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Fluency & Over The Counter Drug Warning Labels

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Fluency & Over The Counter Drug Warning Labels

by

Jonathan M. Cecire

A Thesis Submitted in Partial Fulfillment of the Requirements for the Master of Science
in Experimental Psychology with a Concentration in Cognitive Neuroscience

In

The Department of Psychology

Seton Hall University

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College of Arts & Sciences

APPROVAL FOR SUCCESSFUL DEFENSE

Masters Candidate, Jonathan M. Cecire, has successfully defended and made the required modifications to the text of the master's thesis for the M.S. during this spring Semester

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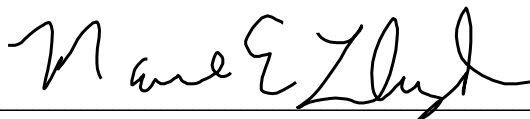
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Abstract

Fluency is defined as the ease with which something is processed (Jacoby & Dallas, 1981; Okuhara, 2017). Recent research has shown that the fluency of a drug's name can have an affect on people's perceptions and evaluation judgments (Dohle & Siegrist, 2013, Dohle & Montoya, 2017). Research has also shown that the fluency of information can have an effect on people's memory and performance (Diemand-Yauman, Oppenheimer, & Vaughan, 2011). The purpose of this study was to see how manipulating the fluency of warning labels could affect people's perceptions, adherence, memory, and behaviors. Results showed that labels with fluent formats improved purchasing preferences and memory; labels with fluent colors were also shown to improve purchasing preferences. However, neither the fluency of the format nor color affected participant's judgments of adherence or perceived hazardousness. The results are of particular importance because a product's label is the key source of safety information for the consumer (Goyal et al., 2012).

Keywords: fluency, perception, evaluation judgments, memory, label

Introduction

The U.S. Food and Drug Administration (FDA) states that, “our mission is to protect the public’s health by ensuring the safety, efficacy, and security of human and veterinary drugs, biological products, and medical devices; and by ensuring the safety of our nation's food supply, cosmetics, and products that emit radiation” (Office of the Commissioner, n.d.). The FDA also states that, “we are responsible for helping the public get the accurate, scientific-based information they need to use medical products and foods to maintain and improve their health” (Office of the Commissioner, n.d.). One of the ways that the public receives accurate information they need about a product is through the product’s label. Labels are one of the most important tools for supplying information and ensuring the safety of the public. The label provides users with the proper information to minimize risks, and explain what to do in case of complications. However, it is possible that many of the hospitalizations and adverse reactions to drugs are due to patients incorrectly taking the medications because they are unable to read, or understand the information on drug labels (Williams et al., 1995). The FDA recognizes the importance of warning labels and has made multiple rules to improve them. The question is, can the warning labels be more effective?

Quality healthcare outcomes depend upon patients’ adherence to recommendations and warnings on the labels. Warning labels are generally defined as any form of information disclosure on a product that alerts one’s attention to a potential danger (Purmehdi, Legoux, Carrillat, & Senecal, 2017). For over the counter drugs, the products label is the key source of safety information (Goyal, Rajan, Essien, & Sansgiry, 2012). In some cases, more than 40% of patients sustain injuries or problems because

they misunderstand, forget, or ignore healthcare advice (Martin, Williams, Haskard, & DiMatteo, 2005). Some of these risks include possible addiction, damage to internal organs, increase of susceptibility to future diseases, and even death (Martin et al., 2005). Acetaminophen, which is the main ingredient in Tylenol, is a pain reliever and fever reducer that is generally viewed as safe by the public. Nevertheless, acetaminophen can be very dangerous if used incorrectly. Between 55,000 to 80,000 people are admitted to the Emergency Room, and close to 500 people die each year from acetaminophen poisoning (Schonfeld, 2013). The information on a warning label is there to help people safely improve their condition or current ailment. Still, some people fail to adhere to these warnings for multiple reasons. One reason may be because they do not even notice or bother to look at the warnings. Bansal-Travers, Hammond, Smith, and Cummings, (2011) observed that 60 % of the participants in their experiment did not even notice the warnings labels on cigarette packs. It is difficult for a person to adhere to the warnings provided by labels if they do not even notice them.

There are also other factors that play into one's adherence to warning labels. For example, one such factor is the person's ability to recall and remember the information on the warning labels. When a person is able to recall the warning information provided to them, adherence increases. Though, when warning labels include a lot of medical jargon and information, it will decrease a person's ability to recall that information (Martin et al., 2005). Not only does it decrease the ability to recall the information, but also the use of needlessly complex wording could result in a negative preference toward that product or information (Oppenheimer, 2005). In most cases it would be best to use direct language with simple common words (Oppenheimer, 2005). Readability and a

person's understanding of the information both play a significant role in adhering to warning labels. The risk of non-adherence is extremely high when a person can't read or understand the medical instructions and warnings (Martin et al., 2005).

Functional health literacy of over 2,500 participants in two hospitals has also been studied in order to test people's abilities to read and understand medical information (Williams et al., 1995). The participants in this study took the Test of Functional Health Literacy in Adults (TOFHLA), a test that measures a person's ability to read and understand medical information that is presented in prose passages and in those containing numerical information (Williams et al., 1995). Normally, this type of information is present on prescription bottle labels and medical forms. The TOFHLA contains a reading comprehension and a numeracy section. TOFHLA scores showed that many participants are unable to read the instructions on medicine bottles or explain how to take the medications correctly (Williams et al., 1995). Around 830 of the participants had poor health literacy, and of those participants, 42% of them misunderstood the directions on the bottle (Williams et al., 1995). This is important to note because even if people are able to remember the warnings on the labels, if they do not understand the information they remembered they will still be at risk to incorrectly take the drug.

The FDA has tried to make this inability to comprehend warning labels less of a problem. The FDA has implemented many rules on what manufacturers can and cannot put on their bottles and boxes. One of the most recent rules was established in 1999, it was known as rule § 201.66. This rule made it so that the content and format for the labeling of over the counter drugs was standardized (Final Rule § 201.66, 1999). This rule was implemented so that it would be easier for people to read and understand the

information presented on OTC drugs (Final Rule § 201.66, 1999). Rule § 201.66 makes it so that people can use the OTC drugs in a safe manner (Final Rule § 201.66, 1999). The rule states that all OTC drugs must have the following eight pieces of information, in this specific order: Drug Facts or Drug Facts (continued), Active Ingredient(s), Purpose(s), Use(s), Warning(s), Directions, Other information, and Inactive ingredients (Final Rule § 201.66, 1999). Now with the information in the same order, it is easier for the consumer to compare and contrast products. This rule also allows manufacturers the option whether or not to have a questions section, but if it is included it must come after the inactive ingredients (Figure 1).



Figure 1. Shows the box labels of two different over the counter drugs Advil (<https://www.drugs.com/otc/102392/advil.html>) and Extra Strength Tylenol (https://static.propublica.org/projects/druglabels/otc/20130712_bb6533e5-e6a9-488c-b8ab-a6a06e87ede9/tylenol-01.jpg).

Warning labels contain important information to help keep people safe and healthy. However, the labels only moderately attract the attention of consumers (Purmehdi et al., 2017). The current warnings used on cigarette packages are printed in small text and leading to low levels of awareness and poor recall (Macy et al., 2015). Nan, Zhao, Yang, and Iles, (2014) illustrated how the current warnings could potentially be improved by altering the way the information is framed. One aspect of the labels that might have been overlooked, by manufacturers and the FDA, is the fluency of the warning labels.

Processing fluency is generally defined as the subjective ease in which information is processed (Jacoby & Dallas, 1981; Johnston, Dark, & Jacoby, 1985; Schwarz, 2004; Alter & Oppenheimer, 2009; Okuhara, 2017). Processing fluency has a wide range of effects, including the ability to influence people's evaluation judgments of liking and preference (Reber, Winkielman, & Schwarz, 1998; Lee & Labroo 2004; Reber, Schwarz, & Winkielman, 2004; Schwarz 2004; Alter & Oppenheimer, 2006; Labroo, Dhar, & Schwarz, 2008; Oppenheimer & Frank, 2008; Dohle & Siegrist, 2013). There are reasons to believe that the fluency of the warning labels can affect consumers. Researchers have suggested that fluency heuristics are decision-making tools that are used in a multitude of situations (Tversky & Kahneman, 1973; Whittlesea, Jacoby, & Girard, 1990). As stated before, many things contribute toward the adherence of warnings, but at a basic level a person still needs to make the decision to adhere. So in essence, adherence is a decision-making task. This means that it is possible for fluency to have an effect on a person's adherence.

