FAITH IN INTUITION AND CONFIDENCE LEVEL AS DETERMINANTS OF
REGRET INTENSITY FOLLOWING DECISION OUTCOMES

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FAITH IN INTUITION AND CONFIDENCE LEVEL AS DETERMINANTS OF REGRET INTENSITY FOLLOWING DECISION OUTCOMES

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Finding regarding “first instinct fallacy”, the tendency to overestimate the effectiveness of sticking with an initial answer, reveals that changing a correct answer to an incorrect answer produces more regret than failing to change an incorrect answer to a correct answer. The current research examines whether emotional responses to outcomes stemming from decisions to switch from versus stick with an initial decision are moderated by individual differences in processing styles. After completing the Rational-Experiential Inventory, participants answered general knowledge questions. Following the initial response and initial confidence rating for each question, participants received consensus information after which they were given an opportunity to stick with or switch from their initial answer prior to their final confidence ratings. Following the veridical outcome feedback, participants rated their emotions. Individual differences did not reveal any significant finding in behavioral tendencies and the amount of regret experienced. Participants reported significantly more regret from their nonswitches that were disagreed by the majority. The implications and the limitations of the current study are discussed.

Approved:

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Overview

Imagine that you are taking a very important multiple-choice exam. On one of the questions, you are considering changing your initial answer to another answer. You agonize over the decision, going back and forth between thinking that you are going to switch your answer and thinking that you will stick with your original answer. Would you change your initial answer or would you stick with it? Imagine further that you ultimately decide to change your answer. However, it turns out that your original answer to the question was correct and thus by switching your answer you get the question wrong. Would you feel any differently than if you had stuck with your original answer and gotten the question wrong?

Students’ reluctance to change their initial answers on multiple-choice tests is but one example of people’s tendencies to stick to an initial choice or decision even if switching to another choice offers clear benefits. This tendency to overestimate the effectiveness of sticking with a first instinct has recently been termed the “first instinct fallacy” (Kruger, Wirtz, & Miller, 2005; Miller, & Taylor, 1995). Miller and Taylor (1995) were the first to demonstrate how changing a correct answer to an incorrect answer produced more regret than failing to change an incorrect answer to a correct answer, a finding that is consistent with a more general pattern typically found in the regret literature – that failed actions (i.e., switches resulting in negative outcomes) elicit more regret than failed inactions (i.e., non-switches resulting in negative outcomes) (e.g., Connolly, & Ordonez, 1997; Connolly, & Zeelenberg, 2002; Gilovich, & Medvec, 1995; Kahneman, & Tversky, 1982; Zeelenberg, Van den Bos, Van Dijk, & Pieters, 2002).
The current research has four main goals. First, the present study will examine whether the tendency to stick with an initial choice, even in the face of subsequently received information that questions the prudence of the initial choice, is moderated by individual differences in experiential versus rational thinking styles (Epstein, 1990). Secondly, the current research will examine differential emotional responses to successful and failed decisions to switch from versus stick with an initial decision as a function of thinking style. Third, the present work will examine the moderating role of pre- and post-decisional confidence levels on emotional responses to successful and failed decisions to switch from versus stick with an initial decision. Finally, the relationship between biased memory for failed switches and strength of belief in the effectiveness of sticking to first instincts will be examined.

Introduction

Regret and Its Underlying Mechanisms

Until recently, researchers have paid minimal attention to the role that emotional factors may play in decision-making (Connolly, & Zeelenberg, 2002; Lerner & Keltner, 2000; Loewenstein, Weber, Hsee, & Welch, 2001). One emotion that has received attention from decision-making researchers, however, is regret. Since the 1980’s, researchers in both laboratory and field settings have developed theories describing factors that elicit regret (Bell, 1982; Connolly, Ordóñez, & Coughlan, 1997; Gilovich, & Medvec, 1994; Kahneman, & Miller, 1986; Landman, 1987; Loomes & Sugden, 1982; Ritov, & Baron, 1995; Thaler, 1980; Tversky, & Kahneman, 1981; Zeelenberg et al. 1998). Economic models of regret attempt to explain violations of axioms of rational choice by describing how individuals will sacrifice monetary gain in order to avoid
experiencing subsequent regret (Bell, 1982; Loomes & Sugden, 1982). However, the definition of regret that economic models have employed – that regret reflects the difference between the values of what an individual has actually received versus what they have rejected - is somewhat narrow, and has difficulty explaining why some rejected alternatives elicit more regret than do other rejected alternatives.

Psychological research on counterfactual thinking, and Norm Theory (Kahneman & Miller, 1986) in particular, has broadened the definition of regret. According to psychological theories (e.g., Markman, Gavanski, Sherman, & McMullen, 1993; Mellers, 1997; Roese, 1997) events are not evaluated in isolation but, rather, are compared to alternatives that might have, could have, or should have happened. By allowing for consideration of imagined outcomes, the study of regret is no longer restricted to an examination of the rejected alternatives whose outcomes are known. Rather, in order to feel regret, the foregone alternative need only be imagined. In addition, the psychological approach to regret stresses the importance of the route taken to arrive at a negative outcome (i.e., the event antecedent that is mutated). Because different routes to the same outcome can elicit differential counterfactual alternatives, different routes to the same outcome can also elicit very different levels of regret.

In defining regret, researchers typically attempt to separate regret from related emotional states such as disappointment, guilt, and sadness (Hampshire, 1960; Landman, 1987, 1993; Taylor, 1985; Zeelenberg et al., 1998). However, definitions of regret vary widely. According to Landman (1993),

Regret is a more or less painful cognitive and emotional state of feeling sorry for misfortunes, limitations, losses, transgressions, shortcomings, or mistakes. It is an
experience of felt-reason or reasoned-emotion. The regretted matters may be sins of commission as well as sins of omission; they may range from the voluntary to the uncontrollable and accidental; they may be actually executed deeds or entirely mental ones committed by oneself or by another person or group; they may be moral or legal transgressions or morally and legally neutral…. (p.36).

The definition offered by Landman is quite broad. For instance, self-blame does not appear to be a necessary part of regret according to this definition. Thus, one might feel regret at the loss of their car keys in a manner that is indistinguishable from the experience of unhappiness in general. Simonson (1992) considers regret and responsibility to be closely related, yet also suggests treating them as separate constructs. According to Simonson, regret is the felt sorrow over something done or not done, regardless of the decision maker’s responsibility. Sugden’s (1985) definition involves self-blame and responsibility as integral parts of regret - wishing you had done something differently in addition to feelings of self-blame. According to Sugden, regret intensity depends upon both self-blame and how one justifies the decision. Similarly, Gilovich and Medvec (1995) consider personal responsibility as being central to the experience of regret, finding in their studies that very few participants report feeling regret over things that are beyond their control (see also Markman, Gavanski, Sherman, & McMullen, 1995).

Whether or not felt responsibility is a necessary condition for producing regret has been a subject of recent debate. According to Zeelenberg et al. (1998), felt responsibility for a negative decision outcome is a necessary element that differentiates regret from other negative emotions such as disappointment. Employing their example, one cannot
feel regret from experiencing rainy weather, which is beyond one’s control, but one might feel disappointment. Despite the fact that disappointment can also stem from thinking counterfactually following a negative outcome, disappointment can still be felt without actually rendering a decision. On the other hand, studies conducted by Connolly, Ordonez, and Coughlin (1997) found that decisional self-blame or self-congratulation played no role in producing regret. A mediocre outcome was judged more positively by those whose fortunes improved and more negatively by those whose fortunes declined, compared to those whose fortunes remained unchanged. Moreover, the result replicated regardless of whether the outcome was imposed by a computer or chosen by an individual.

Decision Justification Theory (DJT - Connolly & Zeelenberg, 2002) describes two components of regret. One component is associated with the comparative evaluation of the outcome, whereas the other component refers to the feelings of self-blame that follow from making a poor decision. According to the theory, the intensity of the regret experience can be enhanced or lessened by combining these two components. However, the components do not necessarily have to occur together. Individuals may still feel regret when they compare the outcome of their decision with a standard (usually compared to the foregone alternative) without experiencing self-blame. Consider the case of having your child vaccinated against a serious disease while knowing that there is a small probability of incurring negative side effects. You gather information, consult doctors, and decide to obtain the vaccination, but your child subsequently suffers the negative side effects, an outcome that would not have occurred if you had decided not to vaccinate. Given that you tried to make the best possible choice, however, there is no felt
responsibility because you trusted the doctors and did your best - your decision was fully justified and thus you do not blame yourself. According to DJT, however, there is still a feeling of regret stemming from the misfortune. Consider another case in which you were invited to a party and drank too much. Nevertheless, you decided to drive home rather than calling a cab. Although you arrive home safely, the next morning you feel regret because of your reckless behavior. In this case, although no negative outcome was experienced, you still feel regret due to self-blame. Your decision to drive while intoxicated was not justified, so, although the outcome was not negative, you still experience regret stemming from feelings of self-blame.

