Processing Fluency and Framing Effects on the Perceived Risk of Prescription Medications

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General-Experimental

by

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DEDICATION

This thesis is dedicated to:

My wonderful girlfriend, Karina and our amazing son, Oliver. This thesis could not have been completed without your love and support.
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I would like to thank my committee members who supported my efforts in writing this thesis.

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ABSTRACT

PROCESSING FLUENCY AND FRAMING EFFECTS ON THE PERCEIVED RISK OF PRESCRIPTION MEDICATIONS

by

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The purpose of this study was to examine

Prescription medication abuse has been on the rise in recent years. Keuhn (2006) found that although illicit drug abuse has decreased, prescription medication misuse has increased in adolescents and emerging adults and the CDC (2013) has found an increase in nonmedical use of prescription medications for peoples aged 12 and older. In the present studies, the role of processing fluency was used as a framework to explain this recent influx of prescription medication misuse. Study 1 was a replication of Alter and Oppenheimer (2006), where the relationship between the ease of pronunciation of real prescription medication names and the 2013 first quarter sales of prescription medications was assessed. Study 2 was a conceptual replication of Song and Schwarz (2009), in which differences in risk perception between the ease of pronunciation of novel prescription medication names. Study 1 yielded a positive relationship between the fluency of medication names and their sales figures, whereas Study 2 found no significant
difference between high and low fluency and risk perceptions of novel prescription medication names. Implications and limitations are discussed in the General Discussion.
INTRODUCTION

There has been a recent shift in drug abuse among youth in the United States. Illicit drug abuse is on the decline, with only 16% of high school students reporting use of illicit drugs in the last month of 2006, compared to nearly 20% in 2001 (Keuhn, 2006). But at the same time that illicit drug abuse has decreased, prescription drug abuse has slowly risen. In a longitudinal study, Keuhn (2006) found that nearly 10% of high school seniors have reported using hydrocodone and a little over 5% have admitted using oxycodone - both of which have increased since 2001. More recently, the National Survey of Drug use and Health (drugabuse.gov, 2013) has found that between 2008 and 2011 past year, and past month nonmedical use of prescription medications has increased for people 12 and older. Emerging adults had the most alarming change, with significant increases in lifetime, past year, and past month nonmedical use, all of which were the highest rates in the study (drugabuse.gov, 2013). The current paper examines the potential role of processing fluency, a metacognitive feeling, as a framework to explain this recent influx of prescription medication misuse.

Drug overdose rates have more than tripled since 1990, with more than 36,000 deaths in 2008, with most of the increase in deaths accounted for by prescription drug abuse (CDC, 2011). This correlates with an increase in the amount of prescription drugs sold to pharmacies, hospitals, and doctors, which was four times higher in 2010 than in 1990 (CDC, 2011). The most frequently abused prescription drugs are painkillers (e.g., Hydrocodone and Oxycodone), which were responsible for more deaths from overdose than cocaine and heroin combined in 2008 (CDC, 2011). CNS depressants (e.g., Valium and Xanax) and stimulants (e.g., Adderall and Ritalin) are also highly abused and pose
the dangers of dependence and overdose (NIDA, 2009). The groups of people most likely to be affected by the increase in overdose deaths from prescription medications are adolescents and emerging adults. Nearly one-third of people 12 and older who used drugs for the first time began by using prescription drugs (SAMHSA, 2010). It is important to consider the factors underlying these trends.

Over the years, raising trends of alcohol use and marijuana use among teens have been attributed to lower levels of perceived threat. Chomynova, Miller, and Beck (2009) found that perceived threat was greater for abstainers, experimental drinkers and illicit drug users than it was for experienced alcohol and illicit drug users. When people have experience misusing a substance (such as alcohol), they are more likely to view it as less risky, regardless of negative side effects they may have experienced (Boys et al., 1999). Decreases in perceived harmfulness among high school students have been correlated with increases in annual marijuana use in the 1990’s (Bachman et al., 1998). Through a survey on a social network website, college students were found to have the belief that prescription drugs were safer than the use of illicit drugs and that misuse was less physically harmful than the use of illicit drugs (Lord, Brevard, & Budman, 2011). They also believed that they were more socially acceptable and less addictive than illicit drugs, and that they would encounter fewer legal repercussions than if they used illicit drugs (Lord et al., 2011). A longitudinal study assessing how personality and sensation-seeking related to risk perceptions of prescription medications found that low perceived harmfulness of prescription medications predicted non-medical use, especially among college students who were high in sensation-seeking behaviors (Arria et al., 2008). Personality and sensation-seeking at the beginning of the study were both correlated with
nonmedical use in the next twelve months as measured at the final time point in the study, but were mediated by perceived harmfulness of nonmedical use of prescription drugs. Friedman (2006) found that students believed that because prescription drugs have been approved for medical use, they are inherently “safer” than illicit drugs. The two most common causes attributed to the lower perceived risk of prescription medications are prior use (Slovic et al., 2007) and the belief that they are safer because they are prescribed by a medical doctor (Friedman, 2006), but these only explain part of the variation in perceived risk of prescription medications. It is important to know what else can be affecting the risk perceptions of prescription medications, especially in adolescents and emerging adults.