Although one might believe that the fluency of a warning label possesses the ability to affect a person's decision making it may not do so for two reasons. One reason it will not matter is because a good portion of people do not notice or read the label. In a study by Bansal-Travers et al. (2011), 60% of participants did not notice the warning. The second reason is because many people cannot read or understand the warnings stated on the label (Williams et al., 1995). Notably, there has been research to show that even if people do not notice or understand an object they can still be affected by the fluency of that object. Shapiro (1999) instructed participants to read a magazine that contained short whodunit mysteries. While reading the magazine, participants did not notice the ads that were on the page. During this task, the fluency of the ads was manipulated by altering the consistency and context of the ads. The results showed that the fluency of the ad could significantly alter/bias a person's response (Shapiro, 1999). Products in the ads that had high fluency were significantly more likely to be included in a consideration set for both the recollection and exclusion tasks. Even if one does not notice or pay attention to a stimulus it can still affect them (Shapiro, 1999).

Another reason why the fluency of a warning label could potentially have an effect on consumers, regardless of their ability to read or notice it, is because of the short amount of time it takes for fluency to affect a person. There are multiple fluency studies where the stimulus is only presented for a very short period of time; this period can be less than one second. Even with this extremely quick presentation of the stimulus, increased fluency has still been shown to have a significant effect on people. Reber, Winkielman, and Schwarz, (1998) presented participants with nineteen circles and asked them to answer the question, "How pretty (ugly) was the circle?" To manipulate the

fluency of the stimuli the circles were filled with grey tones that ranged from 10% black to 100% black. Each circle was presented in the center of the screen for one second and was preceded by a fixation point that was presented for 500ms. The results showed that the participants judged the fluent high contrast circles (e.g. 100% black filled in circle against a white background) as significantly prettier than the low contrast circles (e.g. 10% black filled in circle against a white background). These results show that participants can be affected by an object's fluency even if it is only presented for a second or less.

Labroo et al. (2008) gives us a good reason to believe that the fluency of the warning label can affect consumers. This is because in their study a product's label was manipulated. Labroo and colleagues held trials consisting of a priming phase and a test phase. During the test phase, participants were shown several pairs of wine on a screen. Prior to being shown the pairs of wine, participants were asked to either visualize a control word (e.g., bike) or a word (e.g., frog) that related to one of the two wine labels that they would be presented with (one of the labels had a picture of a frog on it). During the prime phase the visualized word was presented in the middle of the screen for only one second before being quickly followed by a series of crosshatches (#) that were only displayed for 100 milliseconds. During the test phase participants saw a pair of wine bottles that were presented for either 16 milliseconds or 3 seconds. When fluency is increased, the preference for that product is enhanced (Labroo et al., 2008). This shows that the fluency of a label can have an effect on a person's preference and perception.

The FDA has tried to make labels more effective through the implementation of rules and regulations like rule § 201.66. However, there is a problem with rule § 201.66

because it states that the information must appear on the outside container or wrapper of the retail package, or the immediate container label if there is no outside container or wrapper. This is a problem because it makes it so that not all drug-warning labels are the same once they are out of their package (Figure 2). The majority of people will generally discard the outside packaging or box of a product. Once discarded, the only information the purchaser will have left about the product is what is on the bottle label. Another drawback to the FDA's rules is that the wording of the information on each label is allowed to be different to a degree as well. Though, it is the way that this information is presented that might be causing a problem. Some labels contain easy to read and clear warnings (e.g., big font, great contrast, visible color, simple words, and easy to understand instructions), while others have hard to read and unclear warnings (e.g., small font, poor contrast, obscure color, complex words, and medical jargon). For example, on the box of children's Benadryl the drug facts are presented in a light pink and blue color against a white background, that makes the information tough to read (Figure 3). Thus, warning labels differ in their processing fluency. When something is harder to process it requires more cognitive effort. Warning labels should aim to be as easy as possible to process because when something requires increased cognitive effort, people will try to avoid it (Kool, McGuire, Rosen, & Botvinick, 2010).

Advil
Ibuprofen Tablets, 200 mg
(Provided as Ibuprofen Sodium 256 mg)
Pain Reliever/Fever Reducer (NSAID)

FILM-COATED IBUPROFEN SODIUM

Advil **80 Tablets**

READ AND KEEP CARTON FOR COMPLETE WARNINGS AND INFORMATION

Do Not Use if seal under bottle cap imprinted with "SEALED for YOUR PROTECTION" is broken or missing.

Heart attack and stroke warning: NSAIDs, except aspirin, increase the risk of heart attack, heart failure, and stroke. These can be fatal. The risk is higher if you use more than directed or for longer than directed.

Directions:

- do not take more than directed
- the smallest effective dose should be used
- adults and children 12 years and over: take 1 tablet every 4 to 6 hours while symptoms persist
- if pain or fever does not respond to 1 tablet, 2 tablets may be used
- do not exceed 6 tablets in 24 hours, unless directed by a doctor
- children under 12 years: ask a doctor each tablet contains sodium 22 mg

Questions or comments?
Call weekdays 9 AM to 5 PM EST at 1-800-88-ADVIL.
For most recent product information, visit www.Advil.com
Pflizer, Madison, NJ 07940 USA
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READ THE LABEL

DO NOT USE WITH OTHER MEDICINES CONTAINING ACETAMINOPHEN

Extra Strength TYLENOL
Contains Acetaminophen
Pain Reliever - Fever Reducer
Caplets
100 CAPLETS - 500 mg each

Active ingredient (in each caplet): Acetaminophen 500 mg
Purpose: Pain reliever, fever reducer

Uses: temporarily relieves minor aches and pains due to:
 ■ headache ■ muscular aches ■ backache ■ toothache ■ menstrual cramps
 ■ temporarily reduces fever

Warnings:
 ■ **Alcohol warning:** If you consume 3 or more alcoholic drinks every day, ask your doctor whether you should take acetaminophen or other pain relievers/fever reducers. Acetaminophen may cause liver damage.
 ■ **Do not use:**
 ■ with any other product containing acetaminophen.
 ■ Stop use and ask a doctor if:
 ■ new symptoms occur
 ■ redness or swelling is present
 ■ pain gets worse or lasts for more than 10 days
 ■ fever gets worse or lasts for more than 3 days
 ■ If pregnant or breast-feeding, ask a health professional before use.
 ■ Keep out of reach of children.

Overdose warning: Taking more than the recommended dose (overdose) could cause serious health problems. In case of overdose, get medical help or contact a Poison Control Center right away. Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.

Directions:
 ■ do not take more than directed (see overdose warning)
 ■ Adults and children 12 years and over:
 ■ take 2 caplets every 4 to 6 hours as needed
 ■ do not take more than 8 caplets in 24 hours
 ■ Children under 12 years: do not use this adult Extra Strength product. In children under 12 years of age, this will provide more than the recommended dose (overdose) of TYLENOL and could cause serious health problems.
 ■ Other information:
 ■ do not use if neck wrap or foil inner seal imprinted with "Safety Seal" is broken or missing.
 ■ store at room temperature.
 ■ Questions or comments?
 call toll-free 1-877-TYLENOL (1-877-895-3615)

Figure 2. Shows the bottle labels of two different over the counter drugs Advil (<https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=5be198b8-396e-4b44-8819-e2e3b5d2ad0e&type=display>) and Extra Strength Tylenol (<http://b92644cu.beget.tech/run/231-panadol-effect-duration.html>).

Drug Facts

Active ingredient (in each 5 mL = 1 teaspoonful): Diphenhydramine HCl 12.5 mg
Purpose: Antihistamine

Uses:

- temporarily relieves these symptoms due to hay fever or other upper respiratory allergies:
 - ruffy nose
 - itchy, watery eyes
 - sneezing
 - itching of the nose or throat

Warnings

Do not use

- to make a child sleepy
- with any other product containing diphenhydramine, even one used on skin

Ask a doctor before use if the child has

- a breathing problem such as chronic bronchitis
- glaucoma
- a sodium-restricted diet

Ask a doctor or pharmacist before use if the child is taking sedatives or tranquilizers

When using this product

- marked drowsiness may occur
- sedatives and tranquilizers may increase drowsiness
- excitability may occur, especially in children

Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away. (1-800-222-1222)

Directions:

- find right dose on chart below
- mL = milliliter; tsp = teaspoonful
- take every 4 to 6 hours, or as directed by a doctor
- do not take more than 6 doses in 24 hours

Age (yr)	Dose (mL or tsp)
children under 2 years	do not use
children 2 to 5 years	do not use unless directed by a doctor
children 6 to 11 years	5 mL (1 tsp) to 10 mL (2 tsp)

Attention: use only enclosed dosing cup specifically designed for use with this product. Do not use any other dosing device.

