

Behavior feedback and Need for Cognition: Factors affecting coffee beverage consumption

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## **Abstract**

The purpose of this study was to investigate whether one's tendency to engage in and enjoy cognitive activity (i.e., Need for Cognition) affects both individuals' intention to consume high-cost, high calorie "specialty" coffee drinks and their likelihood to reduce consumption of these drinks after reading a persuasive behavior feedback message. Through an online survey, participants viewed one of four messages: a personalized behavior feedback message, a generic feedback message that contained a memory prompt, a generic feedback message that did not contain a memory prompt, and no message. Pre- and post-intervention measures of specialty coffee drink consumption and participants' likelihood to reduce their consumption were recorded, and participants' levels of Need for Cognition were also assessed. Although each of the three behavior feedback messages were successful at encouraging reduced specialty coffee drink consumption compared to the no message control, an interaction effect between Need for Cognition Scale scores and behavior feedback message condition was not established, suggesting that no differences in post-intervention consumption intention were established between individuals of varying levels of Need for Cognition when presented with differing forms of behavior feedback persuasive messages. Furthermore, Need for Cognition predicted both post-intervention specialty coffee consumption intention and likelihood of reducing consumption "in the next few days," but in a surprising manner. Clarification of these results, limitations of the study's methodology, and future research possibilities are also discussed.

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# Chapter 1 - Background

## Coffee Consumption

People all across the world have consumed coffee for thousands of years. It has transcended generations of peoples and cultures to become one of the most consumed drinks on the planet. Prompting several stimulating effects on people's mood and energy levels, coffee consumption has become as much of a social phenomenon as it is an essential part of some peoples' day. Coffee's current status within our culture was cemented in the 1990s when its annual rates of consumption began to continually increase; furthermore, coffee's consumption rates have continued to grow since then, while the number of different ways to consume coffee has also expanded (Experian Simmons, 2009; National Coffee Association, 2017).

Typically, when one thinks of "coffee," they imagine a traditional cup of brewed coffee made from roasted and brewed coffee beans. Moreover, "cold-brewed" coffee and "iced coffee" drinks have also become increasingly popular. These traditional coffee drinks are commonly served with some form of cream and sugar to curb its original bitter taste. Recently, however, other, more "specialty" drinks like lattes, mochas, macchiatos, and their iced and frozen varieties have become more popular (National Coffee Association, 2017). These drinks typically contain espresso as their coffee base; additionally, they also usually include milk or cream, some variety of sugar-based flavoring, and may even be topped with whipped cream and chocolate or caramel syrup.

When comparing "traditional coffee drinks" like brewed and iced coffee to what this line of research refers to as "specialty coffee drinks" like lattes and frappuccinos, there are both close similarities and stark differences. Namely, although these two classes of drinks have similar amounts of caffeine (i.e., around 100mg in a standard serving), they differ significantly in both

price and number of calories. After aggregating data from the four largest vendors of coffee beverages in the United States (i.e., Starbucks, Dunkin, McDonald's, and Caribou Coffee), "specialty coffee drinks" cost an average of \$3.65 and contain an average of 330 calories. However, traditional coffee drinks cost an average of only \$1.80 and contain an average of only 35 calories when including a standard serving of cream and sugar. These numbers were aggregated from medium-sized drink portions; thus, as the drink's size fluctuates, the prices and number of calories of these drinks also change.

### **Understanding the Consequences of Coffee Drink Choice**

Going to a coffee shop and purchasing a coffee drink has become an essential part of daily life for many people. Given its important place in some people's routines, it can be easy for these consumers to ignore the differences between traditional and specialty coffee drinks and the consequences of these differences. The differences in price and number of calories between these two drink classes are apparent when presented with the information discussed above; however, these differences may not be salient to consumers when deciding what coffee drink to order. When contemplating the differences between these classes of drinks, health and financial consequences typically come to mind.

**Health Consequences.** Despite being a considerable component of the human diet, people commonly overlook calories consumed from beverages. Consequently, the U.S. Department of Health and Human Services and Department of Agriculture dedicated a whole section of the *2015-2020 Dietary Guidelines for Americans* to this issue ("United," 2015). According to this report, beverages account for almost 20% of our total daily caloric intake. The *Dietary Guidelines* specifically names coffee drinks and sugar-sweetened beverages to this list of drinks to consider, warning that these drinks can contribute to excess caloric intake while

providing negligible or no nutritional value. This consideration is especially important to examine, as the Center for Disease Control and Prevention's National Center for Health Statistics reports that obesity rates have continued to rise since the turn of the century (Hales, Carroll, Fryar, & Ogden, 2017).

The *Dietary Guidelines*' (United, 2015) warnings about beverages are directly applicable to the differences in the number of calories between traditional and specialty coffee drinks. As discussed earlier, specialty coffee drinks can contain nearly ten times as many calories as traditional drinks of the same size. In terms of the daily recommended calorie intake, this can equate to a considerable portion of calories consumed from a single coffee drink, while acquiring little to no nutritional value. When thinking about this difference over time, it naturally exacerbates, leading to thousands—even tens of thousands—of extra calories consumed.

**Financial Consequences.** Although research into the relationship between stress and financial well-being is relatively limited, these emotions are arguably universal. Shapiro and Burchell (2012) describe the concept of *financial anxiety* as a “psychological syndrome whereby individuals have an uneasy and unhealthy attitude toward engaging with and administering their personal finances in an effective way” (p. 93). This definition originated from Burchell's (2003) previous work in this area, and subsequent research has empirically linked financial anxiety to several adverse outcomes, including financial mismanagement and debt (Shapiro & Burchell, 2012).

Consideration of the consequences of financial anxiety and mismanagement easily fits into the context of specialty coffee drinks. As previously stated, consumers spend nearly double the amount of money on specialty coffee drinks than traditional coffee drinks. Although the difference of a couple of dollars seems negligible initially, it begins to substantiate when

thinking about how often some people purchase these coffee drinks. When thinking about this difference over time, consumers could potentially spend dozens of dollars more each month and hundreds of dollars more each year. Furthermore, as this difference in price naturally adds up over time, increased financial stress and decreased financial freedom can subsequently develop for the consumer.

### **The Traditional Approach to Dietary Interventions**

The traditional approach to dietary interventions, such as those targeting the consumption of certain foods or drinks, primarily involves self-administered changes to dietary habits. These changes are typically initiated either on one's own or with the assistance of psychotherapists, dietitians, or other medical professionals. Many of these suggested approaches include cognitive-behavioral interventions (Taylor, 2006), such as stimulus control (Schüz, Bower, & Ferguson, 2015), self-monitoring (Carels et al., 2008), and contingency contracting (Scull, 2013). These interventions teach individuals specific behavioral and cognitive strategies that aid in overcoming dysfunctional thoughts and behaviors and support the implementation of healthy lifestyle changes (Tsiros et al., 2008). While the exact course of action typically depends on the specificity and severity of the health behavior of interest, researchers and medical professionals traditionally view cognitive-behavioral interventions as the most effective non-medical dietary treatment (Castelnuovo et al., 2017).

While no investigation into cognitive-behavioral interventions targeting the consumption of high-cost, high-calorie coffee beverages has been conducted to date, researchers have developed other interventions using cognitive-behavioral mechanisms. For example, Schüz, Bower, and Ferguson (2015) conducted an intensive longitudinal study to investigate the effects of stimulus control—the idea that external factors (e.g., spotting food in your environment)

rather than internal states (e.g., hunger or thirst) influence our dietary behavior—on eating habits of a non-clinical community sample. The researchers found that stimuli such as foodstuffs availability, social cues, and affect regarding food, played a significant role in eating. Furthermore, Carels and colleagues (2008) examined whether an energy deficit of 500 kcal, as recommended by the CDC's *Dietary Guidelines for Americans*, facilitated weight loss in overweight and obese adults. They provided participants with a calorie consumption goal and instructed them to self-monitor their caloric intake, physical activity, and weekly weight. These researchers found that participants who averaged an energy deficiency of over 500 kcal per day lost nearly four times more weight than those who averaged an energy deficiency of less than 500 kcal per day. They also found that participants who lost the target 5% of their body weight engaged in self-monitoring twice as often as those who lost less than 5% of their body weight. Additionally, Scull (2013) investigated whether contingency contracting (i.e., a type of intervention where the conditions and consequences of a target behavior are identified to increase or decrease that behavior) aided the utilization of simplified habit reversal (i.e., an intervention used to decrease repetitive negative behaviors) to target the unhealthy eating behaviors of late-night eating, consuming high sugar content beverages, and unhealthy snacking in obese individuals. He found that the simultaneous application of these techniques reduced the frequency of the three target behaviors in each participant.

Besides the dietary interventions mentioned above, other previous medical interventions regarding coffee consumption have typically involved caffeine misuse. Due to many of the perceived positive effects that accompany the stimulant nature of caffeine, incidents of misuse and abuse in the general population have been reported (Meredith, Juliano, Hughes, & Griffiths, 2013). The Diagnostic and Statistical Manual (DSM-5) classifies *caffeine use disorder* as a

"condition of further study" ("American," 2013), while the International Classification of Diseases (ICD-10) formally recognizes the closely related *caffeine dependence syndrome* ("World," 1992). However, medical interventions that specifically highlight the health and financial consequences of consuming high-calorie, high-cost coffee drinks remain uninvestigated.

### **The Health Message Approach to Dietary Interventions**

Beyond the traditional cognitive-behavioral approach to dietary interventions, researchers have also explored other ways to encourage healthy lifestyles. One of the earliest and most popular techniques has been the use of educational health communication interventions. Researchers and health professionals have utilized these interventions across several print- and electronic-based mediums to educate individuals about the consequences of dietary behaviors. In their review of print health education materials, Kreuter, Stretcher, and Glassman (1999) outline five types of educational health communications that lie on a continuum based on their level of assessment and nature of the educational content. Of these communication types, the current project focused on the use of tailored health communications.

**Tailored Health Messages.** Kreuter, Stretcher, and Glassman's (1999) describe tailored health communications as messages that incorporate "any combination of strategies and information intended to reach one specific person, based on characteristics that are unique to that person, related to the outcome of interest, and derived from an individual assessment" (p. 276). Like other health communications, the tailored communications approach provides information regarding a specific health matter. However, compared to the other types of health messages, tailored messages present specific information that is unique to—or is "tailored to"—a particular

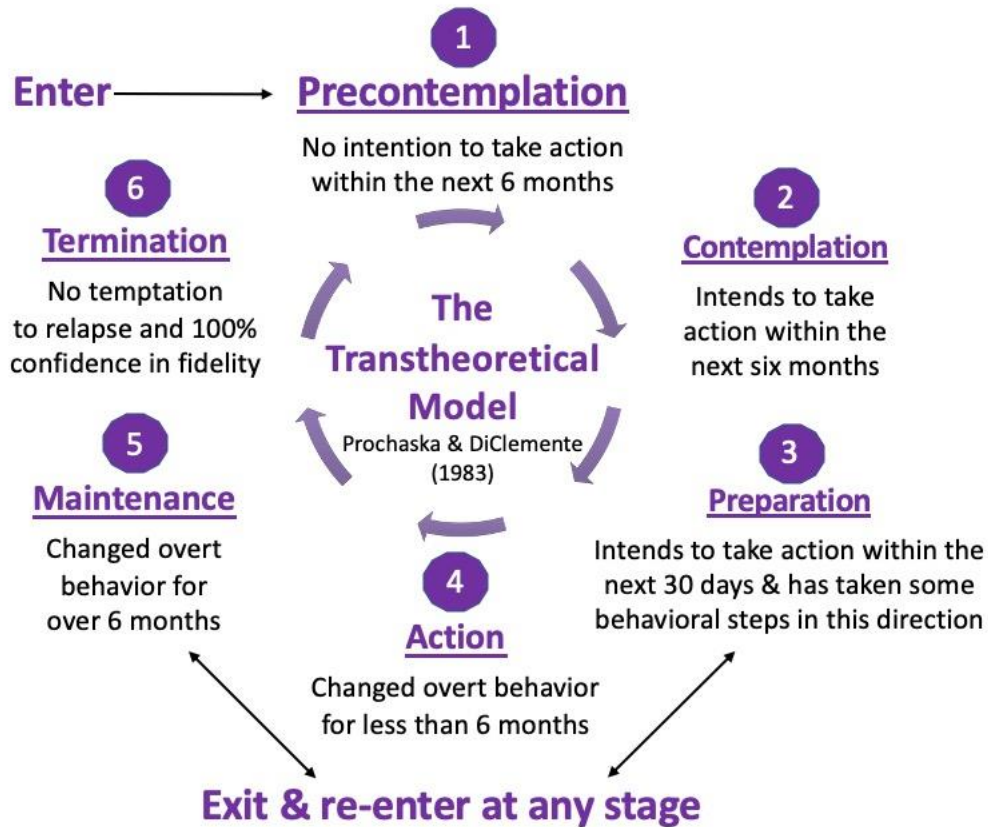
aspect of the target individual, whether it be their name or demographic characteristics, or even their personality traits or behavior.

The formation of tailored communications follows a general process, as explained by Noar, Grant Harrington, Van Stee, and Shemanski Aldrich (2011). First, one or multiple aspects of the individual are measured, typically through a self-report or direct assessment. Next, that individual's information is processed and reconfigured to reflect that input and to relate it to the health outcome of interest. Finally, the researcher formulates the persuasive message using this information and distributes it to the individual. For example, asking participants about why they believe quitting smoking is valuable, and then crafting a persuasive message advocating for smoking cessation that incorporates information about those values—or is "tailored to" those values"—would encompass tailored health communications.

As mentioned, the primary strategy behind using tailored health messages is to make individuals more aware of the connection between specific aspects of themselves and their health outcomes by providing information that is unique to them. This strategy is notably related to Prochaska's and DiClemente's (1983, 1986) Transtheoretical Model (TTM). Also known as the Stages of Change Model, this model of behavior change identifies how motivated an individual is to begin taking steps toward modifying unhealthy or problematic behavior. Prochaska's and DiClemente's (1993) model originally included five temporally determined stages; however, the sixth stage (i.e., *Termination*) is commonly included in some depictions (Glanz, Rimer, & Viswanath, 2008; see Figure 1). For example, individuals typically enter into the behavior change process at the *Precontemplation* stage, where they have put little or no consideration into changing their behavior. Next, they cycle through to the *Preparation* stage when they have decided to initiate change in their behavior within the next 30 days. Following, they continue



onto the *Maintenance* stage after they have sustained their behavior change for more than six months.



