life sciences, and (j) medicine and health. The author and two assistants independently generated two easy and two difficult questions for each topic. Hard and easy questions were generated based on the subjective judgments of the author and two assistants. A total of 12 questions were generated for each topic.

The post-task questionnaire required participants to use a 7-point scale to rate each of the ten categories on the extent to which each category was a representative component of general knowledge (see Appendix B). Participants were also asked to use a 7-point scale to indicate the extent to which the overall test was a good measure of general knowledge. Example of these items were *"As you worked on the questionnaire, to what extent do you agree that this test is a good measure of overall general knowledge?"* and *"To what extent do you agree that all of the categories of information asked in this questionnaire are equally important determinants of one's general knowledge?"*

Procedures

For the general knowledge questionnaire, participants were asked to read through each item and determine which of the two alternatives was correct. Upon finishing the general knowledge questionnaire, participants indicated their opinions on the categories chosen for the general knowledge test as well as the overall test.

Results and Discussion

The overall mean score was obtained for the 120-item general knowledge questionnaire, ($\underline{M}$ = 91.84, $\underline{SD}$ = 9.31). The mean score translated to a difficulty index of .77. The mean item difficulty index for each category is presented in Table 2. The difficulty index was comparable to the general knowledge questionnaire Ronis and Yates (1987) used in their study.

Ratings of each category are provided in Table 3. Overall, the ten categories were perceived as important components of general knowledge. Furthermore, the many participants agreed that the questionnaire was a measure of general knowledge, ($\underline{M}$ = 4.58, $\underline{SD}$ = 1.38).

Based on the comments participants made about the questionnaire, the Bible category was deleted from the primary study. The Bible category was perceived as offensive and inappropriate as a category of general knowledge by some participants. Several participants mentioned that the Bible category made the general knowledge test appear "ethnocentric." In addition, a few of the items were deleted from the primary study on the basis of incorrect or confusing wordings.

Primary Study

Overview

Participants included undergraduates enrolled in psychology courses at the University of Nebraska at Omaha who received extra credit in exchange for their participation. Participants were randomly assigned to a 2 (choice vs. arbitrary cue) X 2 (high ego-involvement vs. low ego-involvement) between-subject factorial design.

Table 2

Means and Standard Deviations of Difficulty Index for Knowledge

Categories

Category	M	SD
Bible	0.80	0.27
Idioms	0.83	0.20
Philosophy and Religion	0.76	0.22
Literature	0.72	0.22
Fine Arts	0.61	0.24
American Politics	0.79	0.18
Anthropology, Psychology, and Sociology	0.79	0.27
Business and Economics	0.79	0.18
Life Sciences	0.81	0.18
Medicine and Health	0.77	0.22

Note. The difficulty index ranges from 0 to 1.0

Table 3

Means and Standard Deviations of Ratings on Knowledge Categories

Category	M	SD
Bible	4.83	1.68
Idioms	4.53	1.68
Philosophy and Religion	5.06	1.38
Literature	5.06	1.56
Fine Arts	4.71	1.57
American Politics	5.50	1.44
Anthropology, Psychology, and Sociology	5.60	1.10
Business and Economics	5.72	1.20
Life Sciences	5.47	1.44
Medicine and Health	5.94	1.28

Note. Judgments on knowledge categories were made on a 7-point scale.

Two factors were manipulated in the experiment: choice and ego-involvement. The two levels of the choice factor consisted of choice and arbitrary cue. The choice condition was identical to the typical two-stage method of the calibration study. The participants first chose among alternatives and then assigned confidence ratings to each chosen alternative. In the arbitrary cue condition, participants simply assigned a confidence rating for each of the arbitrarily-circled alternatives.

Participants

One hundred University of Nebraska at Omaha undergraduate psychology students (76 women and 24 men) volunteered to participate. The age of the participants ranged from 18 to 48 (M = 23.49, SD = 6.18). Volunteers received extra credit for their participation and were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Stimulus Materials

A booklet was constructed for the primary study. The booklet contained the following materials in order: (a) a set of appropriate instructions for each treatment condition (including two sample items), (b) a brief explanation of confidence estimates, (c) a 45-item, 2-alternative general knowledge test, (d) a post-task questionnaire to assess level of commitment to choice, and (e) a demographic information questionnaire. All stimulus materials, with the exception of the general knowledge questionnaire, can be found in the Appendix section.

A 45-item, two-alternative questionnaire was used as the primary stimulus in this experiment. Five items were randomly selected from each of the nine remaining

categories in Study 2. The mean difficulty index, based on Study 2, was calculated for the new 45-item, ($\underline{M}$ = .72, $\underline{SD}$ = .07).

<u>Manipulation of Independent Variables</u>

<u>Choice.</u> Level of choice was manipulated by the researcher through task instructions. In the choice conditions, the questionnaire instructions read: *"Read each knowledge question and then try to determine which of the two alternatives is correct. Answer by circling either alternative A or alternative B. Then indicate the probability that the alternative you chose is correct by circling any number between 50 % and 100%. Note that you can circle any of the 6 probability estimates provided on the scale. To help you use the scale appropriately, anchors are provided for the 50% and 100%. However, please circle any probability estimate."* Participants in the arbitrary cue conditions received the same two alternatives as participants in the choice conditions. However, one of the two alternatives was arbitrarily precircled in an alternating sequence, similar to the procedure employed by Sniezek et al. (1990). Instructions for the arbitrary cue condition read: *"DO NOT ANSWER THE QUESTIONS. Just read each question, then try to determine the probability that the circled alternative is correct by circling any number between 0% and 100%. Note that you can circle any of the 11 probability estimates provided on the scale. To help you use the scale appropriately, anchors are provided for the 0%, 50% and 100%. However, please circle any probability estimate."*

A study conducted by Brake, Doherty, and Kleiter (1996) examined the test-retest reliability in probability estimates and found them to be around .70 to .82. These authors concluded that probability estimates in general knowledge questions were reliable.

Ego-involvement. The degree of ego-involvement was manipulated through information provided about the nature of the task. The ego-involvement manipulation focused participants' attention on their self-perceived ability. Based on the results from Study 1, the ego-involvement condition participants were told that *"the following activity is a **Test of General Knowledge**. The questions are drawn from various categories of general knowledge such as (a) Idioms, (b) Religion and Philosophy, (c) Fine Arts, (d) American Politics, (e) Anthropology, Psychology, and Sociology, (f) Business and Economics, (g) Life Sciences, and (h) Medicine and Health. Research has shown that the performance on this test is linked to **General Success in Life**."* In the low ego-involvement conditions, participants were informed nothing more than the procedural information. No information on general knowledge test and its relation to general success in life was mentioned in the low ego-involvement conditions.

Dependent Measures

Brier (1950) proposed an overall measure of the accuracy of probabilistic judgments, known as the "Brier score." To provide separate measures of different aspects of judgment accuracy, several researchers have proposed decompositions of the Brier score (Murphy, 1973). Therefore, the Brier score is divided into several components. This study included the Brier score, some components of the above mentioned decompositions, and several other descriptive statistics. The study focused on five measures that are particularly important and easy to interpret: accuracy, mean confidence, mean over/underconfidence, the Brier score, and the calibration index.

Accuracy. Accuracy is defined as the correctness of the responses. The formula for accuracy is the number of questions answered correctly over the total number of

questions. Accuracy was calculated for each participant. For example, if a participant answered 50 questions correctly out of a total possible 100 questions, the accuracy level would be .50. Accuracy ranged from 0 to 1.