Although there is controversy regarding whether responsibility is involved in experiencing regret, it does appear that a comparison process is necessary and directly linked to the experience of regret (Markman et al., 1993; Roese, 1994, 1997). In many regret studies, information about the foregone alternatives is provided. However, in real-life situations, such information is rarely available. For instance, it is unclear what outcomes I would have obtained if I had accepted an offer from another university for my graduate studies. Zeelenberg et al. (1998) found that uncertainties about missed opportunities may sometimes be a blessing, in that study participants reported experiencing less regret when they did not learn the outcome of foregone alternatives than when they did learn such outcomes. These authors further suggest that this might be the reason why we do not continuously feel regret about all of our forgone choices; Frijda’s Law of Apparent Reality (Frijda, 1988) suggests that in the case of uncertainty about a missed opportunity, the counterfactual outcome may lack a sense of realness, and should therefore evoke less regret than when the foregone alternative is known. On the
other hand, motivational explanations have also been offered to explain why regret is not felt continuously. According to Tykocinski (2001), individuals attempt to attenuate the impact of negative outcomes by enhancing the perceived inevitability of the outcome. Gilovich, Medvec, and Chen (1995) describe the dissonance reduction strategies individuals may employ to reduce the negative feelings the situation created. For instance, if you miss the grand prize and end up with a smaller one instead, you might reduce negative feelings about the foregone alternative by increasing the value of the smaller prize.

In sum, regret can be separated from other emotional states. As defined by both counterfactual and economical models, regret involves a comparison process, and thus judgment is central to the regret experience.

*Actions Versus Inactions*

A good deal of research on counterfactual thinking has focused on the intensity of regret experienced as a function of whether the negative outcome results from an action taken or not taken. Kahneman and Tversky (1982) asked students to assess the amount of regret experienced by two investors in response to two hypothetical scenarios. Both of the investors lose $1,200 as a result of their decisions. However, one investor chooses to sell his stock and buy another stock, only to end up losing $1,200 (i.e., the initially owned stock would have garnered him $1,200), whereas the other investor holds on to his stock after considering switching to another stock, but also ends up losing $1,200 (i.e., the other stock would have garnered him $1,200). According to the results, most participants believed that the investor that switched stocks would experience more regret than the investor who failed to switch stocks.
Norm Theory (Kahneman & Miller, 1986) asserts that one’s emotional response to an event is amplified if its causes are deemed to be abnormal, as people have a tendency to react more strongly to events for which it is easy to imagine a different outcome occurring. Thus, dying in a plane crash after switching flights at the last moment is judged to be more “tragic” (and abnormal) than dying in a plane crash when the flight had been booked for some time because it is easier to imagine the person in the former case surviving if he or she had not switched flights. By the same token, outcomes that follow exceptional (abnormal) actions will elicit stronger reactions than outcomes that follow routine (normal) actions. With regard to the investor problem, Kahneman and Miller argued that because it is usually easier to imagine oneself abstaining from actions that one has carried out (normal) than carrying out actions that were not in fact performed (abnormal), regret stemming from failed actions should be experienced more intensely than regret stemming from failed inactions (see also Baron & Ritov, 1994; Landman, 1987, 1993; Miller & Taylor, 1995; Spranca, Minsk, & Baron, 1991; Zeelenberg, 1996).

More generally, people may also feel more personal responsibility for their regrettable actions than for their regrettable inactions. Therefore, regrettable actions should also be more likely to elicit dissonance-reduction behaviors than should regrettable inactions. To examine this question, Gilovich et al. (1995) designed a laboratory study that utilized the Monty Hall “three doors” problem. Participants initially selected one out of three available boxes, only one of which contained the grand prize. Later, the experimenter opened one of the two unchosen boxes and revealed a modest prize. Participants were then asked whether they would like to stick with their initial choice or change their choice to the other unopened box. Whatever participants decided,
however, they always received the modest prize. Demonstrating that regrettable actions elicit more regret than regrettable inactions, results indicated that participants who switched boxes subsequently assigned higher monetary value to the modest prize (more dissonance reduction) than participants who stuck with their initial choice (less dissonance reduction).

Alternative explanations for the action/inaction effect are numerous. For instance, inactions may simply be less salient than actions because nonoccurrences lack informational value relative to occurrences (Fazio, Sherman, & Herr, 1982; Newman, Wolff, & Hearst, 1980; Nisbett & Ross, 1980). Alternatively, Weiner’s (1980) attributional theory of emotion predicts that more intense emotions should follow from actions rather than inactions because of the clearer causal connections between antecedents and consequences in the former case (Weiner, 1980).

Subsequent research, however, has questioned the generality of the action/inaction effect. When Gilovich and Medvec (1995) asked participants about their real-life regrets, they found that regrets stemming from \textit{inactions} actually stung more than regrets stemming from actions. Their explanation relied upon what they termed the temporal pattern of experiencing regret – although people experience more regret from their actions in the short run, in the long run it is their failure to act that hurts people the most. Among the multitude of factors described by Gilovich and Medvec that decrease the pain of regrettable actions is the ability people have to take steps to correct failed actions. For instance, when someone regrets marrying Mr. Wrong they may choose to get a divorce. However, when someone misses out on Mr. Right, they can do little but muse upon the fact that he is no longer available. Therefore, working on actions enables people
to decrease their pain. Alternatively, the tendency to address regrettable actions more so than regrettable inactions can be understood in Lewinian terms (Lewin, 1938, 1951). Lewin argued that psychological and physical forces form a tension system that determines the behavior of an individual. These forces are in equilibrium until it is time to act. When individuals act, they disturb the equilibrium and alter this tension system. When forces that maintain inertia are disturbed, it is easier to take steps to overcome whatever mistakes were made. However, when individuals fail to act they are still under the forces of inertia. Whatever is making it difficult for one to act still exists in the situation, and given that one could not act initially, it is thereby less likely that one will act at a later point in time. Thus, it is relatively difficult to switch from initial inaction to subsequent action.

In an exploration of conditions that moderate the action/inaction effect, Zeelenberg et al. (2002) demonstrated that the amount of regret experienced in a situation resulting from an action or inaction also depends upon preexisting conditions. For instance, consider the soccer coach whose team loses a game. The amount of regret he experiences depends not only upon whether he made a change (action) or failed to make a change (inaction), but also on whether the team was already losing or winning before (in)action was taken. If the team was already losing and the coach failed to make changes, participants reported more regret for a lost game than if he did make changes but lost the game.
Anticipatory Regret

Normative models of decision-making view decision-makers as utility-maximizers. According to Expected Utility Theory, decision-makers have well-established preferences (Schoemaker, 1982) and, thus, when making decisions, individuals will choose the option that has the highest expected utility. However, multiple studies have shown that individuals consistently violate the axioms of Expected Utility Theory. Alternatively, Regret Theory, proposed by Loomes and Sugden (1982), assumes that people compare the outcome of the option that they chose with the outcome of the alternative they might have chosen, thereby experiencing either joy or regret as a consequence of this comparison. However, because individuals know what emotions they might experience after making a particular choice, they take these anticipatory emotions into account while making a choice. According to Regret Theory, they will make choices that minimize the amount of regret they believe they will experience.

Research has examined the extent to which knowledge that one will or will not receive feedback regarding the outcome of foregone alternatives enhances feelings of anticipatory regret. Josephs, Larrick, and Nisbett (1992) investigated this question by taking into account individual levels of self-esteem. They found that in cases where the outcome of a foregone alternative would be known, low self-esteem individuals (LSEs) made choices that minimized the possibility of regret. They tended to choose a certain gain over a risky alternative when the choice set was positively framed in terms of gains. If they chose the risky option, which might not pay anything, they would also have to cope with knowing that a modest amount could have been won for certain. Although LSEs acted risk averse in the feedback known condition, LSEs behaved in just as risk-
seeking a manner as high self-esteem individuals when the outcome of a foregone alternative would not be known.