**Figure 1. The Transtheoretical Model (Proshaska & DiClemente, 1983) adapted from Glans, Rimer, & Viswanath (2008)**

It is important to note that although the model's six stages suggest a temporal dimension to behavior change, individuals frequently do not move through each of the stages linearly. Furthermore, it is common for individuals to exit and reenter the model at any stage while attempting to change their behavior.

The TTM also offers ten different *Processes of Change* that people typically use on their journey to behavior change: consciousness raising, dramatic relief, self-reevaluation, environmental reevaluation, self-liberation, helping relationships, counterconditioning, reinforcement management, stimulus control, and social liberation (Glanz, Rimer, & Viswanath,

2008). These are mental tools that individuals tend to utilize when processing through the TTM's stages which have received the most empirical support since Prochaska's and DiClemente's (1983) landmark study on smoking cessation. Of the ten processes, the two most relevant to the current study are *consciousness raising* and *counterconditioning*. Individuals trying to change their behavior commonly engage in consciousness raising by educating themselves on the consequences and cures of their unhealthy behavior. For example, individuals trying to reduce their consumption of high-cost, high-calorie coffee drinks may engage in this after reading a message about the monetary and health effects of consuming these drinks. These individuals might also engage in *counterconditioning* when they substitute healthier alternative behaviors for their unhealthy behaviors, such as if they decide to consume a less caloric and less expensive coffee drink alternative.

Given the popularity of these interventions, the application of educational health communications has undergone rigorous investigation. Specifically, exploration into the comparative efficacy of educational health communications has produced clear distinctions between tailored and non-tailored messages. In their review of tailored print interventions, Noar, Benac, and Harris (2007) determined that tailored message interventions outperformed comparison message interventions, including non-tailored messages, in influencing health behavior change. Furthermore, Krebs, Prochaska, and Rossi (2010) reviewed the efficacy of computer-based tailored interventions across four domains of health behaviors: dietary improvement, physical activity promotion, smoking cessation, and mammography screenings. Their findings indicate that computer-tailored interventions are effective for health behavior change across each of the four domains. Similarly, a review by Lustria and colleagues (2013)

found that web-delivered tailored interventions encouraged significantly greater improvements in health outcomes over comparative messages, both at posttest and at follow-up.

Throughout the literature, it is clear that tailored health communication interventions have successfully encouraged healthy behaviors across many domains. For example, Wangberg, Nilsen, Antypas, and Gram (2011) conducted a longitudinal study to examine the effect of web-delivered tailored versus non-tailored persuasive messages about smoking cessation. The researchers began by surveying participants about various demographic characteristics, their smoking-cessation maintenance efforts, their motivation to quit smoking, and other aspects of their smoking behavior. Subsequently, for the corresponding participants, the researchers tailored the persuasive information displayed through the webpages to these participants' attitudes and behaviors about their smoking cessation habits. As a result, the researchers found that participants in the tailored message group engaged in the intervention website more often overall, and these participants had also engaged in smoking abstinence more often at one and three months compared to the non-tailored group.

The use of tailored persuasive health messages has also been useful when used within dietary interventions. For example, Denmark-Wahnefried and colleagues (2007) examined the efficacy of tailored versus non-tailored print communications to increase fruit and vegetable consumption, reduce fat intake, and increase exercise in breast cancer and prostate cancer survivors. Participants completed a workbook upon enrollment in the study and seven subsequent follow-up surveys at six-week intervals, which recorded their progress toward their goals. Researchers then tailored the persuasive brochures to the participant's perceived barriers, stage of readiness, and progress toward goal attainment regarding exercise, fruit and vegetable consumption, and fat intake. Although participants in both the tailored and non-tailored

conditions significantly improved their lifestyle, those in the tailored intervention group showed significant improvements across multiple factors, including practicing goal behaviors, exercise minutes per week, and fat consumption.

Moreover, Gans and colleagues (2015) tested the use of non-tailored written communication, tailored written communication, and tailored written plus tailored video interventions to increase healthy eating habits of employees within a company health program. The researchers tailored the materials to participants' responses to an initial telephone interview and two brief "retailoring" assessments that were conducted after the first two informational mailings. These interviews included several dietary assessments examining both past and future intended eating habits. Accordingly, the researchers found that fruit and vegetable consumption significantly increased while fat intake significantly decreased for both the tailored print and tailored print plus tailored video groups compared to the non-tailored group.

In another study, York, Brannon, and Miller (2012) tested whether tailoring persuasive health messages about binge drinking to participants' self-schema or a specific context of binge drinking would encourage a decrease in binge drinking habits. Participants first recorded various aspects of their participants' self-schema and their history and beliefs about binge drinking. The researchers then tailored the persuasive messages to participants' binge drinking attitudes and behaviors to encourage healthier drinking habits in the future. Accordingly, they found that the schema-tailored messages reduced intentions to binge drink at home while context-tailored messages reduced intention to binge drink when going out, suggesting that different forms of tailoring are necessary to target different aspects of binge drinking behavior.

As displayed, tailored persuasive health messages have shown efficacy across a broad range of health behavior contexts. The effectiveness of tailored health communications is the

result of its personalized nature, a key difference from the other health communication levels described by Kreuter, Stretcher, and Glassman (1999). Dijkstra (2005) defines “personalization” as incorporating recognizable references to the individual within a persuasive message.

Personalization can range from simply including the individual's name within the persuasive message to distinguishing more specific aspects of the individual within the message, such as certain aspects of their behavior. Given the personalized nature of tailored messages, individuals who read them perceive the information to be more personally relevant and applicable to their lives; thus, individuals are more likely to attend to and remember the information within the message (Kreuter & Wray, 2003). This notion is supported by claims within Petty and Cacioppo's (1986) Elaboration Likelihood Model, which suggests that people engage in two types of processing of persuasive information: central route and peripheral route processing. Many processes influence the extent to which individuals are motivated to elaborate on the message's content and engage in central route processing, including how personally relevant the individual perceives the message. Thus, by crafting a health message specific to an individual and their health outcomes, the message's efficacy in encouraging health behavior change is enhanced.

**Behavior Feedback Health Messages.** As mentioned, the success of tailored health message interventions is due to its personalized nature. When incorporating personalization into a persuasive message, many different thematic variations can be applied, typically based on the specific aspect of the individual to which the researcher tailors the message. One particular form of tailoring that has gained popularity across several domains—and is the primary focus of this project—is tailoring to an individual's behavior. This technique, known as "feedback" or "behavior feedback," is outlined by Dijkstra (2005) as one of the three main mechanisms of

tailoring. It involves providing information to individuals about a specific aspect of their behavior and how that behavior directly affects at least one health-related aspect of their life. The construction of behavior feedback message interventions is very similar to that of tailored health messages. The individual's behavior is first measured, typically either through self-report or by direct behavioral assessment. Next, the health professional or researcher gathers that behavioral input and reshapes it to reflect the health implication(s) of interest. Finally, the researcher provides this reconfigured information to the individual, typically to educate that individual about the consequences of that behavior.

Researchers can target various aspects of an individual's behavior when crafting behavior feedback health interventions. Consequently, the interventions can encourage individuals to engage in many of the Processes of Change described by the Transtheoretical Model (Prochaska & DiClemente, 1983; 1986). As mentioned, when individuals engage in *consciousness raising*, they are working to increase their awareness about why their unhealthy or problematic behavior should be changed. Consciousness raising is usually exhibited between the initial *Precontemplation* and *Contemplation* stages when individuals have begun initiating their behavioral change. With consciousness raising in mind, practitioners can fashion education materials that help facilitate this awareness of why behavior modification should be considered and ultimately initiated. Furthermore, during *counterconditioning* in the later stages of the model, individuals apply what they have learned about the unhealthy aspects of their behavior as they begin to substitute new practices with their old behaviors (Glanz, Rimer, & Viswanath, 2008).

Like tailored persuasive messages, behavior feedback messages have been organized into a specific taxonomy to delineate their form and function. Following Kreuter, Stretcher, and

Glassman's (1999) catalog of educational health communications (including tailored health messages), DiClemente, Marinilli, Singh, & Bellino (2001) fashioned a similar taxonomy of the different types of behavior feedback messages that encourage health behavior modification. As with the former catalog, the latter DiClemente, Marinilli, Singh, & Bellino (2001) taxonomy is organized explicitly along a continuum by the level of personalization the practitioner incorporates within the health message. Of the three different behavior feedback classes, the current study focused on the use of *generic* and *personalized* behavior feedback.

***Generic Behavior Feedback.*** At one end of the taxonomy lies *generic behavior feedback*. This is the simplest form of behavior feedback in which the message provides target individuals with information about their behavior that is both personally relevant and relevant to the entire population or subpopulation to which the individual belongs. That is, the information is personally relevant to the target individual, but it can also apply to other individuals who engage in similar health-related habits. For example, asking smokers about their cigarette smoking habits and then providing them general information about the health effects of repetitive smoking would constitute generic behavior feedback. Within the health persuasion literature, researchers have typically utilized generic behavior feedback messages within control health message conditions.

***Personalized Behavior Feedback.*** At the other end of the feedback taxonomy lies *personalized behavior feedback*. This type of persuasive message provides individuals with feedback that is the most personally relevant to the targeted individual reader. Practitioners formulate this feedback through the assessment of an individual's behavior, either assessed directly or through self-report. For example, asking smokers how many cigarettes they smoke a day, and then providing them with specific details about how that number of daily cigarettes is

directly related to their susceptibility to developing cardiovascular disease would constitute personalized behavior feedback. This behavior feedback is "personalized" because the information provided back to the individual is fashioned directly from their self-report of their smoking habits, making it most appropriate for and applicable to them. Whereas generic behavior feedback provides only generalized information that applies to both the individual and other individuals like them, personalized behavior feedback is designated solely for the target individual. Considering both the specific health behavior of interest and the exact type of feedback provided to the participant, this type of message's versatility is extensive.

Much like when comparing the efficacy of tailored to non-tailored health communications, the key difference between generic and personalized behavior feedback is in the individualized nature of the communication's content. As described earlier, the more personalized the information is, the more personally relevant it is perceived, and the more likely it is attended to and remembered by the individual (Kreuter & Wray, 2003). Petty and Cacioppo's (1986) Elaboration Likelihood Model also supports this notion, as it posits that individuals are more motivated to process personally relevant information. The current study tested this notion by comparing the efficacy of generic behavior feedback to personalized behavior feedback to increase individuals' motivation to modify their future consumption of specialty coffee drinks.

As witnessed with other health interventions, the passage of time and improvements in technology have expanded how practitioners process, display, and disseminate behavior feedback. Over time, practitioners have transitioned from traditionally providing personalized behavior feedback via print materials (Miller, Sovereign, & Krege, 1988), to now commonly distributing the feedback through web-based mediums (Neighbors et al., 2009), mobile



applications on cell phones (Rabbi et al., 2015), and personal fitness devices like smartwatches (Western, Peacock, Stathi, & Thompson, 2015). Alongside this evolution of dissemination, the use of personalized behavior feedback interventions has become popular across a variety of health domains, including reducing problematic alcohol consumption (Miller et al., 2013; Riper et al., 2009) increasing adherence to medication regimens (Wu, Corley, Lennie, & Moser, 2012) and modifying dietary habits (Brug Campbell, & van Assema, 1998; Oenema & Brug, 2003), each with promising results. Furthermore, researchers have also employed behavior feedback to encourage households to reduce their energy consumption (Abrahamse, Steg, Vlek, & Rothengatter, 2007), showing that this type of persuasive intervention is not limited to one kind of behavior.

One example of personalized behavior feedback—most relevant to the proposed study—is seen in Pilling and Brannon’s (2007) study on problematic alcohol consumption in college students. The researchers created different kinds of persuasive messages, including personalized behavior feedback messages, that discussed binge drinking behaviors to better understand which messages were most effective. The researchers used participants' self-reported weekly alcohol consumption frequency to craft a message to inform participants about the number of calories they consumed and the amount of money they spent on alcohol over 12 months. Pilling & Brannon’s (2007) behavior feedback message included the following information:

Binge drinking has bad effects on one’s physical appearance and wallet. Based on the information you provided about your drinking behavior, you spend about \$ $x$  and consume  $y$  calories (that’s like eating  $z$  ice cream sundaes) in a year due to alcohol. Save your looks and your wallet.

As a result, the researchers found that these personalized behavior feedback messages were favored by participants over less personalized messages, suggesting that individuals may be more accepting of this type of personalized persuasive message. In the current study, personalized behavior feedback messages were crafted very similarly to Pilling's and Brannon's (2007) message, such that participants' self-reports of specialty coffee drinks consumption were used to inform them of the caloric and monetary consequences of their consumption habits over time.

Another example of personalized behavior feedback is De Vries and colleagues' (2008) study targeting smoking, physical activity, fruit, vegetable, and fat intake. In this study, participants were randomized to receive either tailored behavior feedback or generic pamphlets regarding the three sets of behaviors of interest. To create the personalized behavior feedback-based pamphlets, the researchers measured the participants' related health behaviors through self-reports at the beginning of the study and three months later; subsequently, this information was reconfigured and added to the corresponding pamphlets. The researchers found that participants in the personalized behavior feedback group significantly increased physical activity and fruit and vegetable consumption while significantly decreasing fat consumption, both at three months and nine months. However, they found no differences between conditions in terms of smoking cessation. These results indicate that not only that personalized behavior feedback is effective at encouraging dietary modification, but also that its outcomes are effective over time.

**The Financial Appeals Message Approach.** Along with the methods described above, the use of financial appeals has also become a popular method for encouraging the modification of health behaviors. There are various approaches to financial appeals, but the current study investigated the use of financial-based educational messages. In this approach, practitioners craft

persuasive messages that provide individuals with the financial consequences of a specific behavior. Bashir and colleagues (2011) used this means and found that financially based messages were more effective at increasing pro-environmental behavior intentions than health-based messages.