Mean confidence. Mean confidence is how sure the participant is with his/her given answers. Participants recorded a probability estimate after each knowledge question. Each probability estimate ranged from .50 to 1.00. The probability estimate indicated the participants' level of confidence that the alternative the chose was correct. The mean confidence was derived by averaging the probability estimates for the 45 questions. The mean confidence was calculated for each participant.

Mean over/underconfidence. Mean over/underconfidence is a measure of the accuracy of confidence judgments. To calculate the mean over/underconfidence, the mean confidence was subtracted from the accuracy measure for each participant. Overconfidence occurred when the difference between accuracy and mean confidence resulted in a positive value and underconfidence occurred when the difference between accuracy and mean confidence resulted in a negative value. Accurate confidence judgments occurred when the difference between the two resulted in a zero value. For example, if a participants answered 70% (.70) of the questions correctly and indicated that he/she was on the average 80% (.80) confident that his/her answers were correct, the mean over/underconfidence measure would be .10.

Brier score. The Brier score is an overall measure of judgment accuracy. A low Brier score is indicative of good judgment. The formula for the Brier score (abbreviated PS because it is also known as the mean probability score) is provide below:

$$PS = \sum (f - d)^2 / N$$

Throughout the formulas, f represents the subjective probability estimate, d represents the outcome (0 for incorrect, 1 for correct), and N represents the total number of judgments made.

Various decompositions of PS have been developed to offer insight into the components of judgment accuracy. The most frequently used decomposition of PS is the Murphy (1973) decomposition. The Murphy decomposition has three components: (a) the calibration index (CI), (b) the discrimination index (DI), and (c) the variance of d:

$$PS = CI - DI + Var(d)$$

Please refer to Appendix C for a detailed review of the computational formulas used for each of the indices.

Calibration index. The calibration index is a measure of the extent to which judgments at various levels of confidence (e.g. 60%, 70%, and 80%) match the accuracy level for that confidence category. Calibration simply refers to the extent to which the subjective confidence closely matches the relatively frequency of correct answer. The calibration of judgments is measured by grouping each of a set of confidence judgments into subjective probability categories. The mean accuracy is then subtracted from each confidence category. Evidence of poor calibration exists when the subjective probabilities for a given confidence category differs greatly from the percentage correct of that category. The participant is called overconfident for categories in which reported confidence exceeds percentage correct. For example, if a participant answered 60% of the questions correct for the questions he/she had assigned 80% level of confidence. This would indicate that the participant is overconfident for the 80% confidence category. Conversely, underconfident occurs for categories in which reported confidence is less

than the percentage correct. For instance, if a participant answered 90% of the questions correct for the questions he/she had assigned 70% level of confidence. This would indicate that the participant is underconfident for the 70% confidence category. Perfect calibration occurs when questions assigned a confidence of 70% are answered 70% of the time correctly. If this were true, we say that the individual's probability judgments are well calibrated.

Commitment

Commitment to choice is operationally defined as those personal and behavioral mechanisms that bind individuals to consistent patterns of choices over time. This definition is influenced by the work of Kim, Scott and Crompton (1997). Two measures of commitment will be outlined.

Behavioral commitment measure. To measure the behavioral component of commitment to choice, participants were given the opportunity to go back and review all of their answers and make the changes they deemed appropriate at the end of the task. Behavioral commitment was measured by the number of changes participants made when given the opportunity to do so. Therefore, the operational measure of behavioral commitment was the frequency of changes. A low frequency of changes of the chosen alternatives reflects a higher degree of commitment toward those chosen alternatives. A high frequency of changes of the chosen alternatives is indicative of a low level of commitment to the previously chosen alternatives. To calculate the behavioral commitment measure, experimenter tabulated the number of changes each participant made when given the opportunity to do so at the end of the experiment.

Self-reported commitment scale. A five-item scale was included in the study to measure the level of commitment to choice for each participant. Participants provided ratings for each item using a 7-point scale. The items were adopted from the work of Kim et al. (1997). (see Appendix D). Examples of items were: *"On this task, it is a big deal if I make a mistake with the circled answer"*, and *"I am so confident with the circled answer that I don't even bother going back making any changes."*

Procedures

Participants were randomly assigned to one of the four treatment groups. Participants were run individually in the research lab. All participants were presented with a 45-item general knowledge questionnaire. Participants first played the audio instructions tape, which contained the manipulation instructions, and followed along with the written instructions. Participants were asked to work through each question in the order presented, and were given as much time as necessary to complete the task.

Following completion of the task, participants were given the opportunity to review their answers and make any changes they deemed appropriate. Then, participants completed the post-task questionnaire, which included self-reported commitment scale and manipulation check items, and provided demographic information.

After all of the materials were returned, participants were debriefed regarding the true purpose of the research. They were then given extra credit and thanked for their participation.

The experimenter tabulated the number of changes each participant made when given the opportunity and recorded the number on the data sheet.

Analyses

Comparisons among treatment conditions were conducted using a separate univariate two-way analysis of variance for each dependent variable

Results

Manipulation check. Participants completed an ego-involvement manipulation check questionnaire upon finishing the task (see Appendix E). The internal consistency reliability estimate of the scale was obtained, (α = .76). The reliability estimate was considered satisfactory based on the recommendation of Nunnally and Bernstein (1994). Responses of high ego-involved and low ego-involved participants to the manipulation check items were compared using an independent t-test. Although the means were in the predicted direction ($\underline{M}$ = 5.33, $\underline{SD}$ = .87 for low ego-involvement condition, and $\underline{M}$ = 5.36, $\underline{SD}$ = .90 for high ego-involvement condition), no significant differences were found between high ego-involved and low ego-involved participants, $\underline{t}$ (98) = -.175, $\underline{p}$ = $\underline{ns}$. Participants in the low ego-involvement condition considered the task just as ego-involving as those in the high ego-involvement condition. Post experimental conversations with the participants revealed that many of them thought the experiment was "interesting" and were eager to learn how they scored on the questionnaire. It is plausible the ego-involvement manipulation may have had an effect on those in the high ego-involved condition but the nature of the task may have inadvertently evoked too much ego-involvement in those in the low ego-involvement condition.

Dependent Measures

Confidence judgments. Five indices were computed for each participant, including accuracy, the mean confidence, the mean over/underconfidence, the Brier

score, and the calibration index. As in Ronis and Yates (1987), participants' choice was inferred from probabilities in the arbitrary cue condition. The circled alternative was assumed to be the participant's choice if the probability assigned was greater than .5. If the probability assigned was less than .5, the uncircled alternative was assumed to be the participant's choice. Circled alternatives assigned probabilities of .5 were randomly divided into chosen and unchosen halves. Therefore, the five indices computed for participants in the arbitrary cue condition are those that would be obtained if choices were consistent with probabilities assigned for the arbitrarily circled alternative. The means and standard deviations on these measures for each condition are shown in Table 4. The overall mean of accuracy was found to be .70 or 70% correct.