Risk Perception

Early research in risk perception has led to a theoretical framework for studying perceptions of risk that we use today. The psychometric paradigm allows researchers to assess perceptions of risk using a variety of psychometric scaling methods to produce quantitative measures of perceived risk, as well as various other aspects of perceptions. Early studies have utilized magnitude estimation techniques (Stevens, 1958) which had people rate how frequently they thought various risks would occur. Fischhoff and colleagues (1978) were able to show that risk was negatively correlated with benefit when subjects were rating nine different descriptive attributes of risk, finding risk to be more acceptable when more benefits were perceived. Over the years, many other studies have demonstrated the validity of assessing risk using quantitative measures and the use of the psychometric paradigm (Slovic, 2000). Studies using the psychometric paradigm have also shifted their focus in theoretical underpinnings of risk as well.
Research on the perceptions of risk has undergone many changes since early examinations of the concept in psychology (e.g., Slovic, Lichtenstein, & Edwards, 1965). Initially, researchers looked into what is now known as “normative models” or descriptive theories of risk perception. These models looked to describe rational decision making through various methods. One of the earlier methods was through the Expected Utility Theory (EUT). This theory posits that risky decision making is like a gamble in which people try to make what is considered as the “best bet” in a particular situation (Slovic, 2000). EUT was initially conceived by Daniel Bernoulli in 1738, though then it was known as moral expectation. His equations determined which decision was the “best bet” by measuring which choice maximized the expected utility of a decision. His equations take into account the probability of each outcome and determine how useful each of the potential outcomes would be. Slovic (2000) provides an example of what the expected utility of bringing an umbrella on a day that has .40 probability of rain (.60 probability of sunshine). This yields to leaving the umbrella at home to have a higher expected utility than taking it with you, suggesting people would be better off without an umbrella on a day where there is a 40 percent chance of rain. This has also been found useful in determining whether people should follow other risk warnings such as listening to flood warnings (Harding & Parker, 1974) and protecting orange groves against frost in Florida (Ward, 1974).

Recently, researchers of risk perception have noted that people make many deviations from normative models. If looking at risk perception under the lens of the normative models, it would seem as though humans are mostly irrational, often making choices with less than desirable outcomes (Slovic et al., 2004). Up until recently,
normative model researchers assumed that if people used emotions or affect in their perceptions of risk, they were considered irrational. Research in heuristics has challenged that notion. Simon (1959), who is credited with discovering heuristics, critiqued EUT because it posits that a person knows all possible outcomes. He proposed the concept of “bounded rationality,” which states that each person creates a simplified model of the world to deal with it. The key distinction between these two theories is that where EUT gives the maximized utility, the bounded rationality model states that people strive for a satisfactory level of utility, not necessarily maximized. Examples of bounded rationality have been found in business organizations (Cyert & March, 1963) and government policy (Lindblom, 1964).

Since Simon first proposed his bounded rationality model, research in heuristics expanded tremendously with the work of Tversky and Kahneman. Their earliest research involved the formal description and definition of cognitive biases called heuristics; simple, efficient, and often non-conscious rules that help explain judgments and decision. Through early studies, they discovered that people rely more on specific information about the event than they do for known probabilities, or base rates, of an event to occur and fail to understand regression to the mean (Tversky & Kahneman, 1973). The availability heuristic (Tversky & Kahneman, 1973), one of the first heuristics identified, is when people make judgments about the probability of an event by how easily an example of that event comes to mind. Typically, this is a valid form of risk assessment; events that occur more often come to mind more readily. However, the availability of an event is also affected by how recently one has come into contact with the event and any emotional attachment to this event (Slovic, 2000; Tversky & Kahneman, 1973). One
example deals with the frequency of home foreclosures. After seeing a newspaper article on recent homes being foreclosed upon, people tend to think these foreclosures are happening more frequently because they are readily available to them (Tverksy & Kahneman, 1973). According to the availability heuristic, anything that makes the occurrence of an event easier to imagine or recall will make frequency judgments increase.

Framing effects (Tversky & Kahneman, 1981) have also shown to have a large effect on how people make judgments about risk. When the phrasing of a hypothetical life and death situation was altered, it changed which statement they preferred. Participants were asked to choose between two treatments for 600 people affected by a deadly disease. In the gain frame condition, treatment A was said to save 200 lives whereas treatment B stated there was a 33 percent chance of saving all 600 people and a 66 percent chance of saving nobody. In the loss frame condition, treatment A said 400 people would die and treatment B said there was a 33 percent chance that no people will die and a 66 percent chance that all 600 people would die. It is important to note that in both negative and positive framing conditions, Treatment A resulted in the same amount of lives saved and lives lost, as did treatment B. Participants in the positive frame condition were more likely to choose treatment A than treatment B and participants in the negative frame condition were more likely to choose treatment B. When the frame of a situation is that of a gain, people are less likely to take a risk, and conversely, when the framing of a situation is that of a loss, people are more likely to choose a riskier treatment (Tversky & Kahneman, 1981). This effect has also been demonstrated by Gatcher and colleagues (2009), who found that a majority of PhD students would register early for
classes when a penalty fee for late registration was emphasized, while significantly fewer would do so when it was framed as a discount for earlier registration classes.

Later researchers began looking into how affect affects our judgments and decisions, especially in the field of risk perception. Thus far, researchers have focused more on rational decision making, trying to downplay the role of affect (Slovic, 2000). Conversely, Zajonc (1980) argued that all first reactions are driven by affect, occurring automatically and driving how we process information and the judgments people make. This led researchers to examine the role played by affect in various aspects of judgment and decision making. Finucane and colleagues (2000) found that people rely on affect when judging the risk and benefits of specific hazards. Manipulating whether participants received information about nuclear power that was positive or negative, affect congruent with the message was achieved and participants rated the nuclear plant described positively as less risky. This study provided evidence for a new heuristic called the “affective heuristic” (Finucane et al., 2000). The affective heuristic posits that representations of events in people’s minds contain varying degrees of affect and are subject to bias. There has been other heuristics dealing with emotions recently studied that have been shown to affect our judgments and decision-making as well. Research into meta-cognitive feelings, specifically a new heuristic known as “processing fluency” has been shown to have large effects on human judgments and perceptions of risk.