Similarly, Sindelar and O'Malley (2014) compared the efficacy of brochures containing either financial- or health-based information to encourage smoking cessation. For their study, the researchers crafted the financial brochures to display the amount of money that smokers could save by quitting smoking. The researchers found that the financial brochures attracted more attention than the health brochures, and the financial brochures were acquired more frequently by passersby. The current study used a similar method as Sindelar and O'Malley (2014), such that the personalized behavior feedback health message displayed how much money could be saved by modifying consumption behavior.

### **Need for Cognition**

Investigating an individual's need for cognition and the characteristics of thinkers has been part of the literature for decades (Cohen, Stotland, & Wolfe, 1955; Murphy, 1947). However, attitudes researchers Cacioppo and Petty (1982) devised the current conceptualization of Need for Cognition (NFC) as individual differences in one's inclination to engage in and enjoy thinking. Need for Cognition is conceptualized as a continuum on which individuals fall between high and low assessment. Cacioppo, Petty, Feinstein, and Jarvis (1996) classify high-NFC individuals as those who willingly engage in critical thinking and cognitive activities across many contexts to gauge information about the world and their environment. Furthermore, these individuals are also known to draw their own conclusions from the persuasive information presented to them (Petty, 2018). Conversely, low-NFC individuals are considered less likely to

engage in critical thinking and more likely to rely on outside sources such as celebrities, experts, heuristics, or social comparison processes to determine their attitudes about the information (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Furthermore, they are also less likely to draw their own conclusions when presented with persuasive information, and practitioners can better serve them by explicitly presenting them with the conclusions of the information (Petty, 2018). The primary tool for assessing this construct, the Need for Cognition Scale, was initially developed by Cacioppo and Petty (1982) but was later refined by Cacioppo, Petty, and Koa (1984).

Although the literature is limited, there has been some investigation into the moderating effects of NFC in health communication research across multiple health behavior domains. For example, Williams-Piehota and colleagues (2003) investigated the impact of health messages tailored to participants' level of NFC on motivation to complete mammography screenings. They found that high-NFC participants whose health message content matched their level for Need for Cognition were more motivated to receive a mammogram screening six months later. In another study, Vidrine, Simmons, and Brandon (2007) examined whether NFC moderated college smokers' responses to a fact-based or emotion-based smoking risk pamphlet. Among occasional smokers, NFC moderated message risk perceptions, such that the fact-based pamphlet produced the greatest risk perception in high-NFC participants while the emotion-based pamphlet produced the greatest risk perception in low-NFC participants. Furthermore, Park, Cho, and Yoon (2012) assessed the relationship between healthy menu choice and three different consumer characteristics, including Need for Cognition. They found that high-NFC participants chose healthier food options most of the time when the menu displayed nutritional information.

Within the NFC and health behavior literature, the main objective of measuring NFC has been to better understand how participants process persuasive health messages. High-NFC

individuals are expected to analyze the merits of the persuasive message critically. Most importantly, in the context of the proposed study, they tend to draw their own conclusions from persuasive information. On the other hand, low-NFC individuals are more likely to need assistance in drawing the intended conclusions. They also tend to take the persuasive information at face value, utilizing heuristics and cues within the message to influence their appraisal. Accordingly, the current study examined how individual differences in NFC lead to varying message processing and consumption behavior intention outcomes after reading a persuasive message.

### **The Pilot Study**

The current study is a continuation and an extension of a pilot study that was previously conducted. In that pilot study, 102 participants (Male = 51%; *M* Age = 35 years, *SD* = 10 years) completed an online Qualtrics survey via Amazon Mechanical Turk that included various behavioral and attitudinal measures and the possibility of receiving a health message intervention. The surveyed asked participants about their current consumption habits of traditional and specialty coffee drinks, provided them one of three health messages to read, and then asked how many traditional and specialty coffee drinks they intend to consume in the future.

For the health message intervention, the survey randomized participants into one of three groups that indicated which message they received. The "no health message" condition did not provide any information regarding coffee beverage consumption, and participants in this condition were simply instructed to continue the survey. The generic behavior feedback message offered participants in this condition general information about the differences in price and number of calories in traditional versus specialty coffee drinks. Furthermore, it informed participants that these differences are important to consider over time, as continually consuming

these high calorie and cost drinks may lead to adverse health and financial consequences in the future (See Appendix A for a copy of the health messages used in the pilot study). Finally, the personalized behavior feedback message provided the same information as the "generic behavior feedback message," except it also provided participants in this condition with the specific caloric and monetary consequences of their consumption habits. These health and financial consequences were calculated from the consumption habits questionnaire administered at the beginning of the survey, and the consequences (i.e., the personalized behavior feedback) were framed in terms of one month and one year. For example, if a participant in this condition reported drinking ten traditional coffee drinks and ten specialty coffee drinks over the past month, they would read the following information after the generic health message:

Earlier, you reported drinking 10 Brewed Coffees during a typical month, which adds up to 350 calories consumed and \$18.00 spent over 1 month, and 4,200 calories consumed and \$216.00 spent over 1 year on Brewed Coffees.

Earlier, you also reported drinking 10 Specialty Coffee Drinks during a typical month, which adds up to 3,300 calories consumed and \$36.50 spent over 1 month, and 39,600 calories consumed and \$438.00 spent over 1 year on Specialty Coffee Drinks.

A generalized Poisson regression analysis and follow-up contrast tests determined that participants in the personalized behavior feedback condition did not differ from those in the generic behavior feedback condition in future consumption intention of specialty coffee drinks [ $\chi^2(2, N = 102) = 0.36, p = .55$ ]; however, participants in both the personalized behavior feedback condition [ $\chi^2(2, N = 102) = 9.82, p < .001$ ] and the generic behavior feedback condition [ $\chi^2(2, N = 102) = 6.32, p = .01$ ] intended to drink significantly fewer specialty coffee drinks in the future compared to the no health message condition (see Figure 2).

This pilot study's findings raised several questions and initiated multiple changes that were implemented in the current study. First, although there was no statistical difference in consumption intention between the two health message groups, the data established the messages' effectiveness in reducing future intention of consumption over receiving no health message. However, the generic feedback condition provided participants in that condition with the differences in price and number of calories between traditional and specialty coffee drinks. As a result, the generic feedback message could have primed these participants to calculate the caloric and monetary consequences of consuming the specialty coffee drinks themselves, which is the primary difference in the information provided in the generic versus personalized behavior feedback messages. In an attempt to remediate this issue, the current study probed this lack of distinction by including a new, nearly identical generic-feedback health message condition that explicitly prompted the participants in that condition to recall their current consumption habits and consider its implications when reading that message.

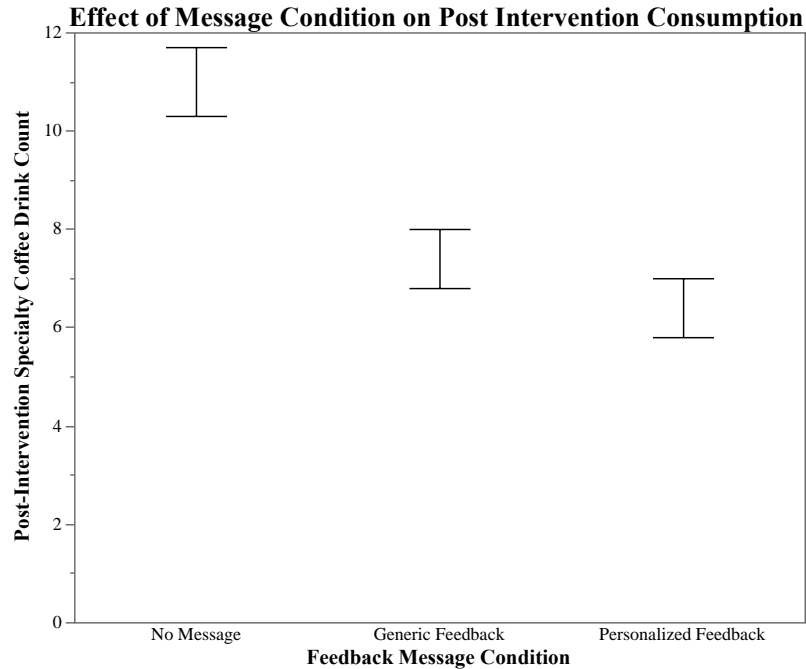
Along these lines, the pilot study's findings also raised questions about the relevant contexts surrounding the application of behavior feedback intervention. The primary objective of the pilot study was to demonstrate the effectiveness of behavior feedback. Having established its efficacy and considered the possible explanation for these results, it is clear that considering the conditions under which behavior feedback is most effective is the next step within this line of research. Thus, the current study investigated if providing the relevant calculations and drawing the pertinent conclusions was more or less advantageous to certain types of people, such as those who differ in Need for Cognition.

Furthermore, the current study implemented other small but notable changes. First, the time between the participants' Time 1 consumption questionnaire and the health message

intervention may have been too short in the pilot study. Consequently, the number of previously consumed drinks may have been especially salient, skewing their appraisal of their future consumption intention. Thus, the current study implemented a set of unrelated survey items as a distractor task between these two survey sections.

Finally, the current study included an additional modification to the personalized behavior feedback message. In the pilot study, the personalized behavior feedback message provided the monetary and caloric consequences for both traditional and specialty coffee drinks, based on the pre-intervention assessment of participants' consumption habits. For example, if participants recorded consuming ten traditional coffee drinks and ten specialty coffee drinks over the past typical month, participants in the personalized behavior feedback message condition would receive monetary and caloric feedback for both classes of drinks over one month and one year. In the proposed study, however, the personalized behavior feedback focused solely on the consequences of participants' specialty coffee consumption. Instead of providing the monetary and caloric feedback of participants' traditional coffee drink consumption habits, the personalized feedback message provided participants in that condition the number of calories and dollars they would have saved if they would have alternatively consumed that same number of traditional coffee drinks. This change was implemented to more effectively and more explicitly communicate the stark differences in the consequences of consuming traditional versus specialty coffee drinks.





**Figure 2. Pilot Study Effect of Feedback Message Condition on Participants' Post-Intervention Specialty Coffee Drink Consumption Intention**

### Hypotheses

Given the stark differences in the price and number of calories between traditional and specialty coffee drinks, coupled with the growing popularity of specialty coffee drinks, an investigation into how to effectively communicate these issues is essential. Past research provides promising support for the efficacy of persuasive health messages to encourage diet-related behavior modification. Tailored, and more specifically, behavior feedback health messages have shown to be especially useful, given their educational nature and the personal relevance of the information provided. Furthermore, an investigation into the specific conditions under which behavior feedback messages are most effective could help to better illuminate the nuances of its application.

The goal of this project was to determine if an individual's inclination toward cognitive activity (i.e., Need for Cognition; "NFC") affects their consumption of high-cost, high-calorie

coffee drinks when presented a specific type of behavior feedback health message. Furthermore, the ultimate goal of the behavior feedback message intervention was for participants to reconsider their future consumption of these coffee drinks, resulting in low consumption intention counts of specialty coffee drinks in the Post-Intervention Consumption Questionnaire. Because low-NFC individuals typically do not critically analyze and draw their own conclusions from persuasive information, it was expected that these participants would require explicit, personally-relevant information to be persuaded to reconsider their intention to consume high-cost, high-calorie coffee drinks in the future. Additionally, with this understanding of low-NFC individuals, it was also expected that prompting them to recall their past consumption behavior and consider its implications before providing them with a generic feedback persuasive message would be more influential than only providing them with a generic feedback message. Moreover, because high-NFC individuals do typically critically analyze and draw their own conclusions from persuasive information, it was expected that these participants would adequately process the information provided by any of the three behavior feedback messages provided within the study, leading them to conclusively reconsider their intention to consume high-cost, high-calorie coffee drinks in the future. Thus, with this information in mind, I tested the following hypotheses regarding participant's intention to consume specialty coffee drinks in the future:

1. For participants in the "personalized feedback message" condition, the lower their level of NFC, the fewer specialty coffee drinks they will intend to consume compared to participants with lower levels of NFC in the other two health message conditions (i.e., the generic feedback with prompt condition and the generic feedback without prompt condition).

2. For participants in the “generic feedback message with prompt” condition, the lower their level for NFC, the fewer specialty coffee drinks they will intend to consume compared to participants with lower levels of NFC in the “generic feedback message without prompt” condition.
3. Participants with higher levels of NFC in either of the three health message conditions will not differ in their future consumption intention of specialty coffee drinks when compared to participants with higher NFC in the other two health message conditions.

Due to the lack of difference in post-intervention consumption intention found in the pilot study, the behavior feedback messages will be examined to see if any of them lead to the lowest future intention of specialty coffee drink consumption in an exploratory manner. However, I hypothesized that individuals in the three health message conditions will intend to consume fewer specialty coffee drinks in the future compared to those in the no message condition.

Finally, along with examining participants' future intention to consume specialty coffee drinks, this study also sought to assess how the immediacy of participants' likelihood to reduce their specialty coffee drink consumption was affected by the feedback message they received and the level of Need for Cognition they employ. Specifically, participants' likelihood to reduce their specialty coffee drink consumption “*in the next 60 days*,” “*in the next 30 days*,” and “*in the next few days*” were measured and analyzed. Accordingly, a parallel set of hypotheses were tested for each of the three likelihood-to-reduce timeframes. Each of these sets of hypotheses were mirrored from the behavior intention hypotheses stated above with the same theoretical support. A list of these hypotheses can be viewed in Appendix B.

## Chapter 2 - Method

### Participants

For the current study, 252 participants (54% male;  $M$  Age = 36 years,  $SD$  = 11 years) were recruited from the online data collection tool Amazon Mechanical Turk (MTurk). Only MTurk workers who spoke English and resided within the United States were allowed access to the study survey. Each participant was compensated \$0.50 for completing the survey.