Analysis of variance was performed to test Hypotheses 1, 2, and 3 (see Table 5-9). For Hypothesis 1, the researcher predicted that the pure cognitive heuristic model proposed by both Sniezek et al. (1990) and Ronis & Yates (1987) would be at work in the absence of ego-involvement. Therefore, higher confidence and overconfidence measures would be expected as the result of selective attention to the precircled alternative. As predicted, a significant main effect of choice was found on the mean over/underconfidence measure and the Brier score. There was a significant choice effect on the mean over/underconfidence measure, $F (1, 96) = 9.16$, $p < .05$. Arbitrary cue participants exhibited more overconfidence than participants in the choice condition. A similar result was obtained for the Brier score. A main effect for choice was observed, such that the arbitrary cue participants were less accurate with their confidence judgments than the choice participants, $F (1, 96) = 5.84$, $p < .05$. In addition, a marginal main effect of choice was found for the calibration index, $F (1, 96) = 3.52$, $p = .06$. Arbitrary cue

Table 4

Means and Standard Deviations on Performance Measures as a Function of Choice and

Ego-Involvement

Condition[a]	Accuracy	Mean Confidence	Mean Overconfidence	Brier Score	Calibration Index
Choice-Hi Ego					
M	0.73	0.80	0.06	0.19	0.04
SD	0.09	0.07	0.07	0.05	0.03
Choice-Low Ego					
M	0.70	0.81	0.10	0.21	0.04
SD	0.10	0.09	0.10	0.06	0.03
Arbitrary cue-Hi Ego					
M	0.68	0.84	0.15	0.23	0.05
SD	0.08	0.08	0.09	0.06	0.04
Arbitrary cue-Low Ego					
M	0.70	0.81	0.12	0.23	0.05
SD	0.09	0.10	0.08	0.05	0.03

Note. [a]n = 25.

Table 5

Analysis of Variance for Accuracy

Source	df	F	p
Choice (C)	1	2.63	0.10
Ego-involvement (E)	1	0.33	0.57
C x E	1	1.62	0.21
$\underline{S}$ within-group error	96	(0.008)	

Note. Values enclosed in parentheses represent mean square errors.

Table 6

Analysis of Variance for Mean Confidenc

Source	df	F	p
Choice (C)	1	1.78	0.18
Ego-involvement (E)	1	0.23	0.63
C x E	1	0.79	0.38
S within-group error	96	(0.007)	

Note. Values enclosed in parentheses represent mean square errors.

Table 7

Analysis of Variance for Mean Over/underconfidence

Source	$\underline{df}$	$\underline{F}$	$\underline{p}$
Choice (C)	1	9.16	0.01
Ego-involvement (E)	1	0.02	0.90
C x E	1	4.93	0.03
S within-group error	96	(0.007)	

Note. Values enclosed in parentheses represent mean square errors.

Table 8

Analysis of Variance for the Brier Score

Source	$\underline{df}$	$\underline{F}$	$\underline{p}$
Choice (C)	1	5.84	0.02
Ego-involvement (E)	1	0.79	0.38
C x E	1	0.89	0.35
S within-group error	96	(0.003)	

Note. Values enclosed in parentheses represent mean square errors.

Table 9

<u>Analysis of Variance for the Calibration Index</u>

Source	<u>df</u>	<u>F</u>	<u>p</u>
Choice (C)	1	3.52	0.06
Ego-involvement (E)	1	0.01	0.90
C x E	1	1.11	0.30
<u>S</u> within-group error	96	(0.0008)	

<u>Note.</u> Values enclosed in parentheses represent mean square errors.

participants were less well calibrated than the choice participants. Further, a marginal main effect of choice was observed for mean accuracy, $F (1, 96) = 3.52$, $p = .10$. Choice participants answered more items correctly on the test than participants in the arbitrary cue condition. For the confidence measure, there was no significant difference among the treatment conditions, $F (1, 96) = 1.78$, $p = ns$.

Hypothesis 2 stated that participants in the high ego-involvement condition would exhibit higher confidence judgments and overconfidence compared to those in the low ego-involvement condition. Contrary to the prediction, no main effect was observed for ego-involvement on any of the five indices. High ego-involved participants did not exhibit higher confidence and overconfidence than low ego-involved participants. The findings could be a result of the weak ego-involvement manipulation as well as the high ego-involving nature of the task.

Hypothesis 3 predicted that participants making explicit choices would exhibit higher confidence judgments and higher overconfidence only if they were highly ego-involved in the task. Under conditions of low ego involvement, it was predicted that participants making explicit choices would exhibit lower confidence judgments and lower overconfidence compared to those in the arbitrary cue condition. A significant choice X ego-involvement effect was indeed observed on the mean over/underconfidence measure, however, in the opposite direction of the prediction, $F (1, 96) = 4.93$, $p < .05$. The significant interaction indicated that the choice main effect held for participants in the high-ego involvement condition, but was nonexistent for participants in the low-ego involvement condition. In other words, in the high ego-involvement condition, arbitrary cue participants exhibited higher overconfidence than choice participants. There was no

significant difference between arbitrary cue participants and choice participants in the low ego-involvement condition. Figure 1 depicts in graphic form the relationships among the means.

Commitment. Commitment to choice was measured using a self-reported commitment scale and a behavioral commitment measure. The internal consistency reliability estimate of the self-reported commitment scale revealed that the scale was unreliable (α = .43). The analysis revealed that alpha would be .56 if item 3 were deleted from the scale. The following analyses were conducted with item 3 deleted from the self-reported commitment scale. The means and standard deviations for both commitment measures are presented in Table 10.

Analysis of variance procedures were used to test Hypotheses 4, 5, and 6 (see Table 11 and Table 12). Unfortunately, the homogeneity of variance test revealed significant differences in within-cell variance across cells for the behavioral commitment measure (Levene's Test, F (3, 96) = 2.81, p = .04). Although the assumption of homogeneity of variance was violated for the behavioral commitment measure, the analysis of variance was still conducted based on the recommendations from Stevens (1996). Stevens (1996) asserts that analysis of variance is robust to the violation of the assumption of homogeneity of variance as long as group sizes are equal or approximately equal. Sniezek et al. (1990) and Ronis and Yates (1987) both made the assumption that explicit choice will automatically evoke personal commitment to the choice. This study directly tested this assumption. For Hypothesis 4, the researcher predicted that participants making explicit choices would exhibit the same degree of commitment to choice compared to those evaluating precircled alternatives in the arbitrary cue condition

Figure 1. Mean overconfidence as a function of choice and ego-involvement.
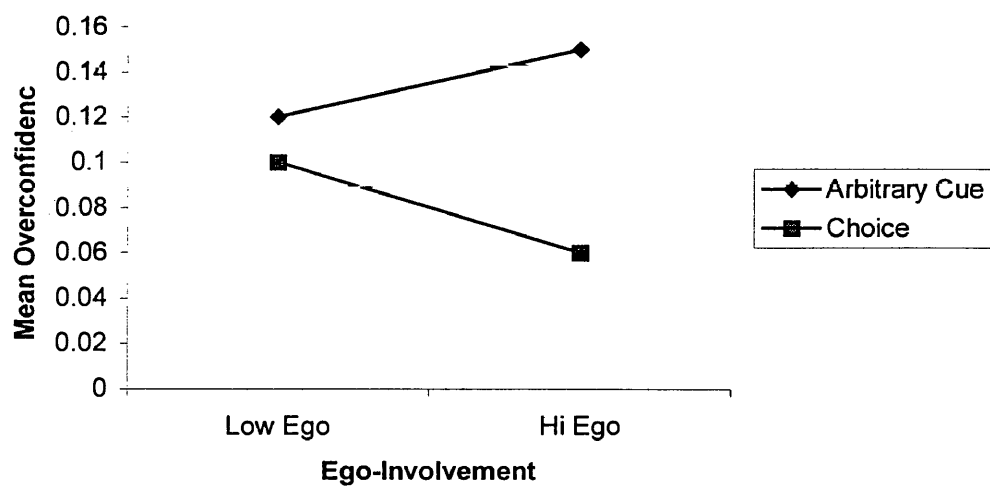
Table 10

Means and Standard Deviations on Commitment Measures as a Function of Choice and

Ego-Involvement

Condition[a]	Self-reported Commitment	Behavioral Commitment
Choice-Hi Ego		
M	4.11	2.52
SD	0.91	2.71
Choice-Low Ego		
M	4.36	3.12
SD	1.23	2.69
Arbitrary cue-Hi Ego		
M	3.78	1.40
SD	1.36	1.41
Arbitrary cue-Low Ego		
M	3.91	2.28
SD	1.06	2.22

Note. [a]n = 25. The possible range for the self-reported commitment measure is from 1 to

7, with 7 representing the highest commitment and 1 representing the lowest

commitment. Behavioral commitment is the number of changes made in responding to

general knowledge questionnaire. The possible range for the behavioral commitment

measure is from 0 to 45, with 0 representing the highest level of behavioral commitment

and 45 representing the lowest level of behavioral commitment.