**Processing Fluency**

Oppenheimer and Frank (2007) found that processing fluency appears to be used as one of several heuristic cues for categorization. Feelings of fluency depend on the ease with which a person processes a target stimulus (Schwarz et al., 1991). There are many
different ways to increase the fluency of a stimulus. The mere exposure effect (Zajonc, 1968; Bornstein, 1989), which has been demonstrated to increase ratings of liking towards a specific stimulus that was previously neutral when the exposure of it is repeated, has been described as a type of fluency. Reber, Winkielman and Schwarz (1998) manipulated fluency by presenting participants with a prime that either matched or did not match a circle shown on a particular background. When matched, participants rated the circle as prettier and reacted to it quicker than if it did not match the circle. In another study, Reber and colleagues (1998) also found that participants liked high contrast (black words on a white screen) stimuli more than low contrast stimuli (brown words on a black screen). High contrast stimuli demand less cognitive effort to read and are thus processed more fluently. In addition, they found perceptual fluency to be affectively positive, meaning that fluency increases the liking of a stimulus, even if its initial ratings of liking were low.

Numerous studies have shown how printed font can affect information processing. When instructions of a task are difficult to read, that task is perceived as more difficult to do than if the instructions were easy to read (Song & Schwarz, 2008). Participants were given a set of instructions for an exercise routine that were either in an easy-to-read font or a difficult-to-read font and were asked to rate how difficult they felt the routine would be for themselves and other people. Participants who read instructions that were presented in an easy-to-read font misattributed the ease of processing the information for how easy the task was to do, rating the exercise routine as less difficult then when it was presented in a difficult-to-read font (Song & Schwarz, 2008). As information becomes easier to process, it will elicit more perceived liking of a stimulus,
and permit its efficient recall (Song & Schwarz, 2008; Reber et al., 1998; Zajonc, 1968; Bornstein, 1989; Collins & Loftus, 1975).

Fluency has other effects beyond increasing liking of a stimulus. Oppenheimer and Frank (2007) manipulated the font of different exemplars of categories (e.g., a raven is a bird) and had participants rate typicality. They found that when the exemplar was in a difficult-to-read font, it was rated to be a worse fit for the category than if it was in an easy-to-read font. Purchasing decisions are also affected by fluency. Participants were asked whether they would prefer to upgrade a car with extra features (e.g., leather seats, GPS) that would cost more. They were either primed with the phrase “customization made easy” or with the name of a fictitious car company and asked whether they would like to upgrade to one of the features. When primed with the phrase “customization made easy,” participants were more willing to upgrade than when they were not primed with the word easy. When a feature decision is met with unexpected ease, people like the feature they were rating better and were more likely to spend money to upgrade to it (Wilcox & Song, 2011).

Judgments of truth have also been shown to be affected by fluency (Reber & Schwarz, 1999). Participants were given statements in the form of “City A is in Country B” (e.g., New York City is in the United States) that were presented in two ways: with colors that contrasted greatly with the white background and with colors that had little contrast with the white background. Participants rated the high-contrast statements (that were easier to see) as more true, regardless of the actual truth of the statements. Research has also shown that when the fluency for a stimulus is increased, it is viewed as more familiar, even if it is novel (Kelley & Jacoby, 1998; Whittlesea, 1993; Whittlesea et al.,
Fluency has also been shown to affect perceived risk. When stimuli are considered familiar (by fluency or previous exposure), they are considered safe (Zajonc, 1980). Song and Schwarz (2009) demonstrated that the fluency of a product’s name can affect the degree to which it is perceived as threatening. Participants read different food additives and rated how dangerous or safe they felt the food additive was. Participants with hard-to-pronounce food additives rated the foods as more dangerous than those with easy-to-pronounce food additives. In their second study, Song and Schwarz (2009) had participants rate the names of rollercoaster rides (some of which were easy and some of which were difficult to pronounce) on how likely the ride would be to make them feel sick (negative risk frame) or how adventurous it was (positive risk frame). They were then asked how desirable it would be to ride the rollercoaster. Participants rated rollercoaster rides as more risky when they had names that were more difficult to pronounce, regardless of whether the risk was framed positively or negatively. Participants rated the riskier ride as more desirable than the less risky ride in the adventure condition. Conversely, in the negative risk frame condition, participants rated the less risky ride as more desirable than the riskier ride, suggesting that processing fluency affects judgments of risk regardless of frame.

In three studies, Alter and Oppenheimer (2006) found in that new stocks benefited significantly when the stock name was easy to pronounce, at least after their first day on the market. In an experimental study, participants predicted that easier-to-pronounce stock names would do better than difficult-to-pronounce stock names. In Study 2 participants rated the ease of pronunciation of various companies and found that the easier the name of the company was to pronounce, the more of an early boost in sales it
experienced. The third study had two independent coders rate how easy the ticker names on the New York Stock Exchange were to pronounce and found that the easier-to-pronounce ticker names experienced a boost in stock share prices.

The present set of studies assess the effect of processing fluency on perceptions of prescription medications. Study 1 was a conceptual replication of Alter and Oppenheimer (2006) in which a real world relationship between the fluency of prescription medication names and sales figures was assessed. The relationship between processing fluency and abuse rates of prescription medications was also analyzed. Study 2 was a conceptual replication of Song and Schwarz (2009) in which the fluency of novel medication names was manipulated and perceptions of risk were measured.
METHOD

Study 1

Study 1 was conducted to assess the real-world relationships between processing fluency and two major concerns with prescription medications in the U.S.: sales and abuse rates. Alter and Oppenheimer (2006) found that for newly created stocks, those with more fluent stock names had greater first month sales than those with more disfluent stock names. A parallel effect is hypothesized for prescription medications; the ease of pronunciation of a prescription medication name should be positively related to the sales figures of the medications. Likewise, it was hypothesized that ease of pronunciation should be related to the abuse rates of the prescription medications after controlling for the sales figures.

