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Influencing the confirmation bias on a matchmaker task through manipulation of the feeling of rightness

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INFLUENCING THE CONFIRMATION BIAS ON A MATCHMAKER TASK THROUGH MANIPULATION OF THE FEELING OF RIGHTNESS

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ABSTRACT

The confirmation bias occurs when an individual ignores potentially disconfirming evidence and gives greater attention to apparent confirming evidence. The confirmation bias is theorized to result from rapid, automatic and unconscious processing. Such processing generates decisions that are considered to be “good enough” to meet the demands of a situation. Although such judgments are guided by unconscious processing, the individual may have conscious awareness of the generated hypothesis while still failing to systematically consider important information. Previous attempts to counter the confirmation bias have focused on directly instructing individuals to use systematic decision making. This method has had some success in laboratory tasks but has shown little transfer to real-world, everyday decision making. Systematic processing requires cognitive resources and more time than reliance on automatic processing. Therefore, individuals may refuse to engage in systematic processing unless they have a strong belief that their hypothesis is flawed. The experiments described in this paper attempt to increase participant’s doubt in their flawed hypothesis by calling attention to failure and by increasing the apparent difficulty of the task. Such doubts were expected to increase systematic processing. While focusing attention on failed decisions did increase the time participants spent making decisions, such increased deliberation time did not translate to improved accuracy. However, the experiments support the use of the Matchmaker Task to create a specific bias that can persist over numerous trials.

CHAPTER 1. INTRODUCTION

Every day, human beings must deal with complex, ambiguous situations requiring them to process a staggering amount of information. People can make decisions nearly instantly without systematic deliberation yet with enough accuracy to continue to function in their complex environment. Unfortunately, such decision-making often occurs automatically and thus, individuals may be misled due to the failure to consider important information and possible alternatives. The purpose of this dissertation is to examine what can lead individuals to accept flawed judgments without systematic consideration and to test methods of increasing deliberation in the hopes of avoiding such errors. I will begin with a brief discussion of the automatic, unconscious processing that can lead to inaccurate judgments. I will also discuss briefly how individuals may develop conscious awareness of their decision criteria while still avoiding systematic consideration and how such shallow, heuristic processing may lead to continuing flawed judgments. In particular, I will discuss how the confirmation bias demonstrates the problems caused by automatic processing coupled with shallow conscious processing. Previous attempts to counter the confirmation bias have focused on instructing individuals to engage in systematic, conscious processing. While such methods have shown some success in improving participant accuracy in laboratory tasks, such instruction does not transfer to situations where the confirmation bias occurs in everyday life (Arkes, 1991; Beyth-Marom & Fischoff, 1983; Kahneman, 2011). The lack of transfer from experimental tasks to later real life decisions may be due partly to laboratory tasks typically being deterministic, meaning that the best hypothesis will guarantee success. In the real world, the best possible decision may simply be the one with the highest probability of success but there may be no guarantee of constant success. Additionally, individuals may only engage in systematic processing in experimental tasks because they are directly instructed to do so. The participants may view the direct instruction as an indication that their initial hypothesis is flawed. Without such a prompt in everyday situations, individuals are willing to accept the first decision that seems good enough (Kahneman, 2011). The experiments described in this paper are designed to evaluate these two hypotheses through the use of the Matchmaker task. The task is adapted from work by Downar, Bhatt, and Montague (2011) to provide a more probabilistic task that should be easy for participants to understand while still complex enough to require systematic consideration to achieve success above that of chance selection. In prior research, the confirmation bias has been found to be very persistent even when participants are not achieving accuracy much better than chance using their biased hypotheses (Arkes, 1991; Gilovich, 1991; Nickerson, 1998). Additionally, the experiments attempt to see if individuals can be led to more deliberate and systematic decision-making without direct prompts to do so and, further, if such deliberation leads to increased accuracy.

1.1 Unconscious, Heuristic, and Systematic Processing

A human being behind the wheel of an automobile must quickly process a great deal of information. The driver must maintain awareness of the vehicles around himself as well as the road in front of him. He must keep track of his speed and any road signs. He must maintain proper position of his hands on the steering wheel and his feet on the pedals. He may have to remember directions to his destination or else listen to the directions given by a passenger or navigation device. Finally, he must do all this while travelling at speeds far in excess of those he could achieve through his own physiology. On the surface, such a task seems truly daunting but most drivers rarely even consider most of the above information. The instruction “turn left” is translated into “place foot on brake until a certain speed is reached and turn the wheel a certain degree to the left” without the driver ever stopping to think. Even a highly unexpected event such as a cat running into the road is likely to be met with an automatic application of the brakes without the driver ever pausing to consider the proper response to the event. Driving is just one example of a human’s ability to rapidly and successfully make decisions in complex and often ambiguous situations (Klein, 1998; Plessner & Czenna, 2008; Sallas, Mathews, Lane, & Sun, 2007).

Automatic processing functions like a motor reflex. When the individual is exposed to particular stimuli, his or her automatic processing is triggered and generates a response (Kahneman, 2011). A myriad of responses are possible but all are based on prior experience and can occur without the conscious awareness of the individual. While looking at a large menu for a restaurant, the individual may feel drawn to order a steak after only glancing over the menu. The individual may not even consider the plethora of other options on the menu or why a steak would be preferable to all other choices. If the person took the time to carefully consider each choice, she might recall prior times when she ate steak and enjoyed the meal. Careful consideration of prior positive experiences would likely lead her to choose the steak as well. Since automatic decision-making is based on experience, it is a useful shortcut and a lifetime of automatic decision-making conditions people to accept the recommendations of their subconscious mind (Bechara, 2005; Kahneman, 2011; Klein, 1998).

Automatic processing can be effective in helping the individual perform complex tasks and may provide an accurate guide for decision-making even if the individual does not consciously understand why certain decisions are preferable to others (Druhan & Mathews, 1989; Frank, Rudy, Levy, & O'Reilly, 2005; Greene, Spellman, Dusek, Eichenbaum, & Levy, 2001; Mathews, Buss, Stanley, Blanchard-Fields, Cho, & Druhan, 1989; Roussel, Mathews, & Druhan, 1990). For example, in the Iowa Gambling Task (Bechara, 2005), participants must select from four decks of cards with ambiguous odds of either a net win or a net loss. Half the decks have a high one-time payout for selecting from them but higher odds of a loss of money with each draw so that over time, these decks will lead to a net loss. The other two decks give a lower payout per draw but have lower odds of losing money and so the participant will have a net gain of money. The majority of participants without any neurological impairments (such as schizophrenia or brain damage) are able to reliably choose the best deck many trials before they can explicitly state what makes one deck better than others (Bechara, 2005).

Individuals may use automatic, unconscious processing to their advantage even if they are consciously attempting to make decisions based on incomplete information. For example, in Berry and

Broadbent's task control experiment, participants were tasked with managing sugar output at a sugar plant as well as relations with a union representative. Participants were told of a relationship between the hiring of workers and sugar production and of a relationship between behavior toward a union representative and the opinion of the union representative toward the factory manager (the participant) (Berry & Broadbent, 1987). However, participants were not explicitly aware that hiring workers also affected the union representative's opinion. Despite having no conscious knowledge of this relationship, most participants made decisions that effectively managed the relationship between these variables. Participant selections indicated awareness of the true relationships within the task but many participants could not explicitly identify the relationships until much later in the task.

When decisions must be made quickly, automatic and unconscious processing is to the individual's advantage. Even if relevant information has not been consciously encoded or can't be easily retrieved, the individual may be able to make decisions quickly and easily as her automatic processing provides a decision that feels right (Gilovich, 1991; Kahneman, 2011; Klein, 1998). Unfortunately, such automatic processing can be inflexible. Irrelevant information may lead to an automatically generated reaction that is not optimal due to some other factor. For example, a person may show the same driving habits while operating a moving van loaded with possessions that he would while driving a small car that he has more experience driving. He might maintain the same distance from the car in front of him that he would normally and thus fail to account for the increased stopping distance required by the larger vehicle. Such behavior, which is likely to occur without the driver even thinking about his driving behavior, could potentially be disastrous. When automatic processing generates sub-optimal decisions due to inflexibility, the resulting pattern of poor decision-making is termed a bias. Biases are rapidly generated beliefs that are less than ideal for the current situation. Biases generate hypotheses that are "good enough" for a given situation and have succeeded in the past (Arkes, 1991; Milkman, Chugh, & Bazerman, 2009; Nickerson, 1998; Weber & Johnson, 2009).

Although biases arise from automatic and unconscious processing, individuals may be consciously aware of their decisions and may even have some knowledge of why a given decision seems correct. To go back to the example above, the driver of the moving van may take a moment to focus on their driving and may even think of a rule from driver's education that dictates how closely he should follow another car. Since the justification for his behavior seems accurate, he does not consider further. This kind of shallow but conscious processing takes a bit longer than purely automatic processing but does not take the time to consider all alternatives (Kahneman, 2011). This kind of shallow processing is termed heuristic processing (Benartzi & Thaler, 2007; Tversky & Kahneman, 1974). Heuristic processing relies on rules of thumb and other shortcuts to make decisions in order to reduce the mental demands of conscious processing (Kahneman, 2011). Unfortunately, heuristic processing is also strongly influenced by automatic, unconscious processing. Thus, heuristic processing is vulnerable to biases. Unless the individual takes the time to systematically consider all relevant information, he or she is vulnerable to bias. The confirmation bias provides an illustration of how an individual may have conscious awareness of the decisions he or she is making yet still fail to recognize important information that would appear obvious with systematic consideration.

1.2 The Confirmation Bias

The confirmation bias occurs whenever a decision maker fails to consider information that might disprove a hypothesis and focuses on information that supports the hypothesis (Lillienfield, Ammirati, & Landfield, 2009; Nickerson, 1998; Silverman, 1992). Information that supports a hypothesis is referred to as confirming evidence and evidence that goes against a hypothesis is referred to as disconfirming evidence. While logical reasoning systems, such as the scientific method, are based on trying to disconfirm hypotheses, people appear to naturally focus more on confirming evidence (Beyth-Marom & Fischoff, 1983; Cohen, 1981; Feeney, Evans, & Venn, 2008). Automatic processing is, by its very nature, based on the things that do happen rather than those that do not. Systematic testing of all possible explanations demands time and mental resources and may pose a risk to the individual when speed is essential.

Individuals tend to accept the first option that seems “good enough as has been shown in the literature. Wason’s triplet task has been repeatedly used to demonstrate that individuals tend to make such decisions without engaging in systematic processing (Wason, 1960; Wason, 1962; Wason, 1968). In the triplet task, participants are given a triplet of numbers such as “2 4 6” and asked to generate a new triplet that follows the rule used to generate the first triplet. Participants typically generate a triplet that confirms to a more specific rule, such as “ascending multiples of 2” rather than a less specific rule like “ascending numbers.” Participants will usually stick with whichever rule they find is able to create a correct triplet and will typically not try other rules to determine if a simpler rule could achieve success and make it easier to generate triplets to test (Mynatt, Doherty, & Tweney, 1977; Shaklee & Fischoff, 1982; Wetherick, 1962). Participants are consciously aware of the rule they use to create new triplets but tend to use the most specific rule that could have generated the example triplet given at the beginning of the task.

The triplet task thus serves as a good representation of the confirmation bias in action. Individuals accept their biased hypotheses because heuristic processing does not find any obvious flaws. If an individual has become sick after eating fish for the first time, he has little motivation to engage in further testing to determine if eating fish always creates sickness. Unless there are no other food options available, the individual will probably not systematically try to find which fish are good and which are not. However, the individual may be prompted to engage in systematic processing if, for example, several trusted friends recommend that he try other kinds of fish. In such a situation, the individual may more carefully consider the information available.

Previous research has focused on countering the confirmation bias by explicitly prompting participants to more carefully consider available information (Larrick, 2004). This method, referred to as the consider the alternative strategy, instructs the participant to think about other possible choices or hypotheses and what evidence confirms or disconfirms each one (Arkes, Faust, Guilmette, & Hart, 1988; Kray & Galinsky, 2003; Lord, Lepper, & Preston, 1984). Without any prompting, participants tend to favor any evidence that supports their pre-existing belief. However, when directly asked to consider what evidence supports an alternative hypothesis, participants had reduced confidence in their initial hypotheses and greater willingness to choose alternatives. The consider the alternative strategy and other forms of deliberate, systematic processing are too cognitively demanding to be used constantly (Lord, Lepper, & Preston, 1984). Therefore, simply telling participants not to let their biases influence them is not reliably effective. Individuals tend to remain reliant on their automatically generated and heuristically accepted hypotheses unless directly prompted to do otherwise.

Even if individuals are directly prompted to consider the alternative, they may still give greater weight to the initial hypothesis than to their alternatives. Further, they may have difficulty recognizing what information is relevant without structured prompting (Cox & Popken, 2008; Kardes, et al., 2006). If participants find it difficult to think of alternatives or evidence supporting alternatives, then the consider the alternative strategy can even backfire and strengthen belief in the original, biased hypothesis (Sanna & Schwarz, 2006; Sanna, Schwarz, & Stocker, 2002). The consider the alternative strategy does not directly address the automatic processing that led the individual to accept a biased hypothesis in the first place. Thus, debiasing should also consider methods to reduce the confidence felt by participants toward an automatically generated, biased hypothesis.