Table 11

Analysis of Variance for Self-Reported Commitment

Source	df	F	p
Choice (C)	1	1.27	0.26
Ego-involvement (E)	1	0.01	0.93
C x E	1	0.74	0.39
S within-group error	95	(19.41)	

Note. Values enclosed in parentheses represent mean square errors.

Table 12

Analysis of Variance for Behavioral Commitment

Source	$\underline{df}$	$\underline{F}$	$\underline{p}$
Choice (C)	1	4.45	0.03
Ego-involvement (E)	1	2.53	0.13
C x E	1	0.09	0.76
$\underline{S}$ within-group error	95	(0.01)	

Note. Values enclosed in parentheses represent mean square errors.

under the context of general knowledge questions. The results were mixed with regard to this hypothesis. A significant main effect of choice on behavioral commitment was obtained, $F(1, 95) = 4.45$, $p < .05$. Choice participants were more likely to change their answers than arbitrary cue participants. This finding indicated that arbitrary cue participants were more committed to their choice than choice participants. On the other hand, no significant main effect of choice on the self-reported commitment measure was found, $F(1, 95) = 1.26$, $p = ns$.

Contrary to Hypothesis 5, participants in the high ego-involvement condition did not exhibit higher personal commitment compared to those in the low ego-involvement condition. There was no ego-involvement main effect on either the behavioral commitment measure, $F(1, 95) = 2.54$, $p = ns$, or the self-reported commitment measure, $F(1, 95) = .01$, $p = ns$. The same was found for Hypothesis 6. No significant interaction was observed for choice and ego-involvement. Ego involvement did not moderate the effect of choice on commitment to choice.

Lastly, Hypothesis 7 was tested using Pearson product-moment correlation. A correlation matrix was generated (see Table 13) for each of the confidence indices and the two commitment measures. It was expected that there would be a positive relationship between personal commitment and confidence judgments and overconfidence such that participants high in personal commitment would engage in biased information search and therefore report higher confidence judgments and overconfidence than those who were low in personal commitment. A significant correlation between the behavioral commitment measure and mean confidence was obtained, $r = -.37$, $p < .05$. This indicated that mean confidence increases as behavioral commitment increases. Moreover,

Table 13

Intercorrelations Among Performance Measures and Commitment

Measures

Measures	1	2	3	4	5	6	7
1. Accuracy	--	.47**	-.56**	.81**	-.40**	-.13	-.25*
2. Mean confidence		--	.47**	-.09	.40**	-.16	-.37*
3. Mean over/underconfidence			--	.73**	.78**	-.19	-.10
4. Brier score				--	.69**	.10	.18
5. Calibration index					--	.04	.02
6. Self-reported commitment						--	.13
7. Behavioral commitment							--

Note. N = 100.
* p < .05   ** p < .01

a significant correlation was observed between accuracy and behavioral commitment measure, r = - .25, $\underline{p}$ < .05. Accuracy increases as behavioral commitment increases. The self-reported commitment measure was not found to correlate with any of the five confidence indices.

Supplementary analyses. To test whether or not the precircled answers in the arbitrary cue condition served as a cue to the correct answer for participants in the arbitrary cue condition, one additional measure was derived and subjected to analysis of variance: the proportion of times participants agreed with the precircled answer. The analyses revealed that arbitrary cue participants agreed with the precircled answer 49% of the time ($\underline{M}$ = .49, $\underline{SD}$ = .09). No significant difference was found between high ego-involved participants and low ego-involved participants, $\underline{t}$ (48) = -.523, $\underline{p}$ = $\underline{ns}$. Participants were then categorized into two groups based on their score on this measure. Participants with scores higher than .50 were classified in the cueing group (n = 25) while participants with scores less than .50 were classified in the non-cueing group (n = 25). The effect of cueing on behavioral commitment was examined, $\underline{t}$ (48) = .295, $\underline{p}$ = $\underline{ns}$. No significant effect of cueing was observed on the behavioral commitment measure.

Discussion

Overview

The primary goal of this research was to use ego-involvement to explain the inconsistent findings in the literature on the effect of choice on confidence judgments. The assumption of commitment to one's choice was explicitly examined in this research. The following discussion will begin with a summary of findings, both predicted and unexpected. Plausible explanations and the underlying mechanisms of the results are then

offered, along with limitations of the study. Finally, implications and suggestions for future research are presented.

Summary of Results

The present study extended the research of Sniezek et al. (1989), Ronis and Yates (1990), and Scherer and De La Castro (1998) by examining the moderating effect of ego-involvement on choice and confidence judgments.

Effect of choice on confidence judgments. Hypothesis 1 predicted that choice would affect confidence judgments, with arbitrary cue participants exhibiting higher confidence judgments and higher overconfidence. The rationale for this prediction was based on the cognitive heuristic model proposed by both Sniezek et al. (1990) and Ronis & Yates (1987). In the absence of ego-involvement, higher confidence and overconfidence measures should be expected as the result of selective attention to the precircled alternative. Hypothesis 1 was supported by three of the four confidence indices: overconfidence measure, the Brier score, and the calibration index. Participants in the arbitrary cue condition were more overconfident, less accurate with their confidence judgments, and therefore less calibrated.

Effect of ego-involvement on confidence judgments. Hypothesis 2 predicted an effect of ego-involvement on confidence judgments, such that participants in the high ego-involvement condition would exhibit higher confidence judgments and higher overconfidence compared to those in the low ego-involvement condition. The logic is that previous research has demonstrated that ego-involvement leads to biased information processing. Therefore, the researcher expected ego-involvement to bias the generation and evaluation of confirming and disconfirming evidence. Hypothesis 2 was not

supported for any measures of confidence judgments. Contrary to the prediction, participants in the high ego-involvement condition did not exhibit higher confidence and overconfidence than participants in the low ego-involvement condition. This particular finding could be the result of the weak ego-involvement manipulation used in the study as well as the high ego-involving nature of the task for all participants.

Effect of choice and ego-involvement on confidence judgments. Hypothesis 3 predicted an interactive effect of choice and ego-involvement on confidence judgments, such that participants making explicit choices would exhibit higher confidence judgments and higher overconfidence only when they are highly ego-involved in the task. In the low ego-involvement condition, participants making explicit choices would exhibit lower confidence judgments and lower overconfidence compared to those evaluating precircled alternatives in the arbitrary cue condition. Recall that previous research has found inconsistent results on the effect of choice on confidence judgments. It was hypothesized that ego-involvement would moderate the effect of choice on confidence judgments and reconcile the discrepancy in the literature. Ego-involvement was found to moderate the effect of choice on the overconfidence measure; however, the effect was in the opposite direction of the prediction. In the high ego-involvement condition, arbitrary cue participants exhibited higher overconfidence than choice participants. There was no significant difference between arbitrary cue participants and choice participants in the low ego-involvement condition.