Participants. Participants were recruited from Amazon’s Mechanical Turk (MTurk) and were compensated $0.20 upon completion of the study. One hundred and one participants were recruited; one was excluded from this analysis because questions were left blank, which made the final sample size 100. They ranged from 18 to 65 years old (M = 32.13, SD = 11.06) and were predominantly women (54.5%). A majority of the participants had at least some college education (81.2%) and were primarily White (73.3%). The participants were demographically similar to most MTurk samples: 64.85% women and between the ages of 18 and 81 years of age (M<sub>age</sub> = 36 years old), which is slightly younger than the U.S. population as a whole and the population of Internet workers (Paolacci, Chandler, & Iperiotis, 2010).

Measure. Prescription medication names were chosen from a list of the top selling medications during the first quarter of the year 2013. The website
www.drugs.com (2013) was accessed; the top 30 names from the sales list of the first quarter of 2013 were chosen and their sales figures were recorded. Fourteen prescription medications with their rank ordered abuse rates and their 2011 sales figures were recorded from Genetic Engineering and Biotechnology News (2012). For a list of the prescription medication names used in the study and their average ratings of fluency, see Appendix A. A total of 43 prescription medication names were chosen for this study.

**Procedure.** Participants were directed to the study from Amazon’s MTurk website. Participants were first presented with an informed consent form (Appendix B). They were then given background information about the study (see Appendix C) and instructed that they would be reading 43 different statements and answering them on two different dimensions. After each prescription medication name, participants were asked to rate its ease of pronunciation on a 1 (very difficult) to 10 (very easy) Likert-type scale. They were also asked to rate how believable each prescription medication name was on a 1 (unbelievable) to 10 (believable) Likert-type scale. Afterward, participants were directed towards a demographics page (see Appendix D). The procedure took approximately ten to fifteen minutes to complete.

**Pilot Study**

To address some of the weaknesses the previous study, a lab experiment was conducted, using novel prescription medication names. Study 2a pilot tested these names on measures of fluency and believability and Study 2b used the pilot tested medication names in an experimental manipulation.

Novel prescription medication names were generated by a research assistant who held a M. A. degree in English. Fifty-six names were generated, all of which contained
three syllables. Names with three syllables were chosen because a majority of the most prescribed prescription medications contained only three syllables (see Appendix E). This was kept constant across all drugs used in the study to avoid a potential confound.

Participants rated each name on two questions using slider scales: how difficult the name was to pronounce (0 = very difficult, 100 = very easy) and how believable the product name was as a prescription medication (0 = very unbelievable, 100 = very believable). The goal of this pretest was to determine which novel prescription medication names would 1) be appropriate for use in the high and low fluency condition and 2) would be believable as prescription medication names. Therefore, only the names that received believability ratings over 50 were considered. Participants were recruited from Amazon’s Mechanical Turk (MTurk) and were awarded $0.12 upon completion of the study. In total, 40 participants were recruited for the 20 minute pilot test. Eight novel prescription medication names were chosen. The high fluency names chosen were Inovex, Sotivan, Avazine, and Weltovan (see Appendix F for descriptive statistics); the low fluency names chosen were Xantramin, Hythazol, Quixotine, and Xytavine (see Appendix G for descriptive statistics).

A paired samples t-test found that the high fluency names ($M = 76.69, SD = 11.04$) were significantly more fluent than the low fluency names ($M = 47.15, SD = 19.55$), $t(35) = 10.955, p < .001$. The difference between believability between high fluency names ($M = 62.47, SD = 18.95$) and low fluency names ($M = 56.06, SD = 22.14$) was not statistically significant, $t(35) = 2.01, p = .051$ suggesting that the groups differed only marginally on how believable they were as prescription medications.

**Study 2**
Study 2b was a conceptual replication of Song and Schwarz (2009), in which processing fluency was manipulated and perceptions of risk and desirability were measured. This study revealed that when names of products (e.g., food additives and roller coaster rides) were disfluent (difficult to pronounce), they were rated as riskier than if they were fluent (easy to pronounce), and that desirability of the product was moderated by fluency. Extending these findings to the current study, prescription medication misuse, ease with which prescription medication names are pronounced will be misattributed to the level of risk of taking the prescription medication. Song and Schwarz (2009) also found that participants rated riskier rides as more desirable when in a positive frame condition and less desirable when in a negative frame condition. Extending from this finding, desirability to try prescription medications should be moderated by the framing of the medication, with medications used for health effects being more desirable when the name is easy to pronounce.

**Participants.** Participants were recruited from Amazon’s Mechanical Turk (MTurk) and compensated $0.20 upon completion. They ranged from 18-63 years old ($M = 32.54, \ SD = 10.33$) and roughly 53% were female. The sample was predominantly Caucasian (76%) with most participants holding a bachelor’s degree or higher (59%). Eighty-eight percent of participants reported using prescription medications for their prescribed purposes in the past, and roughly 35% reported past misuse of prescription medications. Of the 244 participants initially recruited, 15 were excluded from the study. One participant was excluded for guessing the hypothesis and another was excluded for admitting that they did not pay attention during the study. Nine participants were excluded for being multivariate outliers, exceeding a Mahalanobis distance of 51.18 ($df =$
24), and one more participant was excluded for being a univariate outlier. An additional three participants were excluded for being non-native English speakers. In total, 6% of the participants were excluded from the analysis, yielding a final sample of 229 participants.

**Procedure.** Study 2 had a 2 (Fluency) by 2 (Frame) mixed design, with fluency being a within-subjects variable and frame being a between-subjects variable. Each participant saw eight different prescription medication names; four were fluent and four were disfluent. Each novel medication name was paired with an intended effect and an unintended effect. The combinations of intended and unintended effects were randomly assigned to each participant (e.g., Inovex/Gesponel: This drug is intended to treat high levels of anxiety, but also induces feelings of relaxation). Following each phrase were three questions that assessed the medication’s risk, benefits, and desirability on 100-point slider scales.