1.3 Confidence and Feeling of Rightness

Individuals have a lifetime of relying on automatic and heuristic processing to make successful decisions. This leads individuals to have overconfidence in the hypotheses created and confirmed by such processes. Individuals often have confidence in their decision-making abilities for a given task that far exceeds their actual accuracy (Gilovich, 1991). The overconfidence in automatic and heuristic processing is what makes biases so powerful. When assessing a hypothesis, confidence can be thought of as a "feeling of rightness." If a hypothesis "feels right", people will often accept the hypothesis without systematically considering other alternatives (Thompson & Morsanyi, 2012; Topolinski & Reber, 2010). This feeling of rightness has been experimentally measured by rating their confidence on a Likert scale ranging from "Guessing" to "Certain I'm Right." Heuristic decision making is rapid and quick decisions are associated with higher ratings of confidence (Thompson, Turner, & Penncook, 2011). When confidence is high, participants have little reason to engage in more systematic processing. Thinking of alternatives and evidence to support them is a cognitively demanding process and will not feel as easy as automatic and heuristic processing. Since ease of processing is an important component of the feeling of rightness, individuals will be predisposed to retain their original hypothesis. This is supported by Sanna et al.'s work which demonstrates that increasing the cognitive demands required to consider alternatives leads to a greater tendency to reject all alternatives and retain the original hypothesis. (Sanna, Schwarz, & Stocker, 2002). Unless participants are given sufficient reason to doubt their initial hypotheses, they will persist. The following experiments attempted to decrease participant confidence and thus lead participants to engage in more systematic processing. This was done using the Matchmaker task, adapted from work by Downar, Bhatt, and Montague (2011).

1.4 The Matchmaker Task

The Matchmaker Task is based on a medical task created by Downar et al. to study biased decision making in experienced physicians. In Downar et al.'s original task, the doctors were tasked with treating a patient for a heart attack using one of two medicines. They were presented with several health measures to use in determining which drug would be appropriate. Although only one factor was actually relevant, participants invariably believed that at least one other spurious factor was also relevant to making the decision. Although some doctors were able to achieve a high level of success in the task, they did so using overly complex hypotheses that focused on some factors that were not relevant to decision-making.

Participants did have explicit hypotheses about the relevant factors but did not engage in systematic processing. Instead, participants accepted initial hypotheses with little variation throughout the task.

While the medical task was able to demonstrate the confirmation bias, it was designed for experienced physicians and thus may appear overly complex and difficult to understand for those without medical training. The Matchmaker task was created to be more accessible to lay persons by instead using the framing narrative of a matchmaking service (Finkel et al., 2012). Participants must consider some basic personality factors to determine what kinds of matches are preferred by two different bachelors. Additionally, the Matchmaker task adds an additional level of control that is absent from the medical task. In Downar et al.'s task (2011), the spurious factors varied greatly among participants. In the Matchmaker task, a priming phase is introduced to guide some participants toward a specific spurious belief. In doing so, the Matchmaker task allows researchers to more systematically examine how a specific biased belief may form and then determine if confidence in that belief is reduced and if participants eventually reject the apparently relevant but actually spurious factor.

Three experiments were performed using the Matchmaker task. The first was created as a pilot study to determine if the priming phase of the Matchmaker task could lead participants to develop a biased hypothesis and if that hypothesis would persist even when it failed to achieve optimal success. The second experiment was designed to study if calling attention to failures would lead to a reduction in confidence, increase systematic processing, and improve accuracy. Finally, the third experiment was designed to test if increasing the apparent difficulty of the task would reduce confidence and increase systematic processing.

CHAPTER 2. MATCHMAKER TASK PILOT STUDY

The Matchmaker task was created to replicate the physician medical task created by Downar et al. (2011). Matchmaker places participants in the role of recommending matches for clients, similar to a dating service. Many online matchmaking services advertise the idea that compatibility factors can be used to make matches essentially automatically (Finkel, Eastwick, Karney, Reis, & Sprecher, 2012). Although Matchmaker and the physician task are comparable in the abstract, Matchmaker was designed to seem more intuitive to participants without any formal training. Participants were expected to believe multiple factors were relevant to making a match. A priming phase was included to focus individuals on a particular spurious factor.

2.1 Methods

Participants were told that their job was to find good matches for two clients of the Matchmaker service. The participants were presented with pictures of the two clients, named Frank and James. The pictures were selected from royalty free images to be distinct from one another but otherwise normal pictures of Caucasian, young adult males with brown hair. Participants were to match James and Frank with potential matches based on five compatibility factors: whether the match enjoyed watching sports, the match's hair color (blond or brunette), the match's favorite artistic hobby (painting, writing, or music), whether the match liked to drink alcohol regularly or not, and the match's age (ranging from 21 to 32 and arranged into 3 age range blocks). Of these, only hair color was relevant to success or failure for a match. One client preferred blondes while the other preferred brunettes. However, there was a 25% chance of the opposite hair color being correct on a given trial. Therefore, selecting based on the relevant factor was most likely to result in a good match but was not guaranteed. No other compatibility factors were relevant. The Matchmaker task consists of: the priming phase, learning phase, and hypothesis test.

<u>2.1.1 Priming Phase</u>

In the priming phase, participants were shown the pictures of each client along with a short description of the client. This description stated that the client was either a strong supporter of LSU athletics and now worked as a coach or stated that the client was in medical school and had been active in theater. After viewing the client information for one minute, the participants were then shown descriptions of four potential matches that were rated positively by the client in the past. Each match was presented as a short paragraph describing the match and including information relevant to the five compatibility factors. Each of the 8 paragraphs (4 for each client) was unique but used a similar structure. Each match began with a sentence indicating whether the match enjoys watching sports (using sentences such as 'Susan is a lifelong fan of LSU football') or does not enjoy watching sports (using sentences like 'Lisa finds sports very boring') followed by further sentences covering the other four factors. Information about hair color was always included in the middle of the paragraph and never in the first or last sentences. Further, all four positive matches either enjoyed watching sports (in the case of the coach) or did not enjoy watching sports (in the case of the med student). Three of the four positive matches conformed to the hair color preferences of the client while one of those matches was reversed, preserving the probability of hair color match in the learning phase.

2.1.2 Learning Phase

In the learning phase, participants were presented with a short profile of a potential match including a one word response to five questions (one for each of the compatibility factors). The questions were identical but there were a few different possible answers for each factor. There were 72 total matches, representing every possible combination of the parameters for the five variables. Participants were instructed to press a key to recommend the match to one of the two clients (F for Frank and J for James). After making 4 matches, the participant were shown a feedback screen which stated how many of the last 4 matches were successful. Each block of four trials contained two Bias Congruent trials and two Bias Incongruent trials. In the bias congruent trials, the primed Sports Preference corresponded to the correct Hair Color while in bias incongruent trials, Sports Preference and Hair Color were at odds. Each block had two trials in which the correct answer was Frank and two trials in which the correct answer was James. The other three compatibility factors were randomized.

2.1.3 Hypothesis Test

The hypothesis test consisted of a written form on which participants were instructed to rate how relevant each of the five factors was to each client on a scale of 0 (not relevant at all) to 4 (extremely relevant). Participants were also asked to select which parameter the client preferred on a given factor if it was relevant. Each factor's parameters also included a 'Doesn't Matter' option if none of the parameters were important. This was included as an additional method for participants to indicate a spurious factor. Participants did not receive any feedback during the hypothesis test.

2.1.4 Participants

There were 125 participants, recruited from students enrolled in undergraduate Psychology courses. Participants received course credit for participation. Participants were randomly assigned to one of two groups: a control group or a bias prime group. The bias primed group completed the priming phase, then a hypothesis test for each client, then a forced comparison test before completing the learning task and a second round of hypothesis tests and a second speed test. The control group completed only the learning task then hypothesis tests for both clients and a forced comparison test.

2.2 Results

For the learning phase, a mixed model ANOVA found that the bias prime group was significantly less accurate than the control group on bias incongruent trials ($F(1, 123)=35.61$, $p<.001$) but significantly more accurate on bias congruent trials ($F(1, 123) = 19.52$, $p<.001$). On the hypothesis test following the learning phase, there was no significant difference between groups in ability to correctly identify hair color preference ($F(1, 123)=1.39$, $p=.24$) but the bias prime group was significantly more likely to rate sports preference as relevant consistent with the information presented in the bias prime phase ($F(1,123)=9.15$, $p<.005$).   There was a significant difference in reaction time between groups during the learning phase (F(1, 123)=30.48, p<.001) with the bias prime group having a significantly faster reaction time than the control group on the bias incongruent trials.

2.3 Discussion

The bias prime group had a persistently lower performance on bias incongruent trials than the control group. Bias incongruent trials consisted of any trials where the primed bias that Sports Preference was relevant to client preference predicted a choice counter to the choice predicted by the truly relevant factor (hair color). The control group had performance at chance (50% accuracy) throughout the task. The bias prime group was very accurate whenever the biased belief happened to correspond with the true rule of the task, namely that Sports Preference happened to correspond with Hair Color. However, the bias prime group had low accuracy whenever Sports Preference did not correspond with Hair Color. Some participants reported Hair Color as a relevant factor on the hypothesis test. However, no participant endorsed Hair Color as the sole relevant factor. Bias primed participants had poor performance on bias incongruent trials which may indicate that the primed bias interfered with any processes that might lead them to recognize that the importance of Hair Color. Participants saw that 75% of the matches preferred by each client were of a certain Hair Color but showed a much stronger retention of the four matches for each client all having a particular Sports Preference. Despite the feedback given during the task indicating the participants were only accurate about 50% of the time, the bias primed participants persisted in focusing their attention on Sports Preference. The bias priming phase created a bias that ignored a 75% probability of success in favor of a 50% probability. However, there was some shift toward higher accuracy in some of the bias primed participants in the later part of the task, indicating that the bias is not impossible to overcome. This may have been due, in part, to bias primed participants acquiring some knowledge about the relevance of Hair Color but this knowledge may not have been explicit. If bias primed participants are acquiring some automatic knowledge of Hair Color as a relevant factor, then bias primed participants should show greater accuracy than non-primed participants whenever the primed bias can’t be used.

The primed participants had a significantly faster reaction time than control group participants when making choices, indicating they were using automatic processing and quick, heuristic processing more than the control group. The bias prime group did demonstrate some explicit knowledge but did not engage in the effortful processing necessary to learn the true relevant factor. In order for participants to disregard the initial biased prime, they must have some reason to do so. Experiments 2 and 3 attempted to reduce participant confidence in their biased hypotheses in order to prompt more deliberate, systematic decision-making.

CHAPTER 3. ATTENTION TO FAILURE

People rely on automatic processing because doing so has often brought them success in the past. Individuals tend to remember their successes better than their minor failures (Benartzi & Thaler, 2007; Dardenne & Leyens, 1995; Frank, Rudy, Levy, & O'Reilly, 2005). Unless automatic processing is evidently not optimal for a decision, individual heuristic processing will tend to favor the hypotheses generated automatically. If failures are made more salient, the individual should have reduced confidence in their automatic processing and be willing to engage in more systematic processing. Using sound to draw special attention to failures should increase the saliency of failures. Additionally, improved awareness of decision failures may even improve automatic processing as the salient losses provide useful experience for refining the automatic, unconscious processing.

In the Downar et al. study (2011), physicians that devoted greater attention to failures were generally more accurate than those who devoted greater attention to success. Downar et al. used an fMRI and determined that some participants showed greater activation in the prefrontal cortex following a failed match, indicating they were more responsive to failures, while other participants instead showed greater activation in response to successful match. Participants that were more responsive to failure also tended to be more accurate in making decisions.

3.1 Hypotheses

Experiment 2 was designed to test whether using visual and sound feedback to make failures more salient could alter participant confidence and thus lead to more systematic processing and greater accuracy. The hypotheses for the experiment were: 1) Participants experiencing more salient failures will report lower confidence in their decisions than those experiencing salient successes, 2) Participants experiencing more salient failures will show slower reaction time when making decisions than those experiencing more salient successes, 3) Confidence and reaction time will be negatively correlated, indicating that reduced confidence leads to more systematic consideration before making a decision, and 4) Participants experiencing more salient failures will have significantly higher accuracy than participants experiencing more salient successes.

3.2 Methods

Several changes were made to the experimental design following analysis of the first experiment. A confidence measure (Likert scale) was added to follow every trial during the Learning Phase. Second, participants in the No Prime conditions were shown eight randomized matches during what served as the Priming Phase for the Prime conditions.

The Learning Phase was divided into two sections: block feedback and trial-by-trial. Block feedback was comparable to the Learning Phase of Experiment 1. Trial-by-trial feedback provided feedback following every trial of the Learning Phase in order to determine if continuous feedback would lead to improved accuracy and if continuous feedback would lead primed participants to spontaneously reject their initial biased hypothesis. Block feedback was used initially due to concerns that continuous feedback would make it too easy for participants to recognize that their initial hypothesis was flawed. The results of the pilot test indicated that the bias was persistent for most primed participants and therefore, most participants were not expected to easily overcome their bias even if feedback was persistent. The block feedback was retained for the first half of the learning phase to allow for some comparison to the pilot study.

Finally, the variable Sports Preference (used as the priming variable in the Priming Phase) was replaced with the variable Entertainment. Sports Preference only had two possible answers (Yes or No) and thus the primed bias could be used for every trial. Entertainment had three possible answers (Sports, Video Games, and Movies) and only two were presented in the Priming Phase. This change was implemented for two reasons. First it provided trials where the primed participants couldn't use their biased hypothesis and should demonstrate whether the primed participants believe that Hair Color is relevant after the Priming

Phase. Secondly, changing the variable created more trials for the Learning Phase and provides more time for the participants to master the task.

3.2.1 Participants

Participants consisted of 187 students (161 female, 26 male) participating for credit in Psychology courses at Louisiana State University. A target n of 40 per group (total n of 160) was selected based on a power analysis for a 2x2 ANOVA using a medium effect size (f=.25) for a power of 0.88. This effect size was selected based on the lowest significant effect size found in Experiment 1. Participants were randomly assigned into 4 groups: No Prime/Positive Feedback, No Prime/Negative Feedback, Prime/Positive Feedback, and Prime/Negative Feedback.

3.2.2 Priming Phase

In the Priming Phase, participants were shown eight paragraphs describing matches. Participants in the Prime conditions were shown a short description and picture of a client and then shown four matches that were favored in the past by the client (Appendix B). They were then shown the same information for the second client. As in Experiment 1, the matches for each client all had the same answer (either Sports or Video Games) for one factor (Entertainment). In the No Prime conditions, participants were shown eight matches randomized along the five compatibility factors and were told these were simply random example matches.

3.2.3 Learning Phase

In the Learning Phase, participants saw 108 trials presented in a format comparable to Experiment 1. After each trial, participants were asked to rate their confidence in their last match on a seven point Likert scale ranging from 1 (“Guessing”) to 4(“Fairly Certain”) up to 7 (“Certain I’m Right”). Confidence ratings were made before feedback was presented. For the first 54 trials, participants received feedback after every three trials. For the second 54 trials, feedback was presented following every trial.

Participants in the Negative Feedback condition heard an unpleasant buzzer and saw a red background whenever they failed to make a successful match. During the block feedback part of the Learning Phase, this negative feedback was presented after three trials if the participant failed even one match out of the three. During the trial-by-trial feedback section, the negative feedback was given following any failed match. If the participant was successful in all three matches during the block feedback trials or made a successful match during the trial-by-trial feedback section, the feedback given on a white screen with no sound.

For the Positive Feedback condition, participants saw a green background and heard a pleasant ding. This occurred if they were successful on even one match of a block during the block feedback section and every time they made a successful match during the trial-by-trial feedback. If they failed all three matches during the block feedback or missed a match during trial-by-trial feedback, Positive Feedback participants saw a white background with no sound.

Reaction time was measured in the learning phase and testing phase from the point of stimulus presentation until participants made their selections.

3.2.4 Testing Phase

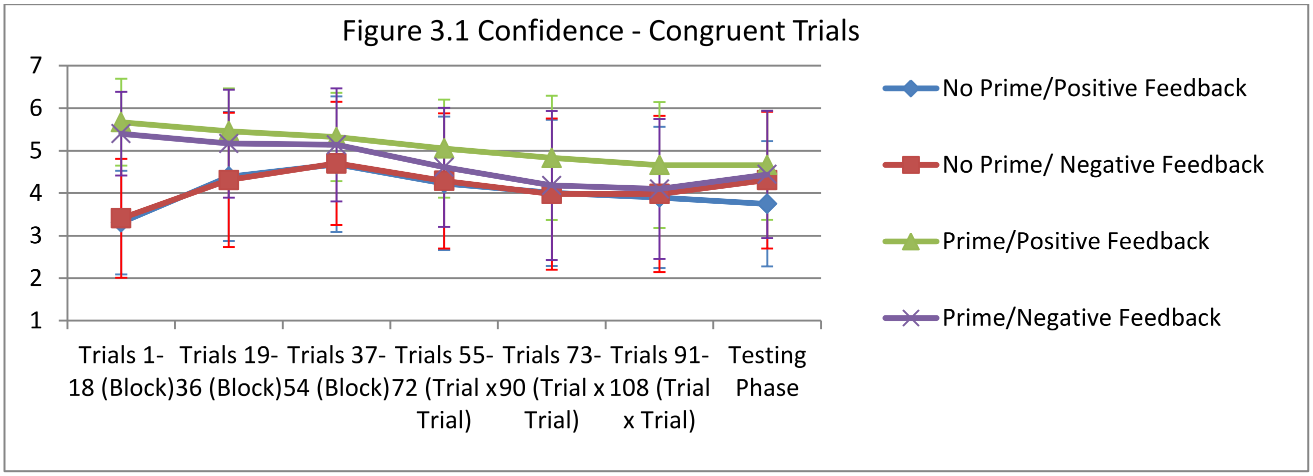
The testing phase was added to the task to test participant accuracy without any further feedback. During the Testing Phase, participants completed twelve trials containing four bias incongruent trials (two for each client), four bias congruent trials (two for each client) and four bias irrelevant trials (two for each client).

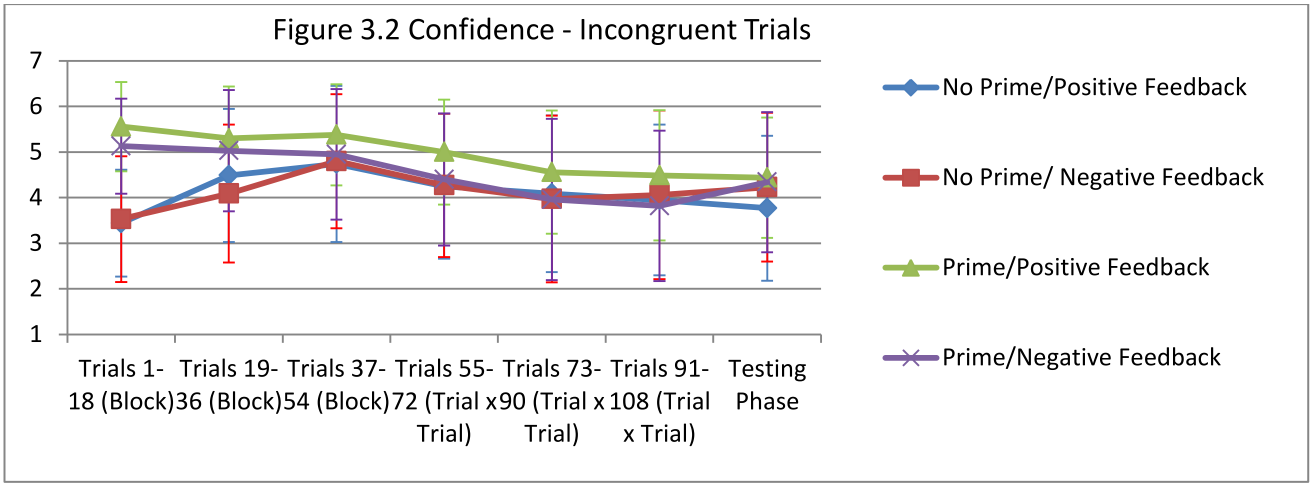
3.3 Results

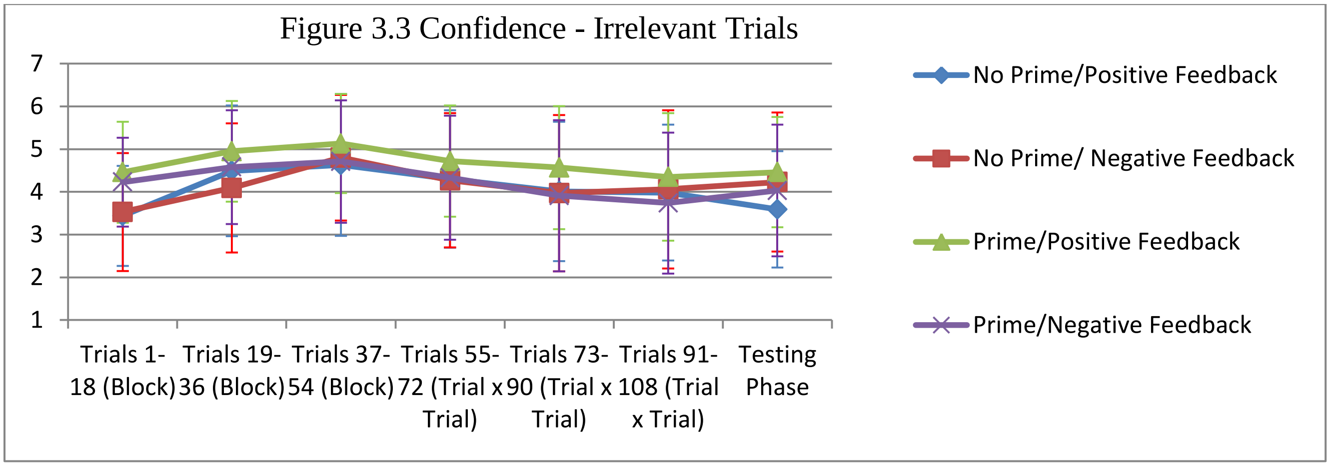
3.3.1 Confidence

Table 3.1 Confidence Ratings (Range: 1-7)						
Group	Congruent Trials		Incongruent Trials		Irrelevant Trials	
	Mean	SD	Mean	SD	Mean	SD
No Prime/Positive	**4.04**	**1.25**	**4.11**	**1.26**	**4.06**	**1.22**
No Prime/Negative	**4.14**	**1.33**	**4.13**	**1.31**	**4.13**	**1.33**
Prime/Positive	**5.09**	**.95**	**4.96**	**.92**	**4.66**	**1.04**
No Prime/Negative	**4.72**	**1.19**	**4.52**	**1.25**	**4.22**	**1.20**

A mixed model ANOVA was conducted with prime and feedback as between subjects variables and trial type and time as within-subjects variables on participant ratings of confidence. There was a significant effect of trial type (congruent, incongruent, or irrelevant) (F(2,182)=22.88, p<.001) as well as a significant interaction between prime and trial type (F(2,182)=24.15, p<.001). There was no significant interaction between feedback and trial type (F(2,182=.89, p=.41) or between trial type, prime, and feedback (F(2,182)=.05, p=.96). There was a significant effect of time (F(6,178)=15.53, p<.001) as well as significant interactions between time and Prime (F(6,178)=9.59, p<.001) and between time and feedback (F(6,178)=2.46,p<.05). There was no significant interaction between time, feedback, and prime (F(6,178)=.70, p=.65). There was a significant interaction between trial type and time (F(12,172)=5.78, p<.001), between trial type, time, and prime (F(12, 172)=8.67, p<.001) and between trial type, time, prime, and feedback (F(12,172)=1.8, p<.05). Post-hoc analysis revealing that the Prime/Positive Feedback group was significantly more confident on all trials (F(3,182)=2.56, p<.05). There was no significant effect of trial type, time, and feedback (F(12,172)=.34, p=.98). There was no significant effect of the Feedback manipulation (F (1,183) = 1.07, p=.30). There was a significant effect of the bias prime with Prime participants demonstrating a higher level of confidence than the No Prime participants (F(1,183)=12.03, p<.005). Post-hoc analysis found that participants in the Prime groups had significantly higher confidence than the No Prime groups in the first 1/3 of the block feedback section of the Learning Phase ($F(6,178) = 15.25$, $p<.001$).







3.3.2 Reaction Time

Table 3.2 Reaction Time (in seconds)						
Group	Congruent Trials		Incongruent Trials		Irrelevant Trials	
	Mean	SD	Mean	SD	Mean	SD
No Prime/Positive	**4.39**	**2.35**	**3.74**	**1.88**	**3.79**	**2.18**
No Prime/Negative	**4.52**	**1.79**	**4.08**	**1.68**	**4.10**	**1.83**
Prime/Positive	**4.27**	**1.41**	**3.96**	**1.37**	**4.44**	**2.39**
No Prime/Negative	**4.45**	**2.04**	**4.54**	**2.04**	**4.36**	**2.05**

A mixed model ANOVA was conducted using reaction time as the DV, feedback and prime as between subjects variables, and trial type and time as within subjects variables. There was a significant effect of trial type ($F(2,182)=13.61, p<.001$), time ($F(6,178)=53.71, p<.001$) but no significant effect of prime ($F(1,183)=1.87, p=.17$) or feedback ($F(1,183)=1.96, p=.16$). There was no significant interaction between prime and feedback ($F(1,183)=.189, p=.66$). There was a significant interaction between type and prime ($F(2,182)=22.06, p<.001$) but no significant interaction between type and feedback ($F(2,182)=1.92, p=.15$) or between type, prime, and feedback ($F(2,182)=.10, p=.91$). There was a significant interaction of time and prime ($F(6,178)=3.94, p<.005$) but no significant interaction between time and feedback ($F(6,178)=1.22, p=.30$), between time, prime, and feedback ($F(6,178)=.59, p=.74$), between type, time, and feedback ($F(12,172)=.87, p=.58$), or between type, time, prime, and feedback ($F(12,172)=.69, p=.76$). There was a significant interaction between trial type, time, and prime ($F(12,172)=6.04, p<.001$). Post-hoc testing revealed that participants in the Prime/Negative Feedback group had significantly longer reaction time during the latter half (trial-by-trial feedback) of the Learning phase on bias congruent ($F(6, 178)=8.13, p<.001$) and bias incongruent trials ($F(6, 178)=3.67, p<.005$) than all other groups.