In addition to outcome feedback regarding foregone alternatives, there are several other factors that may increase the likelihood that anticipatory regret will be factored into a decision. One is related to the ease of decision-making. If one alternative is clearly superior to others, then it is relatively easy to make a decision. However, when the alternatives are equally attractive, it is more likely that people will take anticipatory regret into account when deciding (Sugden, 1985). Other factors include the importance of the decision (Janis & Mann, 1977), how distant/proximal is the outcome of the decision (Miller & Taylor, 1995; Lowenstein, 1992), and whether there is an opportunity to reverse the decision (McAllister, Mitchel, Beach, 1979). If the decision is important or irreversible, then anticipatory regret will factor into the decision.

In a series of studies, Zeelenberg et al. (1996) presented participants with monetary gambles that consisted of two alternatives. One of the gamble alternatives was relatively risky whereas the other one was relatively safe. They also manipulated the feedback provided to the participants. In the “feedback safe alternative” condition, participants always learned the outcome of the safer alternative regardless of their choice. Likewise, in the “feedback risky alternative” condition, participants always learned the outcome of the riskier alternative. In addition to this feedback, all participants expected to learn the outcome of the chosen alternative. Zeelenberg et al.’s reasoning was that if regret stems from the comparison of chosen alternatives to rejected alternatives, in order to minimize regret, people should behave in a manner that allows them to avoid making comparisons that reflect poorly on their decisions. Therefore, it was predicted that
participants in the feedback safe alternative condition would choose the safer alternative in order to protect themselves against making a threatening counterfactual comparison with the outcome of the riskier alternative. On the other hand, participants in the feedback risk alternative condition were expected to choose the riskier alternative. The results supported these predictions - in order to minimize anticipatory regret, participants tended to make choices that allowed them to avoid making deflating counterfactual comparisons.

First Instinct Fallacy

Kruger et al. (2005) recently conducted a series of compelling experiments that investigated a core aspect of the test-taking experience – the uncertainty that often accompanies answering specific test questions. The test-taker might mark down an answer, a “gut” hunch based on a first impression, but experience a feeling of uncertainty and decide to return to that question later in order to reassess the gut hunch. Later, the test-taker indeed might think a different answer is the correct one, thereby leaving the test-taker to face the following dilemma: Stick with the original answer, or change the answer to what now seems to be the best answer.

The rule of thumb that most students hear is to stick to the first answer. Even Kaplan, the company that specializes in preparing students for standardized tests such as the SAT or GRE, suggests that the test-taker should, “Exercise great caution if you decide to change an answer,” as, “Experience indicates that many students who change answers change to the wrong answer” (Kruger et al., 2005). Intriguingly, however, educational research from numerous sources spanning seventy years (see Kruger et al., 2005) is nearly unanimous in demonstrating that it is better to switch than to stick with one’s first
instinct. Most answer changes go from incorrect to correct, and people who change their answers usually improve their test scores.

The goal of Kruger et al.’s (2005) research was to address the question of why so many people mistakenly believe that it is best to cling to a first instinct. In Study 1, Kruger et al. examined student’s midterm exams for markings left from an eraser, and counted the instances in which students changed their answers, which also allowed them to see whether these changes made their overall score better or worse. Of all the erasures, 54 percent were changes that helped (wrong answer changed to right answer) and only 19 percent were changes that hurt (right changed to wrong). The rest of the changes were from one wrong answer to another wrong answer.

Based on research on the action/inaction effect (e.g., Kahneman & Tversky, 1982; Kahneman & Miller, 1986; Landman, 1987), Kruger et al. (2005) hypothesized that the action of switching from a correct answer to an incorrect answer should make a poor outcome more regrettable than the (in)action of sticking with an incorrect answer. Moreover, they reasoned, because counterfactual thoughts centering on action are more regrettable, they should also be more available in memory than counterfactuals focusing on inaction. In support of the differential availability in memory hypothesis, Kruger et al. in Study 2 found that several weeks after taking a version of the SAT exam, students misrecalled the consequences of switching answers and sticking to their original answers. Students mistakenly remembered that switching answers was worse for their exam performance than it actually was, and that sticking to their original answers was better for their exam performance than it actually was.
Kruger et al. (2005) modeled their Study 4 after the popular television game show *Who Wants to Be a Millionaire*. The game requires contestants to answer a series of questions, with each correct answer increasing the amount of prize money. In addition, contestants may use any of three “lifelines.” For example, the contestant can poll the audience as to the correct answer or phone a friend for advice. In Kruger et al.’s version, research participants watched a videotaped version of *Who Wants to Be a Millionaire* in which they saw contestants answer forty questions. Kruger et al. edited the videotape to create several versions with varying numbers of times when the contestant switched when she should have stuck (that is, followed the advice of a lifeline rather than sticking with her first instinct, which turned out to be right) and stuck when she should have switched.

As participants viewed the videotape, they indicated how pleased or frustrated they felt about the outcome of each of the contestant’s answers, and after the video was complete, participants’ memory for the contestant’s pattern of outcomes was probed by asking them to indicate the extent to which the contestant was helped or hurt by her answer changing strategy. Finally, participants’ belief in the wisdom of sticking to one’s first instinct was measured by having participants evaluate the effectiveness of the contestant’s overall answer changing strategy.

According to the results, participants expressed more frustration about the contestant missing questions when she switched when she should have stuck, compared to when she stuck when she should have switched. In turn, and supportive of the differential availability in memory hypothesis, the contestant’s experiences of missing answers after switching was indeed more memorable than the experience of missing an answer by sticking to one’s first instinct. Finally, and importantly, path analyses
supported Kruger et al.’s hypothesized causal model: Switching when one should have stuck produced more negative affect, which in turn produced a memory bias, which in turn enhanced beliefs in the first instinct fallacy.

More generally, the first instinct fallacy can be considered a special case of the action/inaction effect. The novelty of the phenomenon, however, centers on the differential effects on regret of taking action when one had initially chosen the proper course of action – switching from the right answer to the wrong answer. According to Kruger et al. (2005), “…an error that results from the change of a correct answer to a wrong answer seems like an error that almost did not happen, and as such, seems like an error that should not have happened“ (p. 4). The frustration associated with this conclusion serves to make this type of error more available in memory (Gilovich et al., 1995; Miller & Taylor, 1995) and hence seemingly more frequent than it actually is.

**Cognitive-Experiential Self-Theory**

Two of the main goals of the present research are to examine whether the tendency to stick with an initial choice, even in the face of subsequently received information that questions the prudence of the initial choice, is moderated by individual differences in experiential versus rational thinking styles, and whether differential emotional responses to successful and failed decisions to switch from versus stick with an initial decision vary predictably as a function of thinking style. This distinction between experiential and rational thinking styles is addressed by Epstein’s (1990) Cognitive-Experiential Self Theory (CEST).

According to CEST, there are two information-processing systems by which people adapt to their environments: a preconscious experiential system and a primarily
conscious rational system. These two systems work in parallel and interact with each other such that each influences the other. The rational system operates according to one’s understanding of logical rules of inference, whereas the experiential system operates according to heuristic principles. Table 1 (see Appendix) summarizes how each system operates.

The rational system is a deliberative, analytical system that operates relatively affect-free. Although it is capable of high levels of abstraction and facilitating long-term delay of gratification, it is inefficient for reacting to mundane events. Furthermore, it has a relatively brief evolutionary history. In contrast, the experiential system encodes information in a concrete, holistic manner. Although it encodes information as concrete representations, it is capable of abstraction through the use of generalizations, prototypes, and metaphors. It is intimately associated with affect and has a long evolutionary history that both humans and nonhumans share. Because it operates in an automatic, rapid, and effortless manner, it places minimal demands on cognitive resources.

Epstein and his colleagues have conducted a series of studies to demonstrate the existence and operation of the basic principles of these two systems. In a paradigm typical of this research program, participants are asked to respond to vignettes, similar to the ones used in studies of judgmental heuristics (e.g., Tversky and Kahneman, 1982), from three perspectives: how they believe most people would behave in the situations described, how they themselves would behave, and how a logical person would behave (Denes-Raj, Epstein, & Cole, 1995; Epstein, 1994; Epstein, Lipson, Holstein, & Huh, 1992; Epstein, Pacini, et al., 1996). In all of the studies, participants indicated that although they know how a logical person would behave in a given situation, they also
believe that neither they nor most people would actually behave in such a manner. 

Results indicate that the ratings for self and other-person perspective follow the principles of the experiential system, whereas the ratings for the perspective of the logical person follow the principles of the rational system. Results employing alternative experimental paradigms (e.g., Sappington & Russell, 1978; Sappington, Russell, Triplett, & Goodwin, 1980; Schwarz, Strack, Hilton, & Nadderer, 1991) support to Epstein et al’s findings that most people are aware of the two modes of processing that corresponds to the rational and experiential systems of CEST; although people “know better” (logical perspective), their reports indicate that, like others, they themselves would typically comport themselves according to the principles of experiential system.

More evidence for the simultaneous operation of two different processing modes comes from a series of studies on the “ratio bias” (RB) phenomenon (Denes-Raj & Epstein, 1994; Kirkpatrick & Epstein, 1992). These studies found that people prefer to play a large lottery (e.g. winning 10 jelly beans out of 100) over a small lottery (e.g., winning 1 jelly bean out of 10), even though the objective probability of winning is identical across lotteries. They also found that most participants preferred to play the large lottery even when the small lottery offered slightly more favorable odds (Denes-Raj, & Epstein, 1994; Pacini & Epstein, 1999). Additionally, when asked, participants reported that they knew their behaviors were irrational, but they felt like they had a better chance of getting a jelly bean when there were more of them. The RB paradigm is particularly interesting because it presents a conflict between the appeal of numerosity in the experiential system (a fundamental heuristic) and formal knowledge of ratios in the rational system. CEST proposes that the experiential system is better suited to
comprehending smaller numbers than larger numbers, absolute numbers than ratios, and rations expressed in smaller numbers than large numbers due to its nature of encoding information in the form of concrete exemplars.

According to CEST, by working in a holistic manner the experiential system responds better to the overall context of situations rather than to isolated, abstracted elements that require analytical thinking. In a series of studies employing conjunction problems, Epstein, Denes-Raj, and Pacini (1995) reasoned that the major reason why people make conjunction errors is people’s inability (i.e., unwillingness) to ignore irrelevant information and treat the problem as a statistical problem. For instance, in the well-known “Linda problem,” participants are given a brief sketch in which Linda is described as a bright 31-year old woman who majored in philosophy and was active in antinuclear demonstrations. Later, participants are asked to rate the likelihood that Linda is a bank teller, a feminist, and both a feminist and a bank teller. In repeated studies, people violate the conjunction rule and assign a greater likelihood to “Linda is both” than “Linda is a bank teller”. However, the probability of occurrence of both events cannot be more than the probability of the occurrence of either event alone (Tversky & Kahneman, 1983). When asked to explain their ratings, most participants constructed a narrative based on an interpretation of the overall situation; the Linda problem is not treated as a conjunction problem, but rather as one that asks them to match a personality attribute to behavior. This finding is in line with the CEST proposition that concrete representations facilitate performance in the domain of natural problems but interfere with performance on unnatural problems. Experiential processing is effective with concrete representations and, because of the Linda problem’s concrete attributes, nearly everyone responds with a
natural solution—predicting behavior from personality attributes. However, the correct solution requires an unusual response employing abstract statistical principles.

Additional research has demonstrated people’s tendency to judge others in holistic ways when they respond from an experiential rather than a rational perspective. In one of the vignettes employed by Epstein et al. (1994), a rich benefactor offered $100 each to three friends if they threw heads in a coin toss. The first two friends threw heads, but the third one threw tails. Participants were asked to rate the emotions of the three friends and to judge the likelihood that the other two would invite the third friend on a gambling trip to Las Vegas in which they all would split the gambling earnings. Most reported that the third friend would feel guilt whereas the other two would feel angry, and that they would not invite the third friend on the trip. Although the participants reported that they knew their reactions were irrational, they also reported that this is the way most people including themselves would react in real life. Moreover, this effect was heightened when the emotional intensity of the outcome was varied (Epstein et al., 1992). Accordingly, participants were more likely to make negative judgments about the third friend in the $100 condition than in the $1 condition.

The experiential system is associationistic whereas the rational system operates through logical considerations. In a vignette study of counterfactual thinking that manipulated far-misses and near-misses, Epstein et al. (1992) showed that responses from an experiential orientation were associative as opposed to rational in orientation. For instance, in one vignette the protagonist was described as arriving late at the airport because of a traffic jam (cf. Kahneman & Tversky, 1982). In one condition, the flight left on time and the protagonist missed it by 30 minutes (far miss condition), whereas in the
other condition the flight was delayed and the protagonist missed it by 5 minutes (near miss condition). Participants were then asked in which condition the protagonist would feel more foolish for having dawdled at home for 10 minutes before departing to the airport. Because experiential responses follow associative connections, dawdling at home was found to be a more significant factor in the near-miss condition than in the far-miss condition. However, there was no greater association between lateness and dawdling at home in the far-miss than in the near-miss conditions when a rational orientation was adopted.

Epstein et al (1996) constructed the Rational-Experiential Inventory (REI) in order to measure individual differences in processing styles with regard to these two systems. The REI consists of two separate subscales: a modified Need for Cognition Scale (NFC, Cacioppo & Petty, 1982) and a Faith in Intuition Scale (FI, Epstein et al., 1992). Epstein et al. adopted the NFC scale in order to measure analytical-rational processing, but constructed their own scale to measure degree of confidence and engagement in one’s intuitive abilities (FI). The REI employed in Study 1 is a 31-item inventory that selects 19 items out of the original 45-item NFC scale. This modified NFC scale measures the extent to which individuals enjoy and engage in cognitive activities, including items such as: “I would prefer complex to simple problems,” “Thinking is not my idea of fun,” and “Learning new ways to think doesn’t excite me very much.” The second component of the REI scale, the FI scale, consists of 12 items. These 12 items focus on the degree of confidence one has that feelings and impressions are a basis of one’s decisions and actions. The FI scale includes items such as: “My initial impressions of people are almost always right,” “I believe in trusting my hunches,” and “When it
comes to trusting people, I can usually rely on my gut feelings.” Participants rate all 31 items on a 5-point scale ranging from completely false to completely true. In Study 2, Epstein et al. introduced a short version of the REI scale consisting of 10 items - 5 items from the modified NFC scale and 5 items from FI scale, and it is this shorter version that will be employed in the present study.

The preceding description of the studies conducted by Epstein et al. provides support for the notion that there are two independent information processing modes corresponding to experiential and rational systems. Findings suggest that these two kinds of processing operate independently and by different rules. The rational system operates by abstraction, systematic analysis, and logic, whereas the experiential system operates by heuristic rules. In most situations, the automatic processing of the experiential system is the major determinant of behavior due to its rapidity, effortless, and efficiency. However, the experiential system influences the rational system in the sense that unconscious processing can bias conscious reasoning. Because the influence of the experiential system occurs outside of conscious awareness, the rational system is unable to control how information is processed by the experiential system. Empirical work suggests that people are aware of the existence of these two different thinking styles in that participants appropriately shifted from one mode of processing to another when they were asked to adopt a certain perspective. Although every individual employs both processing modes, individual differences in the quantity and quality of their use can be measured by the REI.
Confidence and Post-Decisional Regret

Cognitive dissonance theory (Festinger, 1957) specifies how individuals will strive to reduce the regret that accrues from having to make a decision between two fairly attractive alternatives. The theory proposes that once a decision is made, people will change their attitudes in parallel to their decision in order to minimize any post-decisional doubts or regrets that they might otherwise experience. Many post-decisional dissonance studies employ Brehm’s “free choice paradigm” (Brehm, 1956). In a typical free choice paradigm, participants are asked to rate the attractiveness of household appliances. Later, each participant is given an opportunity to choose a free gift from among two items that they rated fairly equivalently. After choosing one alternative, participants are then asked to re-evaluate the attractiveness of the chosen and unchosen alternative. The key finding is that once a choice between two fairly equivalent alternatives has been made, participants tended to evaluate the chosen alternative more favorably (and the unchosen alternative less favorably) than they had rated it initially. This apparently robust tendency of people to enhance evaluations of a chosen alternative and lessen evaluations of an unchosen alternative has been referred to as the “spreading of alternatives.”

Evidence that post-decisional dissonance reduction can inflate confidence estimates comes from a study conducted by Knox and Inkster (1968). Participants who were acknowledged gamblers placed $2 bets on horses at a racetrack and then reported their confidence that the horses they had chosen would win either 30s before or a few seconds after they had placed their bets. Consistent with dissonance theory, gamblers were more confident about their bets after they had placed their bets than before. Similar results were found when voter confidence was measured either before or after votes were
placed in a national election - individuals were more confident that their chosen candidate would win after they have placed their votes than before (Frenkel & Doob, 1976; Regan & Kulduff, 1988).

Festinger contended that due to the lingering cognitions about the favorable characteristics of the rejected alternative(s), dissonance was the inevitable consequence of a decision (Festinger, 1957). However, Festinger also noted that in order for dissonance to occur, the decision must also have the effect of committing the person psychologically (Festinger, 1964). According to the theory, the individual can reduce post-decisional dissonance by shifting cognitions in such a manner as to increase the attractiveness of the chosen alternative relative to the unchosen alternative(s). In the case of the gambler at the racetrack, the bettor becomes psychologically committed to the decision when the ticket for the horse is purchased. Once this commitment is made, a post-decisional process operates to reduce dissonance by increasing the attractiveness of the chosen horse relative to the unchosen horses in the race. This increase in the perceived attractiveness of the chosen alternative is reflected in the report of greater confidence after the commitment to the chosen alternative has been made in comparison to reported confidence before the commitment is made. Thus, bolstering confidence appears to reduce post-decisional regret.

Study Goals

The present study has four main goals. First, this research examines whether the tendency to stick with an initial choice, even in the face of subsequently received information that questions the prudence of the initial choice, is moderated by individual differences in experiential versus rational thinking styles (Epstein, 1990). Secondly, the
current research examines emotional responses to successful and failed decisions to switch from versus stick with an initial decision as a function of thinking style. Third, the present work examines the moderating role of confidence levels on emotional responses to successful and failed decisions to switch from versus stick with an initial decision. Finally, Kruger et al.’s (2005) differential availability in memory hypothesis is put to a more rigorous test.

Study Overview

Study participants first completed the Rational-Experiential Inventory (REI–Epstein et al., 1996) and then responded to a series of 20 general knowledge questions. The participants were asked to choose the answer they thought most likely to be correct out of four alternatives (initial choice). They then provided a decision confidence estimate for that choice (initial confidence). Following each initial choice, information was provided to the participants regarding which of the four choices had been selected by the majority of students who have already participated in the experiment (consensus feedback). Consensus feedback was determined by the responses of pilot participants. After receiving this feedback, participants were then asked to re-evaluate their initial answer in light of this new information and choose between their initial response and the option advocated by the majority (which may or may not have matched their own choice). After making their final decision, participants were once again asked to rate their decision confidence. Following every final confidence rating, participants were provided with veridical outcome feedback for each question, rated the emotions they were experiencing, and provided a brief explanation for why they felt the way that they did.
Finally, participants were asked to remember how many questions they got wrong as a function of both switching from their initial answer and sticking with their initial answer.

Hypotheses and Rationales

Hypothesis 1

In the base-rate mismatch conditions, participants who score high on the FI subscale (high FIs) will tend to stick to their initial choices more than those who score high on the NFC subscale (high NFCs).

Rationale 1

According to CEST, the experiential system operates automatically and effortlessly via the employment of heuristic rules, whereas the rational system operates consciously and effortfully via the employment of logical rules (Epstein et al, 1992; 1996). CEST also proposes that because the experiential system is a rapid, relatively effortless mode of information processing, it requires less cognitive resources. First instincts and “gut-level” reactions are often associative and non-rational, whereas more systematic thinking indicates the operation of the rational system (Epstein & Pacini, 1999). Because high FIs are more intuitive, they should be more likely to adhere to a first instinct/gut feeling heuristic and thus more likely to ignore consensus information that counters their initial response. On the other hand, high NFCs are more rational, and thus should be less likely to adhere to a first instinct/gut feeling heuristic and more likely to thoughtfully weigh and consider consensus information that counters their initial response.
Hypothesis 2

In the consensus mismatch conditions, high FIs will feel more regret following failed switches than failed nonswitches. On the other hand, high NFCs will feel more regret following failed nonswitches than failed switches.

Rationale 2

The regret literature suggests that people treat event outcomes differently as a function of whether they result from (failed) actions or (failed) inactions (Kahneman, & Tversky, 1982; Landman, 1987; Spranca, Minsk, & Baron, 1991; Landman, 1993; Miller & Taylor, 1995; Baron & Ritov, 1994; Zeelenberg, 1996; Kruger et al, 2005). At least in the short run, actions loom larger than inactions. However, these effects may differ dramatically as a function of individual differences in processing style. High FIs, being more intuitive, are expected to be more motivated to stick to their first instincts/gut feelings and thus more likely to want to ignore consensus information that counters their initial response. For these individuals, then, switching in line with the consensus information and getting the answer wrong is expected to be more regret-inducing (e.g., “I knew that I should have stuck to my guts and not paid attention to the majority”) than sticking to their initial choices and getting the question wrong (e.g., “Going with your gut is always the right thing to do, I can’t beat myself up about it”). On the other hand, sticking to their initial choices and getting the question wrong should be more regret-inducing for high NFCs (e.g., “I should have gone with the majority and switched”) than switching their initial choice and getting the question wrong (e.g., “switching was the logical thing to do, given what the majority said, so, I can’t beat myself up about it”).
Hypothesis 3

Following negative outcomes, participants should report feeling more surprise and disappointment following negative outcomes if higher confidence was expressed at Time2 than if lower confidence was expressed at Time2. On the other hand, participants should report feeling more regret if they expressed lower confidence at Time2 (i.e., post-decisional confidence) than if they expressed higher confidence at Time2, with this effect being exacerbated in the consensus mismatch conditions.

Rationale 3

Previous work (e.g., Mellers, 1997, 1999; Shepperd & McNulty, 2002) has found that unexpected positive and negative outcomes elicit more intense emotional reactions than do expected positive and negative outcomes. In light of this research, then, it is predicted that participants who express a high degree of confidence in their choices will be more surprised and disappointed by negative outcomes (i.e., getting the question wrong) than will those who express a low degree of confidence in their choices. The more novel prediction centers on the relationship between low confidence and regret. In the present paradigm, participants in the consensus mismatch condition will be faced with a choice dilemma: should they stick with the initial response or switch to the majority response? It is posited here that participants who express low confidence at Time2 may be doing so, in part, because they are conflicted about whether to stick or switch. Thus, to the extent that participants with low Time2 confidence stick with their initial answer and get it wrong, the counterfactual alternative, “I should have chosen the other answer” should come to mind and intensify expressions of regret. It should also be noted that this
prediction is consistent with Zeelenberg et al.’s (1998) notion that the experience of regret involves responsibility (i.e., “I could have made a different choice”).

\textit{Hypothesis 4}

\textit{When the consensus information mismatches their initial answer, high FIs who stick to their initial answer will bolster (i.e., increase) their confidence ratings regarding their final answers from Time1 to Time2 to a greater extent than will high NFCs. Furthermore, to the extent that confidence levels are bolstered from Time1 to Time2, participants should express less regret following negative outcomes.}

\textit{Rationale 4}

The need to lessen post-decisional dissonance following a choice between two fairly attractive alternatives should result in confidence bolstering at the final decision stage (Brehm, 1956; Knox, & Inkster, 1968; Frenkel, & Doob, 1976; Gilovich, & Medvec, 1995; Festinger, 1957). Consistent with dissonance theory, individuals who are committed to their initial answers should experience dissonance when they are exposed to the mismatching base-rate information. Once there is a commitment, a post-decisional process will operate to reduce dissonance by increasing the attractiveness of the chosen alternative. This process will be reflected in confidence bolstering from Time1 to Time2. Given that high FIs should be more committed to their initial choices than high NFCs in the base-rate mismatch condition, high FIs should demonstrate more confidence bolstering which, in turn, should buffer them against experiencing overly intense regret following a negative outcome.
Hypothesis 5

The greater the tendency for participants to provide memory reports that exaggerate the number of failed switches relative to the number actually experienced, the greater will be the tendency to evaluate sticking with one’s first answer during the experiment as having been a useful strategy. Moreover, this memory exaggeration should mediate the relationship between regret stemming from failed switches and participants’ evaluation of their answer changing strategy during the experiment.

Rationale 5

According to Kruger et al. (2005), switching when one should have stuck produces more negative affect, which in turn produces a memory bias, which in turn enhances beliefs in the first instinct fallacy. It is suggested here, however, that the memory measure they employed in Study 4 - participants’ memory for the contestant’s pattern of outcomes was probed by asking them to indicate the extent to which the contestant was helped or hurt by her answer changing strategy – is subject to the criticism that it does not constitute a pure measure of memory but, rather, merely calls for an evaluation of the contestant’s answer changing strategy. The present study, however, will provide a more rigorous test of the differential availability in memory hypothesis by employing a purer measure of memory. Specifically, participants will be asked at the end of the experiment to remember how many questions they got wrong as a function of both switching when they should have stuck and sticking when they should have switched. A memory bias index will then be created by subtracting the number they actually got wrong from the number they remember getting wrong for both failed switches and nonswitches. If Kruger et al.’s causal model is correct, then the relationship between
regret stemming from failed switches and participants’ evaluation of their answer changing strategy during the experiment should be mediated by this memory bias. It should also be noted that whereas Kruger et al. examined participants’ memories for the decisions and outcomes of another individual, the present study will examine memories for decisions and outcomes involving the self.

Method

Participants

Ninety two undergraduate students enrolled in introductory psychology courses at Ohio University participated in exchange for course credit.

Design

The study employed a 2 (Faith in Intuition: Low FI vs. High FI) X 2 (Need For Cognition: Low NFC vs. High NFC) X 2 (Consensus Information: Match initial answer vs. mismatch initial answer) X 2 (Outcome: Positive vs. Negative) X 2 (Decision: Switch vs. Stick) mixed factorial design, with the final three factors being within-subjects. Faith in Intuition and Need for Cognition were blocking variables. Given that participants received veridical feedback and made their own decisions to switch or stick, the levels of both the Outcome and Decision variables were not experimentally manipulated but, rather, were determined by the behavior of the participants. Likewise, the extent to which the consensus information matched or mismatched the participants’ initial answer was completely determined by the participants’ response.
Stimulus Materials

Participants were run separately on Dell computers. Stimulus materials and questionnaires were presented using Media Lab software (Jarvis, 2004).

REI. Because of time limitations, the shorter version of the REI (Epstein et al., 1996) was administered. This shorter version of the REI was created by selecting items based on the highest item-total correlations and factor loadings from the original version. Five items formed the modified NFC subscale and five items from the FI subscale were selected. The items were rated along a 5-point scale ranging from *completely false* to *completely true* (see Appendix A).

Question task and confidence ratings. Twenty general knowledge questions of moderate difficulty were selected from Nelson and Narens (1980). Participants chose between four options, after which they expressed their confidence regarding their choice along a scale separated by 10% increments ranging from “0% confident that my answer is correct,” to “100% confident that my answer is correct.”

Post-decisional confidence, affect, memory, and evaluation measures. After receiving the consensus information and making their final choices, participants expressed their confidence along the same scale as before. After learning whether their choice was correct or incorrect, participants rated how much disappointment, joy, regret, surprise, relief, and sadness they felt about the outcome along 7-point scales (1 = none at all, 7 = very much). At the end of the question task, participants were asked to remember how many questions they got wrong after sticking with their original answer, and how many questions they got wrong after switching from their original answer. Finally,
participants evaluated their overall answer changing strategy during the question task (see Kruger et al., 2005) on a 1 (not at all successful) to 7 (very successful) scale.

Procedure

Upon arrival at the lab, participants were seated in front of a computer. Participants were told that the study was about “decision-making” and consisted of two parts - completing a questionnaire concerning how people make decisions, and engaging in an actual decision-making task. At this point, participants completed the REI.

After completing the REI, participants were informed that they were about to take a general knowledge test consisting of 20 items, and they had to select among four alternatives for each item. They learned that following each choice, information would be provided to them regarding which of the four choices has been selected by the majority of students who have already participated in the experiment. Participants then proceeded to the general knowledge test. Each question had four possible answer options. Participants were asked to choose the alternative they thought most likely to be correct out of the four possible choices. Following their initial choice, they were then asked to provide a confidence rating for that choice. Subsequently, participants were provided with consensus information. This information was based on pilot data. In the pilot, twenty graduate and undergraduate students answered the general knowledge questions. The consensus feedback provided to the participants in the actual study was based on these responses. Following exposure to the consensus information, participants were shown the question again and asked to make a final selection. After indicating their final answer, participants expressed their confidence regarding that answer.
After expressing their confidence, participants received veridical feedback indicating whether their answer was correct or incorrect, and then responded to the set of affect measures. Following completion of the question task, participants were asked to remember how many times they got a question wrong after switching to an incorrect answer, as well as how many times they got a question wrong after sticking with the incorrect answer. Finally, participants were asked to evaluate their overall answer changing strategy during the test. Participants were then debriefed and thanked for their participation.

Results

The results section is broken down into five subsections that correspond to each of the specific experimental hypotheses.

Hypothesis 1

The initial hypothesis was that in the consensus mismatch (i.e., majority disagree) conditions, participants who scored high on the FI subscale (high FIs) would tend to stick to their initial choices more than would those who scored high on the NFC subscale (high NFCs). However, because a substantial number of participants scored high on both the FI and NFC subscales, this specific hypothesis could not be directly examined. Instead, separate analyses were performed on (a median split of) the FI and NFC subscales.

When significance test for a single proportion was computed, the results showed that overall participants stuck to their initial answer 64% of the time, $z = 2.71, p < .01, n = 92$. Yet, participants in the consensus mismatch conditions stuck with their initial answer 41.4% of the time, $z = -1.65, p = .10, n = 90$. High FIs stuck to their initial answer 43.7% of the time when the majority disagreed with their initial answer, $z = -1.72, p = .47$,
n=33. Likewise, high NFCs switched their initial answer 41.6% of the time, \( z = 1.14, p = .25 \), \( n=40 \). Additionally, high FIs did not differ from low FIs with regard to the percentage of switches, \( t < 1 \), and there was also no difference between high NFCs and low NFCs, \( t < 1 \). Thus, hypothesis 1 was not supported. Frequency of occurrences is shown in Table 2.

**Hypothesis 2**

The second hypothesis was that in the consensus mismatch conditions, high FIs would feel more regret than would low FIs following failed switches, whereas high NFCs would feel more regret than would low NFCs following failed nonswitches. Before specifically addressing this hypothesis, a paired t-test was conducted to explore the difference in the amount of regret experienced following failed switches compared to failed nonswitches. Contrary to the action effect typically reported in the regret literature, the analysis revealed a non significant difference, such that participants did not experience significantly more regret following failed nonswitches (\( M = 3.00 \)) than failed switches (\( M = 3.14 \)), \( t(81) = .78, p = .44 \). Additional to the finding revealed a non significant difference in the overall regret experienced due to failed switches compared to failed nonswitches, participants did not significantly experience more regret following failed nonswitches (\( M= 3.32 \)) than failed switches (\( M= 3.24 \)) when the consensus disagreed with their initial response, \( t(77)= .38, p=.70 \). However, a pairwise t-test revealed that participants experienced more regret from failed nonswitches when the consensus disagreed with their initial response (\( M= 3.20 \)) than when the consensus agreed (\( M= 2.75 \)), \( t (86) = 2.64, p<.01 \).
An initial comparison between high (M = 3.61) and low FIs (M = 2.94) revealed no significant difference in the level of regret experienced following failed switches when the consensus disagreed their initial response, \( t(78) = 1.57, p = .12 \). Additionally, when high FIs did not differ with regards to the amount of regret experienced following failed switches (\( M = 3.70 \)) versus failed nonswitches (\( M = 3.67 \)), \( t < 1 \), low FIs did not feel significantly more regret following failed nonswitches (\( M = 3.11 \)) than failed switches (\( M = 2.98 \)), \( t(48) = .711, p = .48 \) when the consensus disagreed with their initial answer either. When it comes to NFC, high and low NFCs did not differ with regard to the amount of regret experienced following failed nonswitches, \( t < 1 \), thus failing to provide support for the second half of hypothesis 2. Moreover, high NFCs did not experience more regret following failed nonswitches (\( M = 3.26 \)) than following failed switches (\( M = 3.02 \)), \( t(35) = 1.07, p = .29 \). Thus hypothesis 2 was not supported.

**Hypothesis 3**

It was predicted that following negative outcomes, participants would be more likely to report experiencing surprise and disappointment to the extent that their confidence ratings had increased from Time1 to Time2, whereas participants would be more likely to report experiencing regret to the extent that their confidence had decreased from Time1 to Time2, with these relationships being exacerbated in the consensus mismatch conditions. First, the results of two t-tests indicated that participants significantly increased their confidence ratings from Time1 (\( M = 26.4\% \)) to Time2 (\( M = 35.7\% \)) when they switched at Time2, \( t(90) = 5.66, p < .001 \), and increased from Time1 (\( M= 47.9\% \)) to Time 2 (\( M= 55\% \)) when they stuck with their initial answer at Time2, \( t(91)= 5.88, p<.001 \).
In order to address hypothesis 3, relationships between ratings of surprise, disappointment, and regret and Time2 confidence-Time1 confidence difference scores were examined. No significant relationships were found between any of these three emotion measures and confidence difference scores, either overall, or specifically in the consensus mismatch conditions, all $r$s between .00 and .12.

**Hypothesis 4**

It was predicted that when the consensus information mismatched their initial answer, high FIs who stuck to their initial answer would bolster their confidence ratings from Time1 to Time2 to a greater extent than would high NFCs, and that to the extent that confidence levels were bolstered from Time1 to Time2, participants should express less regret following negative outcomes. As described in the hypothesis 1 subsection, however, because a substantial number of participants scored high on both the FI and NFC subscales, this specific hypothesis could not be examined statistically. Instead, separate analyses were performed on a median split of the FI and NFC subscales. Before examining these individual differences, however, preliminary analyses were conducted. A 2 (Decision: stay vs. switch) X 2 (Confidence Interval: Time 1 vs. Time 1) repeated measures ANOVA was conducted on confidence ratings for all outcomes (see Table 4). There was a significant main effect of decision such that participants were more confident in their stays ($M= 51.8\%$) than in their switches ($M= 31\%$), $F (1, 90) = 158.4$, $p<.001$. Additionally, the main effect of confidence interval was significant, such that participants were more confident in their final ratings ($M= 45.6\%$) than in their initial ratings ($M= 37.3\%$), $F (1, 90) = 42.77$, $p<.001$. Pairwise t-tests also indicated that participants were more confident (at Time2) about their (eventually) correct answers ($M$
= 50.3%) than their (eventually) incorrect answers ($M = 44.6%$), $t(91) = 4.11$, $p < .001$,
and they were more confident when they stuck ($M = 55.5\%$) than when they switched ($M = 35.7\%$), $t(91) = 10.3$, $p < .001$.

Additional analysis indicated that participants’ final confidence was bolstered to a
greater extent when the consensus agreed with their initial answer ($M = 15.33\%$) than
when they disagreed ($M = 4.0\%$), $t(91) = 8.11$, $p < .001$, and participants showed greater
increases in confidence when they switched after the consensus disagreed with their
initial answer ($M = + 8.8\%$) than when they stuck with their answer in the face of
consensus disagreement ($M = -6.1\%$), $t(86) = 8.45$, $p < .001$. However, overall there was
no significant increase in confidence when participants switched ($M = 9.3\%$) than when
they stuck with their initial answer ($M = 7.3\%$), $t(90) = 1.39$, $p = .17$. Participants decreased
their confidence from Time 1 ($M = 47.1\%$) to Time 2 ($M = 41.2\%$) when they stuck to a
decision that was disagreed with by the consensus, $t(89) = 5.41$, $p < .001$ but, increased
their confidence from Time 1 ($M = 26.9\%$) to Time 2 ($M = 36.5\%$) when they switched
from their initial answer that was disagreed by the consensus, $t(88) = 5.74$, $p < .001$.

Finally, separate analyses conducted on the positive and negative outcome conditions
revealed that participants demonstrated larger increases in confidence from Time 1 to
Time 2 for failed switches ($M = 11.64\%$) than for failed nonswitches ($M = 5.2\%$), $t(81) =
2.94$, $p < .01$, but showed larger confidence increases for correct nonswitches ($M =
12.2\%$) than for correct switches ($M = 8.4\%$), $t(86) = 2.47$, $p < .01$.

Two independent-groups t-tests were then employed to specifically examine the
first part of hypothesis 4. Demonstrating slight support for this hypothesis, high FIs who
stuck to their initial answer when the consensus disagreed showed less of a decrease in
final confidence ($M = -2.7\%$) than did low FIs ($M = -7.8\%$), $t(88) = 2.28, p < .05$, whereas high and low NFCs did not differ, $t < 1$. A correlational analysis was then conducted to examine the second part of hypothesis 4. Failing to demonstrate support for this part of the hypothesis, the analysis revealed no significant relationship between changes in Time1 to Time2 confidence levels and reported regret, $r(91) = -.04, p = .73$.

_Hypothesis 5_

It was hypothesized that the greater the tendency for participants to provide memory reports that exaggerated the number of failed switches relative to the number actually experienced, the greater will be the tendency to evaluate sticking with one’s first answer during the experiment as having been a useful strategy. Moreover, this memory exaggeration should mediate the relationship between regret stemming from failed switches and participants’ evaluation of their answer changing strategy during the experiment. To examine this hypothesis, two separate memory bias indices were computed. The memory bias index for failed switches was computed by subtracting the actual number of failed switches from the reported number of failed switches, whereas the memory bias index for failed nonswitches was computed by subtracting the actual number of failed nonswitches from the reported number of failed nonswitches. A pairwise t-test comparing the magnitude of the bias for failed switches versus failed nonswitches indicated that participants exaggerated (i.e., in a positive direction) the number of failed switches to a greater extent ($M = +.90$) than they exaggerated the number of failed nonswitches ($M = -2.03$), $t(91) = 7.29, p < .001$. Looked at another way, it appears that participants over-remembered the number of actual failed switches (consistent with Kruger et al., 2005), but under-remembered the number of actual failed
nonswitches. However, the correlation between the memory bias index for failed switches and the evaluation of one’s answer changing strategy was not significant, \( r(91) = .02, p = .82 \), thereby failing to support hypothesis 5. In light of this nonsignificant correlation, the mediational analysis was not conducted.

Discussion

Overall, the current study failed to provide supporting evidence for the experimental hypotheses. The individual differences by using the REI scale did not reveal any significant finding indicating that there is a difference in behavioral tendencies and the amount of regret experienced given a negative outcome as a result of thinking styles that was measured by NFC and FI subscales. Moreover, this analysis did not reveal any significant result regarding the amount of regret experienced as a function of failed switches vs. failed stays. The previous findings in the affect literature suggesting people experienced more regret following switches than stays could not be replicated. However, the study revealed a significant finding showing that there is a difference in regret experienced following failed nonswitches that was agreed or disagreed by the consensus. Participants regretted significantly more from their nonswitches that was disagreed by the majority such that in a sense they wished they had not stuck to their answer that was disagreed by the consensus. Whereas when they stuck to their answer that was agreed by the majority and got the question wrong, participants experienced regret less. This failed nonswitch was in a sense justified by the fact that their wrong answer was shared by the consensus.

The other significant findings were related to the confidence ratings. Although current study did not reveal any significant finding related to the relationship between
confident ratings and post decisional emotions, it had some implications about the influence of consensus feedback on choice decisions. When the consensus information was taken into account, it is apparent that when the consensus agreed with their initial answer, at time 2 participants increased their confidence no matter what the outcome was. However, whenever the consensus disagreed with their initial answer and participants stuck to their answer by disregarding the consensus information, their confidence decreased from Time 1 ($M=47.1\%$) to Time 2 ($M=41.2\%$), $t(89)=5.41, p<.001$. However, when the consensus disagreed with their initial answer and they switched, their confidence increased from Time 1 ($M=26.9\%$) to Time 2 ($M=36.5\%$), $t(88)=5.74, p<.001$. Even in the condition that they were initially correct, but the consensus disagreed with their correct answer, if they stayed their confidence decreased from Time 1 ($M=55.4\%$) to Time 2 ($M=51\%$), $t(41)=2.44, p<.05$. Clearly, when they went against the consensus their confidence decreased. But, whenever they followed the majority their confidence increased at time 2. Although the data does not seem to indicate a clear effect on regret, these findings implied the role of consensus feedback and how it was used as a justification of their decision of staying and switching from their initial answers.

Crawford, McConnell, Lewis, & Sherman, 2002) conducted a study to explore the relationship between reactance, compliance behavior and anticipated regret regarding influence attempts. The main question being asked was whether people’s choice differs as a function of anticipated regret from compliance or anticipated regret from reactance against the persuasion. Their findings suggest that although people anticipated having greater regrets from defiance against the influence attempts, 70% of them complied. However, on the contrary to their mispredictions about future emotions, retrospectively it
was the compliance that hurt people the most. However, the current study could not replicate their findings either. There was no significant difference in regret experienced following failed switches vs. failed nonswitches when consensus disagreed with their initial answer. However, the only significant finding implied that people could not find the consolation of their failed nonswitches that was challenged by the consensus. It seems people make a differentiation between failed nonswitches whether it was agreed or not by the consensus.