Participants were directed to the study from a list of studies on www.mturk.com, which was hosted on www.qualtrics.com. Participants first gave informed consent to participate in the study, and then read a passage to put the study in context (See Appendix H). Following this passage was the manipulation, in which participants were randomly assigned to answer the questions that followed as if they were someone seeking either the health effects or recreational effects of the prescription medications (See Appendix I). In order to control for a confounding effect of medication names with intended/unintended effects, the phrases were randomized to each prescription medication name, with each phrase being paired with an easy-to-pronounce drug and a difficult-to-pronounce drug. A Latin-Square design was used to combine intended and unintended effects. A Latin-Square design was used to combine intended and unintended effects. A Latin-
square design is a fractional factorial design that is used when all combinations in a factorial design are not feasible (Winer, 1962). The intended and unintended effects were randomly paired together four separate times to create unique pairings in four different conditions. These phrases were then randomly assigned to each of the prescription medication names. Four additional conditions were created in order to have each phrase represented in both high and low fluency prescription names (see Appendix J for examples of statements). In total, sixteen different conditions were created, eight in each level of the frame. Participants then took a short personality measure (Appendix K: the BFI-10; Rammstedt and John, 2007) and the Brief Sensation Seeking Scale 4-item (Appendix K: BSSS-4; Stephenson, Hoyle, Palmgreen, & Slater, 2003). This was done to control for individual differences in perceptions of risk due to personality types (Schaninger, 1976; Stephenson, Hoyle, Palmgreen, & Slater, 2003). Participants were then directed to the same demographics page as in Study 1 (see Appendix B). Next, participants were directed to a manipulation check where they were presented with all eight of the previous prescription medication names, plus two previously unseen prescription medication names. They were asked to choose the two medication names they had not previously seen and then rate how difficult they felt this task was. Finally, participants were shown a debriefing page informing them of the manipulation and that all of the prescription medication names used in the study were created for the purpose of the study (see Appendix L).
RESULTS

Study 1

Results. In order to compute the correlations, the average fluency score for each medication name was used. A Pearson correlation between fluency and sales figures and a Spearman’s Rho correlation between fluency and abuse rankings were then computed.

The first Pearson correlation was computed between the 2013 first quarter sales and the fluency of the prescription medication names. A moderate relationship was found, $r(28) = .517, p = .003, r^2 = .27$, with higher average ratings of fluency being related to higher sales figures. Next, the Spearman’s Rho correlation between processing fluency and the rank ordered abuse rates was analyzed. The Spearman’s rho correlation between fluency and abuse ranking was $\rho(12) = .191, p = .513$, with higher fluency associated with a slightly higher abuse rate.

Discussion. The results from Study 1 were consistent with previous research. The correlation between fluency and first quarter 2013 sales was statistically significant in the hypothesized direction. The correlation between fluency and abuse rate was not significant, though it was in the predicted direction. As in Alter and Oppenheimer (2006), fluency positively related to sales figures of prescription medications, although the relationship found was stronger. Whereas Alter and Oppenheimer (2006) used two independent coders to rate the ease of pronunciation of the stock ticker names, the present study used the average ratings of fluency from a larger number of participants. Because using a large random sample of participants is more representative of the population, the relationship between fluency and sales figures may be even stronger than was found for stock prices. The relationship between fluency and abuse rate found in this study should
not necessarily be taken as evidence that no relationship exists. Upon further analysis of
the data, there was a ceiling effect, with none of the prescription medication names
receiving a fluency ranking below (or near) the midpoint. Processing fluency theory
would predict that the most abused medications would have the easier-to-pronounce
names. If this relationship does exist, the range of variability needed to find it was
severely truncated by using only the extreme scores. The measure used for abuse rating
was also rank ordered, losing the variability that would be found in a continuous variable.
A better measure of abuse rates should be utilized in future studies; for example, one that
is obtained from a government agency (e.g., National Institute of Health), as well as a
wider range of medications.

Moreover, using real prescription medication names in the experiment left a
natural confound with processing fluency. The mere exposure effect (Zajonc, 1968)
states that the more contact with a stimuli a person has, the more familiar it becomes.
This familiarity has been linked to increases in liking and decreases in perceptions of risk
(Song & Schwarz, 2009), and increases in processing fluency (Alter & Oppenheimer,
2009). Since prescription medications are advertised through all forms of media, it would
be impossible to know whether participants had previously been exposed to each
medication.

Study 2

Results. Before the variables were created for the final analysis, the reliabilities of
each question within each level of fluency were assessed. To create the measure of risk
for high fluency, the scores for the risk and the benefits questions of Avazine, Weltovan,
and Sotivan were averaged together ($\alpha = .756$). Likewise, the measure of risk for low
fluency medication names was the average between Xytavine, Lavlizine, and Hythazol ($\alpha = .754$). The same process was used to create the variable from scores for desirability of the drug for high ($\alpha = .432$) and low ($\alpha = .431$) fluency. Although the reliability of desirability was problematically low, there was no other way to analyze the effects of fluency. Because of the low reliability of the desirability question, any interpretations of the results using this variable should be taken with caution.

The perceived risks and benefits composite variable was assessed using a 2 (Frame) by 2 (Fluency) Mixed ANCOVA, with previous prescription medication misuse being the covariate. Previous research has found that prior prescription medication misuse is a significant predictor of how risky people find prescription medications (Chomynova, Miller, & Beck, 2009; Bachman et al., 1998). The mixed ANCOVA revealed that the difference between high fluency drug names ($M = 42.111, SD = 15.39$) and low fluency drug names ($M = 41.90, SD = 15.49$) was not statistically significant, $F(1,226) = .958, p = .329, \eta^2 = .004$. The difference between the health effects ($M = 41.27, SD = 14.99, n = 115$) and the recreational effects ($M = 42.75, SD = 14.99, n = 114$) frames was not statistically significant, $F(1, 226) = .611, p = .435, \eta^2 = .003$. The interaction between frame and fluency was not statistically significant, $F(1,226) = .04, p = .841, \eta^2 < .003$, nor was the covariate itself statistically significant, $F(1,226) = .083, p = .773, \eta^2 < .001$.