Figure 3.4 Reaction Time (in seconds) - Congruent Trials

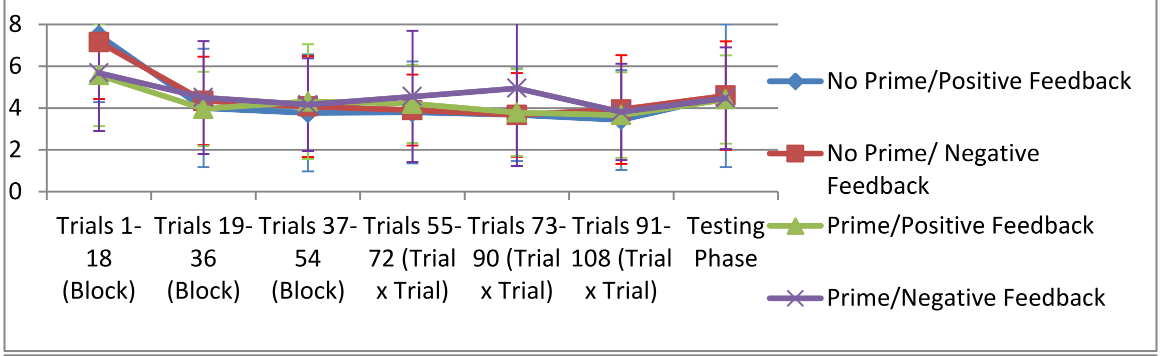


Figure 3.5 Reaction Time (in seconds) - Incongruent Trials

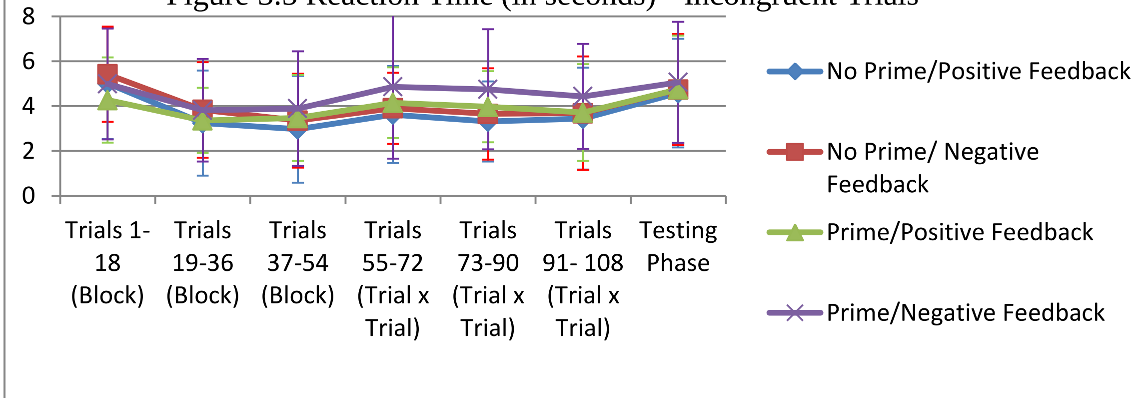
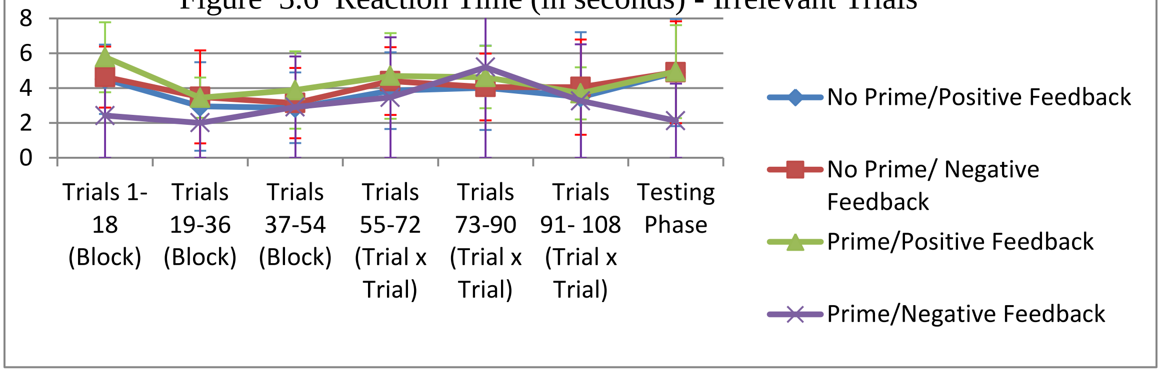


Figure 3.6 Reaction Time (in seconds) - Irrelevant Trials



3.3.3 Correlation between Reaction Time and Confidence.

Table 3.3 Correlation between Reaction Time and Confidence

Group	Pearson's r	Significance
No Prime/Positive	-.07	p<.001
No Prime/Negative	-.12	p<.001
Prime/Positive	-.15	p<.001
No Prime/Negative	-.11	p<.001

For all four groups, there was a significant negative correlation between participant confidence and reaction time (r=-.13,p<.001). As participant confidence increased, reaction time decreased.

3.3.4 Accuracy

Table 3.4 Accuracy (Percent Correct)

Group	Congruent Trials		Incongruent Trials		Irrelevant Trials	
	Mean	SD	Mean	SD	Mean	SD
No Prime/Positive	**55.75**	**17.54**	**54.99**	**17.72**	**55.13**	**14.10**
No Prime/Negative	**59.93**	**16.95**	**50.62**	**18.96**	**54.98**	**12.43**
Prime/Positive	**83.78**	**11.57**	**24.81**	**14.08**	**58.75**	**15.72**
No Prime/Negative	**87.09**	**11.42**	**23.83**	**14.29**	**58.65**	**13.55**

A mixed model ANOVA found no significant effect of the bias prime (F(1,183)=.295, p=.59) or the feedback manipulation (F(1,183)=.027, p=.87) on accuracy. There was a significant effect of trial type (F(2,182)=190.80, p<.001) and time (F(6,178)=11.48, p<.001). There was a significant interaction between type and prime (F(2,182)=138.56, p<.001), between time and feedback (F(6,178)=2.85, p<.05),between type and time (F(12,172)=7.12, p<.001), between type, time, and prime (F(12,172)=5.03, p<.001) and between time, prime, and feedback (F(6,178)=3.15, p<.01). There was no significant interaction between type and feedback (F(2,182)=2.02),p=.14), between type, prime, and feedback (F(2,182)=.23, p=.80), between time and prime (F(6,178)=.87, p=.52), between type, time, and feedback (F(12, 172)=1.49, p=.13), or between type, prime, time, and feedback (F(12,172)=1.57, p=.11). Post-hoc analysis found that the Prime groups had significantly higher accuracy on bias incongruent trials (F(1,183)=165.67, p<.001) than the No Prime groups but significantly lower accuracy on bias incongruent trials (F(1,183)=142.65, p<.001). Additionally, this trend began to reverse over time as the Prime groups showed a reduction accuracy over time on the bias congruent trials (F(6,178=5.87, p<.001) and an increase in accuracy over time on the bias incongruent trials (F(6,178)=3.38, p<.005).

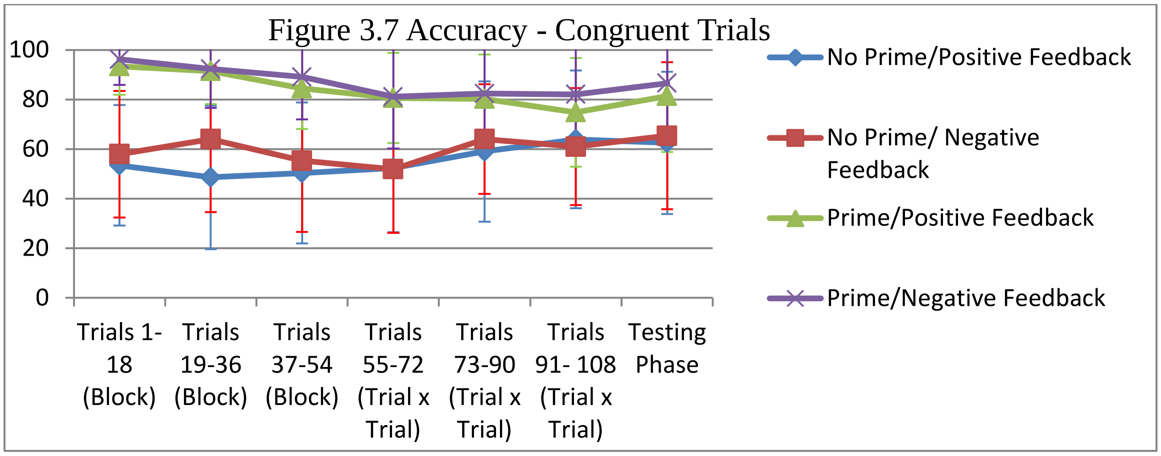


Figure 3.7 Accuracy - Congruent Trials

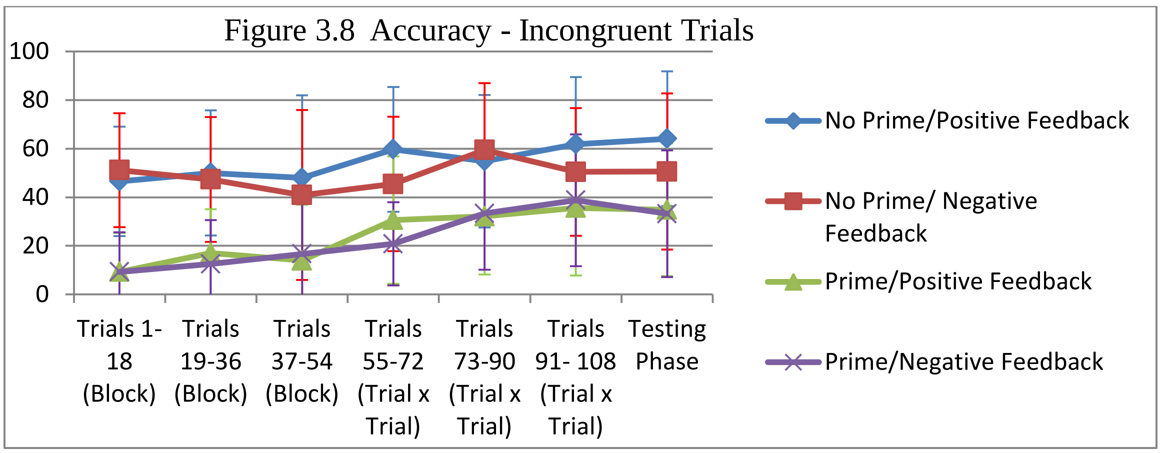


Figure 3.8 Accuracy - Incongruent Trials

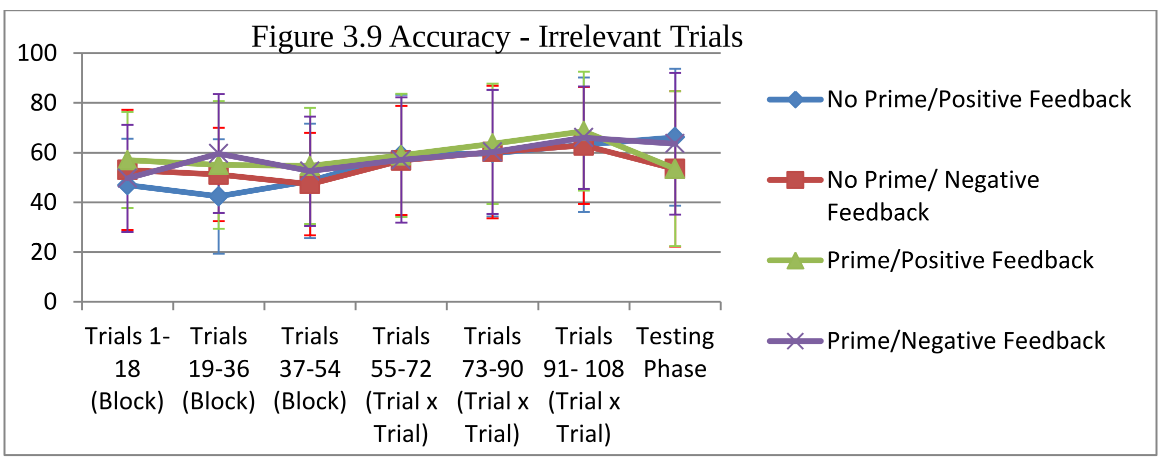


Figure 3.9 Accuracy - Irrelevant Trials

3.3.5 Heuristic and Automatic Judgments

A regression analysis was conducted to determine what factors significantly predicted the choices made by participants. This measure was based off of Downar at al.'s study (2011) which examined explicitly endorsed items as well as significantly predictive factors. No participant explicitly endorsed Hair

Color as the sole relevant factor on the hypothesis test. Every participant endorsed at least one spurious rule. A mixed model ANOVA was conducted using prime and feedback as between subjects factors and test style (significant predictors on regression and endorsed factors on hypothesis test). Participants endorsed significantly more spurious factors than the regression found to significantly predict their choices ($F(1,134)=69.73$, $p<.001$). Thus, participants explicitly identified more factors to be relevant than they actually used in making their choices. There was also a significant interaction between test style and prime ($F(1,134)=5.96, p<.05$). Post-hoc analysis found that the Prime group endorsed significantly fewer spurious factors on the hypothesis test ($F(1,134)=2.46$, $p<.05$). There was no significant interaction between test style and feedback ($F(1,134)=.92$) or between test style, prime, and feedback ($F(1,134)=.02, p=.89$). Chi square analysis found no significant difference between groups in participants that correctly identified color as a relevant factor ($p=.40$) or those who made choices based on color ($p=.72$).

Table 3.5: Heuristic and Automatic Judgments

Group	**Endorsed Hair Color (Explicit)**	**Spurious Factors Endorsed (Explicit)**	**Hair Color (Regression)**	**Spurious Factors Used for Choice (Regression)**
No Prime/ Positive	74.47%	2.90	55.32 %	1.51
No Prime/ Negative	69.05%	2.83	42.86%	1.50
Prime/ Positive	65.71%	2.57	40.00 %	1.83
Prime/ Negative	50.00%	2.32	42.86%	1.57

3.4 Discussion

Experiment 2 replicated the findings of Experiment 1 as the participants receiving the bias prime showed significantly lower accuracy on Bias Incongruent trials than participants who did not receive the prime. Participants in the Prime groups did have much higher accuracy on Bias Congruent trials, as expected, but combined with their low performance on the Bias Incongruent trials and chance performance on Bias Irrelevant trials, the bias prime provided no advantage in total accuracy. Participants in all conditions showed a significant improvement over time, particularly once feedback shifted from occurring every 3 trials to a continuous trial-by-trial feedback. However, the discrepancy between Bias Congruent and Bias Incongruent Trials among Prime participants remained throughout the Learning Phase and Testing Phase.

The use of feedback did not have a significant effect on participant accuracy. Participants in the Negative Feedback groups did not have any difference in accuracy compared to participants in the Positive Feedback groups. However, Negative Feedback did reduce confidence and slow decision-making, particularly in the Prime/Negative group. This indicates that when participants are made more aware of their decision-making failures, they do lose confidence in their own ability and spend more time making decisions. Unfortunately, this did not translate to increased accuracy. Indeed, participants appear to be taking longer but not engaging in truly systematic processing at all. Participants in the Negative Feedback groups do not show any differences in their pattern of selection than the participants in the Positive Feedback group as the Prime/Negative group still chooses primarily based on the primed bias. Participants may default to their heuristic decision-making as the negative feedback also reduces their confidence in their systematic decision-making. If participants are not confident in their decision-making ability due to their failures being made salient, they may choose to use faster, less effortful heuristic processing rather than devote the mental resources to systematic processing. If neither approach seems to be successful, participants have no incentive to be systematic and may simply be taking longer to make decisions to avoid hearing the buzzer as often. Therefore, Experiment 3 is designed to reduce participant confidence due to the apparent difficulty of the task rather than an increased saliency for failure. In doing so, I hypothesized that participants might be more willing to engage in systematic processing to meet the demands of the task but without feeling that they were poor decision-makers. Additionally, changing all feedback to trial-by-trial should be more conducive to systematic processing as participants are no longer required to remember information for multiple trials and guess which trials were successful.

CHAPTER 4. REDUCING SUBJECTIVE FLUENCY

While confidence may be reduced directly by making failures more salient, confidence, and the related feeling of rightness generated by rapid, automatic processing, may also be influenced by the subjective difficult of the task. For example, a common logic problem is "If 5 machines generate 5 units in 5 minutes, how long would it take 100 machines to generate 100 units?" Many individuals respond with the answer "100 minutes" and report confidence in such an answer even though it is logically incorrect (Thompson & Morsanyi, 2012). Such a result indicates that the individual may accept an automatically generated hypothesis on the basis of more than just the information content of the hypothesis. Instead, any generated hypothesis contains both the information content and the sensation of fluency (Pronin & Wegner, 2006; Reber, Schwarz, & Winkielman, 2004; Thompson & Morsanyi, 2012). In the context of judgment and decision making, fluency refers to how quickly an individual can bring something to mind. High fluency, manifested as a rapidly generated response, is associated with positive affect. As demonstrated by Pronin and Wegner (2006), simply 'thinking fast' was able to produce a positive emotional state. When participants read a series of statements designed to elicit either happiness or sadness, they not only reported positive feelings in response to the happy statements but also reported positive feelings whenever a statement was read quickly. Fluency was manipulated by varying how quickly the statement was displayed to either faster, equal, or slower than typical human reading speed. When participants saw the statements displayed quickly, they had an increase in positive affect. This experience of positive emotion was distinct from the content of the items.

Any automatic, rapidly generated response will have an associated level of fluency. This fluency will in turn affect confidence and the individual will accept the automatically generated hypothesis. Fluency may be directly manipulated by making it more difficult for participants to process information. Even if the difficulty is due to an extraneous factor rather than the task itself, participants are more likely to rate the task itself as difficult and therefore engage in more effortful processing (Song & Schwarz, 2008). Song and

Schwarz (2008) found that when task instructions were presented in the Mistral font (EXAMPLE) or Brush font (EXAMPLE), participants believed the task to be more difficult than participants reading the same instructions in Arial font (EXAMPLE). In Experiment 3, font was manipulated in order to manipulate the Feeling of Rightness. A more difficult font was predicted to reduce fluency and thus confidence. However, if participants are able to recognize the external cause of their reduced fluency, research has shown that the reduction in fluency has a reduced impact on confidence. Thus, the current study will directly ask participants about any elements of the task made it more difficult so that participants with explicit awareness of the font manipulation can be identified.

4.1 Hypotheses

Experiment 3 was designed to test whether a more difficult font would reduce fluency, reduce confidence, and improve. The hypotheses for the experiment were: 1) Participants dealing with the more difficult font will have lower confidence in their decisions than those reading in the easy font, 2) Participants in the difficult font condition will have slower reaction time beyond the effect of slower reading, 3) Confidence and reaction time will be negatively correlated, 4) Participants in the more difficult font condition will be more accurate if they engage in more systematic processing, and 5) If participants are explicitly aware of the font being difficult they may show no difference from the easy font condition.

4.2 Methods

The design remained consistent with the changes made in Experiment 2 with one change. All Learning Phase trials were converted to trial-by-trial feedback. The trial-by-trial feedback in Experiment 2 did not result in many participants reaching ceiling accuracy and therefore, it was hypothesized that trial-by-trial feedback would increase the potential effects of manipulations. In Experiment 2, trial-by-trial feedback was found to improve accuracy but not to the point of a ceiling effect for most participants.

4.2.1 Participants

Participants consisted of 199 students (148 female, 51 male) participating for credit in LSU Psychology courses. The target n was set at 40 per group (160 total) as in Experiment 2 but exceeded target n due to unexpectedly high number of sign ups. Participants were randomly assigned into four groups: No Prime/Easy Font, No Prime/Difficult Font, Prime/Easy Font, and Prime/Difficult Font.

4.2.2 Priming Phase

The Priming Phase was identical to that used in Experiment 2. All text was presented in the Brush font for participants in the Difficult Font conditions. The text of the sample matches presented was the same as those in the Experiment 2. After the Priming Phase, participants were asked how difficult they expected the task to be. This measure was included to provide a baseline of subjective difficulty for the task.

4.2.3 Learning Phase

The Learning Phase consisted of 108 trials. Feedback was provided for each trial after participants completed the confidence measure. The participants in the Easy Font conditions saw all text presented in the Arial font (the default font used in all previous version of Matchmaker). Participants in the Difficult Font groups saw all text in the Brush font. Participants were now instructed to "Press SPACEBAR when you are ready to make a decision" and were then prompted to select Frank or James. This was included as a measure to ensure that two measures of reaction time were available in case the change in font created differences in reading speed.

4.2.4 Testing Phase

The testing phase was identical to Experiment 2. All matches were presented in the Arial font. After the testing phase, participants were asked how difficult they felt the task was and then asked if any element of the task had made it more difficult. This question was included to determine if participants had any awareness of the font manipulation.

4.3 Results

4.3.1 Confidence

Table 4.1 Confidence (Range: 1-7)						
Group	Congruent Trials		Incongruent Trials		Irrelevant Trials	
	Mean	SD	Mean	SD	Mean	SD
No Prime/Easy	**3.61**	**1.28**	**3.60**	**1.26**	**3.57**	**1.29**
No Prime/Difficult	**3.53**	**1.22**	**3.51**	**1.19**	**3.51**	**1.19**
Prime/Easy	**4.19**	**1.24**	**3.99**	**1.16**	**3.89**	**1.16**
Prime/Difficult	**4.34**	**1.05**	**4.15**	**1.00**	**4.06**	**1.00**

A mixed model ANOVA was conducted using the prime and font manipulations as between subjects variables and time and trial type as within subjects variables. There was a significant effect of time ($F(2,192)=19.37$, $p<.001$), time ($F(6,188)=48.66$, $p<.001$), and prime ($F(1,193)=11.06$, $p<.001$). was no significant effect of the font manipulation ($F(1,193) = 0.068$, $p=.80$). There was a significant interaction between type and prime ($F(2,192)=12.90$, $p<.001$), between time and prime ($F(6,188)=4.23$, $p<.001$), between type and time ($F(12,182)=2.99$, $p<.001$), and between type, time, and prime ($F(12, 182)=3.35$, $p<.001$). There was no significant interaction between prime and font ($F(1,193)=.48$, $p=.49$), type and font ($F(2,192)=.11$, $p=.90$, between type, prime, and font ($F(2,192)=.04$, $p=.97$), between time and font ($F(6,188)=1.24$, $p=.29$), between time, prime, and font ($F(6, 188)=1.45$, $p=.20$), type, time, and manipulation ($F(12, 182)=.99$, $p=.46$), or between type, time, prime, and font ($F(12, 182)=.94$, .51). Prime participants had significantly higher confidence than those in the No Prime condition.

Figure 4.1 Confidence - Congruent Trials

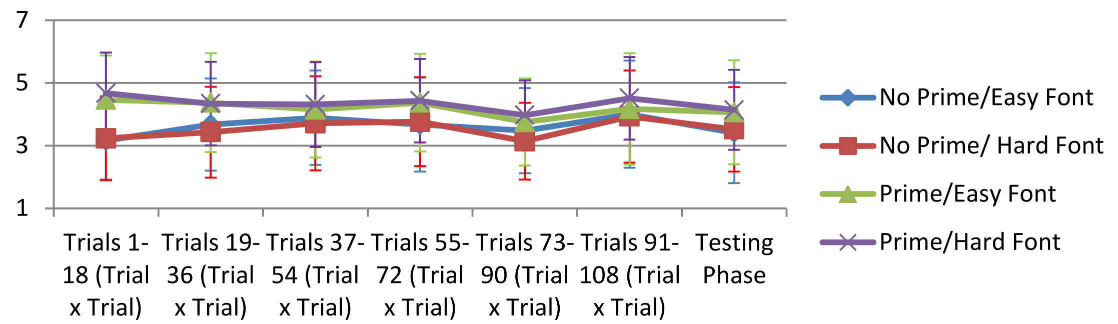


Figure 4.2 Confidence - Incongruent Trials

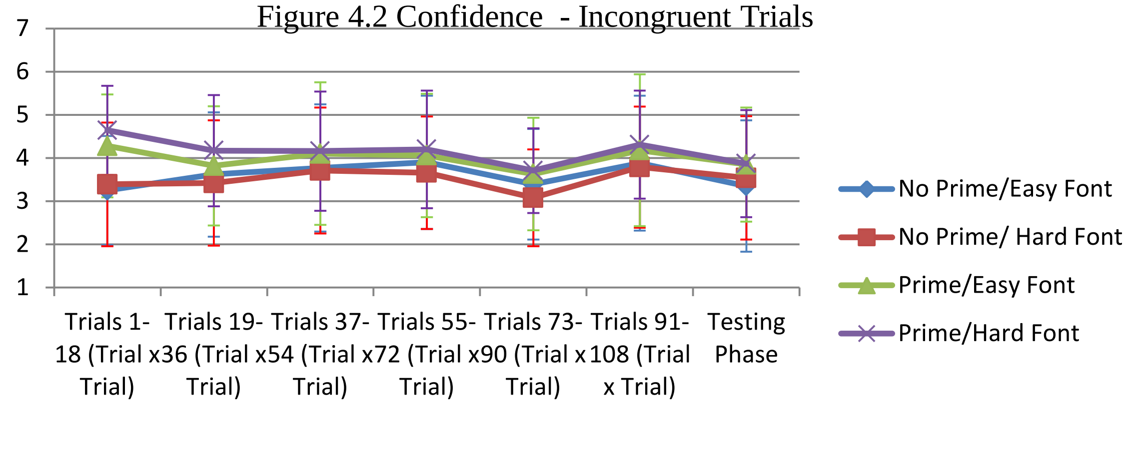
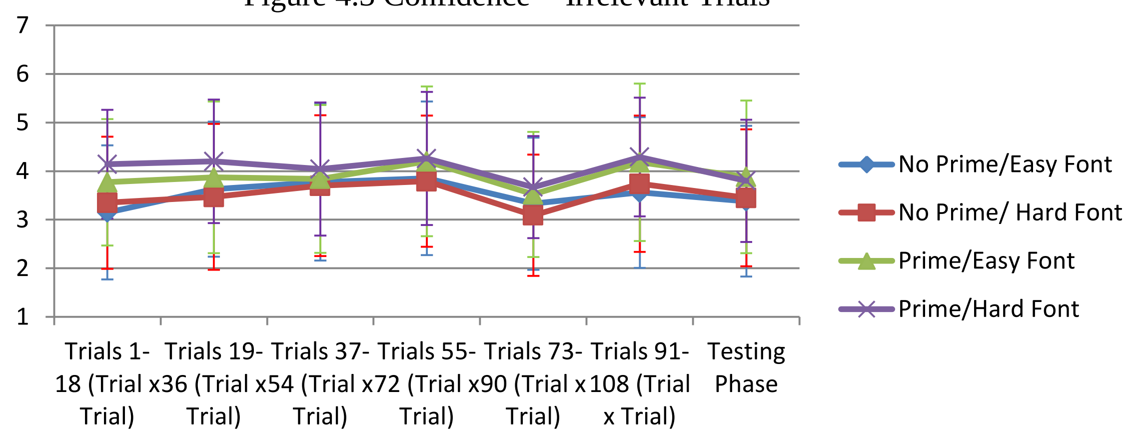


Figure 4.3 Confidence - Irrelevant Trials



4.3.2 Reaction Time

Table 4.2 Reaction Time (in seconds)

Group	Congruent Trials		Incongruent Trials		Irrelevant Trials	
	Mean	SD	Mean	SD	Mean	SD
No Prime/Easy	**3.58**	**1.70**	**3.70**	**1.82**	**3.63**	**1.74**
No Prime/Difficult	**3.77**	**1.48**	**3.74**	**1.57**	**3.77**	**1.45**
Prime/Easy	**3.87**	**1.91**	**4.16**	**2.02**	**4.25**	**2.08**
Prime/Difficult	**4.05**	**1.34**	**4.36**	**1.81**	**4.46**	**1.61**

A mixed model ANOVA using prime and font as between subjects variables and time and trial type as within subjects variables. The analysis found no significant effects of Prime ($F(1,193)=2.64$, $p=.11$) or Font ($F(1,193)=.25$, $p=.62$) nor an interaction between the two ($F(1,193)=.53$, $p=.47$). There was no significant effect of type ($F(2,192)=.62$, $p=.54$), nor significant interactions between type and prime ($F(2, 192)=1.95$, $p=.15$), between type and font ($F(2,192)=.01$, $p=.99$), or between type, prime, and font ($F(2, 192)=.44$, $p=.64$). There was a significant effect of time ($F(6, 188)=25.13$, $p<.001$) and a significant interaction between time and prime ($F(6, 188)=3.17$, $p<.01$). There were no significant interactions between time and font ($F(6,188)=1.35$, $p=.24$), between time, prime, and font ($F(6, 188)=.40$, $p=.88$), between type and time ($F(12, 182)=.92$, $p=.53$), between type, time, and prime ($F(12, 182)=.60$, $p=.84$, between type, time, and font ($F(12, 182)=.43$, $p=.95$, and between type, time, prime, and font ($F(12, 182)=1.21$, $p=.28$). The more difficult to read font did not affect the speed with which participants made decisions.

Figure 4.4 Reaction Time (in seconds) - Congruent Trials

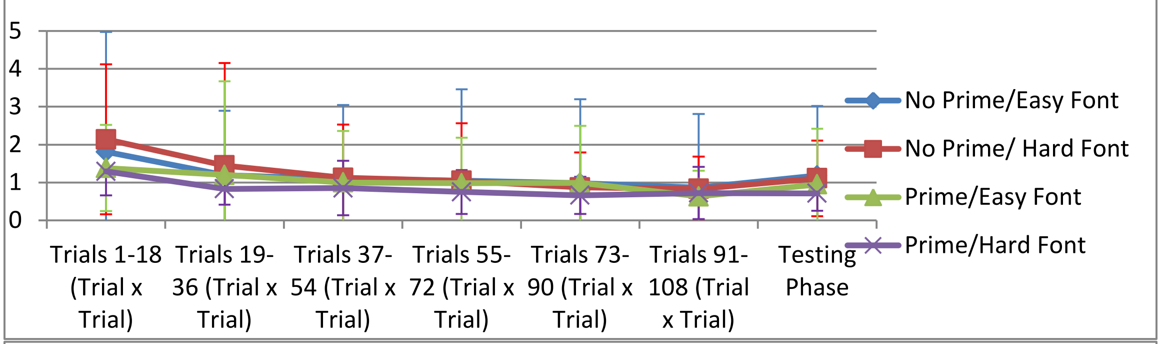


Figure 4.5 Reaction Time (in seconds) -Incongruent Trials

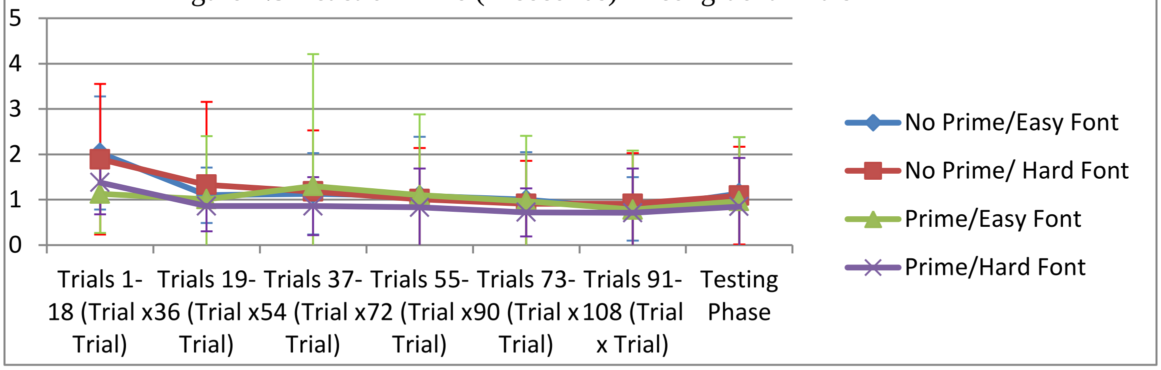
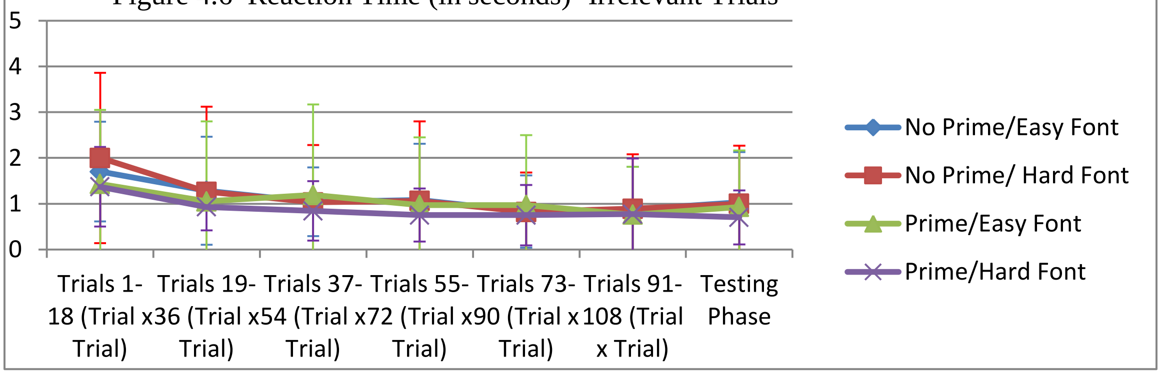


Figure 4.6 Reaction Time (in seconds)- Irrelevant Trials



4.3.3 Correlation between Reaction Time and Confidence

Table 4.3 Correlation between Reaction Time and Confidence

Group	Pearson's r	Significance
No Prime/Easy	-.11	p<.001
No Prime/Difficult	-.11	p<.001
Prime/Easy	-.11	p<.001
Prime/Difficult	-.07	p<.001

For all four groups, there was a significant negative correlation between participant confidence and reaction time (r=-.10, p<.001). All four groups also had individually significant negative correlations between reaction time and confidence. Increased confidence led to a decrease in reaction time.

4.3.4 Accuracy

Table 4.4 Accuracy (Percent Correct)

Group	Congruent Trials		Incongruent Trials		Irrelevant Trials	
	Mean	SD	Mean	SD	Mean	SD
No Prime/Easy	**66.39**	**17.09**	**65.55**	**17.36**	**66.32**	**16.08**
No Prime/Difficult	**66.48**	**17.26**	**64.49**	**17.82**	**64.81**	**14.05**
Prime/Easy	**76.34**	**15.06**	**49.32**	**15.42**	**65.17**	**13.73**
Prime/Difficult	**81.24**	**14.36**	**41.79**	**21.32**	**62.12**	**16.42**

A mixed model ANOVA found no significant effect of the bias Prime (F(1,193)=2.58, p=.12) or the font manipulation (F(1,183)=.508, p=.48) on accuracy. There was a significant effect of type (F(2, 192)=66.36, p<.001), time (F(6, 188)=14.59, p<.001), and significant interactions between type and prime (F(2,192)=56.28, p<.001) and between type and manipulation F(2,192)=3.13,p<.05). The Prime groups did have significantly higher accuracy on bias incongruent trials (F(1,193)=27.76, p<.001) than the No Prime groups but primed participants also had significantly lower accuracy on bias incongruent trials (F(1,183)=27.76, p<.001) than unprimed participants. There was no significant interaction between time and prime (F(6, 188)=1.16, p=.33), between time and font, F(6,188)=.61, p=.73), between and time, prime, and font (F(6, 188)=1.87, p=.09), between type, time, and font (F(12, 182)=1.15, p=.32, or between type, time, prime, and font (F(12, 182)=.90, p=.55). There were significant interactions between type and time (F(12, 182)=5.18, p<.001) and between type, time, and prime (F(12, 182)=4.80, p<.001).

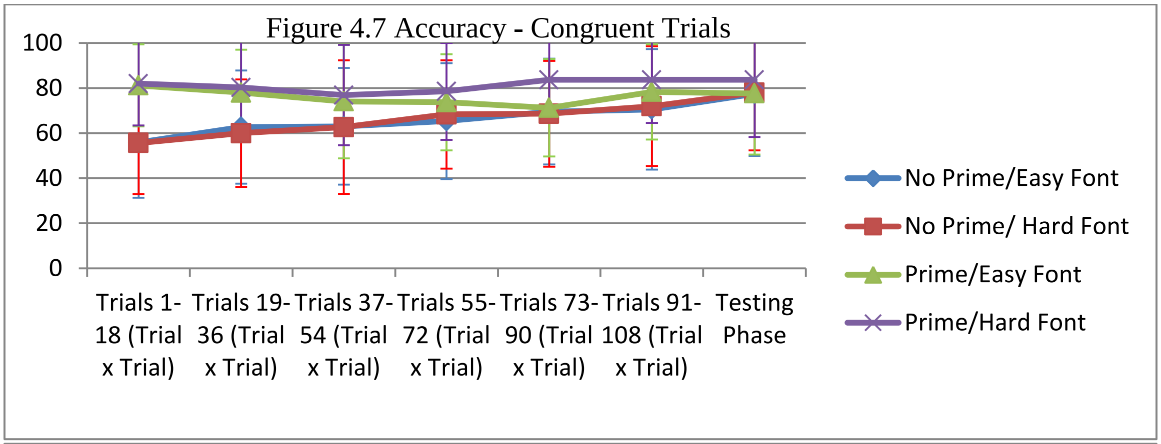


Figure 4.7 Accuracy - Congruent Trials

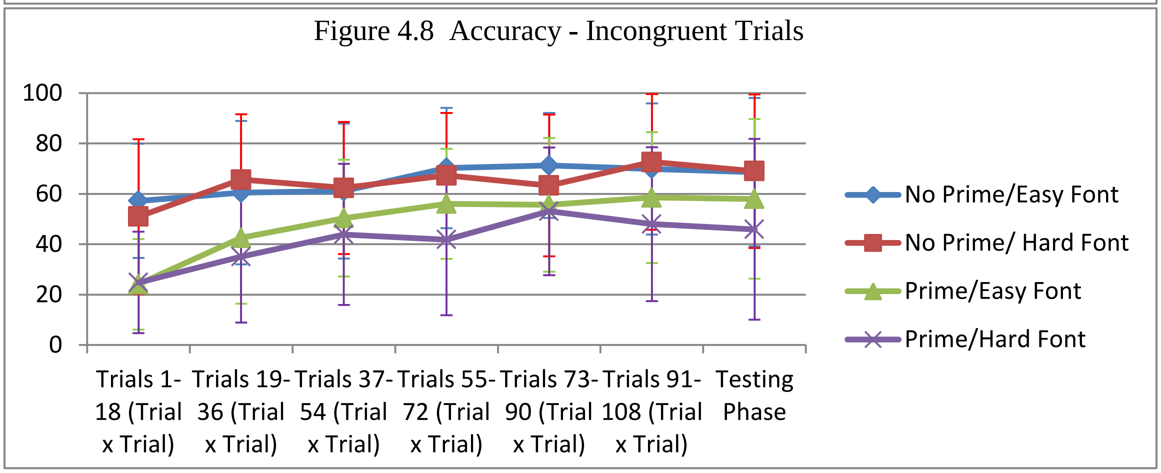
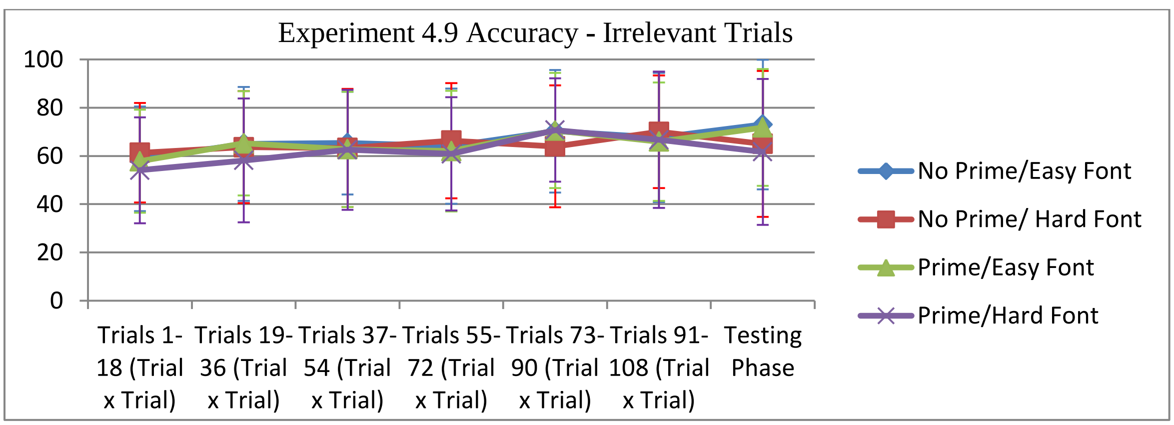


Figure 4.8 Accuracy - Incongruent Trials



Experiment 4.9 Accuracy - Irrelevant Trials

4.3.5 Heuristic and Automatic Judgments

The analyses used for Experiment 2 were repeated for Experiment 3. Participants endorsed significantly more factors on the hypothesis test than were found to significantly predict their choices on a regression analysis ($F(1,164)=124.36$, $p<.001$). Participants in the Prime group were also found to endorse significantly fewer factors on the hypothesis test ($F(1, 164)=5.07$, $p<.05$) but there was no significant interaction between F(1,164)=1.05, p=.31), between test type and font (F(1,164)=1.14, p=.29), or between test type, prime, and font (F(1,164)=1.26, p=.26). There was a significant effect of font (F(1, 164)=5.73, p<.05) with participants in the difficult font group endorsing more factors than the easy font group. Chi square analysis found no significant difference between groups in explicit endorsement of hair color (p=.086). There was a significant difference between groups in the number of individuals making choices based on hair color as shown in regression analysis (p<.001) with participants in the Prime/Difficult group being less likely to make choices based on hair color.

Table 4.5 Heuristic and Automatic Judgments

Group	Hair Color (Explicit)	Spurious Factors (Explicit)	Hair Color (Regression)	Spurious Factors for Choice (Regression)
No Prime/ Easy	68.18 %	1.98	65.91%	.70
No Prime/ Diff.	69.57%	2.41	69.57%	1.13
Prime/ Easy	71.43 %	2.26	70.00%	1.20
Prime/ Difficult	67.44%	2.22	61.17%	1.58

4.3.6. Explicit Awareness of Font Manipulation

In order to determine if awareness of the font manipulation affected performance on the task, participants that were shown the Difficult Font were divided into those able to explicitly identify the font as a contributing factor to task difficulty and those who did not. Only 19 participants (out of 98) in the Difficult Font condition were able to explicitly identify that the font was difficult. A mixed model ANOVA was conducted to determine if knowledge of the font had any effect on accuracy, reaction time, or confidence. The analysis found that recognition of the font difficulty had no effect on accuracy (F(1,96)=.12, p=.73), reaction time (F(1,96)=.02, p=.89, or confidence (F(1,96)=.26, p=.62). The results indicate that awareness of the font had no effect on participant performance. Further, awareness of the font manipulation had no effect on subjective ratings of difficulty for the task (F(1,96)=.06, p=.81).

4.4 Discussion

The Prime manipulation had effects comparable to Experiments 1 and 2, with the Prime groups displaying high accuracy on Bias Congruent trials but lower accuracy on Bias Incongruent trials. The Font manipulation did not show any significant effects on accuracy or confidence. This may be in part due to differences between the Matchmaker task and previous experiments utilizing the font manipulation. In other experiments utilizing a font manipulation, participants were tasked with judging the grammatical accuracy of statements or the difficulty of performing a task based on the instructions (Song & Schwarz, 2008; Thompson & Morsanyi, 2012; Toplinski & Strack, 2010; Topolinski & Reber, 2010; Topolinski & Strack, 2009; Topolinski, 2011). Such tasks require effortful reading with more variation in presentation than Matchmaker. In Matchmaker, participants are shown the same five questions in each match and each question only has a few possible answers. Thus, participants may learn to ignore a great deal of the text to only focus on relevant information and may adapt to the font. The decrease in reaction time over time in the experiment across groups may support the idea that participants were adapting to the font. Alternatively, the greater complexity of Matchmaker compared to previous research may also reduce the impact of the font. Since Matchmaker already appears to be very complex, the addition of a more difficult to read font may not add a great deal of subjective difficulty. Indeed, many participants in the Easy Font condition reported that the task was very complex and difficult. Thus, the font manipulation may have been ineffective for two reasons: first, the Matchmaker task was not as dependent on careful and deliberate reading as the tasks used in previous research and second, the Matchmaker task had such subjective complexity that the difficult font did not significantly increase it.

CHAPTER 5. GENERAL DISCUSSION AND CONCLUSIONS

The three experiments described in this paper were designed to answer two main questions. The first question was whether participants could be primed to develop a persistent bias even when the bias resulted in sub-optimal decision-making. The second question was whether participants could be led to engage in more systematic decision-making without being directly told to do so.

The first question can be answered affirmatively. Participants receiving a bias prime showed a very clear pattern of selecting matches based on the primed bias. The primed participants persisted in selecting based on their bias even when they were receiving continual feedback indicating their accuracy was around or below 50%. Further, the primed bias was based on comparably little information (4 initial matches) while participants completed dozens more matches in which the bias was clearly not as accurate as the initial matches would have predicted. Individuals appear to accept an initial hypothesis generated by automatic and heuristic processing and will stick with it unless given significant reason to discard it. This supports one of the key arguments of this paper: that heuristic processing has a strong influence on decision-making. Individuals will often persist in flawed decision-making due to shallow processing.

Many participants reported high confidence during the task and indicated they were confident in their answers on the explicit hypothesis tests. Indeed, participants often constructed elaborate theories of exactly what each client wanted in a match that could not possibly have held up to systematic scrutiny. The Matchmaker Task favors hypothesis testing using less specific rules as the randomized presentation of matches makes it difficult to regularly test more complex rules. In essence, participants were handicapping themselves by sticking with more specific rules when a simpler rule would actually be more effective.

Even without a prime, participants generated theories about client preferences that were more complex than the client's true preferences. It is possible that participants were naturally inclined to think that the clients had complex tastes in matches rather than unreliable tastes. In a certain light, this might be seen as a logical approach as a person's preferences are presumed to be reliable. People like what they like. In reality of course, general preferences are rarely completely reliable. A man may fall in love with one blond woman while finding another unattractive. A minority of participants did appear to recognize that the clients' preferences were not 100% guaranteed to result in a successful match but nonetheless were able to achieve perfect accuracy during the testing phase. While this unconscious knowledge did not translate into explicit responses on the hypothesis test, these participants did demonstrate true understanding of the clients' preferences when making their selections. This indicates that some other influence shaped their heuristic decision-making when completing the hypothesis test as they should have demonstrated greater accuracy if automatic processing was the only influence on their decision. The participants may have entered the task with the pre-existing belief that multiple factors must be relevant and when forced to explicitly state the relevant factors, the pre-existing belief overrode any subconscious information indicating that only Hair Color was relevant.

While Experiment 2 did demonstrate that making failures more salient leads to decreased confidence and slower reaction time, participants in the Negative Feedback groups were not any better at making accurate decisions. Participants may have engaged in pseudo-systematic processing, in which they took the time to think more carefully about their decisions but still accepted the heuristically generated and biased hypothesis rather than carefully testing all alternatives. Even in the trial-by-trial feedback section of the Learning Phase, participants in the Prime/Negative Feedback group most often made selections based on the primed spurious factor (Entertainment Preference).

It is possible that the success-focus or failure-focus found in the Downar et al (2011) experiment is primarily, or even entirely, an internal trait and is not significantly influenced by the situation. Participants who are failure-focused will pay more attention to failed decisions and thus be more likely to adjust their hypotheses and avoid the confirmation bias. Participants who are success-focused will ignore disconfirming information and be more vulnerable to the confirmation bias. In order to determine if an individual is more failure-focused or more success-focused, psychophysiological measurement or even neuroimaging may be necessary to determine if participants have a stronger level of arousal to failures or to success. Simply drawing attention to failure may reduce participant confidence but may not increase their motivation to engage in more systematic processing and if the individual is success-focused, they may still overweight successes even if failures are more salient.

While the manipulations of Experiments 2 and 3 were not effective in reducing the confirmation bias among primed participants or improving the performance of unprimed participants, the experiments did shed further light on the confirmation bias itself. The Matchmaker Task was shown to be effective in priming a specific bias that persisted throughout the task, thus demonstrating that biases can be generated by very limited information and that this information can be processed consciously to influence future decision-making. Even if individuals experience new information that should counter their initial hypothesis, they will persist in their consciously processed but flawed beliefs. It is possible that the repetitive nature of the task actually aided some participants in improving their performance as they stopped devoting mental effort to the task and relied more on automatic decision-making. The differences found between the explicit hypothesis test and the regression analysis of actual choices indicate that participants were, on the whole, more knowledgeable of client preferences at the subconscious level than in their conscious awareness. One possible future direction for this research is in increasing the length of the task to see if A) participants ever reach a point in which their automatic processing finally convinces them to reject their heuristically generated hypothesis or B) participants reach a ceiling level of accuracy without ever demonstrating complete conscious awareness of the clients' true preferences. Another possible direction for future research is by reframing the way in which participants work through the task. If participants are directed to switch their focus to trying to make bad matches, they may become better aware of the task conditions. While this is similar to the "Consider the Alternative" approach, it is not dependent on participants being able to think of justification for why an alternative might be reasonable or even what possible alternatives are. They simply have to try matches going against their established hypothesis. In doing so, the participant may better explore the preferences of the clients.

In conclusion, the Matchmaker Task serves the purpose of being a seemingly complex, probabilistic task that remains a viable challenge for participants even after numerous trials. Participants are presented with a diverse problem space to explore and the framing narrative is simple enough that participants should not feel that they lack some crucial training important for the task, as compared to medical tasks like Downar et al (2011). The bias generated by Matchmaker appears to be more persistent than the biases shown in more deterministic task like the triplet task. Thus, the Matchmaker Task is a worthwhile “bias simulator” that enables researchers to generate a specific bias among participants and test methods to counter that bias. Ultimately, the task may prove useful in developing techniques that transfer well to countering biases in the real world.

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APPENDIX A: INDIVIDUAL SPURIOUS FACTORS

Table A.1 Experiment 2:Spurious Factors (individual)

Subject	Endorsed Color as Relevant Factor (Explicit)	Number of Spurious Factors Endorsed (Explicit)	Chose Based on Color (Regression)	Number of Spurious Factors Used for Choice (Regression)
101	Yes	0.5	Yes	2
102	Yes	4	Yes	2
103	Yes	2.5	No	2
104	Yes	3	No	0
105	Yes	3	No	1
106	Yes	1.5	Yes	4
107	Yes	2.5	No	1
108	Yes	3	Yes	1
109	Yes	4	No	1
110	No	3	No	1
111	Yes	2	Yes	2
112	Yes	2.5	No	1
113	No	1.5	No	1
114	Yes	4	Yes	1
115	No	3	Yes	2
117	Yes	4	No	1
151	Yes	4	Yes	2
152	No	3.5	Yes	2
155	Yes	0.5	Yes	1
156	No	2	Yes	2
157	Yes	4	No	4
158	Yes	3.5	Yes	1
159	Yes	3.5	Yes	2
160	Yes	3	Yes	3
161	No	4	No	1
162	Yes	3.5	Yes	2
163	Yes	3	No	2
164	Yes	2.5	No	0
165	No	3.5	Yes	3
166	No	3	No	1
167	Yes	1.5	Yes	2
168	No	3.5	No	2
169	Yes	1.5	Yes	0
170	No	4	No	1
171	Yes	3	Yes	0

(Table A.1 cotd)

172	No	3.5	No	1
173	Yes	4	No	2
174	Yes	4	Yes	3
175	Yes	2.5	Yes	1
176	Yes	4	Yes	1
178	Yes	1.5	No	1
179	Yes	2.5	Yes	1
180	Yes	2.5	Yes	1
181	Yes	1.5	No	2
182	Yes	2	Yes	0
183	Yes	3.5	Yes	3
184	No	4	No	1
201	Yes	3.5	Yes	2
202	Yes	2.5	No	1
203	No	4	Yes	2
204	No	2.5	Yes	0
205	No	1	No	1
206	Yes	2	Yes	2
207	No	2.5	No	2
208	No	2	No	2
209	Yes	3	No	1
210	Yes	3.5	Yes	2
211	Yes	3.5	Yes	2
212	Yes	2	No	0
251	Yes	2.5	Yes	2
252	Yes	4	No	3
253	No	3	No	0
254	Yes	3	Yes	1
255	No	3.5	No	2
256	No	2	No	3
257	No	3	Yes	0
259	Yes	2	No	2
260	No	3	No	3
261	Yes	3	Yes	3
263	Yes	3	Yes	3
264	Yes	3.5	No	0
265	Yes	2.5	Yes	1
266	Yes	3	No	1
267	Yes	4	Yes	3
268	No	2	No	1
269	Yes	3.5	Yes	2
270	No	3	No	1

(Table A.1 cotd)

271	Yes	3.5	No	2
272	Yes	3.5	No	1
273	Yes	2	No	2
274	Yes	1	Yes	3
275	Yes	2.5	No	0
276	Yes	3.5	Yes	0
277	Yes	3	No	2
279	Yes	1	No	2
280	No	4	No	0
281	Yes	3.5	Yes	1
282	Yes	3	Yes	2
283	Yes	3	No	0
301	Yes	2.5	No	1
302	No	2	Yes	2
303	Yes	3	Yes	2
304	Yes	0.5	No	2
305	Yes	4	No	2
306	No	2.5	No	2
307	Yes	4	No	1
308	Yes	4	Yes	3
309	Yes	2	No	2
310	Yes	3	No	2
311	No	2.5	Yes	0
312	No	2	No	3
313	Yes	3	Yes	1
314	Yes	3.5	Yes	4
315	Yes	0	Yes	2
316	Yes	2	Yes	1
317	No	2	No	2
318	No	1.5	No	1
351	Yes	2.5	Yes	3
352	No	2.5	Yes	2
353	Yes	4	No	1
354	Yes	3	No	2
355	No	4	Yes	1
356	Yes	1	No	0
357	Yes	2	No	3
358	No	3.5	No	2
359	Yes	2	Yes	2
360	Yes	3	No	2
361	Yes	2.5	No	1
362	No	2.5	No	1

(Table A.1 cotd)

363	No	1.5	No	2
364	No	3	No	2
366	Yes	3	Yes	4
367	Yes	3	No	2
368	Yes	3	Yes	1
475	Yes	3	No	0
476	Yes	2	Yes	3
477	Yes	1.5	Yes	2
478	No	0.5	No	2
480	Yes	2.5	Yes	3
481	Yes	4	Yes	1
482	Yes	2	Yes	1
483	No	1	No	1
485	Yes	4	Yes	2
486	No	2.5	No	2
487	No	3	No	1
489	No	3	No	0
490	No	2	No	3
491	No	1.5	No	1

Table A.2 Experiment 3: Spurious Factors (Individual)				
Subject	**Endorsed Color as Relevant Factor (Explicit)**	**Number of Spurious Factors Endorsed (Explicit)**	**Chose Based on Color (Regression)**	**Total Spurious Rules used for Choice (Regression)**
501	Yes	2	Yes	0
502	No	1	No	0
503	Yes	1.5	Yes	0
504	Yes	2.5	Yes	2
505	Yes	0.5	Yes	0
506	Yes	2.5	Yes	1
507	Yes	2	Yes	1
508	Yes	2	Yes	1
510	Yes	2.5	Yes	0
511	Yes	2	Yes	1
512	Yes	3.5	Yes	2
513	No	3	No	2
514	No	2	Yes	1
515	No	1	No	0
516	Yes	0	Yes	0
517	Yes	0.5	Yes	1
518	Yes	3	No	1
519	Yes	2.5	Yes	1
520	No	4	No	0
521	No	3.5	No	1
522	Yes	2	No	1
523	Yes	3	Yes	0
524	No	0.5	Yes	0
525	No	1	Yes	2
526	No	1	Yes	0
529	No	0.5	Yes	0
530	Yes	1.5	Yes	0
531	Yes	2.5	No	0
532	Yes	3	Yes	1
554	Yes	1	Yes	1
555	No	3	No	1
556	Yes	3.5	No	2
557	No	1.5	No	0
558	Yes	1.5	Yes	1
559	No	1.5	No	0
560	Yes	0	Yes	0
561	Yes	0.5	No	0
562	Yes	3	Yes	0

(Table A.2 cotd)

564	Yes	3.5	Yes	0
565	Yes	2	Yes	2
566	Yes	2.5	No	1
567	Yes	3	Yes	1
568	Yes	2	Yes	1
569	No	2	No	2
601	Yes	1	Yes	0
602	Yes	3	Yes	2
603	Yes	4	Yes	2
604	Yes	0.5	Yes	0
605	No	3	Yes	2
606	Yes	0	Yes	0
607	Yes	1.5	Yes	0
608	Yes	1	No	3
609	No	1	Yes	3
610	Yes	2.5	Yes	3
611	No	2	No	1
612	Yes	3	Yes	2
613	Yes	2.5	Yes	2
614	Yes	3	Yes	0
615	No	2.5	No	0
616	Yes	3.5	Yes	2
617	No	3	No	1
618	No	3	No	1
619	Yes	3.5	Yes	2
620	Yes	4	No	2
621	Yes	2.5	Yes	0
623	Yes	2.5	Yes	1
624	No	4	No	0
627	No	3.5	No	2
628	No	1.5	No	1
629	Yes	2.5	Yes	1
630	No	3	No	2
631	Yes	2	Yes	1
655	Yes	1.5	Yes	0
656	Yes	2.5	Yes	0
657	No	0.5	No	2
658	No	3	No	0
659	Yes	0.5	Yes	0
662	Yes	2	Yes	0
663	No	3	Yes	1
664	No	3	No	2

(Table A.2 cotd)

665	Yes	3.5	No	0
666	Yes	2.5	Yes	0
667	Yes	3.5	Yes	0
669	Yes	2.5	Yes	3
670	Yes	2	Yes	0
671	Yes	2	Yes	3
672	Yes	3.5	Yes	1
673	Yes	3	Yes	1
674	Yes	2	Yes	2
675	Yes	1.5	Yes	1
701	Yes	1.5	Yes	1
702	Yes	1.5	Yes	2
703	Yes	0.5	Yes	0
704	Yes	2.5	Yes	1
705	No	1	No	1
706	Yes	3.5	Yes	2
707	No	1.5	Yes	1
708	Yes	2.5	Yes	0
709	Yes	3.5	Yes	2
710	No	3.5	Yes	4
711	Yes	1	Yes	1
712				
713	Yes	1.5	Yes	0
714	Yes	3.5	Yes	2
715	No	1.5	No	2
716	Yes	4	Yes	0
728	Yes	3.5	Yes	1
729	Yes	2	Yes	1
730	No	2.5	No	1
731	No	3.5	No	0
732	Yes	3	Yes	3
733	Yes	1	Yes	1
734	No	0.5	Yes	0
754	Yes	1	Yes	1
755	Yes	2.5	Yes	2
756	No	0	No	0
757	No	1	Yes	0
759	Yes	3.5	No	3
760	Yes	4	Yes	0
761	Yes	2.5	Yes	1
762	Yes	2	Yes	1
763	Yes	1.5	Yes	1

(Table A.2 cotd)

764	Yes	3	Yes	1
766	No	3	No	3
767	Yes	2.5	Yes	2
768	Yes	3.5	Yes	1
801	No	1.5	No	1
802	Yes	2.5	Yes	1
803	Yes	3.5	No	1
804	Yes	4	No	3
805	Yes	2.5	Yes	2
806	No	2	Yes	2
807	Yes	2.5	Yes	3
808	Yes	3	Yes	0
809	No	3	No	2
810	Yes	0	Yes	0
811	No	1.5	No	1
812	Yes	2	No	2
813	Yes	3.5	Yes	3
814	No	4	Yes	3
815	Yes	0.5	Yes	2
816	Yes	1	Yes	3
817	Yes	3.5	Yes	1
818	Yes	0	Yes	1
819	No	3	No	1
821	Yes	2.5	Yes	0
822	Yes	4	Yes	2
824	Yes	3	No	3
825	Yes	4	No	3
826	Yes	2.5	Yes	2
827	Yes	3	Yes	1
828	Yes	2.5	No	1
829	No	0.5	No	0
835	No	2	No	0
836	Yes	1.5	No	1
837	Yes	2	Yes	2
838	No	2.5	Yes	1
854	No	2	No	1
855	Yes	1.5	No	2
856	No	1.5	Yes	2
857	Yes	0.5	No	3
859	No	1	No	0
860	Yes	2	No	1
861	Yes	2	Yes	2

(Table A.2 cotd)

862	Yes	2.5	No	4
863	No	1.5	No	0
864	Yes	3.5	Yes	1
865	Yes	1	No	2
866	No	3	Yes	2

APPENDIX B: PRESENTED MATERIALS

Appendix B.1 Verbal Instructions

"Welcome to Matchmaker. You are here to help two new clients find compatible matches. You will do this by seeing potential matches and testing to determine what each client's preferences are. Please pay careful attention to all on-screen instructions.

Please make sure your cell phone and any other devices are silent or turned off during the task. When you are ready to begin, press the 'B' key."

Appendix B.2 Client Pictures

Appendix B.3 Client Descriptions

Frank recently graduated from LSU with a degree in sports medicine. He now works at a local high school.

James just finished his degree in computer programming. He's currently employed as a designer for Nintendo.

Appendix B.4 Match Descriptions

Frank

Mary is an avid fan of LSU football. She's a 26 year old with long blond hair. She writes poetry in her spare time and likes going to bars.

Susan is an LSU cheerleader. She is 21 years old and an amateur singer. She has short brown hair. She does not like to drink.

Karen has season basketball tickets. Karen is 31 and likes to paint. She is a brunette. She has never consumed alcohol.

Lisa is the third generation of her family to play softball at LSU and a proud supporter of the Tigers. She has long brown hair and is 28 years old. She enjoys sketching when she isn't bar hopping.

James

Jenny considers herself a hardcore video gamer. She's a 25 year-old brunette. She doesn't drink but loves singing karaoke.

Heather is an avid player of first person shooter video games. She is a 27 year-old blond and likes to write in her spare time. She enjoys drinking with her friends.

Beth loves playing games on her xbox. She has long blond hair and enjoys classical music. She does not like to drink and she is 23 years

Nancy really enjoys playing World of Warcraft and other online games. She has short blond hair and is 31 years old. She enjoys painting in her spare time and is a wine enthusiast.

APPENDIX C: TEST MATERIALS

Appendix C.1 Hypothesis Test

For the following list, you will first rate the importance of each compatibility factor from 0 (Not Relevant at all) to 5 (Extremely Important) when making a match for **FRANK**. After that, mark which of the options **FRANK** prefers for any relevant factor.

FACTOR	IMPORTANCE (0-5)		BEST CHOICE FOR A MATCH
Entertainment Preference			**If ENTERTAINMENT PREFERENCE is relevant, which choice(s) does Frank like best?**
			Sports
			Video Games
			Movies
			Doesn't Matter
Age			**If AGE is relevant, which age range(s) does Frank like best?**
			21-24
			25-28
			29-32
			Doesn't Matter
Drinking Habits			**If DRINKING HABIT is relevant, does Frank like for the match to drink regularly?**
			Yes
			No
			Doesn't Matter
Hair Color			**If HAIR COLOR is relevant, which color does Frank like best?**
			Brown
			Blond
			Doesn't Matter
Artistic Hobby			**If ARTISTIC HOBBY is relevant, which choice does Frank like best?**
			Drawing
			Writing
			Music
			Doesn't Matter

For the following list, you will first rate the importance of each compatibility factor from 0 (Not Relevant at all) to 5 (Extremely Important) when making a match for **JAMES**. After that, mark which of the options **JAMES** prefers for any relevant factor.

FACTOR	IMPORTANCE (0-5)	BEST CHOICE FOR A MATCH	
Entertainment Preference		**If ENTERTAINMENT PREFERENCE is relevant, which choice(s) does James like best?**	
			Sports
			Video Games
			Movies
			Doesn't Matter
Age		**If AGE is relevant, which age range(s) does James like best?**	
			21-24
			25-28
			29-32
			Doesn't Matter
Drinking Habits		**If DRINKING HABIT is relevant, does James like for the match to drink regularly?**	
			Yes
			No
			Doesn't Matter
Hair Color		**If HAIR COLOR is relevant, which color does James like best?**	
			Brown
			Blond
			Doesn't Matter
Artistic Hobby		**If ARTISTIC HOBBY is relevant, which choice does James like best?**	
			Drawing
			Writing
			Music
			Doesn't Matter

PRESS **C** TO CONTINUE IN THE TASK WHEN YOU ARE DONE

Appendix C.2 System Knowledge Test

On this test, you will estimate the probability of a client liking a match for each choice. For each choice, give your estimate (from 0% to 100%) of how likely the client is to like a match with the listed quality.

Match Quality	**Frank**	**James**
Enjoys Sports		
Enjoys Video Games		
Enjoys Movies		
Has Blond Hair		
Has Brown Hair		
Likes to Drink		
Does Not Like to Drink		
Likes to Write		
Likes to Draw		
Likes Music		

Describe the best possible match for each client. Please try to print legibly.

Frank	
James	

PRESS **C** TO CONTINUE IN THE TASK WHEN YOU ARE DONE

VITA

Patrick Clinton Ledet completed his undergraduate degree in Psychology in 2004 with a Minor in Marine Biology. He presented a senior thesis examining relations between problem solving and dominance behavior in rats. He then worked as a behavior shaping specialist at the Peltier-Lawless Developmental Center until beginning graduate school at LSU in 2005. He completed a Masters in Psychology in 2008 before completing his Doctorate in 2013 under Robert Mathews, Ph.D. He also served as an adjunct instructor for Louisiana State University and Baton Rouge Community College during this time.

Dr. Ledet's research interests include cognitive biases, compulsive behaviors, skill and bias development through video games and similar electronic tools, problem solving, and the interaction of explicit and implicit cognitive processes.