### Design

A between-groups design was utilized with one factor being manipulated. This manipulated factor was the type of message that the participants read, with four levels: a personalized behavior feedback message, a generic behavior feedback messages that contains a memory prompt, a generic behavior feedback message that does not contain a memory prompt, and no health message. Each of the three persuasive messages provided participants with information regarding the monetary and caloric consequences of traditional and specialty coffee drink consumption, but they varied in the degree of personalization that they display. This study also incorporated a pre- and post-intervention design, where participants self-reported their coffee consumption habits and their perceptions about these habits before and after receiving a persuasive message intervention.

### Materials

The current study was generated and administered remotely through the online survey tool Qualtrics. MTurk workers were provided an invitation link to the Qualtrics survey upon accepting the survey task on MTurk (i.e., the HIT). Participants were subsequently able to access and complete the survey on the internet from their computer or mobile device. The survey was

contained four components: the prescreening questionnaires, the pre-intervention questionnaires, the persuasive message intervention, the post-intervention questionnaires, and the study debrief.

**Prescreening Questionnaires.** After participants consented to participate in the study, they were tasked with completing three prescreening checks in order to ensure that the sample was filled by coffee consumers who could read and understand the persuasive message intervention provided within the survey (see Appendix C). Participants first completed a robot captcha check by clicking a box and completing an item selection task, designating that an actual human person, rather than a computer-generated program is participating in the survey. Next participants were asked if they regularly consumed two or more specialty coffee drinks during a typical week. Only participants who answered “yes” to this screening continued on to the final prescreening task. Finally, participants were tasked with reading a passage and answering one question adopted from the TOEFL (Test of English as a Foreign Language), which tested the reader’s ability to comprehend the theme of the passage. Following the successful completion of each screening, participants were enrolled in the study.

### **Pre-Intervention Measures**

**Pre-Intervention Consumption Questionnaire.** The study began by asking participants about their current consumption habits of both traditional and specialty coffee drinks (see Appendix D). Specifically, the items asked, “*Over a past typical month (30 days), how many Traditional/Specialty Coffee Drinks did you consume?*” Two distinctions of this question are noteworthy. First, it employed the word “typical” to describe the one-month timeframe so that participants did not feel obligated to answer in the context of only the previous one month. Given the variability in some peoples’ schedules from week to week and month to month, the study sought to gauge typical behavior over a standard month. Second, it used the timeframe of one

month/30 days over other periods of time to avoid any time-related confounds and to ensure a comprehensive measure of their behavior.

**Pre-Intervention Immediacy of Reducing Consumption Questionnaire.** To assess a holistic view of participant's current consumption behaviors, a set of three questions regarding participants' attitudes about their consumption behavior was employed (see Appendix D). This questionnaire was inspired by the temporal dimensions of the Transtheoretical Model (Prochaska & DiClemente, 1983), and its items were constructed in order to measure how likely participants are to begin initiating change in their coffee consumption habits. These three items probed how likely the participant was to begin reducing their specialty coffee consumption "*in the next six months*," "*in the next 30 days*," and "*in the next few days*." These timeframes derive from the Contemplation, Preparation, and Action stages of the TTM, respectively. Participants answered each question based on a five-point Likert scale ranging from "*strongly unlikely*" to "*strongly likely*."

### **Message Interventions**

A set of unrelated survey items was presented to participants between the Pre-Intervention Immediacy of Reducing Consumption Questionnaire and the persuasive message intervention to act as a distractor task in order to discourage demand characteristics in subsequent survey items. After completing these items, participants read one of three persuasive messages or no message, based on their block-randomized condition assignment (see Appendix E). Each of the health messages were constructed with language that all English-speaking adults should be able to read and comprehend, and it was presented to them in prose form. The block-randomization of participants into one of the four message condition was conducted by Qualtrics.

**No Health Message.** Participants in the no health message group were not provided any feedback information regarding coffee consumption and were simply instructed to “*click ‘next’ to continue.*”

**Generic Feedback without Prompt Message.** The generic feedback without prompt message provided participants in this condition with basic information regarding the consequences of consuming high-cost, high calorie (i.e., “specialty”) coffee drinks. Specifically, it highlighted how, despite having similar amounts of caffeine between traditional and specialty coffee drinks, there is a large discrepancy between the prices and number of calories of these drinks. Furthermore, by consuming these high-cost and high-calorie drinks over time, consumers would potentially be putting themselves at risk of increasing their susceptibility to adverse health and financial outcomes in the future. The prices and numbers of calories of an average medium-sized traditional and specialty coffee drink were also provided by this message. These averages were calculated from current figures of the top four popular coffee retailers in the United States (i.e., Starbucks, Dunkin Donuts, McDonalds, and Caribou Coffee).

**Generic Feedback with Prompt Message.** Given the results of the pilot data that were discussed earlier, participants in the generic feedback group may have been primed to recall their past (Pre-Intervention) consumption behavior and consider the implications of those habits. As a result, they may have also subsequently performed mental math for themselves to calculate the consequences of their behavior, such information that is provided in the personalized feedback condition. To remediate this, the current study sought to investigate whether a change to the generic behavior feedback message would produce significant changes in consumption intention. Accordingly, the “generic feedback *with* prompt” message contained the exact same information as the “generic feedback *without* prompt” message, but the “*with* prompt” message also

encouraged its readers to “*Please take a moment to recall how many Specialty Coffee Drinks you typically consume, and consider the implications of your coffee-drinking behavior when reading the following information.*” This prompt was provided in bolded and underlined print at the beginning of the message. By explicitly instructing the participants to recall this information and to consider the implications, the current study was able to identify if this recollection and consideration is in fact important in this process or not.

**Personalized Feedback Message.** The personalized feedback message provided participants in this condition with the same message as the two generic behavior feedback messages; however, instead of providing a memory prompt at the beginning, this message instead provided participants with the caloric and monetary consequences of their specific consumption habits (i.e., their personalized behavior feedback) at the end of the message. This feedback was processed by the embedded data tool within Qualtrics in which participants’ responses to the specialty coffee drink item of the Pre-Intervention Consumption Questionnaire and was presented within distinct portions of the message.

As mentioned earlier, the personalized feedback provided in the current study differed from the personalized feedback provided in the pilot study. Instead of providing feedback that was specific to the traditional coffee consumption habits recorded in the Pre-Intervention Consumption Questionnaire, the caloric and monetary consequences of the number of consumed specialty coffee drinks was also translated into the number of calories and dollars they would have saved if they would have chosen to drink that same number of traditional coffee drinks instead. Additionally, the consequence timeframe provided in this message was one month and one year, which were chosen to most effectively show the effects of consumption over time. For example, if a participant in this condition recorded that they consumed ten specialty coffee



drinks during a typical month in the Pre-Intervention Consumption Questionnaire, they would have read the following message:

“Earlier, you also reported drinking 10 Specialty Coffee Drinks during a typical month, which adds up to 3,300 calories consumed and \$36.50 spent over 1 month, and 39,600 calories consumed and \$438.00 spent over 1 year on Specialty Coffee Drinks.

However, if you would have instead consumed 10 Traditional Coffee Drinks instead, it would have only added up to 350 calories consumed and \$18.00 spent over 1 month, and 4,200 calories consumed and \$216.00 spent over 1 year.

That means you could save 2,950 calories and \$18.50 over 1 month, and 35,400 calories and \$222.00 over 1 year if you switch to drinking Traditional Coffee Drinks.”

As mentioned, this change was implemented in hopes of more explicitly communicating the differences in the consequences of consuming traditional versus specialty coffee drinks.

Furthermore, by presenting the caloric and monetary consequences of both one month and one year, it was expected that participants in this condition would be encouraged to reassess their own perception of threat associated with consuming these high-cost, high calorie drinks. With this in mind and considering that this personalized feedback was representative of their own specific behavior, participants were expected to be highly motivated to rethink their future intention of these behaviors.

### **Post-Intervention Measures**

**Post-Intervention Consumption Intention Questionnaire.** To analyze the feedback intervention’s effect on encouraging future modification of coffee consumption habits, the Post-Intervention Consumption Intention Questionnaire asked each participant how many traditional and specialty coffee drinks they intend to drink in the future. Specifically, this questionnaire

asked, “*Over the next typical month (30 days), how many Traditional/Specialty Coffee Drinks do you expect to drink?*” (see Appendix F). Again, the timespan of one month/30 days was selected over other time periods in order to ensure the potential for a reduction in consumption intention, as well as to remain consistent with the timeframe used in the Pre-Intervention Questionnaire. Consumption intention was chosen for this study because of its effectiveness in predicting future behavior (Sutton, 1998); however, future projects will attempt to investigate actual behavior.

**Post-Intervention Immediacy of Reducing Consumption Questionnaire.** To examine the feedback intervention’s effect on participants attitudes about their coffee consumption habits, the Post-Intervention Immediacy of Reducing Consumption Questionnaire asked participants about their likelihood to begin initiating change in their coffee consumption habits. However, the Post-Intervention Immediacy of Reducing Consumption Questionnaire assessed these perceptions after participants received the health message intervention. This questionnaire is identical to the Pre-Intervention Immediacy of Reducing Consumption Questionnaire, consisting of three Likert-scale items, each with the same phrasing as used in the Pre-Intervention Questionnaire (see Appendix F).

**Need for Cognition Scale (Cacioppo, Petty, & Kao, 2013).** To investigate how participants’ motivation to engage in cognitive activity affected their coffee consumption habits after receiving a feedback intervention, the survey included the Need for Cognition Scale (Cacioppo, Petty, & Koa, 1984). This is an 18-item scale with nine reverse-scored items. Participants answered questions like “I prefer complex to simple problems” and “Thinking is not my idea of fun” on a five-point Likert scale ranging from “extremely uncharacteristic of me” to “extremely characteristic of me” (see Appendix G). Given the nature of this scale, it was placed toward the end of the survey in hopes of preventing demand characteristics in participants.

**Demographics Questionnaire.** The final set of items were employed to collect demographic information from the sample. Specifically, participants' age, gender identity, and sex were self-reported (see Appendix H).

## **Procedure**

Participants were recruited from MTurk, where they selected and chose to participate in the HIT. All subjects who selected the HIT read and signed an online consent form before providing any data. Following, participants completed the three prescreening items (see Appendix C). Participants who reported consuming fewer than two specialty coffee drinks during a typical week or failed to correctly answer the reading comprehension question about the TOEFL passage were stopped after the prescreening, told that they did not qualify to complete the survey, and were asked to return the MTurk HIT. Participants who successfully completed those items were officially enrolled in the study. They subsequently began the survey with the pre-intervention set of measures, including the Pre-Intervention Consumption Questionnaire and the Pre-Intervention Immediacy of Reducing Consumption Questionnaire, which asked about the frequency of their coffee consumption habits and how likely they were to begin modifying these habits (see Appendix D). Following these questionnaires and a distractor task, participants read a message based on their block-randomized condition assignment to either the personalized feedback condition, the generic feedback with prompt condition, the generic feedback without prompt condition, and the no message condition (see Appendix E). Participants then completed the post-intervention set of measures, including the Post-Intervention Consumption Intention Questionnaire, the Post-Intervention Immediacy of Reducing Consumption Questionnaire, which inquired about participants' future intended frequency of coffee consumption how likely they were to begin modifying these habits (see Appendix F). Participants ended the survey by

completing the Need for Cognition Scale (See Appendix G) and the demographics questionnaire (See Appendix H). To conclude, participants were debriefed on the nature of the study and instructed on how to receive their payment for completing the survey.

## Chapter 3 - Results

### Data Preparation

Data were initially collected from 319 participants who completed each of the prescreening questionnaires at the beginning of the survey. Specifically, through the consumption prescreening item, only participants who reported consuming at least two specialty coffee drinks during a typical week were allowed to complete the survey. From this initial sample, 53 participants' data were removed from the sample after reporting consumption of fewer than five specialty coffee drinks in the Pre-Intervention Consumption Questionnaire. This cutoff of five drinks was chosen with the Pre-Intervention Consumption Questionnaire parameters in mind, which asked participants how many specialty coffee drinks they had consumed over a past typical month. Accordingly, five drinks over a four-week period (i.e., more than once per week) were established as the regular consumption threshold for this sample. Furthermore, one participants' data were removed for reporting an abnormally high consumption count of specialty coffee drinks in the Pre-Intervention Questionnaire (i.e., 200 drinks), two participants' data were removed for careless responding of survey items, and 11 participant's data were removed due to a failure to answer each item in the Need for Cognition Scale, rendering incomplete scores for the analysis. Of the final 252 participants included in the analyses, 54% were male with an average age of 36 years ( $SD = 11$  years).

In the analyses predicting future intended specialty coffee drink consumption, it should be noted that the variable "number of specialty coffee drinks" is essentially a count variable. As such, a floor effect was expected, where participants could not report consuming fewer than zero specialty coffee drinks. This floor is raised when considering the analyses, as only the data of participants who reported consuming five or more specialty coffee drinks over a typical month in

the Pre-Intervention Consumption Questionnaire were included. As such, the data are positively skewed, with an average of 11 drinks recorded in the Post-Intervention Consumption Questionnaire. Accordingly, generalized linear modeling, which effectively accounted for the potential non-normal distribution of the predicted outcomes, was chosen for this analysis over general linear modeling, which would have required supplementary transformation of the outcome variable. Conversely, the three models predicting likelihood to reduce consumption implored general linear modeling; however, after analyzing the distribution of these models' residuals, no transformations were required. Each statistical analysis of the data, discussed below, was conducted using the JMP Pro 14 statistical software. See Table 1 for the means, standard deviations, and bivariate correlations between the variables of interest in the current study.

**Table 1. Means, Standard Deviations, and Bivariate Correlations between variables of interest in the current study**

Variable	<i>M (SD)</i>	1	2	3	4	5	6	7	8
1. Pre- Specialty Consumption	14 (12)	–							
2. Pre- Reduce in 6mo	3.08 (1.25)	-.02	–						
3. Pre- Reduce in 30d	3.05 (1.34)	-.00	.78	–					
4. Pre- Reduce Soon	2.79 (1.31)	.06	.70	.77	–				
5. Post- Specialty Consumption	11 (10)	.79	-.03	-.02	.07	–			
6. Post- Reduce in 6mo	3.44 (1.21)	.02	.61	.52	.44	-.15	–		
7. Post- Reduce in 30d	3.35 (1.27)	.02	.57	.65	.55	-.09	.78	–	
8. Post- Reduce Soon	3.13 (1.33)	.06	.52	.60	.68	-.02	.68	-.78	–
9. Need for Cognition Score	59.35 (8.90)	-.01	.35	.45	.43	.11	.23	.34	.39

Variables 1 and 5 were count variables of the number of Specialty Coffee Drinks consumed. Items in Variables 2–4 and 6–9 were measured on a 1 to 5 response scale.

### **Intended Specialty Coffee Drink Consumption**

To examine participants' future intention to consume specialty coffee drinks (i.e., participants' responses to the Post-Intervention Consumption Questionnaire), a multiple generalized regression with a Poisson distribution and log link function was conducted. The

Poisson regression approach was utilized to account for the non-normal distribution of the count criterion variable (i.e., participants' responses to the Post-Intervention Consumption Questionnaire). Main effects in this model included behavior feedback message condition (with four levels), Need for Cognition Scale score, and participants' current specialty coffee drink consumption (i.e., participants' responses to the Pre-Intervention Consumption Questionnaire), which functioned as a quasi-continuous covariate predictor. Furthermore, the interaction between health message condition and pre-intervention specialty coffee consumption count was included to account for past consumption across each condition, and the interaction between health message condition and Need for Cognition Scale scores was included to account for participants' scores across conditions. This first consumption intention model was significant ( $\chi^2(11, N = 252) = 1060.658, p < .001$ ), and results from this model can be found in Table 2 below.

Generalized linear modeling with a set Poisson distribution is generally regarded as the most appropriate way to analyze count criterion variables (Frome, Kutner, & Beauchamp, 1973); however, it is important to note that the use of Poisson regression assumes equivalent variance around the values fit by the model (Dean & Lawless, 1989). When the variance of the data's distribution is greater than predicted by the set Poisson distribution, the data are considered overdispersed (Berk & MacDonald, 2008). Although overdispersion does not alter the parameter estimates of the models' predictors, it does produce an understatement of variance, which can inevitably lead to inaccurate conclusions (Cox, 1983). A common method to initially assess for overdispersion is through the Pearson statistic. While it is most generally used to assess goodness-of-fit, the Pearson statistic can also be used to detect overdispersion (Schwarz, 2019). Model 1 produced a Pearson statistic of  $\chi^2 = 621.148, p < .001$ . Accordingly, an extremely low

$p$  value, such as  $p < .001$ , suggests that the model does not fit the data well and overdispersion most likely had occurred (Dean & Lawless, 1989).

As a result of the gathered evidence for overdispersion, a second generalized linear model with a quasi-Poisson distribution and log link function was conducted. This second model included the same predictor and criterion variables as the previous model. The adjustment for overdispersion, designating a quasi-Poisson regression, was conducted within JMP. Including this adjustment within this second model produced the original model's overdispersion statistic of 2.963; being that the original model's overdispersion factor is larger than 1, overdispersion was confirmed to have occurred (Schwarz, 2015). Model 2 was significant ( $\chi^2(11, N = 252) = 358.008, p < .001$ ), and results of this model can be viewed in Table 2 below.

When comparing the effects of the adjustment for overdispersion implemented in the second model, a number of differences and similarities are notable. When comparing the parameter estimates tables from Model 1 (Table 2) and Model 2 (Table 3), the intercepts and slopes of the two model are identical, as expected (Cox, 1983). Conversely, due to the inclusion of the overdispersion adjustment within Model 2, the standard error metrics for the intercept, slope, and each individual predictor has been inflated by nearly double when compared to Model 1. The inclusion of the overdispersion adjustment also deflated the chi-squared test statistic in the whole model test and in each of the individual parameters in the current model; as a result, the  $p$  values of each parameter estimate has also been adjusted accordingly. Finally, when comparing both models' Akaike information criterion, the current model with the included adjustment for overdispersion ( $AICc = 604.123$ ) fits the data better than the previous model ( $AICc = 1733.559$ ).

Within Model 2, the pre-intervention measure of specialty coffee consumption was a significant predictor of future consumption intention count ( $B = 0.037, SE = 0.001, p < .001$ ), as



expected of a covariate predictor variable. Need for Cognition score was also a significant predictor of future consumption intention count ( $B = 0.014$ ,  $SE = 0.004$ ,  $p < .001$ ), suggesting that as Need for Cognition score decreased, post-intervention consumption intention also decreased (See Figure 3). While the estimates for the generic feedback with memory prompt group ( $B = 0.008$ ,  $SE = 0.062$ ,  $p = .902$ ), and generic feedback without memory prompt group ( $B = -0.079$ ,  $SE = 0.062$ ,  $p = .222$ ), were not significant, the estimate for the no message group was significant ( $B = 0.193$ ,  $SE = 0.059$ ,  $p = .001$ ), indicating that the absence of a behavior feedback message had an effect on participants' future intention to consume specialty coffee drinks. The interaction between feedback message condition and Need for Cognition Scale score was not significant at any level of the feedback message condition.

Finally, contrast tests were conducted to determine differences in future intention to consume specialty coffee drinks between participants in each of the four behavior feedback message conditions. Overall, these tests show that although each of the three behavior feedback messages lead to significantly lesser post-intervention specialty coffee drinks consumption intention when compared to the no message control, no differences were detected between the three behavior feedback message groups. Specifically, the personalized feedback group was significantly different from the no message group ( $\chi^2 = 9.775$ ,  $p = .002$ ) and that the generic feedback with memory prompt message group was significantly different from the no message group ( $\chi^2 = 7.488$ ,  $p = .006$ ), while the generic feedback without memory prompt message group was approaching significantly different from the no message group ( $\chi^2 = 3.753$ ,  $p = .053$ ). However, the personalized feedback message group was not significantly different from the generic feedback with memory prompt message group ( $\chi^2 = 0.160$ ,  $p = .689$ ), the personalized feedback message group was not significantly different from the generic feedback without memory prompt

message group ( $\chi^2 = 1.517, p = .218$ ), and the generic feedback with memory prompt message group was not significantly different from the generic feedback without memory prompt message group ( $\chi^2 = 0.689, p = .407$ ). Differences between the behavior feedback message conditions can be viewed in Figure 4 below.

In sum, while both Need for Cognition and behavior feedback message condition were significant predictors of future specialty coffee drink consumption intention, the interaction between these main effects, of which this study's hypotheses were based, was not significant. The main effect of Need for Cognition score was surprising, as the data suggest a positive, albeit small, relationship between Need for Cognition and post-intervention consumption intention. The main effect of behavior feedback message condition showed that specialty coffee drink consumption intention was equally low between the three feedback message groups compared to the no message control group, which replicates the findings of the pilot study. Finally, both the main effect of pre-intervention specialty coffee drink consumption and its interaction with feedback condition were significant predictors, as was expected as quasi-covariate predictors.

**Table 2. Results of the Poisson Regression Model 1 Predicting Future Intention of Specialty Coffee Drink Consumption Count**

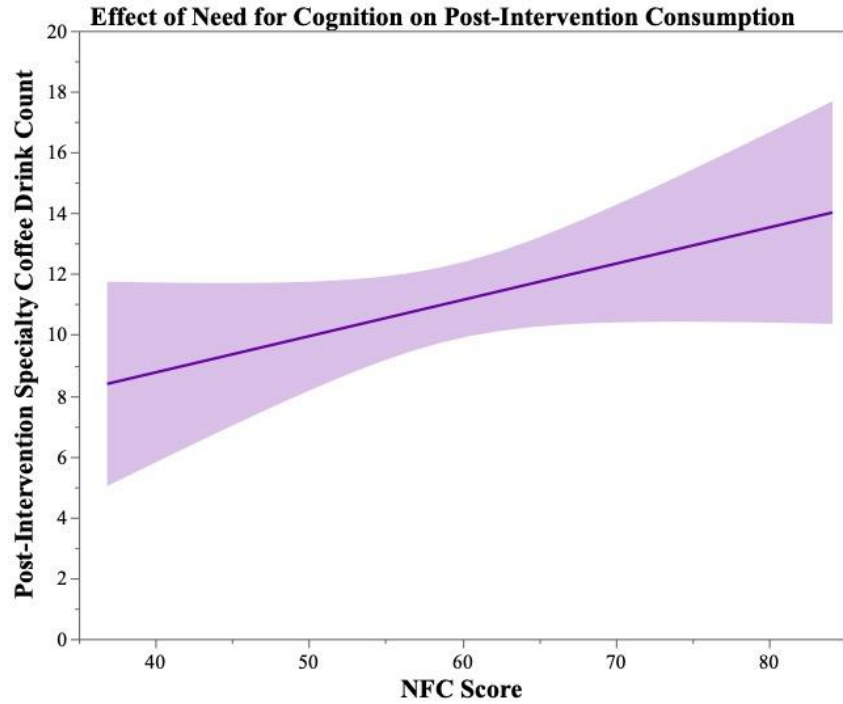
	<i>B</i>	<i>SE</i>	$\chi^2$	<i>p</i>
Intercept	0.876	0.139	39.909	<.001*
Pre_Specialty Count	0.037	0.001	719.634	<.001*
Generic w/o Prompt Message	0.008	0.036	0.045	.832
Generic w/ Prompt Message	-0.079	0.034	4.421	.036*
No Message	0.193	0.034	31.194	<.001*
NFC Score	0.014	0.002	42.711	<.001*
Generic w/o Prompt <sup>x</sup> NFC	0.005	0.004	2.014	.143
Generic w/ Prompt <sup>x</sup> NFC	0.011	0.004	8.061	.005*
No Message <sup>x</sup> NFC	-0.005	0.003	2.145	.143
Pre_Count <sup>x</sup> Generic w/o Prompt Message	0.008	0.002	12.140	.001*
Pre_Count <sup>x</sup> Generic w/ Prompt Message	-0.004	0.002	3.690	.056
Pre_Count <sup>x</sup> No Message	0.002	0.002	2.169	.141

Note: The Personalized Feedback Message Group was effects coded by JMP as the comparison group.

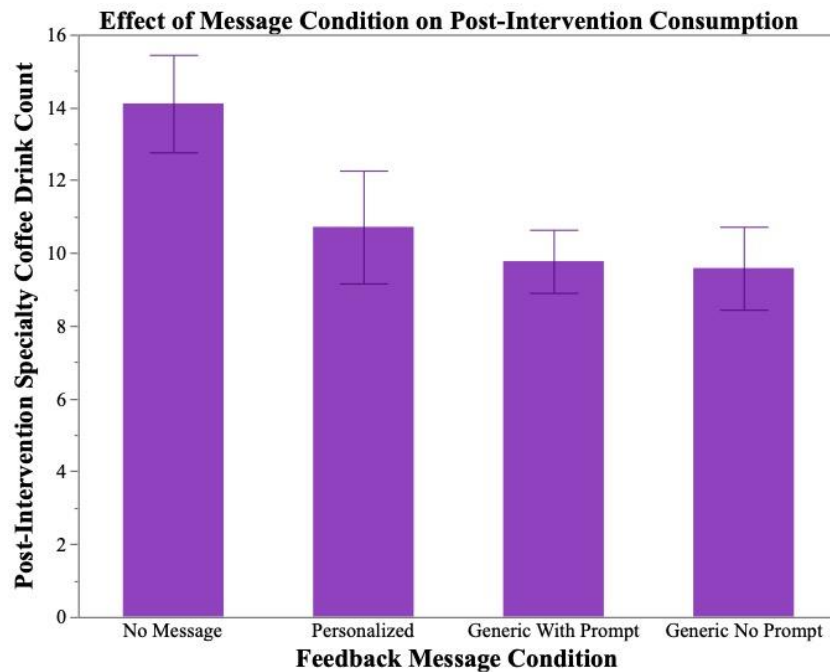
**Table 3. Results of Poisson Regression Model 2 Predicting Consumption Intention Count of Specialty Coffee Drinks**

	<i>B</i>	<i>SE</i>	$\chi^2$	<i>p</i>
Intercept	0.876	0.239	13.471	<.001*
Pre_Specialty Count	0.037	0.002	242.901	<.001*
Generic w/o Prompt Message	0.008	0.062	0.015	.902
Generic w/ Prompt Message	-0.079	0.065	1.492	.222
No Message	0.193	0.059	10.529	.001*
NFC Score	0.014	0.004	14.416	<.001*
Generic w/o Prompt <sup>x</sup> NFC	0.005	0.007	0.680	.410
Generic w/ Prompt <sup>x</sup> NFC	0.011	0.007	2.721	.099
No Message <sup>x</sup> NFC	-0.005	0.005	0.724	.395
Pre_Count <sup>x</sup> Generic w/o Prompt Message	0.007	0.004	4.097	.043*
Pre_Count <sup>x</sup> Generic w/ Prompt Message	-0.004	0.004	1.245	.264
Pre_Count <sup>x</sup> No Message	0.003	0.003	0.731	.392

Note: The Personalized Feedback Message Group was effects coded by JMP as the comparison group.



**Figure 3. Need for Cognition Scale Score by Post-Intervention Specialty Coffee Drink Consumption Intention in Model 2**



**Figure 4. Differences between Feedback Message Condition in Post-Intervention Specialty Coffee Drink Consumption Intention**

## **Immediacy of Reducing Specialty Coffee Drink Consumption**

Along with future intended consumption, a secondary group of three attitudinal outcome variables was created to understand how Need for Cognition and the different behavior feedback messages affect participants motivation to change their specialty coffee drink consumption habits. Specifically, these three outcome variables represent participants willingness to reduce their specialty coffee consumption in the next six months, in the next 30 days, and in the next few days, respectively. These outcome variables were created from participants' responses to the three Post-Intervention Immediacy of Reducing Consumption Questionnaire items, which were temporally based on the Contemplation, Preparation, and Action stages of the Transtheoretical Model (Prochaska & DiClemente, 1983). Within these multiple general linear models, main effects included the pre-intervention measure of the outcome variable as a covariate predictor, the behavior feedback message condition as a categorical predictor with four levels, and Need for Cognition Scale score as a continuous predictor. Furthermore, the two interactions between behavior feedback message condition Need for Cognition Scale score and between the behavior feedback message condition and the pre-intervention measure of likelihood to reduce their consumption were also included within these models.

Model 1, predicting participant's likelihood of reducing their consumption of specialty coffee drinks "*in the next six months,*" was significant ( $F(11, 239) = 15.882, p < .001$ ), and results of this model can be seen in Table 4 below. Parameter estimates of this model indicate that the pre-intervention measure of likelihood to reduce their consumption significantly predicted post-intervention likelihood to reduce consumption ( $B = 0.593, SE = 0.052, p < .001$ ), as expected of a covariate predictor. Furthermore, the interaction between pre-intervention

likelihood to reduce consumption and the No Message condition was significant ( $B = 0.196$ ,  $SE = 0.094$ ,  $p = .038$ ). However, no other predictors within Model 1 were significant.

Model 2, predicting participants' likelihood of reducing their consumption of specialty coffee drinks "*in the next 30 days*," was significant ( $F(11, 237) = 19.035$ ,  $p < .001$ ), and results from this model can be viewed in Table 5 below. As with the previous model, parameter estimates suggest that only the pre-intervention measure of these likelihood to reduce consumption significantly predicted post-intervention likelihood to reduce consumption ( $B = 0.583$ ,  $SE = 0.051$ ,  $p < .001$ ), as expected of a covariate predictor. However, no other predictors within Model 2 were significant.

Model 3, predicting participant's likelihood of reducing their consumption of specialty coffee drinks "*in the next few days*," was significant ( $F(11, 236) = 23.448$ ,  $p < .001$ ), and results of this model can be seen in Table 6 below. As with the previous two models, parameter estimates reveal that the pre-intervention measure of likelihood to reduce consumption significantly predicted post-intervention likelihood to reduce consumption ( $B = 0.635$ ,  $SE = 0.051$ ,  $p < .001$ ), as expected of a covariate predictor; furthermore, the interaction between pre-intervention likelihood to reduce consumption and the generic feedback with memory prompt message was also significant ( $B = 0.235$ ,  $SE = 0.089$ ,  $p = .009$ ). Need for Cognition was also a significant predictor of these post-intervention likelihood to reduce consumption ( $B = 0.016$ ,  $SE = 0.008$ ,  $p = .031$ ), suggesting that as Need for Cognition decreases, likelihood to reduce consumption "*in the next few days*" also decreases (see Figure 5). However, no other predictors within Model 3 were significant.

While each one of the three attitudinal models were significant, only the third model, predicting likelihood of reducing specialty coffee drink consumption "*in the next few days*,"

produced a significant main effect besides the covariate predictors. The data suggest another positive, albeit small, relationship between need for cognition and likelihood to reduce consumption. As in the behavior intention, this study’s interaction of interest, between behavior feedback message condition and Need for Cognition score, was not a significant predictor of likelihood to reduce specialty coffee drink consumption.

**Table 4. Results of Multiple Regression Model 1 Predicting Post-Intervention Likelihood of Reducing Specialty Coffee Drink Consumption “in the next 6 months”**

	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Intercept	1.460	0.410	3.56	<.001*
Pre_Reduce 6mo	0.593	0.052	11.36	<.001*
Generic w/o Prompt Message	-0.035	0.103	-0.34	.736
Generic w/ Prompt Message	-0.138	0.105	-1.32	.187
No Message	-0.084	0.103	-0.81	.418
NFC Score	0.003	0.007	0.35	.725
Generic w/o Prompt <sup>X</sup> NFC	-0.005	0.013	-0.37	.714
Generic w/ Prompt <sup>X</sup> NFC	0.002	0.012	0.12	.903
No Message <sup>X</sup> NFC	-0.003	0.011	-0.28	.782
Pre_Reduce 6mo <sup>X</sup> Generic w/o Prompt Message	0.157	0.085	1.84	.067
Pre_Reduce 6mo <sup>X</sup> Generic w/ Prompt Message	-0.109	0.097	-1.13	.262
Pre_Reduce 6mo <sup>X</sup> No Message	0.196	0.090	0.09	.038*

Note: The Personalized Feedback Message Group was effects coded by JMP as the comparison group.

**Table 5. Results of Multiple Regression Model 2 Predicting Post-Intervention Likelihood of Reducing Specialty Coffee Drink Consumption “in the next 30 days”**

	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Intercept	1.015	0.420	2.42	.017*
Pre_Reduce 30d	0.584	0.051	11.49	<.001*
Generic w/o Prompt Message	-0.067	0.103	-0.65	.515
Generic w/ Prompt Message	-0.030	0.105	-0.29	.776
No Message	-0.083	0.103	-0.80	.425
NFC Score	0.009	0.008	1.19	.233
Generic w/o Prompt <sup>X</sup> NFC	-0.010	0.013	-0.79	.428
Generic w/ Prompt <sup>X</sup> NFC	0.017	0.014	1.23	.221
No Message <sup>X</sup> NFC	0.006	0.012	0.52	.604
Pre_Reduce 30d <sup>X</sup> Generic w/o Prompt Message	0.129	0.084	1.54	.126
Pre_Reduce 30d <sup>X</sup> Generic w/ Prompt Message	-0.092	0.092	-1.00	.318

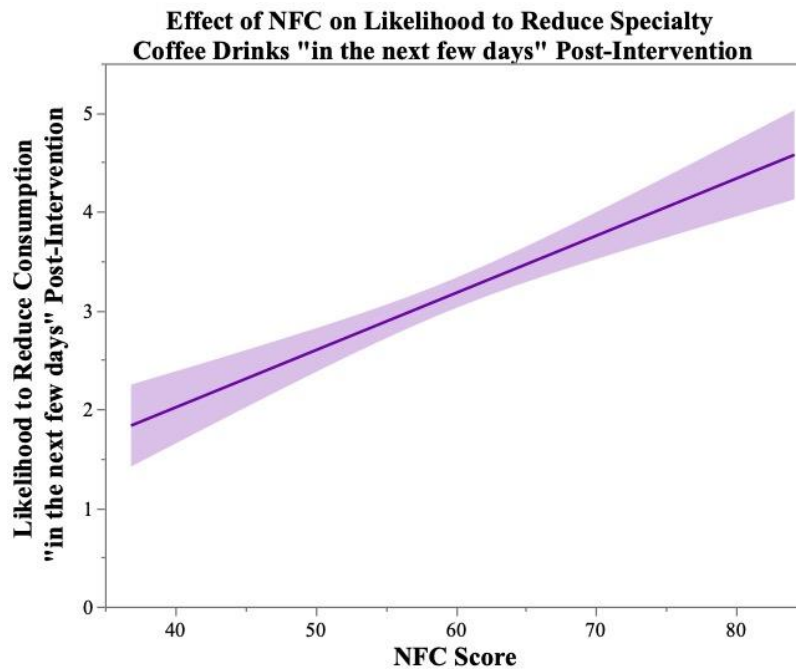
Pre_Reduce 30d <sup>X</sup> No Message	0.143	0.087	1.64	.102
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Note: The Personalized Feedback Message Group was effects coded by JMP as the comparison group.

**Table 6. Results of Multiple Regression Model 3 Predicting Post-Intervention Likelihood of Reducing Specialty Coffee Drink Consumption “in the next few days”**

	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Intercept	0.409	0.411	0.99	.321
Pre_Reduce Soon	0.635	0.051	12.49	<.001*
Generic w/o Prompt Message	-0.0004	0.103	-0.00	.996
Generic w/ Prompt Message	-0.108	0.105	-1.03	.305
No Message	-0.138	0.103	-1.34	.182
NFC Score	0.016	0.008	2.16	.032*
Generic w/o Prompt <sup>X</sup> NFC	-0.021	0.014	-1.55	.123
Generic w/ Prompt <sup>X</sup> NFC	-0.005	0.013	-0.41	.685
No Message <sup>X</sup> NFC	0.013	0.012	1.09	.275
Pre_Reduce Soon <sup>X</sup> Generic w/o Prompt Message	0.235	0.089	2.64	.009*
Pre_Reduce Soon <sup>X</sup> Generic w/ Prompt Message	-0.141	0.087	-1.61	.108
Pre_Reduce Soon <sup>X</sup> No Message	0.140	0.090	1.55	.123

Note: The Personalized Feedback Message Group was effects coded by JMP as the comparison group.



**Figure 5. Need for Cognition by Likelihood to Reduce Specialty Coffee Drink Consumption “in the next few days” Post-Intervention**



## Chapter 4 - Discussion

The primary goal of this study was to investigate whether one's tendency to engage in and enjoy cognitive activity (i.e., their Need for Cognition) affects their future intention to consume high-cost, high-calorie coffee drinks after reading a message about the consequences of that behavior (i.e., a behavior feedback persuasive message). Furthermore, this study sought to determine if these factors have an effect on participants' willingness to reduce their specialty coffee drink consumption and if either of the three behavior feedback messages—the personalized feedback message, the generic feedback message including a memory prompt, or the generic feedback message not including a memory prompt—were more effective than the others at reducing specialty coffee drink consumption intention. To achieve these objectives, participants from across the United States completed an online pre-post design survey that included a behavior feedback message intervention. Within the survey, participants first recorded their current specialty coffee drink consumption habits and their likelihood to reduce their consumption of these drinks in the future. Following the persuasive behavior feedback message intervention, participants were asked to record the number of specialty coffee drinks they intend to consume in the future and, again, their likelihood to reduce their consumption of these drinks in the future. Finally, toward the end of the survey, participants' tendency to engage in and enjoy cognitive activity was measured using the Need for Cognition Scale (Cacioppo, Petty, & Kao, 2013). Although each of the three behavior feedback messages were successful at encouraging reduced intention to consume specialty coffee drinks compared to the no message control, no interaction effect between Need for Cognition Scale scores and behavior feedback message condition was established. Furthermore, the data suggest that level of Need for Cognition also

affected both post-intervention consumption intention and likelihood to reduce consumption of these drinks “in the next few days,” but in an inconsistent fashion.

Within this study, various sets of hypotheses regarding level of Need for Cognition and behavior feedback message condition were tested. In the first set of hypotheses, focusing on participant’s behavior intention, three hypotheses were tested. First, I hypothesized that for participants in the “personalized feedback message” condition, the lower their level of NFC, the fewer specialty coffee drinks they will intend to consume compared to participants with lower levels of NFC in the other two health message conditions (i.e., the generic feedback with prompt condition and the generic feedback without prompt condition). Next, I hypothesized that for participants in the “generic feedback message with prompt” condition, the lower their level for NFC, the fewer specialty coffee drinks they will intend to consume compared to participants with lower levels of NFC in the “generic feedback message without prompt” condition. Lastly, I hypothesized that for participants with higher levels of NFC in either of the three health message conditions will not differ in their future consumption intention of specialty coffee drinks when compared to participants with higher NFC in the other two health message conditions. Furthermore, I hypothesized that participants in each of the three behavior feedback messages would intend to consume fewer specialty coffee drinks in the future compared to those in the no message condition, but specific differences between the three behavior feedback messages were examined exploratorily. Finally, three attitudes-based hypotheses were tested to predict participants’ likelihood of reducing their specialty coffee drink consumption “*in the next six months,*” “*in the next three months,*” and “*in the next few days,*” each of which mirror the three behavior-based hypotheses described above.

Two sets of analyses were conducted, one set examining participants' behavior intentions and one set examining participants' likelihood to reduce their specialty coffee drink consumption, to examine each of the study's hypotheses. In the first set, Poisson regression was utilized to predict post-intervention specialty coffee drink consumption intention (see Table 3). Each of the model's main effects (i.e., pre-intervention consumption, Need for Cognition Scale score, and behavior feedback message condition) were each significant predictors of the outcome variable. The pre-intervention measure of the outcome variable was anticipated to be a significant predictor, being that it is a covariate predictor that is highly positively correlated with the post-intervention outcome measure. However, the findings surrounding the main effect Need for Cognition Scale score were surprising. Given what is known about the differences between individuals with low versus high Need for Cognition—such that those with higher levels of Need for Cognition are most likely to critically analyze persuasive information that is presented to them, leading to a greater possibility for modification of future behavior intentions—it was expected that a negative relationship between Need for Cognition Scale score and post-intervention specialty coffee drink consumption would have been exhibited. Conversely, a positive relationship between these variables was observed, suggesting that as one's level of Need for Cognition decreases, so does their intention to consume these drinks in the future.

To test the hypotheses regarding the varying effects of the behavior feedback messages, a series of contrast tests were conducted on the main effect of message condition in the behavior-intention model. These findings support the hypothesis that participants in each of the three feedback message conditions (i.e., the personalized feedback message condition, the generic feedback with memory prompt message condition, and the generic feedback without memory prompt message condition) would intend to consume fewer specialty coffee drinks in the future

than participants in the no message control condition (see Figure 4). However, these analyses also demonstrate that no differences in consumption intention were recorded between these three feedback message conditions. These findings replicate those from the pilot study, and together they suggest that both generic and personalized behavior feedback message interventions are equally effective at encouraging reduced consumption intention of high-cost, high-calorie coffee drinks. One explanation of these findings may involve how participants analyzed the three behavior feedback messages. It is highly plausible that participants with higher levels of Need for Cognition would have thoroughly considered the compounding effects of frequent consumption of specialty coffee drinks, regardless of the type of behavior feedback (i.e., generic versus personalized feedback) they received. Conversely, it is also highly plausible that participants with lower levels of Need for Cognition perceived the numerical information included in each of the three behavior feedback messages, whether it was personalized to their behavior or not, as a peripheral cue of its importance, making the message compelling to them (Yalch & Elmore-Yalch, 1984). Consequently, each of the three behavior feedback messages potentially encouraged participants in those message conditions, regardless of their level of Need for Cognition, to reduce their future intention to consume specialty coffee drinks.

Finally, although the main effects of Need for Cognition Scale score and behavior feedback message condition were significant predictors of post-intervention specialty coffee drink consumption intention, the interaction between these predictors was not significant (see Table 3). This interaction was of the highest interest to this project, as the three behavior-intention hypotheses were meant to be testing through the probing of this interaction. However, the data suggest that no differences were revealed between individuals of varying levels of Need for Cognition when presented with differing forms of behavior feedback persuasive messages.

In the second set of analyses, general linear regression was utilized to predict participant's likelihood to reduce their specialty coffee drink consumption "*in the next six months*" (Table 4), "*in the next 30 days*" (Table 5), and "*in the next few days*" (Table 6), was examined. The same main effects and interaction terms from the behavior-intention model were incorporated in these three models. Surprisingly, only the model predicting likelihood of reducing consumption "*in the next few days*" included a significant predictor (i.e., Need for Cognition Scale score) beyond the covariates. In this model, a positive relationship was found between likelihood to reduce consumption "*in the next few days*" and NFC score, such that as participants' level of Need for Cognition decreased, their likelihood to decrease their consumption intention also declined (see Figure 5).

After consideration, it appears that the findings surrounding the main effect of Need for Cognition seem to be at odds between the behavior intention and likelihood to reduce consumption models. As a reminder, results from the behavior-intention model suggested a positive relationship between Need for Cognition and future consumption intention, such that as participants' level of Need for Cognition decreased, their post-intervention specialty coffee drink consumption intention also decreased (see Figure 3). However, results from the attitudinal model also suggested a positive relationship between Need for Cognition and likelihood of reducing consumption "*in the next few days*," such that as participants' levels of Need for Cognition decreased, their likelihood to reduce consumption in the next few days also decreased (see Figure 5). One explanation for this inconsistency may again involve how participants perceived the messages displayed in the study. Although the messages' numerical cues potentially encouraged participants with lower levels of Need for Cognition to record reduced specialty coffee drink consumption intentions, these cues may have been less effective at motivating these participants

to enact this behavior change “in the next few days.” This notion is supported in the literature, as the Elaboration Likelihood Model posits that peripheral route persuasion, such as persuasion achieved through the use of numerical cues, does not effectively predict future behavior (Petty & Cacioppo, 1986). As a result, if behavior feedback in fact causes an incongruence between attitudes about reducing consumption and behavior intention in this context, it may be that future interventions should also include some kind of aspect that encourages their commitment to this behavior change. Regardless, future investigation into this inconsistency is necessary.

### **Limitations**

There are a few limitations to the study’s design that are important to address. First, using a sample of Amazon Mechanical Turk workers has both advantages and disadvantages. Although MTurk is able to capture a nationally representative sample, some participants may not have been motivated to carefully respond to the survey items due to the relatively low payment they received for participating. This sample of participants may have also completed any number of MTurk surveys before this, giving them an enhanced ability to extract information about the nature of study, which could ultimately encourage biased responding. Furthermore, given the nature of this study and its intervention goals, participants from MTurk may not be the best to sample from with regards consuming high-cost coffee drinks, as research shows that these samples tend to be more frugal with their spending compared to community participants (Goodman, Crymer, & Cheema, 2012).

Along these lines, given that these participants completed an online survey that included a persuasive message intervention, other similar limitations could have surfaced. Specifically, this design and the measures included within it (e.g., the Pre- and Post-Intervention Consumption Questionnaires) assume a reliance on the accuracy of participants’ memory regarding their

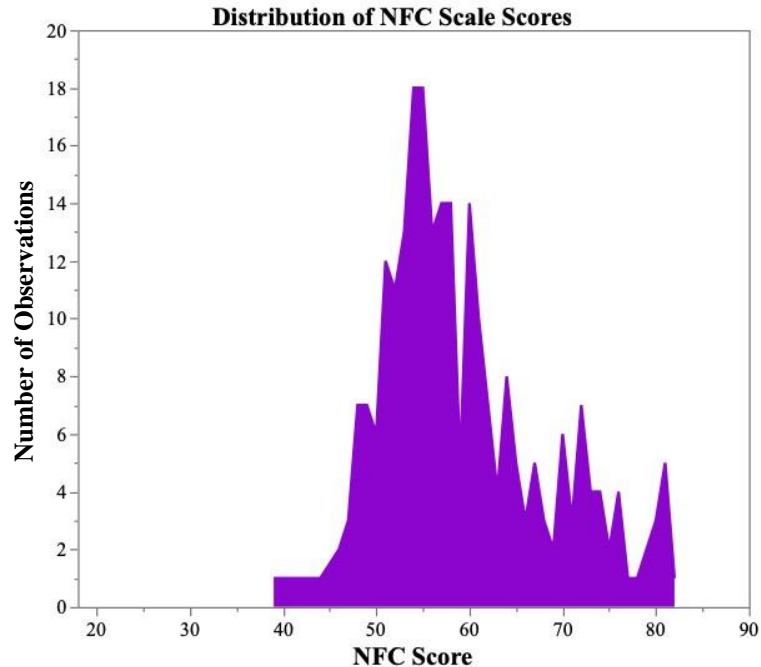
specialty coffee drink consumption habits. This could affect both the effectiveness of the intervention and the generalizability of the demonstrated results. Additionally, due to the pre-post intervention design of this online survey, there was limited time between the pre- and post-intervention measures of the outcome variables, potentially limiting the impact that the behavior feedback messages utilized in this study could have made.

Upon further investigation into the distributions of the study's variables, two potential limitations were identified. First, although the distribution of Need for Cognition Scale scores was positively skewed, a floor effect was identified. Figure 6 below portrays the distribution of scores, with the *x*-axis manipulated to represent the possible range of scores (i.e., 18 to 90). Two-thirds (66.67%) of observations were larger than the scale's median score of 54; thus, a disproportionately low number of Low NFC individuals was sampled. Given that both the behavior intention and immediacy of reducing consumption hypotheses were crafted toward low-NFC individuals, this could have affected the outcomes of the study. Second, after reviewing participants' responses to the Pre-Intervention Consumption Questionnaire, which asked participants how many specialty coffee drinks they had consumed over a past typical month, responses were relatively low. After removing outliers (for this distribution analysis only), the average pre-intervention consumption count was 11 drinks ( $SD = 5$  drinks). Over a one-month period, that averages to nearly 3 specialty coffee drinks per week. While this is still a notable frequency when considering the health and financial consequences over time, the efficacy of the three behavior feedback messages utilized in this study could be different if analyzed from a sample of more frequent consumers of these coffee drinks. Thus, a sampling of these higher-frequency consumers could answer this uncertainty and improve the generalizability of the study's findings.

Taking a closer look at the differences between traditional and specialty coffee drinks and the content of the feedback messages, another study limitation may be in how dramatic and noticeable the differences between these two drink classes were. As mentioned, specialty coffee drinks contain nearly ten times as many calories and cost almost double the price compared to traditional coffee drinks. Although it was expected that low-NFC participants may not have thought extensively about the content of the generic feedback messages presented to them, they may have been easily able to conduct the mental math of their future consequences in their head, which is the exact information that was explicitly presented to the personalized feedback message group. Furthermore, given the magnitude of the differences between the calories and cost of these two drink classes, low-NFC individuals may not have even needed to extensively think about these differences, as these large difference could have functioned as a cue that this information is compelling and should be followed. Thus, in the future, investigation into the use of feedback interventions when the comparisons between the target behaviors are less dramatic and obvious may be warranted.

Finally, it is also important to discuss that the primary outcome of interest of this study was participants' behavior intention, rather than their actual behavior. As discussed, data was collected for this study via an online survey. Consequently, this limits the types of variables that can be measured, including the ability directly measure behavior. Although behavior intention has been shown to be an effective predictor of actual behavior (Sutton, 1998), a measure of participants' actual behavior would have provided a clearer representation of the efficacy of these behavior feedback message interventions.





**Figure 6. Distribution of Participants’ Need for Cognition Scale Scores**

### **Future Directions**

Considering the findings of the current study, a number of potential future research opportunities have been identified. First, future studies could improve upon the methodological limitations discussed above. For example, more robust methods of sampling should be considered. Although prescreening measures and consumption count cutoffs were already utilized, methods for capturing a more normal distribution of Need for Cognition Scale scores and for sampling more frequent consumers of specialty coffee drinks should be explored. Second, methods of measuring actual specialty coffee drink behavior should also be explored. For example, the use of a longitudinal design that includes web- or app-based methods of consumption tracking and feedback delivery may be advantageous for this task. Participants could first record their current consumption habits and receive the behavior feedback message intervention, and then they could be equipped with technology that would allow them to record their consumption habits over a set amount of time following that initial engagement. Using this

methodology could both provide an accurate measure of actual behavior and create a measure of the effectiveness of the intervention over time. Furthermore, this methodology could help to further investigate the incongruence between consumption intention and willingness to reduce consumption, as shown by the collected data. That is, using a longitudinal design examining actual consumption behavior could be used to investigate whether this inconsistency is stable over time in the context of actual consumption, or if it was an artifact of this sample or the study's methodology. Finally, due to the restricted financial flexibility that MTurk workers commonly experience, sampling methods outside of Amazon Mechanical Turk should also be explored.

Along with methodological modifications, future investigation into these constructs should continue exploring the specific components of these persuasive behavior feedback message interventions that are most useful. First, for example, the effectiveness of varying lengths of behavior feedback messages should be investigated to see exactly how much feedback information is necessary. This effort could yield important real-world implications, as health researchers and practitioners could gain a better understanding of the degree of resources necessary for these kinds of persuasive interventions. Second, each of the three persuasive messages in this study included specific feedback about money spent and calories consumed from these drinks over one month and one year. However, as discussed, behavior feedback message interventions are highly adaptable in terms of the type of behavior feedback that can be presented. Thus, the efficacy of other feedback-related tools could be investigated. For example, comparative processes could be incorporated within the messages to highlight the similarities and dissimilarities between specialty coffee drinks and easily identifiable foods, such as candy bars or ice cream sundaes. Along these lines, similar comparative processes could be utilized to

highlight healthier versions of specialty coffee drinks. Furthermore, future research could also examine the effect of feedback interventions when the differences between compared target behaviors are less dramatic, such as with behaviors whose differences are not as extreme as ten times as many calories or double the price.

In the current study, both calorie and financial appeals were incorporated within the behavior feedback messages to maximize the likelihood of encouraging low post-intervention consumption intention of high-cost, high-calorie coffee drinks. However, future investigation into the comparative effectiveness of calorie versus financial appeals could be conducted to better understand their individual effects. It could be reasoned that some individuals are more strongly influenced by either of the two forms of appeals, while less strongly or not at all influenced by the other form of appeal. For example, someone who is more health- or appearance-conscious may be more strongly influenced by the calorie-consequence portions of the feedback messages employed in these studies. Along these lines, people who are more financially conscious may be more strongly influenced by the monetary-consequence portions of the feedback messages. Furthermore, one might speculate the possibility of sex differences in specialty coffee drink consumption intention when presented with different feedback information, such as calorie versus monetary appeals. Although sex differences were explored in the current study in an exploratory manner, in which no sex differences were found, the design of the current study did not allow for this exploration of sex differences with respect to the individual effects of calorie versus monetary appeals. Nonetheless, by investigating the comparative difference in effect between financial and health appeals, researchers and medical practitioners could better understand how to more effectively apply these kinds of behavior feedback dietary interventions.

Finally, future investigation into this program of research should also include methods of measuring how this type of dietary intervention affects the strength and tendency of other health and unhealthy behaviors. The nature of the behavior feedback messages created for this study highlighted the difference between high- and low- cost and calorie coffee drinks, implying that there are healthier and less expensive options for coffee consumers to choose. However, two unintentional outcomes of this and other behavior interventions like this could occur. On one hand, participants could apply the information they learn from these messages to other dietary domains of their life. For example, if these messages encourage participants to reflect on another high-cost, high-calorie dietary behavior that they regularly partake in, the messages could also consequently encourage these readers to consider a healthier, less expensive alternative in the future. On the other hand, participants could be motivated by these messages to enact a healthier and less expensive behavior in the present, but then follow this with an unhealthier or more expensive behavior in the future. For example, these messages may encourage consumers to purchase a healthier and less expensive coffee drink on their next coffee outing, but then, because they engaged in this healthier and less expensive behavior in the present, they may feel justified in engaging in an unhealthy, more expensive behavior, like buying and eating a box of donuts, later on. This examination would allow researchers to test a wider range of behaviors affected by this intervention, as well as better understand how the scope of this domain of dietary interventions.

## **Conclusion**

Behavior feedback-related messages have shown to be a useful intervention for encouraging consumers of high-cost, high-calorie coffee drinks to modify their habits in the future. The findings of this study, which replicate the findings of the pilot study, provide insight

into which type of feedback health practitioners and researchers could effectively use. Given that no differences in post-intervention consumption intention were measured between members of the three behavior feedback message groups, practitioners and researchers could theoretically incorporate either generic or personalized feedback effectively within interventions targeting high-cost, high-calorie drink consumption. If time and resources are available, the data suggest that personalized behavior feedback is a solid approach; however, if these and other relevant commodities are limited, the data suggest that generic feedback is also a worthy intervention option.

Although the behavior feedback message interventions were successful at encouraging reduced consumption intention, the results surrounding participants' Need for Cognition were surprising. Because no interaction effects between Need for Cognition and behavior feedback message condition were established, this study was unable to determine whether the various types of behavior feedback messages were more or less effective for people at different levels of Need for Cognition. Furthermore, while participants with lower levels of Need for Cognition recorded lower post-intervention consumption intention, these participants also recorded a lower likelihood to reduce their consumption of high-cost, high-calorie coffee drinks "*in the next few days.*" Due to this incongruence between participants' attitudes and intended behavior, further investigation into the relationships between these behavior feedback interventions, consumption behaviors, and Need for Cognition is needed.

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## Appendix A - Pilot Study Message Interventions

### Personalized Behavior Feedback Message

When considering the consequences of consuming certain coffee beverages, cost and health outcomes almost immediately come to mind. Focusing on the two coffee beverages we have been discussing, there is a considerable difference between the number of calories in these drinks. While a traditional cup of **Brewed Coffee** (with a standard serving of cream and sugar) only has around **35 calories** on average, **Specialty Coffee Drinks** (which commonly include milk/cream, flavoring, and topped with whipped cream and syrup) contain around **330 calories!** These numbers were calculated from medium-sized portions, so naturally the calorie, sugar, and fat counts fluctuate with size. This is especially important to consider, because a number of different research studies have shown that sugar-sweetened drinks significantly increase the chances of developing serious health conditions down the road, such as Type II Diabetes and various cardiovascular diseases.

There is also a considerable difference in cost between these coffee drinks. On average, you can expect to spend around **\$1.80** when buying a medium cup of **Brewed Coffee**. However, that price is more than doubled when buying a **Specialty Coffee Drink**, which averages to about **\$3.65** for medium sizes! Again, these prices fluctuate as the size of the drink changes. This is also especially important to consider, as consistently spending this money prevents you from spending that money elsewhere, as well as adds up over time.

Earlier, you reported drinking **10 Brewed Coffees** during a typical month, which adds up to **350 calories** consumed and **\$18.00** spent over **1 month**, and **4,200 calories** consumed and **\$216.00** spent over **1 year** on **Brewed Coffees**.

Earlier, you also reported drinking **10 Specialty Coffee Drinks** during a typical month, which adds up to **3,300 calories** consumed and **\$36.50** spent over **1 month**, and **39,600 calories** consumed and **\$438.00** spent over **1 year** on **Specialty Coffee Drinks**.

## Generic Behavior Feedback Message

When considering the consequences of consuming certain coffee beverages, cost and health outcomes almost immediately come to mind. Focusing on the two coffee beverages we have been discussing, there is a considerable difference between the number of calories in these drinks. While a traditional cup of **Brewed Coffee** (with a standard serving of cream and sugar) only has around **35 calories** on average, **Specialty Coffee Drinks** (which commonly include milk/cream, flavoring, and topped with whipped cream and syrup) contain around **330 calories!** These numbers were calculated from medium-sized portions, so naturally the calorie, sugar, and fat counts fluctuate with size. This is especially important to consider, because a number of different research studies have shown that sugar-sweetened drinks significantly increase the chances of developing serious health conditions down the road, such as Type II Diabetes and various cardiovascular diseases.

There is also a considerable difference in cost between these coffee drinks. On average, you can expect to spend around **\$1.80** when buying a medium cup of **Brewed Coffee**. However, that price is more than doubled when buying a **Specialty Coffee Drink**, which averages to about **\$3.65** for medium sizes! Again, these prices fluctuate as the size of the drink changes. This is also especially important to consider, as consistently spending this money prevents you from spending that money elsewhere, as well as adds up over time.

## **Appendix B - Immediacy of Reducing Consumption Hypotheses**

1. For participants in the “personalized feedback message” condition, the lower their level of NFC, the more likely they will be to reduce their specialty coffee drink consumption in the next [6 months / 30 days / few days] compared to participants with lower levels of NFC in the other two health message conditions.
2. For participants in the “generic feedback message with prompt” condition, the lower their level for NFC, the more likely they will be to reduce their specialty coffee drink consumption in the next [6 months / 30 days / few days] compared to participants with lower levels of NFC in the “generic feedback message without prompt” condition.
3. Participants with higher levels of NFC in either of the three health message conditions will not differ in their immediacy to reduce their specialty coffee drink consumption in the next [6 months / 30 days / few days] when compared to participants with higher NFC in the other two health message conditions.

## Appendix C - Participant Prescreening

### Consumption Check

Do you, on average, consume **at least two Specialty Coffee Drinks** (such as Lattes, Mochas, Macchiatos, Cappuccinos, their iced/frozen varieties, and other similar drinks) **in a week**?

- No
- Yes

### Reading Proficiency Check

Read the passage and then choose the best answer to the question below. Answer the question on the basis of what is stated or implied in the statement or passage.

**Myths are stories, the products of fertile imagination, sometimes simple, often containing profound truths. They are not meant to be taken too literally. Details may sometimes appear childish, but most myths express a culture's most serious beliefs about human beings, eternity, and God.**

The main idea of this passage is that myths...

- are created primarily to entertain young children
- are purposely written for the reader who lacks imagination
- illustrate the values that are considered important to a society**
- provide the reader with a means of escape from reality

## Appendix D - Pre-Intervention Surveys

### Pre-Intervention Consumption Questionnaire

To begin, you will be asked a few questions about your coffee consumption habits over a **past typical month** (30 days). The two different coffee beverages we are interested in are Traditional Coffee Drinks and Specialty Coffee Drinks.

**"Traditional Coffee Drinks"** include your typical brewed or iced coffee drink that is prepared from ground and roasted coffee beans. These drinks usually only contain some form of cream and sugar.

**"Specialty Coffee Drinks"** cover a variety of commonly consumed coffee drinks, including lattes, mochas, macchiatos, and all frozen and blended varieties of these drinks, like frappuccinos. These drinks commonly use espresso as their coffee base, and typically include cream or milk, some kind of sugar-based flavoring, and may even be topped with whipped cream and chocolate or caramel syrup.

Over a **past typical month** (30 days), how many **Traditional Coffee Drinks** did you consume?  
(\*Please enter response as a whole number in the text box below)

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Over a **past typical month** (30 days), how many **Specialty Coffee Drinks** did you consume?  
(\*Please enter response as a whole number in the text box below)

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## Pre-Intervention Immediacy of Reducing Consumption Questionnaire

For the following questions, please rate how likely or unlikely you are to adopt the following statements regarding your Specialty Coffee Drinks consumption habits.

As a reminder, Specialty Coffee Drinks include a variety of drinks, such as...

- Lattes
- Mochas
- Macchiatos
- Frozen & Blended varieties like Frappuccinos
- Iced & Brewed Coffee (WITH syrup sweetener)
- Other similar drinks

1 (Strongly Unlikely) 2 3 4 5 (Strongly Likely)

1. How likely/unlikely are you to start reducing your Specialty Coffee Drink consumption **in the next 6 months?**
2. How likely/unlikely are you to start reducing your Specialty Coffee Drink consumption **in the next 30 days?**
3. How likely/unlikely are you to start reducing your Specialty Coffee Drink consumption **in the next few months?**

## Appendix E - Current Study Message Interventions

### Personalized Behavior Feedback Message

When considering the consequences of consuming certain coffee beverages, cost and health outcomes almost immediately come to mind. Focusing on the two coffee beverages we have been discussing, there is a considerable difference between the number of calories in these drinks. While a traditional cup of **Brewed Coffee** (with a standard serving of cream and sugar) only has around **35 calories** on average, **Specialty Coffee Drinks** (which commonly include milk/cream, flavoring, and topped with whipped cream and syrup) contain around **330 calories!** These numbers were calculated from medium-sized portions, so naturally the calorie, sugar, and fat counts fluctuate with size. This is especially important to consider, because a number of different research studies have shown that sugar-sweetened drinks significantly increase the chances of developing serious health conditions down the road, such as Type II Diabetes and various cardiovascular diseases.

There is also a considerable difference in cost between these coffee drinks. On average, you can expect to spend around **\$1.80** when buying a medium cup of **Brewed Coffee**. However, that price is more than doubled when buying a **Specialty Coffee Drink**, which averages to about **\$3.65** for medium sizes! Again, these prices fluctuate as the size of the drink changes. This is also especially important to consider, as consistently spending this money prevents you from spending that money elsewhere, as well as adds up over time.

Earlier, you also reported drinking **10 Specialty Coffee Drinks** during a typical month, which adds up to **3,300 calories** consumed and **\$36.50** spent over **1 month**, and **39,600 calories** consumed and **\$438.00** spent over **1 year** on **Specialty Coffee Drinks**.

However, if you would have consumed **10 Traditional Coffee Drinks** instead, it would have only added up to **350 calories** consumed and **\$18.00** spent over **1 month**, and **4,200 calories** consumed and **\$216.00** spent over **1 year**.

That means you could save **2,950 calories** and **\$18.50** over **1 month**, and **35,400 calories** and **\$222.00** over **1 year** if you switch to drinking **Traditional Coffee Drinks**.

## Generic Behavior Feedback *with* Prompt Message

**Please take a moment to recall how many Specialty Coffee Drinks you typically consume, and also consider the implications of your coffee-drinking behavior when reading the following information.**

When considering the consequences of consuming certain coffee beverages, cost and health outcomes almost immediately come to mind. Focusing on the two coffee beverages we have been discussing, there is a considerable difference between the number of calories in these drinks. While a traditional cup of **Brewed Coffee** (with a standard serving of cream and sugar) only has around **35 calories** on average, **Specialty Coffee Drinks** (which commonly include milk/cream, flavoring, and topped with whipped cream and syrup) contain around **330 calories!** These numbers were calculated from medium-sized portions, so naturally the calorie, sugar, and fat counts fluctuate with size. This is especially important to consider, because a number of different research studies have shown that sugar-sweetened drinks significantly increase the chances of developing serious health conditions down the road, such as Type II Diabetes and various cardiovascular diseases.

There is also a considerable difference in cost between these coffee drinks. On average, you can expect to spend around **\$1.80** when buying a medium cup of **Brewed Coffee**. However, that price is more than doubled when buying a **Specialty Coffee Drink**, which averages to about **\$3.65** for medium sizes! Again, these prices fluctuate as the size of the drink changes. This is also especially important to consider, as consistently spending this money prevents you from spending that money elsewhere, as well as adds up over time.



## Generic Behavior Feedback *without* Prompt Message

When considering the consequences of consuming certain coffee beverages, cost and health outcomes almost immediately come to mind. Focusing on the two coffee beverages we have been discussing, there is a considerable difference between the number of calories in these drinks. While a traditional cup of **Brewed Coffee** (with a standard serving of cream and sugar) only has around **35 calories** on average, **Specialty Coffee Drinks** (which commonly include milk/cream, flavoring, and topped with whipped cream and syrup) contain around **330 calories!** These numbers were calculated from medium-sized portions, so naturally the calorie, sugar, and fat counts fluctuate with size. This is especially important to consider, because a number of different research studies have shown that sugar-sweetened drinks significantly increase the chances of developing serious health conditions down the road, such as Type II Diabetes and various cardiovascular diseases.

There is also a considerable difference in cost between these coffee drinks. On average, you can expect to spend around **\$1.80** when buying a medium cup of **Brewed Coffee**. However, that price is more than doubled when buying a **Specialty Coffee Drink**, which averages to about **\$3.65** for medium sizes! Again, these prices fluctuate as the size of the drink changes. This is also especially important to consider, as consistently spending this money prevents you from spending that money elsewhere, as well as adds up over time.

## Appendix F - Post-Intervention Surveys

### Post-Intervention Consumption Intention Questionnaire

Now we will ask you about your future plans to consume the two coffee drinks we have been discussing (**Traditional Coffee Drinks** and **Specialty Espresso Drinks**) over the **next typical month** (30 days).

As a reminder, **Traditional Coffee Drinks** include your typical brewed or iced coffee drink that is prepared from ground and roasted coffee beans. These drinks usually only contain some form of cream and sugar.

**Specialty Coffee Drinks** cover a variety of commonly consumed coffee drinks, including lattes, mochas, macchiatos, and all frozen and blended varieties of these drinks, like frappuccinos. These drinks commonly use espresso as their coffee base, and typically include cream or milk, some kind of sugar-based flavoring, and may even be topped with whipped cream and chocolate or caramel syrup.

Over a **next typical month** (30 days), how many **Traditional Coffee Drinks** do you expect to drink? (\*Please enter response as a whole number in the text box below)

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Over a **next typical month** (30 days), how many **Specialty Coffee Drinks** do you expect to drink? (\*Please enter response as a whole number in the text box below)

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## Post-Intervention Immediacy of Reducing Consumption Questionnaire

For the following questions, please rate how likely or unlikely you are to adopt the following statements regarding your Specialty Coffee Drinks consumption habits.

As a reminder, Specialty Coffee Drinks include a variety of drinks, such as...

- Lattes
- Mochas
- Macchiatos
- Frozen & Blended varieties like Frappuccinos
- Iced & Brewed Coffee (WITH syrup sweetener)
- Other similar drinks

1 (Strongly Unlikely) 2 3 4 5 (Strongly Likely)

1. How likely/unlikely are you to start reducing your Specialty Coffee Drink consumption **in the next 6 months?**
2. How likely/unlikely are you to start reducing your Specialty Coffee Drink consumption **in the next 30 days?**
3. How likely/unlikely are you to start reducing your Specialty Coffee Drink consumption **in the next few months?**

## **Appendix G - Need for Cognition Scale (Cacioppo, Petty, & Kao, 2013)**

For each of the statements below, please indicate whether or not the statement is characteristic of you or of what you believe.

For example, if the statement is extremely uncharacteristic of you or of what you believe about yourself (not at all like you) please elect the "1" next to corresponding statement.

If the statement is extremely characteristic of you or of what you believe about yourself (very much like you) please elect the "5" next to corresponding statement.

**1** (Extremely uncharacteristic of me) **2** (Somewhat uncharacteristic of me) **3** (Uncertain)  
**4** (Somewhat characteristic of me) **5** (Extremely characteristic of me)

1. I prefer complex to simple problems.
2. I like to have the responsibility of handling a situation that requires a lot of thinking.
3. Thinking is not my idea of fun.
4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
5. I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something.
6. I find satisfaction in deliberating hard and for long hours.
7. I only think as hard as I have to.
8. I prefer to think about small daily projects to long-term ones.
9. I like tasks that require little thought once I've learned them.
10. The idea of relying on thought to make my way to the top appeals to me.
11. I really enjoy a task that involves coming up with new solutions to problems.
12. Learning new ways to think doesn't excite me very much.
13. I prefer my life to be filled with puzzles I must solve.
14. The notion of thinking abstractly is appealing to me.
15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
16. I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.
17. It's enough for me that something gets the job done; I don't care how or why it works.
18. I usually end up deliberating about issues even when they do not affect me personally.

## Appendix H - Demographic Questionnaire

What is your gender identity?

- Female
- Male
- Transgender Female
- Transgender Male
- Non-Binary / Third Gender
- Prefer to self-describe: \_\_\_\_\_
- Prefer not to answer

What was your sex assigned at birth?

- Female
- Male
- Prefer to self-describe: \_\_\_\_\_
- Prefer not to answer

Please enter your age (as a whole number) in the box below:

\_\_\_\_\_