To assess the desirability variable, another 2 (Frame) by 2 (Fluency) mixed ANCOVA was conducted. The Mixed ANCOVA found that, when controlling for prior prescription medication misuse, the difference between high ($M = 73.04, SD = 14.53$) and

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1 When the covariate was removed from the model, the main effect of fluency was not significant, $F(1,227) = .069, p = .794, \eta^2 < .001$. 

---
low \((M = 72.05, SD = 15.49)\) fluency on average desirability of taking the medication was not statistically significant, \(F(1, 226) = .42, p = .52, \eta^2 = .002\). The difference between the health \((M = 72.26, SD = 15.12, n = 115)\) and recreational \((M = 72.84, SD = 15.12, n = 114)\) frames was also not statistically significant, \(F(1, 226) = .099, p = .753, \eta^2 < .001\), nor was the interaction between frame and drug, \(F(1,226) = .04, p = .835, \eta^2 < .001\). The covariate, previous misuse of prescription medications, was also not statistically significant in this analysis, \(F(1,226) = 2.566, p = .11, \eta^2 = .01\).²

**Discussion** Results indicate that fluency did not affect the perceptions of risk of prescription medications. These findings are inconsistent with previous research in processing fluency - specifically the Song and Schwarz (2009) study, in which high fluency was associated with lower scores of risk perception. The lack of difference between the frames could potentially be explained by the wording of the questions. In Song and Schwarz’s (2009) study, different questions for the positive and negative framing of the rollercoaster rides were used. This study asked participants directly how risky a drug was, which could have led participants to think negatively about the side-effects of the medication. Future studies may want to ask questions specific to health risks and recreational risks.

Finally, when evaluating the desirability of each medication name, there were no significant effects. Previous research from Song and Schwarz (2009) found a moderated effect between fluency and preference of rollercoaster ride. When there was a positive frame of the ride, participants preferred rides with low fluency names, whereas when the rides were framed negatively, participants preferred rides with high fluency names. In the

² When the covariate was left out of the analysis, the interaction between fluency and frame was still not significant, \(F(1, 227) = .079, p = .78\).
current study, it was expected that participants would find the high fluency names more
desirable in the health frame and the low fluency names more desirable in the recreational
effects frame. This finding was inconsistent with previous research. With the low
reliability of this variable, these results should be taken with extreme care.
GENERAL DISCUSSION

In Study 1, the relationship between processing fluency and prescription medication sales was in the hypothesized direction. Fluency and prescription medication abuse rates were in the predicted direction, but the relationship was not statistically significant. Study 2 found that the difference between high and low fluent novel medication names was not significant, even after controlling for prior prescription medication misuse. The anticipated interaction between level of fluency on the health and recreational effects frame for desirability to take the medication was not significant.

Extensive research in processing fluency has found consistent results in how fluency relates to perceptions of risks (Song & Schwarz. 2009), familiarity (Zajonc, 1968), sales figures (Alter & Oppenheimer, 2006) and various other judgments. Alter and Oppenheimer (2006) found that the sales figures of stocks were related to how easy company names and stock ticker names were to pronounce. Song and Schwarz (2009) found fluency to have a strong effect on the ratings of risks and an interaction between fluency and desirability. If fluency does affect risk perceptions of prescription medications, similar results should have been found. Results from the present study are inconclusive with regards to the effect of processing fluency on risk perceptions of prescription medications. The effect processing of fluency on sales figures, however, was clear, and stronger than found in previous studies (Alter & Oppenheimer, 2006).

Study 1 yielded a relationship between fluency and sales figures much stronger than that found by Alter and Oppenheimer (2006), providing evidence of a real world relationship between the fluency of medication names and their sales figures. The lack of relationship found between fluency and prescription medication abuse rates should not be
taken as evidence of the absence of a real world relationship. Picking extreme values can lead to a homogenous subset of the real population (Shaddish, Cook, & Campell, 2002), truncating the range of variability and eliminating any chance of a real relationship being found. When assessing the means of pronunciation between the top selling prescription medications, they were all found to be rated as easy to pronounce, perhaps not providing enough variability in fluency. A larger list of prescription medication names, including those that are not the most abused, would be needed to assess a real-world connection between processing fluency and prescription medications. Moreover, the rank ordered data may not have been an ideal accurate measure of abuse rates. The only data readily available were rank ordered data of the top abused prescription medications. Again, using extreme cases could have yielded a homogenous subset of participants, with regards to the scores on fluency. The abuse rates of all the medications, with information from a government agency (e.g. CDC, NIH), would be necessary to determine the real-world connection between fluency and abuse rates of prescription medications.

The results from Study 2 also need to be interpreted cautiously. A replication of this study would be necessary to make any generalizable claims. Such a replication should contain methodological refinements. For example, questions about risk specifically geared towards each of the frames (health and recreational) should be utilized. The current wording of the questions did not parallel those used in Song and Schwarz (2009), potentially explaining why the main effects of fluency and the interaction between fluency and frame were not found. The present study asked participants about how risky they felt the medication was, with no information about specific risks that can be experienced. This can be misleading, as risk is usually thought
of as negative. Future studies should try to parallel Song and Schwarz (2009) more carefully, providing participants with more direct information about risks. Instead of setting participants up with a frame, each question could be geared towards a different framing of a negative or positive type of risk (e.g., How likely is it to become addicted to this medication?, How likely is it that this medication would stop a severe cough?).

The very low reliability of the desirability question was troubling and suggests that a different question be used to measure this construct. As with the risk question above, the desirability question was not direct enough for participants to answer in a meaningful way. Future studies should use a different conceptualization of this question, possibly asking the question congruent with a frame (e.g., “How likely are you to take this medication for a severe cough?” Or “How likely are you to take this medication to increase fun at a party?”).