Other information

- each 5 mL (1 tsp) contains: sodium 14 mg
- store between 20-25°C (68-77°F). Protect from light. Store in outer carton until contents used.
- do not use if bottle wrap, or foil inner seal imprinted "SAFETY SEAL" is broken or missing
- see bottom panel for lot number and expiration date

Inactive ingredients: anhydrous citric acid, D&C red no. 33, FD&C red no. 40, flavors, glycerin, monoammonium glycyrrhizinate, poloxamer 407, purified water, sodium benzoate, sodium chloride, sodium citrate, sucrose

Questions or comments?
call 1-877-717-2824 or 215-273-8755 (collect)

Figure 3. Shows a children's Benadryl box warning label (<https://www.healthinessentials.com/products/childrens-benadryl-allergy-liquid>).

The children's Benadryl label only illustrates one way that labels differ in their processing fluency. Processing fluency has multiple different subdivisions (e.g. retrieval, perceptual, imagery, lexical, conceptual, etc.). Each subdivision can affect a person's judgments, perceptions, memory, and behavior. One of these subdivisions is known as perceptual fluency. Perceptual fluency can be defined as the subjective ease with which stimuli are perceived (Jacoby & Dallas, 1981; Jacoby, Woloshyn, & Kelley, 1989; Okuhara, 2017). This manipulation has been tested in two common ways; one is by changing the contrast/color between the words and the background (e.g. Reber & Schwartz, 1999). The other way is by adjusting font clarity (e.g. Song & Schwartz, 2008). Currently, the FDA has no such rules regulating the colors of text making Reber and Schwartz (1999) work particularly noteworthy. By looking at *Figure 2*, one can see an example of how text colors can be different from bottle to bottle. The color of the text of the Advil bottle is a type of blue, while the text color of the Tylenol bottle is black.

Due to the work of Dohle and Siegrist (2013) and Dohle and Montoya (2017) the current study looked at how the perceived hazardousness of a product changes when the fluency of the products warning label is manipulated. Dohle and Montoya (2017) found that changing the fluency of a drugs name could result in more hazardous dosing behavior and affect a person's perception of how hazardous the drug is. The current study also measured individuals purchasing preferences towards the different warning labels. This was mainly due to the research done by Labroo et al. (2008), and Dohle and Siegrist (2013). During their research, they both found that when the fluency of the product was increased, people's preference to buy that product also increased. This is important because a person's perception can affect their adherence. Another reason that this is

important is because, generally, the main objective of a company that sells these drugs is to make as much money as possible. So, if it can be shown that changing the fluency of their product's warning labels in a certain way will improve people's purchasing preference and adherence, then a company would be more apt to do so. This appears to have more to do with sales than improving safety/adherence.

The main goal of this study was to see how manipulating the fluency of warning labels could affect people's perceptions, adherence, memory, and behaviors. The information learned through this experiment could then, potentially, be used to improve upon the current warning labels. Another goal of this study was to expand upon our current knowledge of fluency and its effects. We already know that fluency has the ability to influence people's evaluation judgments of liking and preference (Reber, Winkielman, & Schwarz, 1998; Lee & Labroo 2004; Reber, Schwarz, & Winkielman, 2004; Schwarz 2004; Alter & Oppenheimer, 2006; Labroo & Schwarz, 2008; Oppenheimer & Frank, 2008; Dohle & Siegrist, 2013). We also know, fluency generally has an effect on a person's memory (Tversky & Kahneman 1973; Jacoby & Dallas, 1981; Diemand-Yauman, Oppenheimer, & Vaughan, 2011; Susser, Mulligan, & Besken, 2013). The field of fluency has already covered the topic of labels. Labroo et al. (2008) examined the fluency of wine bottle labels. However, the field is lacking information on warning labels and how their information/presentation may be affecting people. It is important to try and get a better understanding of warning labels effects because a product's label is the key source of safety information for the consumer (Goyal et al., 2012). Perceptual fluency of OTC drug warning labels was manipulated in this study.

During the study, we measured the effects that fluency has on perceived hazardousness, memory, judgments of adherence, and purchasing preference.

For this study four hypotheses were formulated about how the fluency of the warning labels would affect participants' adherence, purchasing preference, memory recall, and perceived hazardousness. Lee and Labroo (2004) investigated the effects that processing fluency had on brand evaluations. Participants were presented with four different storyboards (high perceptual and conceptual fluency, high perceptual and low conceptual fluency, low perceptual and high conceptual fluency, and low perceptual and conceptual fluency) that consisted of four different slides. The results showed that when participants were presented with a storyboard that had high fluency, they rated the product as significantly more likeable than when presented with a storyboard that had low fluency. Dohle and Siegrist (2013) also illustrated that fake over-the-counter drug brand names with high fluency are viewed as less hazardous and more likely to be purchased. Therefore, the following hypothesis is proposed.

H1: Fluent warning labels will have significantly higher purchasing preference scores than the disfluent warning labels.

The second hypothesis pertains to judgments of adherence. When people make decisions they consider numerous pieces of information to help them in the decision making process. Adherence is similar to decision making in that regard, as many things go into a person's adherence decision like: trust, language, literacy, readability, understanding, emotion, cultural backgrounds, and other factors (Martin et al., 2005). Although a number of these factors are not affected by fluency, some of them can be, like trust (Reber & Schwartz, 1999) and readability (Song & Schwartz, 2008). However,

when it comes to making a decision not everything is weighed equally and some factors carry more weight than others (Shah & Oppenheimer, 2007). Shah and Oppenheimer (2007) proposed that people weigh fluent, easy to process, information more heavily than disfluent, hard to process, information. In their study, participants were presented with a negative consumer review of a product and were asked to price the item based on the review. Half of the participants were randomly assigned to the fluent consumer review condition and the other half was assigned to the disfluent condition. The fluency of the consumer review was manipulated by altering the font it was presented in. Fluent reviews were presented in a clear, black, 12-Pt Times New Roman font and disfluent reviews in an unclear, grey, 12-Pt, italicized, Monotype Corsiva font. All the information in the reviews was exactly the same for both fluent and disfluent conditions. The results showed that the consumer weighed the review more heavily if it was presented in a fluent font; meaning that when the font was fluent, participants priced the items at a significantly lower price than when reviews were presented in a disfluent font.

H2: Fluent warning labels will have significantly higher judgments of adherence scores than disfluent warning labels.

The third hypothesis pertains to perceived hazardousness. Researchers have shown that disfluently processed stimuli are perceived as riskier and more hazardous than fluently processed stimuli (Song & Schwarz, 2009; Dohle & Siegrist, 2013; Dohle & Montoya, 2017). Dohle and Montoya (2017), presented participants with six medicine bottles each of which was labeled with an easy to pronounce, fluent name, or a difficult to pronounce, disfluent name. The names used were very similar to the ones used by Dohle and Siegrist (2013). Each medicine bottle contained 200 mL of the fictitious liquid drug

and participants were asked to pour the maximum amount of the liquid drug that they would take during one entire week into a transparent cup. The results revealed that participants poured significantly lower amounts of the liquid drug with a disfluent name, as opposed to the higher amounts they poured of the drug with a fluent name. This shows that people perceived the disfluent, harder to pronounce name as significantly more hazardous than the fluent, easy to pronounce drug. Song and Schwarz (2009) revealed similar findings to that of Dohle and Montoya (2017). Song and Schwarz (2009), presented participants with ostensible food additives that either had easy-to-process, fluent names or difficult-to-process, disfluent names and were asked to judge how harmful they were. In this experiment participants judged the ostensible food additives with disfluent names as significantly more harmful than the ostensible food additives with fluent names.

H3: Participants will perceive the drugs with disfluent labels as significantly more hazardous than the drugs possessing fluent labels.

Fluency has been shown to have an effect on a person's ability to recall information (Diemand-Yauman, Oppenheimer, & Vaughan, 2011; Susser, Mulligan, & Besken, 2013.). Susser, Mulligan, and Besken (2013) conducted multiple experiments to explore the effects of perceptual fluency on judgments of learning and on actual recall performance. Susser, Mulligan, and Besken (2013) presented participants with a list of words over headphones. All words were presented fluent intact or disfluent generate (replacing portions of the speech signal with silence). The results of Susser, Mulligan, and Besken (2013) showed that the judgments of learning were significantly higher when words were fluent (intact) than disfluent (generate). Though, it was also shown that

participants actual recall performance was significantly higher for perceptually disfluent words (generate) than fluent words (intact). Diemand-Yauman, Oppenheimer, and Vaughan (2011) also conducted experiments to explore the effects of fluency on memory. Diemand-Yauman, Oppenheimer, and Vaughan (2011) conducted two different experiments. In both experiments fluency was manipulated the same way, by altering the font types of the words presented. In the first experiment participants were asked to study three species of aliens, each of which had seven features for 90 seconds. After the 90 seconds were up participants were given a 15-minute distractor task, before finally taking a memory test on the studied information. The results showed that people recalled significantly more information when it was presented in a disfluent font type than a fluent font type. In the second experiment actual high school students were presented with learning materials that differed in their fluency (font type). After being put through an entire lesson plan students were given an assessment test. Results showed that participants who were presented with disfluent learning materials scored significantly higher than those who were presented with fluent learning materials. The results of Diemand-Yauman, Oppenheimer, and Vaughan (2011) showed the same type of effect that Susser, Mulligan, and Besken (2013) observed in their experiments. Therefore, the following hypothesis is proposed.

H4: Participant's memory recall of the health information on the warning label will be significantly higher for disfluent labels than fluent labels.

Method

Participants

The study consisted of 68 participants ($n = 68$). All of the participants were gathered from Seton Hall University undergraduate programs. Each participant was given a written informed consent form, which they read through before signing. Each participant in the study received course credit for his or her participation. The participants were all tested individually.

Stimuli and Apparatus

The stimuli used in the study consisted of pictures of real world box and bottle warning labels (Advil, Extra Strength Tylenol, Nyquil, and Robitussin Cough & Chest Congestion DM). The pictures of the labels shown on screen were bigger than the actual labels. The active and inactive ingredients were blurred out for all the stimuli. Any mention of the original products name on the stimuli used was also blurred out. The format and color of the stimuli presented to the participants varied depending on which group they were a part of. This experiment was programmed using Qualtrics survey tool.

Design and Procedures

The experimental design used was a 2 (Color: Black & White [Matching box color] or Light Blue & White [Not Matching box color]) x 2 (Label Format: Matching or Not Matching) Between-Subjects design.

Study Phase. Participants entered the lab and were seated in front of a blank computer screen. Once they were seated participants were presented with the following instructions, “Throughout the experiment please imagine that you are suffering from the

common cold. On the next page you will be presented with four different over the counter drug box labels. Please read through each label carefully. Once you have read through all of the labels presented, please choose the label that you feel would be the best for treating your common cold. There will be no time limit during this part of the experiment so you may take as long as you need to carefully examine and compare the labels before making a decision.” Once participants were comfortable with the instructions they were allowed to advance to the next page. On the next page the participants were presented with pictures of four different over the counter drug box labels. All four labels presented to the participants had the same coloring of black text against a white background. The active and inactive ingredients were blurred out for all the labels and any mention of the original products name on the label was also blurred out. (Figure 4). This was done as a way to prevent participants from knowing which real life drugs they were looking at. For example, if the text and outline of the box is blue there is a chance that they will associate that label with Advil and select it based on their previous experience and knowledge of Advil. The participants were then asked, “Please select which drug you feel would be the best for treating your common cold?” Participants were allowed to take as long as they needed to make a decision and were allowed to zoom in if they had trouble reading the labels. After they made their selection they proceeded to the next screen. On the next screen participants were asked to answer two questions, “How effective do you believe this product will be in treating your common cold?” and, “In detail please explain why you choose this product over the others?” To answer the effectiveness question they had to select one of five choices presented (1 = Not effective at all, 2 = Slightly effective, 3 = Moderately effective, 4 = Very effective, 5 = Extremely effective). Once they completed

answering the questions participants advanced to the next screen were they were given a 10-minute distractor task. This distractor task was meant to simulate the time it would generally take for one to purchase the drug till they opened the box and took the medicine.

Drug Facts
Active ingredients (in each 30 mL dose cup) Purpose

Uses temporarily relieves common cold/flu symptoms: nasal congestion, sinus congestion & pressure, cough due to minor throat & bronchial irritation, cough to help you sleep, minor aches & pains, headache, fever, sore throat, runny nose & sneezing, reduces swelling of nasal passages, temporarily restores free breathing through the nose, promotes nasal and/or sinus drainage.

Warnings
Liver warning: This product contains [redacted]. Severe liver damage may occur if you take more than 4 doses in 24 hours, which is the maximum daily amount for this product, with other drugs containing acetaminophen, or 3 or more alcoholic drinks every day while using this product.
Sore throat warning: If sore throat is severe, persists for more than 2 days, is accompanied or followed by fever, headache, rash, nausea, or vomiting, consult a doctor promptly.
Do not use with any other drug containing acetaminophen (prescription or nonprescription), if you are not sure whether a drug contains acetaminophen, ask a doctor or pharmacist, if you are now taking a prescription monoamine oxidase inhibitor (MAOI) (certain drugs for depression, psychiatric or emotional conditions, or Parkinson's disease), or for 2 weeks after stopping the MAOI drug, if you do not know if your prescription drug contains an MAOI, ask a doctor or pharmacist before taking this product, to make a child sleep.

Ask a doctor before use if you have liver disease, heart disease, high blood pressure, thyroid disease, diabetes, glaucoma, cough that occurs with too much phlegm (mucus), a breathing problem or chronic cough that lasts or as occurs with smoking, asthma, chronic bronchitis, or emphysema, trouble urinating due to enlarged prostate gland, a sodium-restricted diet.

Ask a doctor or pharmacist before use if you are taking the blood thinning drug warfarin.

When using this product do not use more than directed, excitability may occur, especially in children, marked drowsiness may occur, avoid alcoholic drinks, be careful when driving a motor vehicle or operating machinery, alcohol, sedatives, and tranquilizers may increase drowsiness.

Stop use and ask a doctor if you get nervous, dizzy or sleepless, pain, nasal congestion, or cough gets worse or lasts more than 7 days, fever gets worse or lasts more than 3 days, redness or swelling is present, new symptoms occur, cough comes back or occurs with rash or headache that lasts. These could be signs of a serious condition.

If pregnant or breast-feeding, ask a health professional before use. **Keep out of reach of children. Overdose warning:** Taking more than directed can cause serious health problems. In case of overdose, get medical help or contact a Poison Control Center right away. Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.

Directions take only as directed - see Overdose warning. Use dose cup or tablespoon (TBS) do not exceed 4 doses per 24 hrs. Adults & children 12 yrs & over: 30 mL (2 TBS) every 4 hrs. Children 4 to under 12 yrs: ask a doctor. Children under 4 yrs: do not use.

When using other products, carefully read each label to ensure correct dosing.

Other information each 30 mL dose cup contains sodium 81 mg, store at room temperature.

Inactive ingredients

Questions?

1.

Drug Facts
Active ingredient (in each caplet) Purpose

Uses temporarily relieves minor aches and pains due to: common cold, headache, backache, minor pain of arthritis, toothache, muscular aches, premenstrual and menstrual cramps, temporarily reduces fever.

Warnings
Liver warning: This product contains [redacted]. Severe liver damage may occur if you take more than 4,000 mg of [redacted] in 24 hours, with other drugs containing acetaminophen, or 3 or more alcoholic drinks every day while using this product.
Allergy alert: [redacted] may cause severe skin reactions. Symptoms may include: skin redness, blisters, rash. If a skin reaction occurs, stop use and seek medical help right away.

Do not use with any other drug containing acetaminophen (prescription or nonprescription), if you are not sure whether a drug contains acetaminophen, ask a doctor or pharmacist, if you are allergic to [redacted] or any of the inactive ingredients in this product.

Ask a doctor before use if you have liver disease.

Ask a doctor or pharmacist before use if you are taking the blood thinning drug warfarin.

Stop use and ask a doctor if pain gets worse or lasts more than 10 days, fever gets worse or lasts more than 3 days, new symptoms occur, redness or swelling is present. These could be signs of a serious condition.

Drug Facts (continued)

If pregnant or breast-feeding, ask a health professional before use. **Keep out of reach of children. Overdose warning:** In case of overdose, get medical help or contact a Poison Control Center right away. (1-800-232-1222) Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.

Directions do not take more than directed (see overdose warning). Adults and children 12 years and over: take 2 caplets every 6 hours while symptoms last, do not take more than 6 caplets in 24 hours, unless directed by a doctor. Children under 12 years: ask a doctor.

Other information store between 20-25°C (68-77°F), do not use if carton is opened or neck wrap or foil inner seal imprinted with [redacted] is broken or missing.

Inactive ingredients

Questions or comments?

2.

Drug Facts
Active ingredient (in each tablet) Purpose

Uses
Temporarily relieves minor aches and pains due to:
 ■ headache ■ toothache ■ backache
 ■ menstrual cramps ■ the common cold ■ muscular aches
 ■ minor pain of arthritis
 ■ temporarily reduces fever

Warnings
 Allergy alert: _____ may cause a severe allergic reaction, especially in people allergic to aspirin. Symptoms may include:
 ■ hives ■ facial swelling ■ asthma (wheezing)
 ■ shock ■ skin redness ■ rash ■ dizziness
 If an allergic reaction occurs, stop use and seek medical help right away.
 Stomach bleeding warning: This product contains an _____ which may cause severe stomach bleeding. The chance is higher if you:
 ■ are age 60 or older ■ have had stomach ulcers or bleeding problems
 ■ take a blood thinning (anticoagulant) or steroid drug
 ■ take other drugs containing prescription or nonprescription NSAIDs (aspirin, ibuprofen, naproxen, or others)
 ■ have 3 or more alcoholic drinks every day while using this product
 ■ take more or for a longer time than directed
Heart attack and stroke warning: _____ increase the risk of heart attack, heart failure, and stroke. These can be fatal. The risk is higher if you use more than directed or for longer than directed.

Do not use
 ■ if you have ever had an allergic reaction to any other pain reliever/fever reducer
 ■ right before or after heart surgery

Ask a doctor before use if
 ■ stomach bleeding warning applies to you
 ■ you have problems or serious side effects from taking pain relievers or fever reducers
 ■ you have a history of stomach problems, such as heartburn
 ■ you have high blood pressure, heart disease, liver cirrhosis, kidney disease, asthma, or had a stroke
 ■ you are taking a diuretic

Ask a doctor or pharmacist before use if you are
 ■ under a doctor's care for any serious condition
 ■ taking aspirin for heart attack or stroke, because _____ may decrease this benefit of aspirin
 ■ taking any other drug

Drug Facts (continued)
When using this product
 ■ Take with food or milk if stomach upset occurs

Stop use and ask a doctor if
 ■ you experience any of the following signs of stomach bleeding:
 ■ red, black, or coffee-ground stools
 ■ have bloody or black stools
 ■ have stomach pain that does not get better
 ■ you have symptoms of heart problems or stroke:
 ■ chest pain
 ■ trouble breathing
 ■ weakness in one part or side of body
 ■ slurred speech ■ leg swelling
 ■ pain gets worse or lasts more than 10 days
 ■ fever gets worse or lasts more than 3 days
 ■ redness or swelling is present in the painful area
 ■ any new symptoms appear

If pregnant or breast-feeding, ask a health professional before use. It is especially important not to use ibuprofen during the last 3 months of pregnancy unless definitely directed to do so by a doctor because it may cause problems in the unborn child or complications during delivery.

Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away.

Directions
 ■ Do not take more than directed
 ■ the smallest effective dose should be used
 ■ adults and children 12 years and over: take 1 tablet every 4 to 6 hours while symptoms persist
 ■ if pain or fever does not respond to 1 tablet, 2 tablets may be used
 ■ do not exceed 6 tablets in 24 hours, unless directed by a doctor
 ■ children under 12 years: ask a doctor

Other information
 ■ read all warnings and directions before use
 ■ store at 20-25°C (68-77°F)
 ■ avoid excessive heat above 40°C (104°F)

Inactive ingredients

Questions or comments?
 call toll free _____

3.

Drug Facts
Active ingredients (in each 20 ml) Purposes

Uses
 ■ Temporarily relieves cough due to minor throat and bronchial irritation as may occur with a cold
 ■ helps loosen phlegm (mucus) and thin bronchial secretions to drain bronchial tubes

Warnings
 Do not use if you are now taking a prescription monoamine oxidase inhibitor (MAOI) (certain drugs for depression, psychiatric, or emotional conditions, or Parkinson's disease), or for 2 weeks after stopping the MAOI drug. If you do not know if your prescription drug contains an MAOI, ask a doctor or pharmacist before taking this product.

Ask a doctor before use if you have
 ■ cough that occurs with too much phlegm (mucus)
 ■ cough that lasts or is chronic such as occurs with smoking, asthma, chronic bronchitis, or emphysema

Stop use and ask a doctor if cough lasts more than 7 days, comes back, or is accompanied by fever, rash, or persistent headache. These could be signs of a serious condition.

If pregnant or breast-feeding, ask a health professional before use.

Drug Facts (continued)
Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away.

Directions
 ■ do not take more than 6 doses in any 24-hour period
 ■ measure only with dosing cup provided
 ■ keep dosing cup with product
 ■ ml = milliliter
 ■ this adult product is not intended for use in children under 12 years of age

age	dose
adults and children 12 years and over	20 ml every 4 hours
children under 12 years	do not use

Other information
 ■ each 20 ml contains: sodium 12 mg
 ■ store at 20-25°C (68-77°F). Do not refrigerate.

Inactive ingredients

Questions or comments? call weekdays from 9 AM to 5 PM EST at _____

4.

Figure 4. Shows the box label stimuli with the blurred ingredients being presented during the study phase.

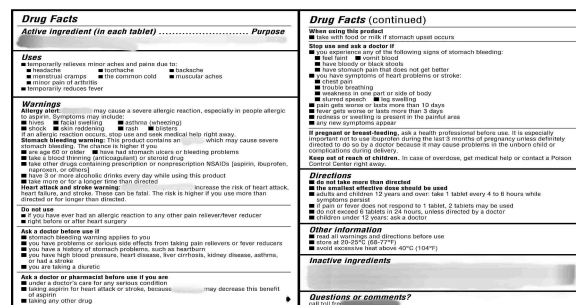
Test Phase. Once the distractor task was completed participants advanced to the next screen, which contained the following instructions, “On the next page you will be presented with a plus sign on the screen. Please fixate on the plus sign. The plus sign will disappear after 2 seconds. Once the plus sign, disappears you will be presented with a drug label. Please read through and carefully examine the label. There is no time limit for this part of the experiment so you may take as long as you need to carefully examine and read through the label before proceeding. Once you proceed to the next part you will be presented with some judgment questions and a memory test about the label. Again please imagine that you are suffering from the common cold through out this experiment.”

Once they proceeded past the instructions page onto the next screen participants saw a black (+) that was in the middle of the screen and presented for 2 seconds. Once the black (+) left the screen participants saw the box-warning label of the drug they selected previously for 200 milliseconds followed by another black (+) for 200 milliseconds and then the bottle-warning label for the same product. Once the bottle label was on the screen it stayed there until the participant decided to proceed to the next screen. Fluency was manipulated by how well the bottle label matched the box label selected previously (Figure 5). Participants were assigned to one of four different groups using the randomizing function in excel.

1. Complete Match (n = 12): The drug bottle label contained the same color and format/content as the box label.
2. Color Match (n = 17): The drug bottle label's color and box labels color matched while the format/content between the two was different.
3. Format Match (n = 22): The drug bottle label and the drug box label presented had matching format/content while the colors between the two were different.
4. Mismatch (n = 17): This was where neither the color nor format/content of the box label matched the bottle label.

The color combinations used were fluent black text on a white background and disfluent light blue text on a white background. The bottle-warning label shown to the participants varied in its fluency based on which group the participants were a part of. After the participants investigated the bottle-warning label to their liking they pressed a button to proceed to the next screen. Next the participants were presented with a screen

that only contained three judgment questions about the product based on the bottle-warning label they just saw. One judgment question was, “On a scale of 1 to 7 how safe do you feel this product is? 1 = very safe and 7 = very hazardous.” Another judgment question was, “On a scale of 1 to 7 how likely are you to purchase this product? 1 = very unlikely to purchase and 7 = very likely to purchase.” The last judgment question was, “On a scale of 1 to 7 how likely are you to adhere to all the warnings on the label of this product? 1 = very unlikely and 7 = very likely.” The order in which the judgment questions were presented was randomized during each experiment to prevent any order effects from occurring. Participants had to answer all of the judgment questions on the screen before they were allowed to proceed to the next screen. After the participants completed answering the judgment questions they were given a 35-question memory test (Appendix) about the information presented on the bottle label. The order in which the questions were presented during the memory test was randomized during each experiment to prevent any order effects from occurring. After completing the memory test participants were allowed to advance to the next screen. On the next screen participants were presented with one last question asking them, “What is your preferred method of treating the common cold?” Once they answered that question they were debriefed and allowed to leave.



+



Figure 5. Shows the order and how the stimuli were presented during the test phase.

Results

The majority of participants (81%) reported that they normally treat their common colds with some sort of over the counter drug or cough drop. Consistent with this the most frequently chosen OTC drug was Nyquil (67.6%). On the drug effectiveness questions, participants rated the drugs as very effective at treating their common cold ($M = 3.74$, $SD = 0.73$). There was no significant difference between the drugs selected and the effectiveness ratings, $F(3,64) = 1.20$, $p = 0.319$, $\eta_p^2 = .053$. A 2 (Color: Black & White (Matching box color)), Light Blue & White (Not Matching box color)) x 2 (Format: Matching, Not Matching) Between-Subjects analysis of variance (ANOVA) was carried out on each dependent measure. First, the results of purchasing preference were analyzed (Figure 6). The analysis yielded a main effect for format, $F(1,64) = 6.82$, $p = 0.011$, $\eta_p^2 = .096$ and color, $F(1,64) = 4.16$, $p = 0.046$, $\eta_p^2 = .061$. Participants were more willing to purchase a drug that had a fluent color or format. However, there was no significant format x color interaction, $p = .47$.

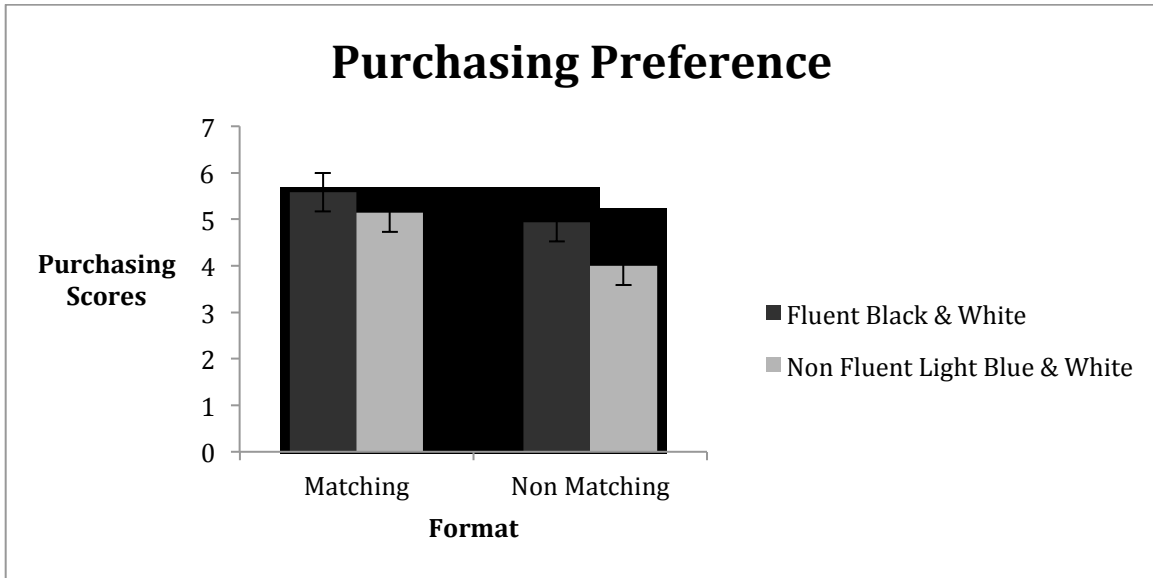


Figure 6. Shows the mean participants scores on the likelihood to purchase scale for each condition.

Next, the results for judgments of adherence were analyzed (see Figure 7). The analysis yielded no main effects for format, $F(1,64) = 0.08, p = 0.78, \eta_p^2 = .001$ or color, $F(1,64) = 0.29, p = 0.59, \eta_p^2 = .005$ and showed no significant format x color interaction, $p = .39$. Participants judged that they were likely to adhere to all of the warnings on the label regardless of the label.

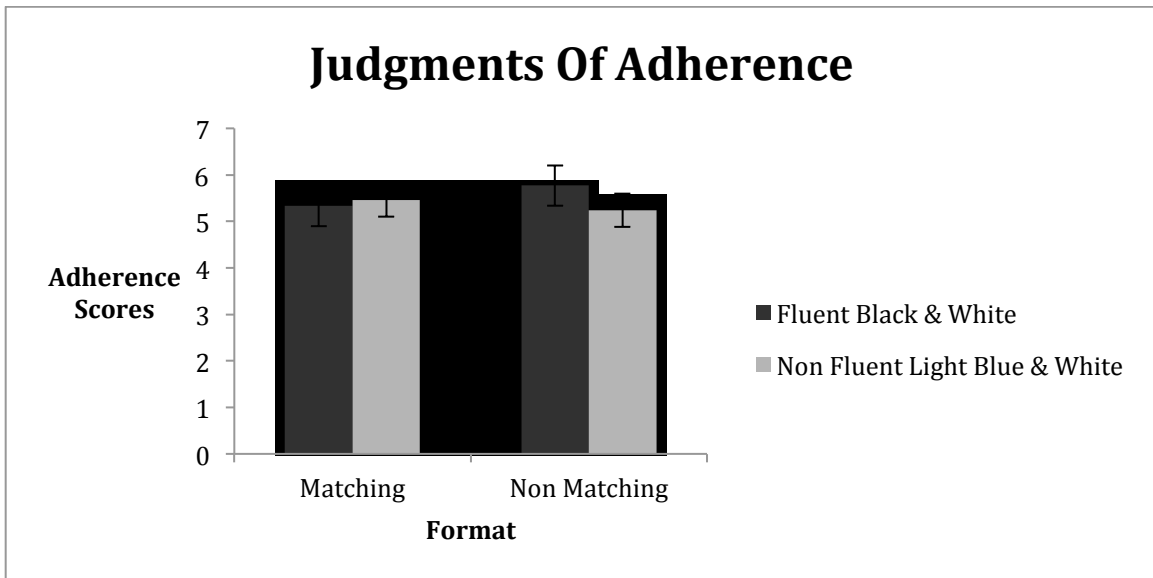


Figure 7. Shows the mean participants scores on the perceived adherence scale for each condition.

Third, the results for perceived hazardousness were analyzed (see Figure 8). The analysis yielded no main effects for format, $F(1,64) = 1.11, p = 0.30, \eta_p^2 = .017$ or color, $F(1,64) = 0.004, p = 0.95, \eta_p^2 = .000$ and showed no significant format x color interaction, $p = .45$. Participants perceived all of the drugs to be relatively safe regardless of the color or format of the label.

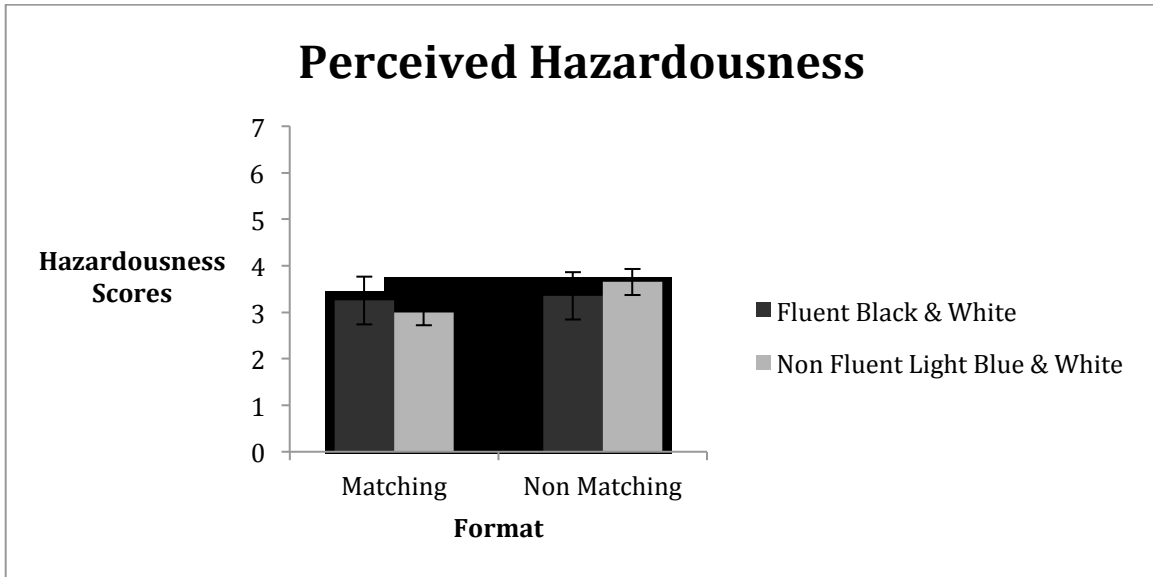


Figure 8. Shows the mean participants scores on the perceived hazardousness scale for each condition.

Finally, the results for memory were analyzed (see Figure 9). The analysis yielded a significant main effect for format, $F(1,64) = 12.99, p < 0.001, \eta_p^2 = .17$. However, not for color, $F(1,64) = 0.13, p = 0.72, \eta_p^2 = .002$. No significant format x color interaction was found $p = .72$. Participants remembered significantly more of the warning information on the bottle label if it had a fluent format (Format match: $M = 21.27, SD = 4.85$. Complete match: $M = 22.08, SD = 4.98$) than if it had a disfluent format (Color match: $M = 17.59, SD = 3.83$. Mismatch: $M = 17.59, SD = 4.58$).

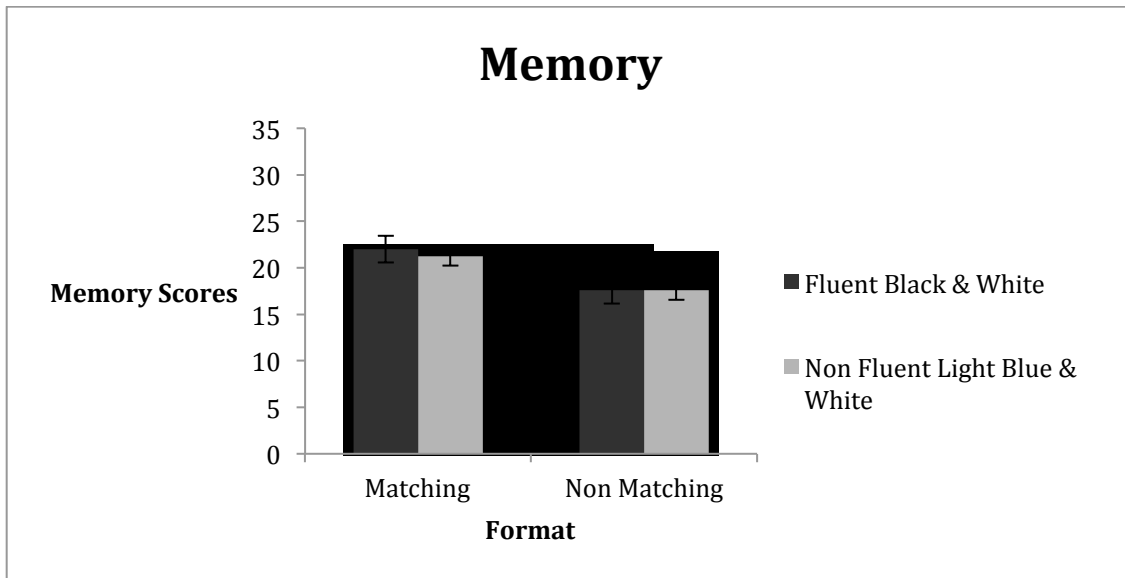


Figure 9. Shows the participants mean memory scores for each condition.

Discussion

The present research demonstrates that warning labels' fluency has a strong affect on memory and purchasing preference. More precisely, the results showed that the ease with which visual stimuli (warning label information) are processed, positively influenced the subsequent purchasing preference rating and memory scores of an over the counter drug. The results about purchasing preference were consistent with the prior research (e.g. Lee & Labroo, 2004; Dohle & Siegrist, 2013; Gmuer, Siegrist, & Dohl, 2015) as participants gave significantly higher purchasing preference ratings to drugs that possessed labels with either a fluent color or fluent format. However, the results showed a significant increase in memory scores when presented with fluent format labels but showed no effect for fluent color labels.

Although significant, the results contradicted the outcome of other studies in which disfluent items showed increases in memory performance (e.g. Diemand-Yauman, Oppenheimer, & Vaughan, 2011; Susser, Mulligan, & Besken, 2013). Previous research

has shown that disfluent information can improve memory and learning (e.g. Diemand-Yauman, Oppenheimer, & Vaughan, 2011; Susser, Mulligan, & Besken, 2013; Yue, Bjork, & Castel, 2013) but there is a fine line; if the information is too disfluent it will cause the opposite effect (Seufert, Wagner, & Westphal, 2016). The results of Seufert, Wagner, and Westphal (2016), showed that learning performance increases with increasing disfluency but decreases when the text becomes too illegible. Therefore, it is possible that the disfluent format label was too hard to read causing the participants in the fluent label groups to have higher memory scores. These inconsistencies may also be explained by cognitive demand. People are more likely to engage in an activity if it requires less effort (Song & Schwarz, 2008). When all outcomes are equal, people will generally try to avoid situations that require effortful cognitive processing (Kool et al., 2010). Subsequently, if the disfluent format label required high cognitive effort to process or participants perceived the label as requiring high cognitive effort, then that could have caused participants to avoid carefully reading the label. Thus, resulting in the significant difference in memory scores between fluent and disfluent formats.

This research supplements the literature on fluency because it fills a gap, as there is a lack of information and research on warning labels and how their information/presentation may be affecting people. Only a small amount of research attention has been dedicated to labels and how their fluency may be affecting people (e.g. Gmuer, Siegrist, & Dohl, 2015). Moreover, the results suggest that increasing over the counter drug warning label processing fluency could be beneficial for marketers as participants purchasing preference scores were higher for the fluent labels.

Contrary to our expectations, the fluency of the warning labels showed no influence on the perceived hazardousness rating, contradicting the outcome of other studies in which fluency had an impact on perceived hazardousness (e.g. Song & Schwarz, 2009; Dohle & Siegrist, 2013; Dohle & Montoya, 2017). The inconsistency between these other studies (e.g. Song & Schwarz, 2009; Dohle & Siegrist, 2013; Dohle & Montoya, 2017) and our study may be explained by the difference in the type of fluency used: physical perceptual fluency versus linguistic fluency. The present study used both format and color of the labels' information to manipulate fluency whereas as other studies like Dohle and Siegrist (2013), used the name of the product to manipulate fluency. Another possible reason for these inconsistencies is that the fluency might have been discounted during our task when it came to perceived hazardousness. This could be because the warning labels in our study provided information that affects people's lives, while Dohle and Siegrist (2013), just provided participants with the name of the drug. Tasks that involve information that affect people's lives can cause fluency to be discounted (Guenther, 2012). Thus, making it possible that when it came to making a judgment about the hazardousness of the drug, fluency was discounted and other cues became more important. It's also important to note that the majority of people believe that over the counter medication is safe. Prior beliefs and knowledge reduce the use of heuristics and can impact fear arousal (Averbeck, Jones, and Robertson, 2011). So if people already come into the experiment having the belief and prior knowledge that over the counter medication is safe, then fluency manipulations won't have much of an effect on their perceptions of hazardousness. It's possible that if a less commonly known drug

class were used in this experiment perceived hazardousness would have been affected by the fluency manipulations.

Our hypothesis regarding judgments of adherence was not supported, as the fluency of the warning labels had no effect on judgments of adherence ratings. This inconsistency could be due to the fact that people have high opinions of themselves and can be bad at judging their own performance. When people are asked to give pre-performance evaluations of themselves before a task, they will tend to be overly optimistic and have poor accuracy when it comes to their actual performance (Radhakrishnan, Arrow, & Sniezek, 1996). The results of Susser, Mulligan, and Besken (2013), support this explanation as their participants' judgments of learning were significantly higher for fluent words than disfluent ones, but their actual recall performance was significantly higher for perceptually disfluent words than fluent words. Perhaps a way to correct for this problem would be to alter the question so that it is asking about other consumers' adherence to the warnings instead of their own adherence.

One of the main benefits of this study was that it used real-world stimuli. The use of the real-word stimuli gives our study translational value. Although, it is important to note that participants were not exposed to the actual labels but pictures of the labels shown on computer screens. The size of the labels on the screen differed from the actual labels. Specifically the labels shown on the screen were bigger than the actual labels. People's perceptions are often directly related to physical characteristics such as size (Rhodes & Castle, 2008). When information is presented in a larger font it is processed more fluently than smaller font (Rhodes & Castle, 2008). Font size has been shown to affect judgments of learning (Rhodes & Castle, 2008; Undorf, & Zimdahl, 2019). People

that are presented with words in a large font size have significantly higher judgments of learning scores than when they are presented with words in a small font size (Rhodes & Castle, 2008; Undorf, & Zimdahl, 2019). It's possible that the size of the labels used could have had an effect on participant's answers to some of the judgment questions. However, it's unlikely that the size of the labels had any effect on memory scores. Font size has little to no effect on recall or memory performance (Rhodes & Castle, 2008).

Another benefit to the study was that participants were familiar with OTC drugs as 76.5% reported using them in their normal cold treatment methods. This familiarity with OTC drugs is important as it illustrates that the results seen in our experiment were not a by-product of being unfamiliar with OTC drugs and their warning labels. Also, when asked which drug would best relieve their common cold symptoms they selected label 1 (Nyquil) 67.6% of the time. This high percentage is expected as Nyquil contains both acetaminophen, which is the main ingredient in Tylenol, and dextromethorphan, which is the main ingredient of Robitussin Cough and Chest Congestion DM.

Limitations/Future Research

Some limitations of the study have to be addressed. Participants were confronted with a hypothetical scenario as they were asked to imagine that they were suffering from the common cold. It's entirely possible that people may react differently when they are really affected by the common cold. Though, the existing literature shows that when people are stressed, distracted, or overwhelmed they will rely more on heuristic cues and fluency because they require less cognitive demand (Jacoby & Dallas, 1981; Kool et al., 2010).

Perhaps the biggest limitation of this study is that the sample size used was too small and lacked sufficient statistical power. This small sample size and lack of sufficient statistical power could have been the reason for some of the inconsistencies between the results and previous research. It's also important to note that the sample sizes between each group were unbalanced. This imbalance also could have contributed to some of the inconsistencies between the results of the current study and previous studies. Future studies should take these limitations into consideration.

This experiment gave some insight into how people treat colds. We discovered that 76.5% of our participants normally use OTC drugs when treating their colds. Out of the four labels participants were able to select Nyquil was the most common at 67.6 %. Based on this future researchers might want to explore what type of medicine is preferred and how this affects the reading of a label. Future researchers might also want to take a look at the differences between people with respect to labels they may see more frequently. People are creatures of habit and once they find a product that works they generally stick to it. So it is important to explore if there are any differences in label affects between a more frequently used drug and a more novel drug. It's important to remember that not everyone takes or is exposed to OTC drugs. In our experiment although, 76.5% of our participants normally used OTC drugs there was still around 19% that used no drugs at all. Future researchers may want to explore the differences between OTC drug users and nonusers. When exploring these differences future researchers can see if OTC drug users and nonusers read a label differently and if label affects are similar for OTC users and nonusers.

The present research only looked at one type of fluency but there are many different types of fluency. Future researchers should build upon the present research and look at these different types of fluency and warning labels. One type of fluency that future research should look at is imagery fluency. Imagery Fluency is the subjective ease with which one can imagine hypothetical scenarios that have not yet occurred (Okuhara, 2017; Petrova & Cialdini, 2005; Mandel et al., 2006). When a person is able to easily imagine the information presented to them they will have a positive preference to that product (Petrova & Ciandini, 2005). Certain cigarette packs have been known to use graphic images on their warning labels. These cigarette packs containing graphic images on the warning label are viewed as more effective and liked more than warning labels consisting of just text (Nan et al., 2014). Due to the graphic images it was easier for the people to imagine the harmful side effects that occur from smoking a cigarette. Future researchers should consider adding graphic images to OTC drug warning labels and investigate how it would affect the consumer's perceptions and behavior toward the product.

Future studies should also look at drug administration behaviors. Although, participants judged that they would adhere to all the warnings on the label it has been shown that people are optimistic about their own performance (Radhakrishnan, Arrow, & Sniezek, 1996). Dohle and Siegrist (2013), looked at the effect that fluency had on dosing behaviors. However, there has not been any research done on long-term drug administration behaviors and fluency. Future studies should look into these types of experiments, as acetaminophen poisoning and other over the counter drug injuries can occur due to poor dosing or administration behavior. Future research can also look to see

if fluency can have an effect on people's perception about how effective the drug is. One can look at both, the perceptions of drug effectiveness prior to administration and after administration. This type of information could be very valuable to drug companies and their marketing teams as the consumers' evaluations of a product before administration is an important factor when it comes to purchasing that product. Also, the consumers' evaluations after administration are an important factor when it comes to repurchasing the product. Some existing literature has already shown that the fluency of the products' label can positively influence consumers' experience and preference for that product (e.g. Gmuer, Siegrist, & Dohl, 2015). This type of research should not be limited to OTC drugs. Future researchers should also consider looking at real-world medical forms and documents that consumers/patients are presented with.

Conclusion

The results show that high drug warning label processing fluency, which was achieved via matching label formats or easy to read black and white font, positively influenced purchasing preferences. The results also showed that high drug warning label processing fluency achieved via matching label formats, positively affected memory. When drug companies design their warning labels, they should consider the fluency of the design. Drug companies should try to design their labels so that the format has high fluency by matching the box and bottle labels, as well having the information presented in a fluent color (e.g. black text on white background). Doing so will generate positive judgments (e.g. increasing purchasing preference), and improve the recall of the warning information, which will enhance consumers' ability to perform healthy drug administration behavior. If companies design warning labels to be processed more

fluently, they will be able to improve product desirability and potentially help decrease the number of over the counter drug related injuries due to the increase in memory of the warning information.

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Appendix

Memory test questions

1. Adults are directed to take 1 dose how often?
2. In the directions section of the label it states not to exceed _____ doses in a 24-hour period.
3. Children _____ years old should ask a doctor before use.
4. Children under the age of _____ years old should not use this product.
5. One dose of this product is equal to _____ (mL/Caplets/Tablets)?
6. Will this product temporarily relieve a cough?
7. Will this product help loosen up phlegm?
8. On the label it states, "Ask a doctor before use if you have a cough that lasts."
9. On the label it states, "Ask a doctor before use if you have a cough that occurs with too much phlegm."
10. One should not use this product if they are taking a monoamine oxidase inhibitor (MAOI)
11. On the label it states, "Stop use and ask a doctor if cough lasts for more than 7 days."
12. Will this product temporarily relieve a headache?
13. On the label it states, "Temporarily relieves minor aches and pains due to toothache."
14. On the label it states, "Temporarily relieves minor aches and pains due to backache."

15. On the label it states, "Temporarily relieves minor aches and pains due to menstrual cramps."
16. On the label it states, "Temporarily relieves minor aches and pains due to throat irritation."
17. On the label it states, "Temporarily relieves minor aches and pains due to liver disease."
18. On the label it states, "Temporarily relieves minor aches and pains due to blisters."
19. On the label it states, "Temporarily relieves minor aches and pains due to stomach bleeding."
20. Will this product temporarily reduce a fever?
21. Select which one is an allergic reaction symptom listed on the label
22. One should not use this product right before or after heart surgery
23. There is a stomach bleeding warning on the label
24. There is a heart attack and stroke warning on the label
25. Do not have _____ or more alcoholic drinks a day while using this product
26. On the label it states, "Ask a doctor before use if you have high blood pressure."
27. On the label it states, "Stop use and ask a doctor if pain gets worse or lasts more than 10 days."
28. Select which of the following is not listed under the "Uses" section of the label?
29. There is a liver warning on the label
30. There is a sore throat warning on the label

31. Select which of the following is not listed under the "Ask a doctor before use if you have" section of the label
32. Does the warning label mention pregnancy?
33. On the label it states, "In case of an overdose you should contact _____."
34. On the label it states, " The chances of stomach bleeding are higher if you are 60 or older."
35. Select which of the following is not listed under the "Stop use and ask a doctor if" section of the label.