Effect of choice on commitment. Hypothesis 4 predicted that in the context of general knowledge questions, participants making explicit choices would exhibit the same degree of personal commitment to choice as those evaluating precircled alternatives

in the arbitrary cue condition. The present author disagrees with Sneizek et al.'s (1990) assumption that explicit choice will automatically evoke personal commitment. The relationship between choice and personal commitment is contingent upon the context within which the choice is made. The premise that choice automatically evokes personal commitment is questionable in the context of general knowledge questions. The prediction was that in the context of general knowledge questions, personal commitment would be low irrespective of choice. The results were mixed with regard to this hypothesis. A choice effect was found for the behavioral commitment measure, but not for the self-reported commitment measure. The nonsignificant finding on the self-reported commitment measure may be attributable to the unreliable nature of the measure. Therefore, contrary to the initial expectation, arbitrary cue participants were more committed to their choice than participants in the choice condition.

Effect of ego-involvement on commitment. Hypothesis 5 predicted an effect of ego-involvement on commitment, with participants in the high ego-involvement condition exhibiting higher commitment than the low ego-involving participants. The prediction was based on previous works of self-perception theory and cognitive dissonance theory. Ego-involvement was thought to be an antecedent of personal commitment. Hypothesis 5 was not supported for the behavioral commitment measure or the self-reported commitment measure.

Effect of choice and ego involvement on commitment. Hypothesis 6 predicted that ego-involvement would moderate the effect of choice on personal commitment, such that choice would lead to higher personal commitment only when participants were ego-

involved. Hypothesis 6 was not supported in the study. Ego involvement did not moderate the effect of choice on commitment to choice.

Relationship between confidence judgments and commitment. Hypothesis 7 predicted a positive relationship between confidence judgments and commitment, such that participants high on commitment would engage in a biased information search and therefore report higher confidence judgments and overconfidence than those who were low in commitment. Again, the results were mixed with regard to this hypothesis. A positive relationship was obtained between the behavioral commitment measure and mean confidence. This indicated that mean confidence increases as behavioral commitment increases. However, the self-reported commitment measure was not found to correlate with any of the five confidence indices.

Interpretations of Findings

Ego-involvement manipulation. The manipulation check revealed that there was no significant difference in the degree of ego-involvement between the high ego-involvement group and the low ego-involvement group. It is imperative to understand what exactly occurred in the two ego-involvement conditions because all of the hypotheses were predicated on the assumption that ego-involvement manipulation worked. There are three plausible interpretations for the nonsignficant finding. First and foremost, the finding may be a true reflection of what occurred between the high ego-involvement condition and the low ego-involvement condition. The ego-involvement manipulation may have been contaminated with the nature of the task. It is plausible the ego-involvement manipulation may have had an effect on those in the high ego-involved condition but the nature of the task may have inadvertently evoked too much ego-

involvement in those in the low ego-involvement condition. Participants in the low ego-involvement condition were just as ego-involved in the task as those in the high ego-involvement condition. However, if this was the case, why did the results indicate a significant interaction between ego-involvement and choice on confidence judgments? If the ego-involvement manipulation failed to differentiate between the high ego-involvement group and the low ego-involvement group, the same main effect of choice would be expected in the low ego-involvement condition. This was not observed in the study. Therefore, this interpretation could not be tenable.

The second interpretation of the finding rests on the notion of demand characteristics. The specific type of demand characteristics that could have accounted for the observed results is the "good subject effect." The good subject effect occurs when participants attempt to respond in such a way as to confirm the hypothesis, even when they are guessing what the hypothesis is (Rosnow and Rosenthal, 1997). Given that these participants were rewarded with extra credit for their participation, it is very plausible that participants may perceive being ego-involved in the task as socially desirable. As the result, they may have indicated being highly involved in the task even when that was not the case. In other words, a good subject might have wanted to show the experimenter that he/she was taking the task seriously by indicating that on the manipulation check items. The norm of reciprocity may have caused participants to provide false information with regard to their ego-involvement in the task.

Relatedly, the demographic information revealed that the sample consisted of 76 female students and 24 male students. Given the nurturing nature of women, it is conceivable that women are more prone to compliance than men. If such an assumption

were tenable, it would only enhance the "good subject effect." However, if the good subject effect were indeed the cause of the observed finding, arguably one would expect the same from the self-reported commitment scale. Specifically, the good subject effect should result in high ratings on the self-reported commitment scale. This was not observed in the study. It is not clear if there is indeed a good subject effect present in the study.

Lastly, it is plausible that there may be different types of ego-involvement. Although the results indicated that participants in the low ego-involvement were just as ego-involved as those in the high ego-involvement, it could be argued that the source of their ego-involvement differed. Participants in the low ego-involvement condition may have been ego-involved due to the nature of the task. Participants may have perceived the task of completing a general knowledge questionnaire to be self-relevant. To an extent, one could argue that participants in the low ego-involvement might have considered the general knowledge questionnaire to be an ability test, such as an intelligence test. Perhaps participants in the high ego-involvement condition were more influenced by the salient ego-involvement manipulation. Recall that the ego-involvement instructions emphasized that performance on the general knowledge test is predictive of general success in life. Study 1 showed that most participants considered success in life to be an important future outcome. It is plausible that the ego-involvement instructions may have evoked a core value that is highly regarded by participants. If there is indeed different types of ego-involvement, the present manipulation check items could not have differentiated among the different types of ego-involvement. As the result, both groups appeared to be high on the global ego-involvement scale.

Effects of choice and ego-involvement on overconfidence. Contrary to the prediction of more overconfidence under choice in the high ego-involvement condition, participants who made explicit choices were significantly less overconfident than those who did not make explicit choices. One possibility is that participants in the arbitrary cue condition may have believed that the precircled alternatives were not circled arbitrarily. Participants may have perceived the precircled alternatives as either the correct answers or the incorrect answers. Such expectation could lead to increases in overconfidence such as those observed in the study. However, it is doubtful that a belief that all or none of the precircled alternatives were correct could have resulted in the observed findings given that supplementary analyses showed no systematic relations between precircled alternatives and the actual choices made. Participants "chose" arbitrarily circled alternatives 22 out of 45 times, or 49% of the time.

Another possible approach to understanding the unexpected overconfidence demonstrated by arbitrary cue participants under high ego-involvement is the cognitive heuristic process model of confidence assessment. The cognitive heuristic process model posits that the overconfident assessment is a byproduct of biased generation and evaluation of evidence. The cognitive heuristic explanation for results obtained in the present study would be that in the arbitrary cue condition, seeing a circled alternative may have focused participants' attention on the preselected alternatives. As the result, participants searched their memories only for confirming evidence of the preselected alternative and thereby increased the perceived likelihood of that alternative being correct. Furthermore, it is likely that focusing attention on one alternative may decrease the likelihood for consideration of pros and cons of the other alternative. This may have

resulted in the higher overconfidence observed in the arbitrary cue condition. Conversely, in the choice condition, participants may have searched for both confirming and disconfirming evidence regarding both alternatives. This may have resulted in greater depth of processing of information of the less preferred alternative, thereby reducing the confidence for the initial preferred alternative. However, given that the underlying cognitive processes were not directly measured in the present study, this interpretation is merely speculative. Further, the pure cognitive heuristic model could not explain why the overconfidence of arbitrary cue participants disappeared in the low ego-involvement condition.

Perhaps a better explanation is a motivational one. Under the high ego-involvement condition, it is plausible that there was greater involvement in the task. Individuals perceived the task to be important to their self-concept. However, there is a distinction between whether one makes explicit choices and assessing confidence and merely assessing confidence on preselected alternatives. First of all, the degree of responsibility may be different between the two groups. Participants who made explicit choices may have felt that they were fully responsible for their answers, whereas responsibility may have been perceived as shared by those in the arbitrary cue condition. Arbitrary cue participants may not have felt that they were responsible for the precircled answers. The task merely asked them to rate the precircled answers. This issue was also raised in the Scherer and De La Castro (1998) study. If this assumption is true, the logic follows that the consequences of making a mistake are much higher for those who made explicit choices. Because the self is the agent of selection and the task is important to the self-concept of the individual, it is plausible that the individual would do all he/she could

to protect his/her self-concept. Under the high ego-involvement condition, self-concept would be threatened if the choice turned out to be wrong. Being 100% sure that the answer was correct and finding out that he/she was completely wrong is not a good feeling. In fact, it makes the person feel bad. The fear of being wrong may have resulted in the observed low overconfidence in the choice condition. On the other hand, arbitrary cue participants may be more removed from the chosen answers, and thereby the fear of being wrong was not so much of a concern. For example, assume that a newly hired manager is required to come up with a budget proposal for the year. The new manager can come up with a budget proposal from scratch or use the previous year's budget from a former manager of the department. Chances are that if the manager starts from scratch, he/she would not be very confident with the budget. Conversely, if the manager had a sample budget proposal from a previous year, he/she could confidently determine which items are relevant to his/her department. Therefore, using a sample budget proposal as a guide will result in higher confidence about the final budget proposal.

In reality, both the cognitive heuristic model and the motivational explanation could interact to account for the observed results. It is plausible that under a high ego-involvement condition, the fear of being incorrect may have forced choice participants to devote more attention to both alternatives. Participants then engaged in a less biased information search for both confirming and disconfirming evidence. As the result, overconfidence was minimized in the choice high ego-involvement condition. Conversely, the effect of cognitive heuristic may have been accentuated for the arbitrary cue participants in the high ego-involvement condition.

More difficult to interpret is the lack of main effect of choice in low ego-involvement condition. Recall that participants in the low ego-involvement condition reported a moderate level of ego-involvement rather than a low level of ego-involvement. Based on the manipulation check data and post-task conversations, participants were found to be ego-involved in the task regardless of treatment conditions. Thus, the obvious explanation is that the manipulation of ego-involvement was not sufficiently strong to tease apart the effect of choice under the low ego-involvement condition. As the result, conclusions on the null effect of choice in the low ego-involvement should be made with caution. The effect of choice on confidence judgments observed in the high ego-involvement condition could reverse under a true low ego-involvement environment.

This study directly tested the assumption of commitment to one's choice that Sniezek et al. (1990) and Ronis and Yates (1987) discussed in their research. Commitment was thought to be an antecedent of confidence. The predicted positive relationship between the two constructs was observed only for behavioral commitment measure. This finding could be explained by the unreliability of the self-reported commitment measure. The lack of correspondence between measures of confidence judgments and measures of commitment, on the other hand, is difficult to interpret. It is possible that behavioral commitment and self-reported commitment could be completely different constructs. This implies that the measures are tapping into different component of commitment. Another possibility could be that participants did not have good insight about their behaviors. Nisbett and Ross (1980) claim that one should not make inferences based on self-reported measures because results of self-reported measures often times do

not match the actual behaviors. Therefore, the observed finding could be attribute to this inconsistency.

Limitations

This study, like all others, has its limitations. First, the manipulation of ego-involvement was not sufficiently strong. The effect of the manipulation was minimized in the low ego-involvement condition. Providing no instructions in the low ego-involvement condition did not result in the expected low ego-involvement on the part of the participants. Instead, participants in the low ego-involvement condition were moderately ego-involved in the task. The general knowledge questionnaire was sufficient to evoke ego-involvement in the low ego-involvement condition. Future research needs to deliberately control for ego-involvement in the low ego-involvement group.

Further, the between-subject design and issues of sampling raise several concerns. The study opted for a between-subjects approach because the concern was more with the differences between choice and arbitrary cue when ego-involvement is taken into account. However, it is probable that individual differences in the degree of overconfidence may have ramifications on the observed results. It is plausible that some participants are confident or overconfident in almost every situation they encounter, regardless of choice or ego-involvement. The opposite could also be true. For some individuals, overconfidence may represent a broad trait that is common to different tasks and invariant to environmental conditions. For instance, someone could consistently overestimate the chances of projects being completed within specified time limits despite of types of project as well as the feedback from past experience.

It should, of course, be noted that the present sample of participants is composed entirely of college students, whereas the experimenter has attempted to address the broader issue of the entire population. College students may be more susceptible to the ego-involving nature of the task, given that the study was conducted in a research lab on campus.

Further, the general knowledge test that was used in the present study was relatively easy compared to the previous calibration studies. Analyses have revealed that individuals who answered more items correctly exhibited less overconfidence in general. In other words, they found a systematic decrease in overconfidence as the percentage correct increased. This implies that the overconfidence measures may have been diluted due to this ceiling effect. As the result, that range of overconfidence may not be large enough to detect a difference between the two ego-involvement conditions.

In addition, the domain of interest is general knowledge questions. The findings indicated that the domain of general knowledge is highly ego-involving due to self-relevance nature of the task. The extent to which general knowledge can be extended to other self-relevance tasks remains to be tested. A decision between alternative A or alternative B on a general knowledge test may or may not be the same as investing money in company A or company B. Do the same mechanisms apply when an individual is making a real world decision? Do they engage in the same biased information search?

Implications and Future Research

Several recommendations can be drawn directly from the results of the study. First, participants in the arbitrary cue and high ego-involvement condition demonstrated the highest overconfidence. It is likely that judgments may be less accurate when they are

made under those circumstances. One may wish to avoid making critical decisions under those conditions. Of all the treatment groups included in the experiment, participants in the choice and high ego-involvement condition exhibited the least overconfidence. The latter were more accurate with their probability estimates and better calibrated than all of the other treatment groups. This suggests that the potential to make poor choices may be reduced by enhancing ego-involvement.

One of the unexpected findings of the present study was that the general knowledge questions do evoke ego-involvement in the participants. Even when no explicit instructions were given to the participants, they still regarded the task as somewhat ego-involving. This finding suggests that the three previous calibration studies using general knowledge questions (e.g. Ronis and Yates, 1987; Sniezek et.al., 1990; Scherer and De La Castro, 1998) may be assumed to be ego-involving and conclusions across these studies might all be tenable. For all but the Scherer and De La Castro (1998) study, arbitrary cue leads to more overconfidence than choice. That is, the pattern of results suggests that making judgments of others' choices (arbitrary cue) leads to more overconfidence than making one's own choices. However, given that Scherer and De La Castro (1998) were the only ones to manipulate responsibility, future research needs to clearly delineate the conditions under which overconfidence is most likely to occur.

Interestingly, if one assumes that the nature of general knowledge questionnaire is sufficient to evoke ego-involvement, one does not have any information regarding what goes on under low ego-involvement. The effect of choice on confidence judgments observed in the high ego-involvement condition could reverse under a true low ego-involvement environment. Future research should replicate this study and deliberately

manipulate ego-involvement instructions to decrease the amount of ego-involvement. One may want to embed the task of general knowledge questions with some other research to decrease the amount of attention on the task. Another suggestion, borrowed from the literature on social loafing, is to make participants believe their responses are not traceable to them individually. Researchers have found that people tend to exert less effort when they believe their outputs are anonymous and unidentifiable (Karau & Williams, 1993; Weldon & Gargano, 1988). This loafing phenomenon has been observed for physical tasks as well as cognitive tasks (Weldon & Gargano, 1998). As the loafing research, one could deliberately manipulate the anonymity of the task and provide specific information regarding the possibility of receiving feedback on the task. No feedback is possible if participants' responses are anonymous. When participants believe their outputs are anonymous and unidentifiable, it is likely they will exert less cognitive effort, thereby decreasing the degree of ego-involvement in the task. Thus, by ensuring the anonymity of participants' responses, one could reduce the self-relevance effect of scoring people's general knowledge.

In addition, future study should replicate the present study and include items that would tease apart different types of ego-involvement. Recall the arguments made earlier, that the present manipulation check might have omitted items that could potentially differentiate among different types of ego-involvement. Examining various types of ego-involvement such as self-relevance ego-involvement, value-based ego-involvement, and issue-based ego-involvement, could potentially explain the nonsignificant results of ego-involvement.

The present findings may have implications on the typical decision making procedures adopted in most organizations. When decisions are made in organizational settings, it is often recommended that they be evaluated by a separate person or group of people before being implemented. This procedure is often justified by the assumption that a person who was not directly involved in making the decision can offer a more impartial and therefore more accurate assessment of its quality. As observed in the current study, such an assumption may not be true. The secondary group may act in a similar fashion to those in the arbitrary cue condition and exhibit higher overconfidence than the actual decision- makers. In fact, Koehler and Harvey (1997) examined confidence judgments made by actors and by observers and found that actors were significantly less confident in their answer than were observers. This particular finding is similar to what was observed in the high ego-involvement condition of the present study. Confidence judgments by actors and observers may also be moderated by ego-involvement of the task.

Another practical significance of overconfidence is related to developmental psychology. Based on developmental research, judgments of task-specific, expected performance (self-efficacy) can affect the activities one chooses to pursue and the extent of effort devoted to them. Judgments of self-efficacy are made under uncertainty; therefore, they are subject to the same cognitive constraints such as limited attention and limited information processing capacity (Switzer & Sniezek, 1991). Overt positive self-evaluation, as discussed at the onset of the study, suggests that judgments of self-efficacy may reflect overconfidence. Stone (1994) observed that initial self-efficacy judgments made in cognitively complex tasks are biased toward overestimates of personal ability. In other words, individuals are overconfident about their personal ability. It is plausible that

ego-involvement may minimize overconfidence in judgments of self-efficacy, as was the case of the present study, or ego-involvement may actually exacerbate overconfidence in judgments of self-efficacy. Research to date has yet to examine this issue. Future research should include items that explicitly measure judgments of self-efficacy.

Furthermore, the observed findings of the effect of choice on overconfidence in the high ego-involvement condition may have theoretical implications on the consistent findings of cross-cultural variations of overconfidence. Research has shown that overconfidence for general knowledge is stronger in most Asian countries than in Western countries. Ego-involvement may account for this difference. Specifically, participants in Asian countries may have perceived the task of general knowledge as less ego-involving than participants in Western countries. Participants in Western countries may have acted in accordance with choice participants in the high-ego involvement condition, and thereby exhibited less overconfidence. On the other hand, the task of general knowledge may not have sufficiently evoked ego-involvement in Asian participants, and as the result, they were more overconfident than participants in Western countries. Future research should attempt to measure the extent to which general knowledge is perceived as ego-involving by Asians and Westerners and perhaps derive a more conclusive theory of overconfidence.

Future research should explicitly test the cognitive heuristics model and the threaten self-esteem explanations. For instance, to test the cognitive heuristics model, one could attempt to examine the depth of processing through verbal protocol, or items that ask for explanations of a decision. It is important to explicitly investigate the types of information people are processing. The threaten self-esteem explanation could easily be

tested by incorporating some measures of evaluation apprehension. Future research should directly test for these models to derive a more definitive underlying mechanism for the overconfidence phenomenon.

Researchers have often assumed that a person who exhibits overconfidence in general knowledge can be expected to overestimate the quality of his/her knowledge base and hence sees no need to try to improve it. However, such an assumption has not been tested empirically. Future research should extend the knowledge questionnaire of the present study with more items to encompass a broader domain of knowledge. This would allow researchers to examine whether overconfidence in one knowledge component could be generalizable to the entire knowledge base as well as overconfidence across knowledge components.

Conclusion. The present study demonstrated that overconfidence is more likely to occur when one is assessing the accuracy of others' choices rather than one's own. In addition, the study suggests that overconfidence may be minimized by enhancing ego-involvement. Future research should examine different types of ego-involvement and other moderators of the effect of choice on overconfidence.

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Appendix A

Study 1 Questionnaire

QUESTIONNAIRE A INSTRUCTIONS: The following questions pertain to several tests. Please answer by circling the number which best describes how you feel about each test if you were to complete them.

I.   **Test of Intelligence**

    1. How involved would you be in taking a test of intelligence?

         1   2   3   4   5   6   7
       Not Involved   Very
         At All   Involved

    2. To what extent is it important to you to do well on a test of intelligence?

         1   2   3   4   5   6   7
       Not Important   Very
         At All   Important

    3. How important is it to you to be correct on a test of intelligence?

         1   2   3   4   5   6   7
       Not Important   Very
         At All   Important

    4. To what extent do you feel competitive about answering more items on a test of intelligence correctly than other students'?

         1   2   3   4   5   6   7
     Not Competitive   Very
         At All   Competitive

    5. Good performance on a test of intelligence is primarily due to my ability.

         1   2   3   4   5   6   7
       Strongly   Strongly
       Disagree   Agree

II.   **Test of Cultural Literacy**

    1. How involved would you be in taking a test of cultural literacy?

         1   2   3   4   5   6   7
       Not Involved   Very
         At All   Involved

    2. To what extent is it important to you to do well on a test of cultural literacy?

         1   2   3   4   5   6   7
       Not Important   Very
         At All   Important

    3. How important is it to you to be correct on a test of cultural literacy?

         1   2   3   4   5   6   7
       Not Important   Very

At All   Important

4. To what extent do you feel competitive about answering more items on a test of cultural literacy correctly than other students'?

  1   2   3   4   5   6   7
Not Competitive   Very
At All   Competitive

5. Good performance on a test of cultural literacy is primarily due to my ability.

  1   2   3   4   5   6   7
Strongly   Strongly
Disagree   Agree

III. Test of General Knowledge

1. How involved would you be in taking a test of general knowledge?

  1   2   3   4   5   6   7
Not Involved   Very
At All   Involved

2. To what extent is it important to you to do well on a test of general knowledge?

  1   2   3   4   5   6   7
Not Important   Very
At All   Important

3. How important is it to you to be correct on a test of general knowledge?

  1   2   3   4   5   6   7
Not Important   Very
At All   Important

4. To what extent do you feel competitive about answering more items on a test of general knowledge correctly than other students'?

  1   2   3   4   5   6   7
Not Competitive   Very
At All   Competitive

5. Good performance on a test of general knowledge is primarily due to my ability.

  1   2   3   4   5   6   7
Strongly   Strongly
Disagree   Agree

QUESTIONNAIRE B INSTRUCTIONS: The following questions pertain to several tests. Please answer by circling the number which best describes how you feel about each test.

Test of Intelligence

1. To what extent is performance on a test of intelligence predictive of **professional success**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

2. To what extent is performance on a test of intelligence predictive of **general success in life**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

3. To what extent is performance on a test of intelligence predictive of **success in college**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

4. To what extent is performance on a test of intelligence predictive of **interpersonal success**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

Test of Cultural Literacy

1. To what extent is performance on a test of cultural literacy predictive of **professional success**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

2. To what extent is performance on a test of cultural literacy predictive of **general success in life**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

3. To what extent is performance on a test of cultural literacy predictive of **success in college**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

4. To what extent is performance on a test of cultural literacy predictive of **interpersonal success**?

     1   2   3   4   5   6   7

   Not Predictive   Very

   At All   Predictive

Test of General Knowledge

1. To what extent is performance on a test of general knowledge predictive of **professional success**?

   1   2   3   4   5   6   7

   Not Predictive   Very
   At All   Predictive

2. To what extent is performance on a test of general knowledge predictive of **general success in life**?

   1   2   3   4   5   6   7

   Not Predictive   Very
   At All   Predictive

3. To what extent is performance on a test of general knowledge predictive of **success in college**?

   1   2   3   4   5   6   7

   Not Predictive   Very
   At All   Predictive

4. To what extent is performance on a test of general knowledge predictive of **interpersonal success**?

   1   2   3   4   5   6   7

   Not Predictive   Very
   At All   Predictive

Appendix B

Post-Task Questionnaire for Study 2

Rate the following categories base on the extent to which you think each category is a good representative of a component of general knowledge. For example, if you believe that knowledge of Literature is a very important component of general knowledge, then you should record a 7 on your scantron sheet. Note that you can have the same value assign to multiple categories. Please indicate your ratings on the space provided and then transfer the ratings to the scantron sheet when you are done.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very Unimportant
Component of
General Knowledge

Very Important
Component of
General Konwledge

1. ____The Bible

2. ____Idioms

3. ____Philosophy and Religion

4. ____Literature

5. ____Fine Arts

6. ____American Politics

7. ____Anthropology, Psychology, and Sociology

8. ____Business and Economics

9. ____Life Sciences

10.____Medicine and Health

11. As you worked on the questionnaire, to what extent do you agree that this test is a good measure of overall general knowledge?

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

12. To what extent do you agree that some of the **categories** asked in the questionnaire are more representative of general knowledge than others?

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

13. To what extent do you agree that some of the **items** asked in the questionnaire are more representative of general knowledge than others?

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

14. To what extent do you agree that all of the **categories** of information asked in this questionnaire are equally important determinants of one's general knowledge?

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

15. To what extent do you agree that all of the **items** asked in this questionnaire are equally important determinants of one's general knowledge?

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

16. Your overall prediction of your performance on this questionnaire (percentage correct)

1	2	3	4	5	6
50%	60%	70%	80%	90%	100%

Rank the following categories from 1 to 10 with 1 being the category that best represents the domain of general knowledge and 10 being the category that least represents the domain of general knowledge. Note that you **cannot** have the same rank assigned to multiple categories. Please indicate your rankings on the spaces provided and then transfer the rankings to the scantron sheet when you are done.

17.____The Bible

18.____Idioms

19.____Philosophy and Religion

20.____Literature

21.____Fine Arts

22.____American Politics

23.____Anthropology, Psychology, and Sociology

24.____Business and Economics

25.____Life Sciences

26.____Medicine and Health

Comments. Please record any comments or reactions to the questionnaire in the space provided.

Appendix C

Note on Confidence Measures

The computational formulas for the confidence judgments indices presented in this paper are provided below. A complete treatment of these indices is beyond the scope of the study, readers should refer to works by Yates (1990, Ronis & Yates, 1987). Throughout the formulas, f represents the subjective probability estimate, d represents the outcome (0 for incorrect, 1 for correct) N represents the total number of judgments made, and J represents the number of judgments made within a set of questions with a common f.

The most commonly used index in studies of calibration is the Brier score. The Brier score (abbreviated PS because it is also known as the mean probability score) gives an overall measure of accuracy in judgment:

$$PS = \sum (f - d)^2 / N$$

Various decompositions of PS have been developed to offer insight into the components of judgment accuracy. The most frequently used decomposition of PS are Murphy (1973) decomposition. The Murphy decomposition has three components: (1) the calibration index (CI), (2) the discrimination index (DI), and (3) the variance of d:

$$PS = CI - DI + Var(d)$$

Where

$$CI = 1/N \sum N_j (f_j - d_j)^2$$

$$DI = 1/N \sum N_j (d_j - d)^2$$

$$Var(d) = d (1 - d)$$

Appendix D

Self-reported Commitment Scale

1. On this task, it is a big deal if I make a mistake with the circled answer.

1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

2. I would be upset if the circled answer turned out to be wrong.

1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

3. I am confident with the circled answer that I don't even bother going back making any changes.

1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

4. I am reluctant to change the circled answers.

1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

5. Once I made a decision about an answer, I will stick to that decision no matter what.

1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

Appendix E

Manipulation Check Questionnaire

1. How involved were you in completing the task?

1	2	3	4	5	6	7
Not Involved						Very
At All						Involved

2. To what extent was it important for you to do well on the task?

1	2	3	4	5	6	7
Not Important						Very
At All						Important

3. How important was it to you to be correct on the task?

1	2	3	4	5	6	7
Not Important						Very
At All						Important

4. To what extent did you feel competitive about answering more items on the task correctly than other students?

1	2	3	4	5	6	7
Not Competitive						Very
At All						Competitive

5. It was important to my self-concept that I do well on the general knowledge questionnaire.

1	2	3	4	5	6	7
Not Important						Very
At All						Important

Appendix F

Demographic Questionnaire

For the following questions, please fill in the numbered on the scantron sheet.

1. What is your gender?   1 Male
                           2 Female

2. What is your race?   1 Caucasian   4 American Indian
                          2 African American   5 Asian American
                          3 Hispanic   6 Other

3. What is your highest level of educational experience?

    1 Less than high school   5 Some college
    2 High school graduate   6 Associate's Degree
    3 Certificate   7 Dual Associate's Degree
    4 Dual Certificate   8 Bachelor's Degree

4. How many semesters have you been enrolled in at least one college course?

    1   1 - 2 semesters   3   7 - 10 semesters
    2   3 - 6 semesters   4   more than 10 semesters

5. Which of the following best describes your academic standing?

    1   Freshman   3   Junior
    2   Sophomore   4   Senior

6. How many college courses have you taken?

    1   0 - 5 courses   4   21 - 30 courses
    2   6 - 10 courses   5   31 - 40 courses
    3   11 - 20 courses   6   more than 40 courses

7. How many psychology courses have you taken?

    1   1 - 2 courses   4   7 - 9 courses
    2   3 - 4 courses   5   10 - 12 courses
    3   5 - 6 courses   6   more than 12 courses

8. Is English your primary language?   1 Yes
                                        2 No

9. Which number below best represents your <u>difficulty</u> in reading English?

    1 None   4 Quite a bit
    2 Very little 5 Lots
    3 Some

10. Are you currently employed?   1 Yes
                                     2 No

11. Are you married?   1 Yes
                                     2 No

12. Have you ever been married?   1 Yes
                                     2 No

13. Do you have children?   1 Yes
                                     2 No

14. If "yes", how many children do you have?

        1 1 child   4 4 children
        2 2 children   5 5 or more children
        3 3 children

15. Please indicate your birth date on the lower left hand corner of the scantron sheet.