Upon further analysis of the data, it is possible that the low fluency medication names were not believable enough as prescription medication names. Results from the pretest (Study 2a) revealed all of the medication names to have an average believability score above the midpoint, though the differences between average believability of the high and low fluency medication names was marginally significant. This marginal difference could explain the results and need to be addressed before any decision is made on the relationship between processing fluency and risk perception of prescription medications.

The overall results of this study are inconclusive. The results in Study 1 found a strong, significant relationship between fluency and medication sales, whereas Study 2’s results found no significant effect between fluency and risk perceptions. The results from
Study 1 merit further research into this area. Previous studies by the CDC (2011) have found sales figures to be related to increases in abuse rates. Future experimental studies need to take into account the methodological flaws highlighted in Study 2a.
REFERENCES


## APPENDIX A

Top 30 prescribed prescription medications and ratings of fluency

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<th>Drug</th>
<th>Mean</th>
<th>SD</th>
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APPENDIX B

Informed Consent

California State University, Northridge

CONSENT TO ACT AS A HUMAN RESEARCH SUBJECT

First Impressions Study

You are being asked to participate in a research study. Participation in this study is completely voluntary. Please read the information below and ask questions about anything that you do not understand before deciding if you want to participate.

RESEARCH TEAM

Researcher:
Johnny Felt
Psychology
Johnny.Felt.58@my.csun.edu

Faculty Advisor:
Abraham Rutchild, PhD.
Psychology
18111 Nordhoff St.
Northridge, CA 91330-8255

PURPOSE OF STUDY

The purpose of this research study is to explore people’s first impressions of the names of prescription medications.

SUBJECTS

Inclusion Requirements
You are eligible to participate in this study if you are at least 18 years of age.

Time Commitment
This study will involve approximately 10 minutes of your time.
PROCEDURES

The following procedures will occur: You will be given an online survey consisting of different prescription drug names that you will be asked to rate with a number of questions. This will be followed by demographic questions.

RISKS AND DISCOMFORTS

This study involves no more than minimal risk. There are no known harms or discomforts associated with this study beyond those encountered in normal daily life.

BENEFITS

Subject Benefits

You will gain knowledge about an advanced psychological theory and help further the progress of the science.

Benefits to Others or Society

An understanding of how people form first impressions of prescription drugs.

ALTERNATIVES TO PARTICIPATION

There are other studies available if you do not wish to participate in this study.

COMPENSATION, COSTS AND REIMBURSEMENT

Compensation for Participation

You will receive $0.15 for your participation in this study.

Costs

There is no cost to you for participation in this study.

WITHDRAWAL OR TERMINATION FROM THE STUDY AND CONSEQUENCES

You are free to withdraw from this study at any time. If you decide to withdraw from this study you should notify the research team immediately. The research team may also end your participation in this study if you do not follow instructions, miss scheduled visits, or if your safety and welfare are at risk.

CONFIDENTIALITY

Subject Identifiable Data

No identifiable information will be collected. The study will be anonymous.
Data Storage

All research data will be stored electronically on a secure computer with password protection.

Data Access

The researcher and faculty advisor named on the first page of this form will have access to your study records. Any information derived from this research project that personally identifies you will not be voluntarily released or disclosed without your separate consent, except as specifically required by law. Publications and/or presentations that result from this study will not include identifiable information about you.

IF YOU HAVE QUESTIONS

If you have any comments, concerns, or questions regarding the conduct of this research please contact the research team listed on the first page of this form.

If you are unable to reach a member of the research team listed on the first page of the form and have general questions, or you have concerns or complaints about the research study, research team, or questions about your rights as a research subject, please contact Research and Sponsored Projects, 18111 Nordhoff Street, California State University, Northridge, Northridge, CA 91330-8232, or phone 818-677-2901.
APPENDIX C

Background information for Study 1

A major pharmaceutical company is in the process of renaming prescription medications that are commonly used recreationally (Recreational prescription medication use is defined as any use of a prescription medication for purposes other than prescribed including: taking larger doses than prescribed, using a prescription not prescribed to you, and using a prescription to obtain the unintended effects). You will be asked to read 43 different statements and answer 2 questions that follow each statement.
APPENDIX D

Demographics

What is your gender? Male or Female

What is your age? _______

Educational Background: High school diploma, Some college, 2 year degree (Associate’s Degree), 4 year degree (Bachelor’s Degree), or Graduate/Professional Degree.

What is your race/ethnicity? Native American/Alaskan Native, Asian, African American/Black, Hispanic, Native Hawaiian or other Pacific Islander, White (non-Hispanic), Two or more races, or Other.

Are you a native English speaker? Yes or No

Have you ever used prescription medications for their prescribed purpose? (Prescribed purpose means a prescription under your own name and taken as the doctor prescribed it). Remember, your answers will be completely anonymous and kept confidential. Yes or No

Have you ever used a prescription medication for anything other than its prescribed purpose? (This includes: taking a prescription that was not prescribed for you, taking larger doses than were prescribed, or taking it for any reason other than it was prescribed). Remember, your answers will be completely anonymous and kept confidential. Yes or No
### APPENDIX E

*List of all novel medication names in Pilot study*

<table>
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<th>Name of Medication</th>
<th>Fluency N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Believability Mean</th>
<th>Std. Deviation</th>
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<td>20.641</td>
<td>17.95</td>
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<td>65.13</td>
<td>27.176</td>
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<td>Vahvistin</td>
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<td>29.193</td>
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<td>26.466</td>
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<td>Vansertrol</td>
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<td>27.775</td>
<td>53.74</td>
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<tr>
<td>Vensemet</td>
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<tr>
<td>Weltovan</td>
<td>39</td>
<td>72.05</td>
<td>21.090</td>
<td>54.92</td>
<td>34.566</td>
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<td>29.289</td>
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<td>Xytavine</td>
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<td>30.435</td>
<td>50.15</td>
<td>32.245</td>
</tr>
<tr>
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<td>64.23</td>
<td>24.949</td>
<td>54.28</td>
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<td>Yimboltra</td>
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<td>28.769</td>
<td>47.36</td>
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<tr>
<td>Zequilin</td>
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<td>31.622</td>
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<tr>
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<td>64.33</td>
<td>24.656</td>
<td>62.79</td>
<td>30.560</td>
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</tbody>
</table>
# APPENDIX F