Current study has basic limitations that none of the variables were under the control. Because none of the variables were experimentally manipulated, the key condition that was discussed in Kruger et al. (2005) paper as well as the findings in the regret literature was not being replicated. One of the main reasons for this failure is due to the lack of control on the variables. Because the variables were not manipulated, only 2.45% of the time participants switched to a wrong answer that was initially correct. It is the key case that where they once had the correct answer and switched from it because of incoming new evidence. Since this special case was not experimentally manipulated, by chance it happened so few times that it did not reveal any significant results that are in line with the previous literature. Basically people did not experienced regret more from their switches due to the fact that it happened to occur very few times to create such an effect.

Secondly, the failure is due to the material used in this study. In the current study the consensus feedback provided the correct answer 75% of the time. Taking the fact that consensus feedback has impact on their confidence ratings, it might be a factor that has influence on their post decisional emotions. Additionally, the stimulus material used in
the current study does not seem to do a good job of creating a conflict between the alternatives. It seemed that participants either knew the correct answer or not. If they initially knew the correct answer, they did not switch their answer in the light of the incoming information. When they did not know the correct answer, they then considered the consensus feedback Therefore, it is not expected to feel regret following a negative outcome that was not initially correct.

Therefore a second study is needed to be conducted which employs more control on the variables, yet helps to create the key case in which participants initially had the correct answer but lost it after switching from their initially correct answer in the light of incoming new evidence. This implies a better selection of the stimulus material that creates a conflict between the alternatives. Hence, it requires the use of pretests in which participants are required to generate their own answers that they think most likely to be correct, rather than choosing among the multiple choice answers that were already generated. By having the participants come up with the answers they think to be correct, it might be possible to have equally attractive (challenging) answers that will increase the 2.45% to higher rates which in turn cause people experience regret from switching to a wrong answer that was initially correct.

Finally, the future research will be directed toward exploring the nature of the incoming evidence. Credibility of an external informational source as well as the source being a single person vs. “majority” in the ongoing debate regarding whether failed actions hurt more than the failed inactions will be the subject of follow-up research as well.
References


<table>
<thead>
<tr>
<th>Experiential System</th>
<th>Rational System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic</td>
<td>Intentional, effortful</td>
</tr>
<tr>
<td>Automatic, effortless</td>
<td>Analytic</td>
</tr>
<tr>
<td>Affective: Pleasure-pain oriented (what feels good)</td>
<td>Logical: Reason oriented (what is rational)</td>
</tr>
<tr>
<td>Associationistic connections</td>
<td>Logical connections</td>
</tr>
<tr>
<td>Behavior mediated by &quot;vibes from past events&quot;</td>
<td>Behavior mediated by conscious appraisal of events</td>
</tr>
<tr>
<td>Encodes reality in concrete images, metaphors, and narratives</td>
<td>Encodes reality in abstract symbols, words and numbers</td>
</tr>
<tr>
<td>More rapid processing: oriented toward immediate action</td>
<td>Slower processing: oriented toward delayed action</td>
</tr>
<tr>
<td>Slower and more resistant to change: Change with repetitive or intense experience</td>
<td>Changes more rapidly and easily: changes with strength of argument and new evidence</td>
</tr>
<tr>
<td>More crudely differentiated: Broad generalization gradient; stereotypical thinking</td>
<td>More highly differentiated</td>
</tr>
<tr>
<td>More crudely integrated: Dissociative, emotional complexes; context specific processing</td>
<td>More highly integrated: Context-general principles</td>
</tr>
<tr>
<td>Experienced passively and preconsciously: we are seized by our emotions</td>
<td>Experienced actively and consciously: we are in control of our thoughts</td>
</tr>
<tr>
<td>Self-evident valid: &quot;Experience is believing&quot;</td>
<td>Requires justification via logic and evidence</td>
</tr>
</tbody>
</table>
Table 2 Frequency of Occurrences

<table>
<thead>
<tr>
<th>Initial Correctness</th>
<th>Initially Correct</th>
<th></th>
<th>Initially Wrong</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Consensus</td>
<td>Majority Agree</td>
<td>Majority Disagree</td>
<td>Majority Agree</td>
<td>Majority Disagree</td>
</tr>
<tr>
<td>Decision</td>
<td>Stay, Switch</td>
<td>Stay, Switch</td>
<td>Stay, Switch</td>
<td>Stay, Switch</td>
</tr>
<tr>
<td>Outcome</td>
<td>Correct, Wrong</td>
<td>Correct, Wrong</td>
<td>Wrong, Correct</td>
<td>Wrong, Correct</td>
</tr>
<tr>
<td>Frequency of Occurrence</td>
<td>536.00, 11.00, 56.00, 45.00, 187.00, 0.00, 1.00</td>
<td>401.00, 462.00, 141.00</td>
<td>1840.00</td>
<td></td>
</tr>
<tr>
<td>Percentage of Occurrence</td>
<td>29.13, 0.60, 3.04, 2.45, 10.16, 0.05</td>
<td>21.79, 25.11, 7.66</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9, 10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 Confidence Estimates for All Outcomes as a Function of Time and Decision

<table>
<thead>
<tr>
<th>Decision</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay</td>
<td>48%</td>
<td>55%</td>
</tr>
<tr>
<td>Switch</td>
<td>27%</td>
<td>36%</td>
</tr>
</tbody>
</table>
Appendix A

REI Scale and item

**Need for Cognition**
- I don’t like to do a lot of thinking. *(R)*
- I try to avoid situations that require thinking in depth about something. *(R)*
- I prefer to do something that challenges my thinking abilities rather than something that requires little thought.
- I prefer complex to simple problems.
- Thinking hard and for a long time about something gives me little satisfaction. *(R)*

**Faith in Intuition**
- I trust my initial feelings about people.
- I believe in trusting my hunches.
- My initial impressions of people are almost always right.
- When it comes to trusting people, I can usually rely in my “gut feelings”.
- I can usually feel when a person is right or wrong even if I can’t explain how I know it.

*(R) = reverse scored*
Appendix B

General Knowledge Questions

1. In which city is Michelangelo’s statue of David located?
a. Florence  
b. Rome  
c. Venice  
d. Bologna

2. What is the last name of the French author who wrote “The Stranger”?
a. Sartre  
b. Dumas  
c. Camus  
d. Truffaut

3. What is the last name of the man who said “I only regret that I have but one life to lose for my country”?
a. Adams  
b. Hale  
c. Washington  
d. Henry

4. What is the last name of the playwright who wrote “A Streetcar Named Desire”?  
a. Williams  
b. Miller  
c. Wilder  
d. Shepard

5. What is the last name of the artist who painted “Guernica”?
a. Miro  
b. Dali  
c. Goya  
d. Picasso

6. For which country is the Drachma the monetary unit?
a. Turkey  
b. Greece  
c. Germany  
d. Afghanistan
7. What is the name of the brightest star in the sky excluding the sun?
   a. Polaris
   b. Betelgeuse
   c. Sirius
   d. Alpha Centauri

8. Of which country is Buenos Aires the capitol?
   a. Chile
   b. Argentina
   c. Panama
   d. Portugal

9. What is the last name of the man who was president directly after James Madison?
   a. Monroe
   b. Adams
   c. Jackson
   d. Van Buren

10. What is the capital of Denmark?
    a. Oslo
    b. Copenhagen
    c. Helsinki
    d. Prague

11. What is the last name of the actor who received the best actor award for the movie “On the Waterfront”?
    a. Dean
    b. Stewart
    c. Brando
    d. Clift

12. What is the last name of the criminal who was killed by FBI agents outside of a Chicago movie theatre?
    a. Capone
    b. Lansky
    c. Diamond
    d. Dillinger

13. What is the name of the organ that produces insulin?
    a. Pancreas
    b. Spleen
    c. Colon
    d. Liver
14. What is the last name of the composer who wrote the opera “Don Giovanni”?
   a. Verdi
   b. Beethoven
   c. Puccini
   d. Mozart

15. What was the last name of the astronomer who published in 1543 his theory that the earth revolves around the sun?
   a. Galileo
   b. Newton
   c. Copernicus
   d. Brahe

16. Who is known as “the father of geometry”?
   a. Euclid
   b. Ptolomey
   c. Descartes
   d. Aristotle

17. Which country was the first to use gunpowder?
   a. Japan
   b. China
   c. Spain
   d. France

18. What is the capital of Canada?
   a. Toronto
   b. Montreal
   c. Quebec City
   d. Ottawa

19. What is the capital of Australia?
   a. Canberra
   b. Sydney
   c. Melbourne
   d. Perth

20. What is the last name of the poet who wrote the line “Into each life a little rain must fall”?
   a. Frost
   b. Longfellow
   c. Tennyson
   d. Dickinson