*High Fluency Medication Names*

<table>
<thead>
<tr>
<th>Name of Drug</th>
<th>Fluency Mean</th>
<th>Fluency SD</th>
<th>Believability of prescription medication Mean</th>
<th>Believability SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluent Prescription Medication Names</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inovex</td>
<td>80.26</td>
<td>16.570</td>
<td>65.38</td>
<td>26.641</td>
</tr>
<tr>
<td>Sotivan</td>
<td>76.72</td>
<td>13.205</td>
<td>56.74</td>
<td>28.263</td>
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<tr>
<td>Avazine</td>
<td>72.33</td>
<td>19.775</td>
<td>72.82</td>
<td>24.165</td>
</tr>
<tr>
<td>Weltovan</td>
<td>72.05</td>
<td>21.030</td>
<td>54.92</td>
<td>34.566</td>
</tr>
</tbody>
</table>
### APPENDIX G

**Low Fluency Medication Names**

<table>
<thead>
<tr>
<th>Name of Drug</th>
<th>Fluency Mean</th>
<th>Fluency SD</th>
<th>Believability of prescription medication Mean</th>
<th>Believability SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gespronel</td>
<td>52.00</td>
<td>22.404</td>
<td>53.33</td>
<td>28.315</td>
</tr>
<tr>
<td>Hythazol</td>
<td>51.67</td>
<td>26.617</td>
<td>65.13</td>
<td>29.278</td>
</tr>
<tr>
<td>Lavlizine</td>
<td>45.03</td>
<td>26.443</td>
<td>55.64</td>
<td>29.091</td>
</tr>
<tr>
<td>Xytavine</td>
<td>36.03</td>
<td>30.435</td>
<td>50.15</td>
<td>32.245</td>
</tr>
</tbody>
</table>
APPENDIX H

Background Information for Study 2

A major pharmaceutical company is in the process of renaming prescription medications that are commonly used recreationally (Recreational prescription medication use is defined as any use of a prescription medication for purposes other than prescribed including: taking larger doses than prescribed, using a prescription not prescribed to you, and using a prescription to obtain the unintended effects). You will be asked to read 8 different statements and answer 3 questions that follow each statement. You will not be given very much information about each drug, so you will need to use your "gut" or first reaction to each drug when answering the questions that follow.
APPENDIX I

Between-groups Manipulation

All of these drugs have intended health effects and unintended recreational effects. Some people will be attracted to these drugs for their health effects, and others for their recreational effects. Given this fact, the company wants to know how you think people interested in the health/recreational effects would perceive these drugs.
APPENDIX J

Sample Measurement

Please answer the following questions based on how much you agree or disagree with them. Remember, your responses will be completely anonymous and kept confidential.

- **Inovex**: This drug is intended to treat high levels of anxiety, but also induces feelings of relaxation.

- **Gespronel**: This drug is intended to treat insomnia, but also increases metabolism.

- **Xytavine**: This drug is intended to treat high cholesterol, but also induces feelings of euphoria.

- **Avazine**: This drug is intended to treat attention-deficit disorder, but also makes colors appear more vibrant.

- **Weltovan**: This drug is intended to treat the common cold, but also induces feelings of drowsiness.

- **Lavlizine**: This drug is intended to treat sinus infections, but also induces feelings of light-headedness.

- **Sotivan**: This drug is intended to treat high blood pressure, but also induces feelings of energy and excitement.

- **Hythazol**: This drug is intended to treat chronic pain, but also increases sexual sensitivity.
**APPENDIX K**

*Personality Measure*

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Questions</th>
<th>Disagree Strongly</th>
<th>Disagree a little</th>
<th>Neither Agree nor Disagree</th>
<th>Agree a little</th>
<th>Agree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>…is reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>...is generally trusting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>…tends to be lazy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>…is relaxed, handles stress well</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>…has few artistic interests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>…is outgoing, sociable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>…tends to find fault with others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>…does a thorough job</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>…gets nervous easily</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>…has an active imagination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>…would like to explore strange places</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>…likes to do frightening things</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>…likes new and exciting experiences, even</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>if I have to break the rules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>…prefers friends who are exciting and unpredictable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Scoring the BFI-10**

Extraversion: 1R, 6; Agreeableness: 2, 7R; Conscientiousness: 3R, 8; Neuroticism: 4R, 9;

Openness: 5R, 10 (R = Reverse Coded).

**Scoring the BSSS-4**

Sensation Seeking: 11, 12, 13, 14.
Debriefing Form

Prescription drug abuse has been on the rise in recent years, and it is important to understand the different mechanisms that may be contributing. This study set out to examine the relationship between processing fluency and the perceived risk of prescription medications. Processing fluency is the ease to which information is processed. Song and Schwarz (2009) found that when food additives were difficult to say, participants rated them as more hazardous to their health than when they were easy to say. This study looks to replicate their results with novel prescription drug names.

You were presented with novel prescription drug names that were either difficult to pronounce or easy to pronounce and were asked to rate them on numerous dimensions. It is hypothesized that when a prescription drug name is difficult to pronounce, it will be viewed as riskier than when it is easy to pronounce.

The prescription drug names you saw in this study were NOT real. You will NOT be able to find these drugs in any pharmacy and your doctor CANNOT prescribe them to you. The names were generated for the purpose of the study only. You were told they were potential prescription drug names in order to distract you from the manipulation of how easy or difficult the names were to pronounce.

If you have any questions about the study, you can contact the researcher at: Johnny.Felt.58@my.csun.edu or the advisor, Abraham Rutchick at: Abraham.Rutchick@csun.edu

Reference: