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EYE TRACKING TO EVALUATE THE EFFECTS OF BILINGUAL TOBACCO HEALTH WARNING LABELS ON YOUNG PEOPLE'S ATTENTION IN LEBANON

by
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ABSTRACT
OF THE THESIS OF

Reem Ahmad Jalaleddine   for   <u>Master of Engineering</u>
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Title: <u>Eye Tracking to Evaluate the Effects of Bilingual Tobacco Health Warning Labels on Young People's Attention in Lebanon</u>

Health warning labels play a critical role in making sure that people are aware of the risks of different products. As a result, the design of labels has received considerable attention, particularly for products with well-documented health risks, such as tobacco. Most of the literature has focused on the ratio of text to graphics, as well as the content of text. However, Lebanon is a country where most of the population is at least bilingual, meaning that different languages need to be accounted for in warning labels. It may be that having English in addition to Arabic text on warning labels would make for more effective labels, particularly for young people. At the same time, it is known that clutter – or having too much data within a certain area – can negatively affect the ability of people to process information. It could be that the addition of more text simply leads to more clutter. Thus, the overall goal of this study was to determine whether having bilingual text health warnings on tobacco packages (namely, Arabic and English), compared to using only one language, leads to better attention to and recall of warning label information. Three types of labels were tested: English only, Arabic only, and combined English and Arabic labels. Eye tracking was used to trace participants' attention allocation and participants were asked to recall as many of the labels as they could immediately after the experiment as well as two weeks later. Results showed that having bilingual labels did not lead to better recall performance than having one language in both the short and long term, and Arabic labels generally led to better recall. Eye tracking data showed participants taking more time to extract data from bilingual labels and looking at them later in time than monolingual labels. Although participants believed that having bilingual warning labels are the best option, the results of this study warn against bilingual labels as a means of attracting more attention to their content.

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CHAPTER I

INTRODUCTION

Tobacco use remains one of the leading causes of death in the world and it is estimated that tobacco is killing about 6 million people per year (World Health Organization (WHO), 2018). Moreover, according to a recent US survey, around 300 young people under the age of 18 become daily smokers every day (Rockville, 2017). Thus if current tobacco marketing trends continue, tobacco will claim more than 8 million lives worldwide by 2030 (WHO, 2008).

These numbers highlight the importance of reducing the purchase and use of tobacco products. As such, the WHO Framework Convention on Tobacco Control (FCTC) has established an agreement which includes policies and regulations that countries should follow in order to protect their citizens from the harmful effects of tobacco (Nakkash, Torossian, El Hajj, Khalil, & Afifi, 2018). Among these policies is the development and enforcement of effective tobacco warning labels (Cummings et al., 2004; Hammond, Fong, McNeill, Borland, & Cummings, 2006). In 2018, the WHO FCTC reported that an increasing number of countries have developed national strategies and implemented measures related to the reduction of tobacco usage, such as increasing taxes on tobacco products and implementing regulations for tobacco packaging (WHO, 2018).

In Lebanon, however, progress has been slow. Around 21% of all deaths in the country are linked to smoking, with an estimated 57 male deaths per week, or more than 4,800 men per year (Drope, 2018). Lebanon signed the WHO FCTC agreement in 2006, but not until August 2011 was a law related to smoking (Law 174) enacted by the

Lebanese parlement (Nakkash et al., 2018). This law included: (1) prohibiting smoking in all indoor public areas, (2) prohobiting advertising, promotion, and sponsorship of tobacco products, and (3) requiring larger text warning labels (Nakkash et al., 2018). Despite these positive steps, Lebanon remains one of the weakest countries in the Middle East in applying tobacco control policies. Currently, Law 174 does not conform to FCTC Article 11, which specifically addresses packaging and labelling of tobacco products. Although FCTC Article 11 guidelines indicate that health warning labels should occupy at least 50% of the display area and that graphical images combined with texts are more effective than text-only warnings ([WHO], 2008), warning labels in Lebanon are text-only and occupy 40% of the size of the package on each of the front and back wide sides.

Moreover, the tobacco warning situation in Lebanon is further complicated by the issue of language selection. Lebanon is known to be a country of many languages; while the official language is Arabic, French and English are widely spoken and written (Bacha & Bahous, 2011; Esseili, 2011, 2017; Shaaban, 2017). In fact, the use of French and English instead of Arabic in professional, educational, and social functions is becoming increasingly common. More than half of the Lebanese people are bilingual, where 75% of students learn French as a second language and 25% English especially in the private schools (Bacha & Bahous, 2011). The occurence of these multiple languages leads to code-switching, or shifting between two or more languages in the same sentence, which has become part of the Lebanese culture (Joseph, 2004). However, tobacco products in Lebanon contain warning labels in Arabic only, in conformance with FCTC Article 11. This was confirmed by collecting seventy-five random tobacco packages from supermarkets in different areas of Lebanon (Saida, Baalbeck, and Beirut). The only exceptions to this rule are the tobacco packages purchased from abroad or the Beirut

airport's duty-free stores, in which case the warning labels are in English only. However, there are no bilingual warning labels as yet in Lebanon, although it could be that bilingual or even multilingual labels are more effective in the country, particularly for the younger population. At the same time, the risk with having more languages is that the resulting clutter may end up having an opposite effect to what is intended: making people ignore the warnings. There is a need to better understand how people's attention to and recall of warning labels are affected by the number of languages used in the warning labels.

Thus the overall goal of this study was to carry out a controlled, eye-tracking based study to investigate the effects of monolingual vs. bilingual text-only tobacco warning labels on young Lebanese people. The effects will be studied in terms of recall performance – how well people remember the labels, both in the short and long term – as well as attention allocation by means of an eye tracker. The scope of this study was limited to young, college-age students, who are assumed to be more inclined to read non-Arabic material and who are also possibly still debating whether to smoke or not. Knowing how best to present warning labels to them will then ultimately help reduce the number of young people who smoke or take up smoking in Lebanon and potentially other multilingual contexts. Also it will help other bilingual countries who are applying text-only tobacco warning labels, such as Syria and Tunisia (Drope, 2018). In particular, Tunisia is well-known for its multilingual population (Belazi, 1993).

The specific aims of this study are to:

1) Analyze the effects of monolingual (English-only or Arabic-only) and bilingual (English and Arabic) tobacco warning labels on young people's ability to recall warning information in the short and long term. It is expected that bilingual warnings will lead to better short- and long-term recall performance than having

Arabic-only or English-only text warnings, with the presence of two languages (and, as a result, more data) not negatively impacting performance.

2) Analyze the effects of monolingual (English-only or Arabic-only) and bilingual (English and Arabic) tobacco warning labels on young people's attention allocation on the warning labels using eye tracking metrics. It is hypothesized that, despite the presence of more data and possibly more clutter in the case of bilingual labels, the amount of attention to the warning labels will be more for bilingual labels than for Arabic-only or English-only labels.

CHAPTER II

BACKGROUND

A. Tobacco Health Warnings

Cigarette packages are required by law to contain health warning labels aimed at motivating people to avoid smoking (Hammond, 2011). The importance of these health warning labels to convey the health risks of smoking has been backed up by several studies (De Hoog, Stroebe, & De Wit, 2007; Hammond, 2011; Hammond et al., 2006; Quisenberry et al., 2018; Thrasher et al., 2007). Hammond et al. (2006), conducted a survey on smokers from different countries and concluded that smokers in countries that enforced the placement of warnings on tobacco packages were more likely to agree with the health risks caused by smoking as compared to smokers from other countries. In addition, the study suggested that smokers who usually notice the warning labels on tobacco packages are more knowledgeable about the health risks associated with smoking cigarettes as compared to smokers who do not notice warning labels.

1. Label Design

Given the importance of tobacco warning labels, researchers have conducted several experiments to determine the best approach to designing these labels in terms of size, content, and location (Kaufman, Klein, Koblitz, & Price, 2018). For example, studies have shown that plain package designs that contain no branding (colors, imagery, logos, or trademark) but keep the brand name on tobacco packages attract more attention toward health warning labels compared to branded packages (Maynard, Brooks, Munafò,

& Leonards, 2017; Maynard, Munafò, & Leonards, 2013; Munafò, Roberts, Bauld, & Leonards, 2011; Shankleman, Sykes, Mandeville, Di Costa, & Yarrow, 2015).

Moreover, many studies have shown that illustrating the health risks of tobacco using graphical images improves participants' ability to recall tobacco health risks more than text-only warnings (Klein et al., 2017; Lochbuehler, Mercincavage, et al., 2018; Lochbuehler, Wileyto, et al., 2018; Mercincavage et al., 2018; Peterson, Thomsen, Lindsay, & John, 2010; Skurka et al., 2017; Strasser, Tang, Romer, Jepson, & Cappella, 2012). This effect has been shown to hold true across diverse cultures (Hammond et al., 2018). The use of threating, graphic images (e.g., a picture of a man with thyroid cancer), on the other hand, was not found to be more effective than non-threatening images, although it did attract more attention (Rossi et al., 2017; Süssenbach, Niemeier, & Glock, 2013). The size of the health warning label on tobacco packages has also been investigated, with one study finding that graphical warnings covering 50% of the package size attracted more visual attention than those that occupied 30% of package size (Skurka et al., 2017).

Other studies have highlighted the importance of the content of text warning messages. For example, motivational text warnings that provide help for quitting smoking (e.g., "You can do it, your doctor or pharmacist can help you stop smoking") have been found to be more effective than threatening text warnings (e.g., "Smoking clogs the arteries and causes heart attacks and strokes"; (Dutra et al., 2018; Kessels & Ruiter, 2012; Vlăsceanu & Vasile, 2015). Combining text and graphical image messages that share the same meaning has been found to be an effective way to increase risk awareness about smoking and improves the recall of health warning information (Lochbuehler, Mercincavage, et al., 2018; Lochbuehler et al., 2016; Mercincavage et al., 2018).

However, these studies were all done for warning labels in one language. There might be both advantages and disadvantages to using more than one language in a bilingual or multilingual context.

2. *Bilingual Labels*

In general, and at the simplest level, the main advantage of using bilingual labels is that non-local buyers would be able to understand the information provided by the product and make better decisions (Han & Shavitt, 1994). In countries such as Lebanon, there could also be an advantage for local people who are more comfortable with one language than another.

To date, using more than one language in product warning labels has been investigated by only one study. Lim and Wogalter (2006) investigated whether the location of bilingual warnings on pesticide products had any effect on native English and Spanish language users in terms of acceptability and purchasing decision. Results showed that the design of packages with English text on the left half and Spanish text on the right half of the package was the most preferred by both English and Spanish language users. Moreover, it was found that native English speakers prefer to have their native language text in a primary position of the package (left side or top side).

While this one study did not raise any concerns about bilingual warnings, having two or more languages on a label might reduce the attractiveness of the information to the consumer due to the presence of excess text (Silver & Braun, 1993). More generally, the presence of more text might lead to the problem of clutter, or having too much data and poorly-organized data within a certain space (Moacdieh & Sarter, 2015b). Clutter has been known to lead to frustration, delays in detecting information, and errors of detection

(Bravo & Farid, 2006). Studies have shown that consumers pay less attention to nutrition and warning labels on packages if these are presented in a more complex or cluttered context (Bialkova, Grunert, & van Trijp, 2013; Wogalter, Rashid, Clarke, & Kalsher, 1991). One study showed that the quantity of information displayed on the front side of nutrition products has a negative effect on participants' attention (Bialkova et al., 2013). When the number of elements (i.e. guidelines, logo and nutrition label) displayed on the package was high, the nutrition labels were observed less by the participants compared to a less cluttered labeling environment.

Nevertheless, given the paucity of studies on bilingual warning labels, it is very difficult to reach any kind of conclusion with regards to their merits and limitations. It is not clear how bilingual warning labels affect the short and long-term recall of a bilingual population such as the Lebanese one. It is also not clear which language draws their attention the most, especially given that the warning labels in Lebanon tend to be in one language (Arabic), whereas the younger population tends to use English or French more (Bacha & Bahous, 2011). There is a need to more carefully examine what language attracts more attention, something that can be accomplished by means of an eye tracker.

B. Eye Tracking

Eye tracking is a technique that is used to measure the eye movements of individuals (Jacob & Karn, 2003). The rationale behind the use of eye tracking is that the location of a person's gaze can be used as the focus of attention (Just & Carpenter, 1976), although of course there are some cases where that does not hold true. An eye tracker consists of a camera and related electronic devices that measure eye movements in order to generate data related to the gaze positions. The eye tracking data obtained from an eye

tracker can be expressed in term of fixations and saccades (Poole & Ball, 2006; Richardson & Spivey, 2004). Fixations are periods during which the eye movements are relatively stable; these periods often last between 100 and 500 milliseconds (Kaufman et al., 2018; Wedel & Pieters, 2008). Visual processing takes place during fixations. Saccades, on the other hand, are rapid movements of the eye from one point to another that occur between fixations (Kaufman et al., 2018; Wedel & Pieters, 2008). No visual processing takes place during saccades. The time spent by an individual looking at an area of interest is known as dwell or gaze time (Meernik et al., 2016). Areas of interest (AOI) correspond to display regions that are defined by experimenters and are used to analyze the eye movement data extracted from that targeted region (Salvucci & Goldberg, 2000). Other terms that are used in eye tracking include the scanpath, which gives a visual representation of eye movements by grouping saccades and fixations (Noton & Stark, 1971).

Using a combination of these building blocks, researchers have been able to obtain a window into attention allocation on tobacco packages (Asan & Yang, 2015; Noar et al., 2016; Strasser et al., 2012). Eye tracking has helped reveal what types of health warnings are more visited and what package designs improved the visibility of the warnings (Dutra et al., 2018; Kessels & Ruiter, 2012; Shankleman et al., 2015; Süssenbach et al., 2013; Vlăsceanu & Vasile, 2015). By tracking eye movements, one can then assess different label designs and propose more effective tobacco warning labels (Kaufman et al., 2018).

Eye tracking metrics that have been used to this effect include average dwell time on different AOIs (where the AOIs are usually the warning labels and the package), time to first viewing an AOI, and fixation frequency (Meernik et al., 2016). For example, some studies found that the graphical warning labels on tobacco packages had a higher number

of fixations and average dwell time as compared to text-only warnings (Dutra et al., 2018; Peterson et al., 2010; Strasser et al., 2012). On the other hand, another study on middle school students showed that total fixation duration on text tobacco warning labels is longer than on images (Maródi et al., 2015). This suggests that text drew young people's attention more than images.

The content of warning labels has also been explored using eye tracking to see what type of warnings best attract attention or enhance retention. For example, the dwell time, dwell number, time to first fixate, number of fixations and total fixations on text warnings helped reveal that threatening warning messages were less visited by participants than non-threatening warning messages (Dutra et al., 2018; Kessels & Ruiter, 2012; Süssenbach et al., 2013; Vlăsceanu & Vasile, 2015). Along the same lines, Kessels and Ruiter (2012) showed that smokers had more fixation and longer dwell time on warning messages that contain helpful information for quitting smoking than highly threatening text warnings, regardless of the graphical warnings associated with the text. In another study, the time to first fixate, number of fixations, and dwell time on warning labels showed that new, non-familiar warnings were neither more quickly attended to than old messages (familiar messages) nor cognitively processed to a greater extent (Crespo, Cabestrero, Grzib, & Quiros, 2007).

Furthermore, other studies used fixation count and fixation duration to study the behavior of smokers vs. nonsmokers on graphical warning labels. It was found that smokers' fixation count and fixation duration on graphical areas of the label were higher than those of non-smokers', suggesting that graphical warnings draw smokers' attention more than nonsmokers (Gerçek et al., 2016). It was also suggested in a study that non-

smokers that have higher numbers of fixation on graphical warnings are less intended to start smoking in the future (S. Byrne, Kalaji, & Niederdeppe, 2018).

In addition, other eye tracking studies showed that health warnings were more visited on plain packages than branded packages (Maynard et al., 2017; Maynard et al., 2013; Munafò et al., 2011; Shankleman et al., 2015). Shankleman et al. (2015) showed that the gaze time on warning labels was higher when the pack was plain compared to branded packs. Additionally, participants' correct recall of warning messages has been linked to the amount of time participants look at the health warning labels. Strasser et al. (2012) examined the link between viewing patterns and participants' ability to recall warning labels. The study found that participants' correct recall of warning messages is linked to shorter dwell time on the text warning and longer dwell time on the graphic image warnings.

In summary, examining eye tracking metrics helps researchers in understanding the effects of different health warning labels on peoples' attention and ability to recall the warnings. However, none of these eye tracking studies have investigated the differences in attention due to monolingual versus bilingual labels. Table 1 summarizes the eye tracking metrics that were used in this study. Total number of fixations and gazes on the warning labels were analyzed and used to determine the amount of information that is perceived and extracted from the tobacco health warnings by participants (Rayner, 1998; Wedel & Pieters, 2000). Besides the number of fixations, mean fixation duration was also used as an indicator of how difficult it is to extract information for each warning label. Total fixation duration was used to quantify the amount of attention on the warning labels. Finally, time to first fixate was used to determine the effectiveness of health warning labels in attracting attention (Strasser et al., 2012).

Table 1: Eye tracking metrics that was used in this study

Eye tracking metrics (all of these metrics are applied to the warning labels area only)	Description	Reference
Total number of fixations	Indicates to what extent participants devoted attention to a certain area of the display. A higher number of fixations on a warning label would indicate that participants looked at it more.	Manhartsberger and Zellhofer (2005), Kasprowski (2004), Moacdieh and Sarter (2015a), Wedel and Pieters (2000)
Number of gazes	The number of gazes to a warning label would indicate the number of times a person returned to look at the label. This measure would give an indication of the interest in the label.	Shankleman et al. (2015)
Mean fixation duration	The duration of a fixation indicates how much visual processing took place to extract information. Longer mean fixation durations on a warning label would indicate that people are having difficulty extracting information.	Just and Carpenter (1976), Roefs et al. (2008), Moacdieh and Sarter (2015a)
Percent fixation duration	The percent fixation duration is the total fixation divided by the total viewing time of stimuli. It indicates which warning language attracts most or least attention. The longer the fixation durations mean the language attracted more attention.	Manhartsberger and Zellhofer (2005)
Time to first fixate	The time to first fixate indicates how much the area attracts attention better or worse. The faster the time to first fixate the better attention property	(M. D. Byrne, Anderson, Douglass, & Matessa, 1999)

` In line with this study's hypothesis that bilingual labels will draw more attention than English-only and Arabic-only labels, it is expected that the total number of fixations, number of gazes, mean fixation duration, percent fixation duration will be higher for bilingual labels than for monolingual labels while time to first fixate will be shorter.

CHAPTER III

METHODS

A. Participants

The participants were 48 undergraduate and graduate students (24 women and 24 men; average age: 22.79 ± 4.43) from the American University of Beirut (AUB). They all had to be at least 18 years old and can speak, read, and write both English and Arabic. The participants were recruited using flyers attached around campus. The study procedure was approved by the AUB Institutional Review Board (IRB).

B. Experiment Setup

The experiment took place in the Ergonomics Laboratory (Scientific Research Building, Room 407). Participants were seated at around 60 cm from a 27- inch monitor with a resolution of 1680 x 1050 pixels. A Tobii X3-120, desktop mounted and infrared-based eye tracker is located underneath the monitor and used to record the eye movement of the participants at a sampling rate of 120 Hz and accuracy of 0.4 degrees visual angle. The eye tracking data was analyzed and extracted using iMotions software, which is installed on the computer.

C. Experiment Stimuli

Stimuli consisted of a set of tobacco packages that were created specifically for this study. Each stimulus consists of a background, brand name, and a warning label that could be in Arabic, English, or both (see Figure 1). In order to be clearly visible on the screen, the background of the packages is 8.5 cm in height and 5.5 cm in width. The

warning labels were created in Adobe Arabic Bold 14 point font. The warning is located at the bottom of the package and covers 40% of the package height, in conformance with package designs in Lebanon. There is a 0.1 cm margin on both sides (left and right) of the warning label. The images were subtend 17° visual angle in the vertical direction and 12° visual angle in the horizontal direction.

Figure 1: Sample Stimuli

The stimuli were created using Adobe Photoshop. The backgrounds of the stimuli were selected from the website Tobacco Labels (Tobacco Labelling Resource Centre, 2013) as well as the packages that were taken from the Lebanese Markets. The label texts were also based on the existing warning labels in Lebanon. For the English-only warnings, the texts were translated from the Arabic-only warnings (see Table 2). The number of words per individual text warning is between three and nine words in both English and Arabic, in keeping with most warning labels in Lebanon.

Table 2: Warning labels used in the experiment

English Warning Labels	**Arabic Warning Labels**
1. Smoking doubles the risk of stroke	١. التدخين يضاعف خطر الاصابة بالجلطة الدماغية
2. Smoking leads to serious and fatal diseases	٢. التدخين يؤدي الى امراض خطيرة و مميتة
3. Smokers die early	٣. المدخنون يموتون بسن مبكر
4. Smoking causes cancer of the mouth and throat	٤. التدخين يسبب سرطان الفم و الحنجرة
5. Smoking causes heart disease	٥. التدخين يسبب امراض القلب
6. Smoking causes cancer and lung disease	٦. التدخين يسبب سرطان و امراض الرئة
7. Smoking leads to blockage of arteries and veins	٧. التدخين يؤدي الى انسداد الشرايين و الأوردة
8. Smoking causes skin aging	٨. التدخين يسبب شيخوخة الجلد
9. Smoking during pregnancy harms the fetus	٩. التدخين اثناء الحمل يؤذي الجنين
10. Smoking leads to impotence	١٠. التدخين يؤدي الى العجز الجنسي
11. Smoking leads to addiction	١١. التدخين يؤدي الى الادمان فلا تبدأ
12. Indirect smoking harms others	١٢. التدخين غير المباشر يؤذي الآخرين

A total of 12 unique stimuli were created (i.e., each with a different background and warning label). Each of these 12 stimuli had three versions: one in Arabic, one in English, and one with both (bilingual), for a total of 36 stimuli. All bilingual labels had a version with English first, followed by Arabic, and another version with Arabic first, followed by English. Therefore, a total of 48 tobacco stimuli were created which includes: 12 stimuli with Arabic-text warning labels, 12 stimuli with English-text warning labels, 12 stimuli with bilingual warning labels with English first, followed by Arabic and 12 stimuli with bilingual warning labels with Arabic first, followed by English.

In addition to those experiment stimuli, 14 "dummy" stimuli were used in order to prevent participants from realizing that this study is about tobacco warnings. If participants realized this, they might have paid particular attention to these labels in unnatural fashion and memorized them. Thus, the dummy stimuli were images from four categories: medicines, detergents, canned foods and pesticides that were collected online. All of the dummy stimuli either contained warning labels or had warning labels added to the image (see Figure 2). Half of the dummy stimuli (seven) were in English and the other half were in Arabic. The data from these stimuli was discarded and not included in the analysis.

Figure 2: Sample of dummy stimuli one with already implemented warning and canned food with added label

D. Experiment Design

The independent variable was the language of the warning labels (English-only, Arabic-only, and bilingual (combination of the two)), which was varied between subjects. Each participant was randomly assigned to one of the three groups. There were 13 participants (6 women and 7 men) in the English group, 17 participants (9 women and 8

men) in the Arabic group, and 18 participants (9 women and 9 men) in the Bilingual group. There were no significant differences between the three groups in terms of age or smoking status.

Group 1 viewed the 12 English-only experiment stimuli, Group 2 viewed the 12 Arabic-only experiment stimuli, and Group 3 viewed the 12 bilingual stimuli, with a random mix of Arabic-first and English-first stimuli. The same dummy stimuli were randomly interspersed between the experiment stimuli for each group. Thus each participant in the group viewed a total of 26 images: 12 images of tobacco packages and 14 dummy stimuli.

Each group was divided into two subgroups and the participants in each group were equally and randomly divided between the subgroups (the subgroups were combined for analysis; see Figure 3). The participants in each subgroup viewed the stimuli in a randomly-assigned but fixed order. The order of the second subgroup is the inverse of the first. For the Bilingual group, half of the participants viewed the stimuli with English first, followed by Arabic, and the other half viewed the stimuli with Arabic first, followed by English.
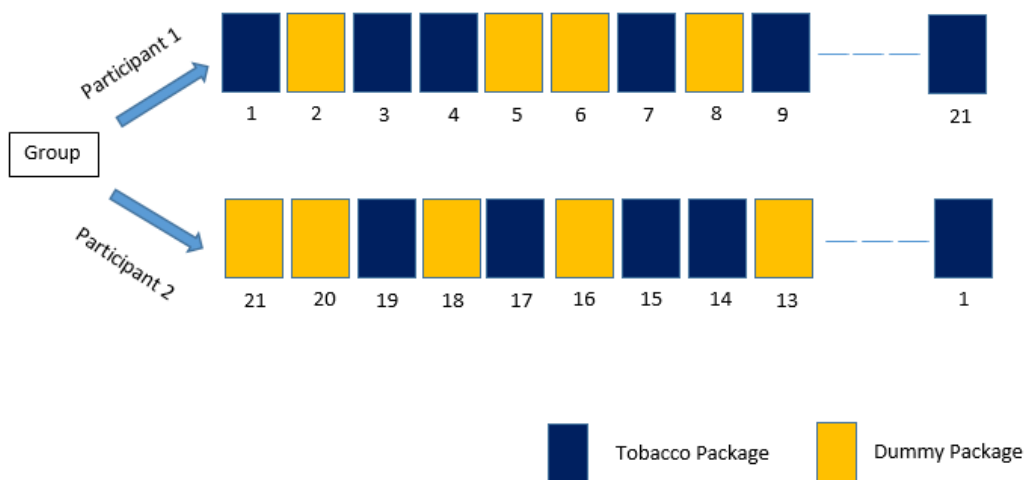

Figure 3: How the groups were divided in order to prevent confounds

The dependent variables in this study were divided into performance measures, eye tracking measures, and subjective measures. The performance measures included participants' short- and long-term recall rate. These were gathered by means of a post-experiment interview (short-term recall), post-experiment checklist (short-term recall), and email two weeks after the experiment (long-term recall). In addition, the partial recall rate was measured using the interview and the email, and is defined as a participant not remembering the full warning label but the gist of it or a couple of words. For data analysis, recall performance was measured by the total of warnings each participant recalled correctly within each group, and at each of the post-experiment interview, checklist, and email (long-term) stage. In the Bilingual group, English and Arabic warning labels were treated separately, exception for the checklist recall, since the Arabic and English warnings share the same meaning (see Figure B.3 of Appendix B). For the bilingual label, the language that participants recalled the warning labels in is also noted. Table 3 shows the definition for each of the recall performance measures.

Table 3: Recall Performance measurements for the warning labels in English-only, Arabic-only and bilingual. Note that for the checklist there was only full recall. The total number of warning labels was 12

Recall performance	Short Term Recall Performance		Long Term Recall Performance
	Interview	Checklist	Email
Partial recall	The total number of partially recalled warnings calculated for each participant; partial recall was considered when the gist or a couple of words were recalled without any prompts from the experimenter. In the case of bilingual warning labels, partial recall was considered if there was partial recall of either language. The language that was remembered was noted as well.	-	Same as the interview but obtained through email.
Full recall	The total number of correctly fully recalled warnings, calculated for each participant. The warning was considered recalled when the full warning was remembered exactly as is without any prompts from the experimenter. In the bilingual case, it was considered recalled if one language was remembered and the language(s) of the recalled warning label(s) was also noted.	The total number of correctly selected warning labels out of the given checklist, calculated for each participant. This sum does not include warning labels that had been partially or fully recalled in the interview.	Same as the interview but done through email.
Total Recall	The sum of the partial and total recall values. The total number of warning labels participants remembered either fully or partially.	-	Same as the interview but done through email

The eye tracking measures of Table 1 were calculated for each experiment stimulus. The metrics were calculated using experimenter-set AOIs (see Figure 4) that targeted the warning labels. The size of the AOI area is equal for all stimuli. The mean of each eye tracking metric was averaged over the 12 warning labels displayed per

participant. In the Bilingual group, the eye tracking metrics for the English warning labels and Arabic warning labels were calculated separately for all eye metrics, except for mean fixation duration and time to first fixate. This was done to make sure that the metrics that are directly proportional to the size of the AOI are only compared to AOIs of the same size.
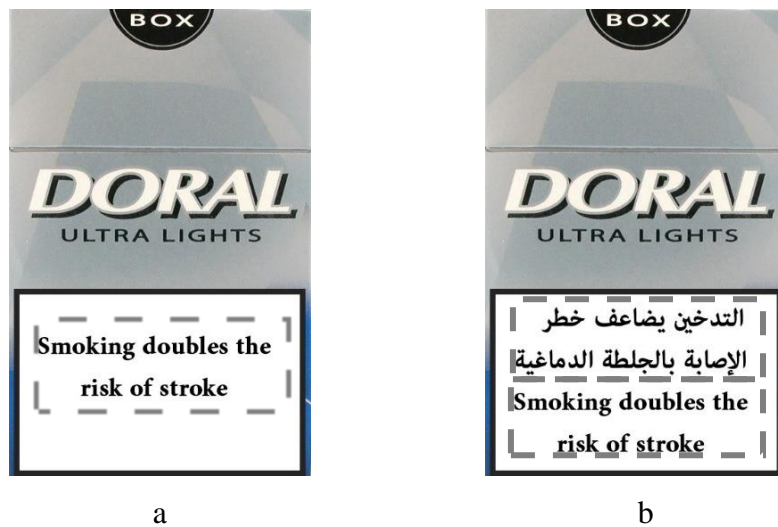

Figure 4: The AOIs for a (a) monolingual and (b) bilingual stimulus

Finally, the subjective measures, which was collected by means of a post-experiment debriefing questionnaire, were used to explore the results and determine whether there are any differences in the results between people of different backgrounds and experiences.

E. Experiment Procedure

Participants were informed that the aim of the study is to examine the benefits and limitations of different product and label designs so they do not make an effort to memorize and recall the tobacco warning labels. After reading and signing the consent

form, they were given a brief presentation about what they will have to do. Participants were told that they will be shown different package designs and labels each for 10 seconds and that they have to asses them as they will have to evaluate them at the end. The time limit is based on what previous studies have used (Kessels & Ruiter, 2012; Munafò et al., 2011) and based on pilot tests. Next, the eye tracker was set up and calibrated using a nine-point grid, after which the actual experiment started. A set of crosshairs were displayed at the center of the screen in between images, and participants were asked to focus on the crosshairs to ensure a common gaze position at image inception.

After the experimental phase, participants were asked to complete an oral post-experiment interview to check how much they recall from the experiment stimuli warning labels (see Appendix A). The interview was done by the experimenter and started by asking participants to list all the products that they recalled, followed by asking them to list all the tobacco warning labels they can recall. Both full and partial recalls of the warning labels were considered. For the Bilingual group, a label was considered to be recalled if they remembered it in English or in Arabic, and the language was noted.

Then the participant was shown a post-experiment checklist of the actual 12 warnings that were used in the experiment, excluding the warnings that they remembered fully or partially in the interview, combined with 6 other (completely different) warning labels that were not used in the experiment (see Table 4 and Appendix B). The participants were asked to select the labels that they remembered to be part of the study. Participants in the English-only group was shown the warnings in English, the Arabic-only group was shown warnings in Arabic, while the Bilingual group was shown bilingual warnings. The bilingual warnings were also equally divided between English first followed by Arabic and vice versa. Each participant in the Bilingual group viewed the

order of the warnings in the checklist recall task as in the experiment. In other words, participants who viewed English warning labels first followed by Arabic labels were shown a checklist that had English warnings first.

Table 4: Additional warnings that were used in the post-experiment checklist

English Dummy Warnings	Arabic Dummy Warnings
1) Your doctor can help you stop smoking	١) يستطيع طبيبك بمساعدتك لإيقاف التدخين
2) Smoking causes type 2 diabetes	٢) التدخين يسبب مرض السكري من الفئة الثانية
3) Stop smoking; you can do it	٣) يمكنك الإقلاع عن التدخين
4) Quitting smoking improves lung function	٤) ترك التدخين يحسن من وظيفة الرئة
5) Smoking increase the risk of fertility problems	٥) التدخين يزيد من مخاطر الخصوبة
6) Smoking causes cervical cancer	٦) التدخين يؤدي الى سرطان عنق الرحم

Participants were debriefed about the main purpose of the experiment and asked to confirm that they agreed for their data to be used. If not, participants were excused at this point and their data was not used. If they consented, participants were asked to fill a post-experiment questionnaire about their smoking behavior; demographics, preferred language, and other information (see Appendix C). Finally, participants were asked if they are ok with being contacted at some later point for some follow-up questions. If they consent, then participants were contacted two weeks after the study by e-mail and asked to recall as many of the warning labels as they can (exactly as the second question in the interview). This email is found in Appendix D. The whole experiment took around 25 minutes.

CHAPTER IV

RESULTS

The results were analyzed using a one-way ANOVA to determine the main effects of the type of warning label: English-only, Arabic-only, and bilingual labels. Analysis was done in IBM SPSS version 20. Bonferroni-adjusted post-hoc tests were used for pairwise comparisons. A repeated-measures ANOVA was used to compare the results of English versus Arabic labels in the Bilingual group. Four participants with eye tracking data quality below 80% were discarded, making for a total of 44 participants that were included in the data analysis. Normality was checked using a Shapiro-Wilk test and visual inspection of a normal Q-Q plot. Only the email recall performance (partial, full, and total) failed both of these tests, in which case a non-parametric Kruskal-Wallis H test was carried out. All participants consented to the use of their data and to be contacted by email two weeks after the experiment but only 33 participants responded to the email.

The participants were 32 (72.7%) non-smokers, 3 (6.8%) quitters, 6 (13.6%) social smokers, 1 (2.3%) non-daily smokers and 2 (4.6%) daily smokers (see Figure 5). In terms of language, 37 (84.1%) of the participants' first language was Arabic and 7 (15.9%) of their first language was English. For the participants whose first language was Arabic, 36 (97.3%) of their second language was English and 1(2.7%) was French. For the participants whose first language was English, 6 (85.7%) of their second language was Arabic and 1 (14.3%) was French (see Table 5).
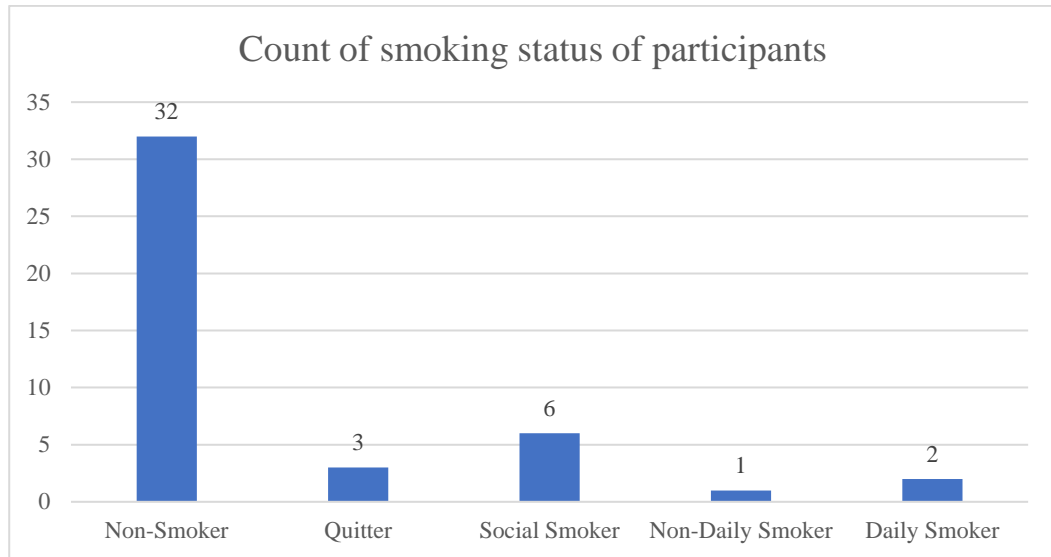
Figure 5: Smoking status of participants

Table 5: The count of the participants' first and second language

First language count	Arabic		English	
	37		7	
Second language count	**English**	**French**	**Arabic**	**French**
	36	1	6	1

A. Recall Performance

1. Short Term Recall Performance

Interview – partial recall. No significant difference were found in the mean of total number of unaided partially correct recalled warnings between groups, $F(2, 41) = 62.167$, $p = .127$. Participants could partially remember an average of 1.41 (SD = 0.99), 1.5 (SD = 0.96), and 2.25 (SD = 1.52) in the English, Arabic and Bilingual groups, respectively.

Interview – full recall. No significant difference were found in the mean of total number of unaided fully recalled warnings between groups, $F(2, 41) = .127$, $p = .881$.

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Participants could fully remember an average of 1.00 (SD = 1.34), 1.12 (SD = 0.80), and 0.93 (SD = 1.06) in the English, Arabic and Bilingual groups, respectively.

Interview – total recall. There was no significant difference in the mean of total short term recall rate, $F(2, 41) = 6.902$, $p = .089$. Participants could fully remember an average of 2.41 (SD = 1.44), 2.62 (SD = 1.31), and 3.12 (SD = 1.45) in the English, Arabic and Bilingual groups, respectively. There was a significant difference, however, between the recall rate for English and Arabic warning labels within the Bilingual group, as evidenced by a repeated-measures ANOVA, $F(1, 15) = 8.392$, $p = .011$, $\eta p2 = .359$ with an average of 3.68 (SD = 2.02) warnings remembered in Arabic and 2.68 (SD = 1.74) in English (see Figure 6).
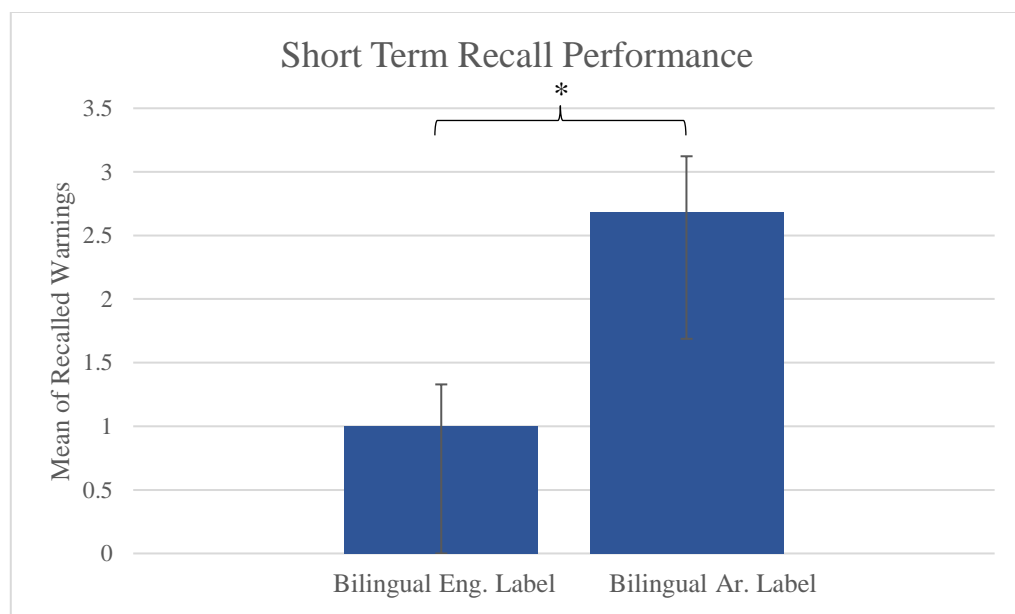

Figure 6: Mean of the total recalled warnings for the Bilingual groups in interview out of a total of 12 warning labels

Checklist. No significant differences were found in the mean of total number of aided correct recalled warnings between groups, $F(2, 41) = .566$, $p = .572$. Participants

correctly checked an average of 4.33 (SD = 1.61), 3.68 (SD = 1.81), and 4.00 (SD = 1.31) in the English, Arabic and Bilingual groups, respectively.

2. *Long Term Recall Performance*

Email - partial recall. The results of the Kruskal-Wallis test showed that there was no significant difference found in the mean of total number of long term partially recalled warnings between groups $\chi2$ (2) = .520, p = .771. Participants could partially remember an average of 0.88 (SD = 1.05), 1.08 (SD = 1.24), and 1.16 (SD = 0.71) in the English, Arabic and Bilingual groups, respectively.

Email – full recall. The results of the Kruskal-Wallis test showed that there was no significant difference found in the mean of total number of long term fully recalled warnings between groups $\chi2$ (2) = 3.960, p = .138. Participants could fully remember an average of 0.33 (SD = 0.50), 1.16 (SD = 1.11), and 0.58 (SD = 0.66) in the English, Arabic and Bilingual groups, respectively.

Email – total recall. The results of the Kruskal-Wallis test showed that there was no significant difference found in the mean of total number of long term recalled warnings between groups $\chi2$ (3) = 2.426, p = .297. The total email recall was an average of 1.22 (SD = 1.09), 2.08 (SD = 1.62), and 1.83 (SD = 1.19) in the English, Arabic and Bilingual groups, respectively. Table 6 summarizes the performance results of this study.

Table 6: Performance results (mean and standard deviation of number of warnings recalled).None of these results showed significant differences, but the highest values are presented in bold.

Recall	Short Term Recall Performance						Long Term Recall Performance		
	Interview			Checklist			Email		
	English	Arabic	Bilingual	English	Arabic	Bilingual	English	Arabic	Bilingual
Partial recall	1.41 (0.99)	1.50 (0.96)	**2.25 (1.52)**		-		0.88 (1.05)	1.08 (1.24)	**1.16 (0.71)**
Full recall	1.00 (1.34)	**1.12 (0.80)**	0.93 (1.06)	**4.33 (1.61)**	3.68 (1.81)	4.00 (1.31)	0.33 (0.50)	**1.16 (1.11)**	0.58 (0.66)
Total Recall	2.41 (1.44)	2.62 (1.31)	**3.12 (1.45)**		-		1.22 (1.09)	**2.08 (1.62)**	1.83 (1.19)

B. Eye Tracking Metrics

Number of gazes. There was a significant difference in the mean number of gazes between groups, $F(2, 41) = 23.38$, $p < .001$, $\eta p2 = .533$. Bonferroni-adjusted post-hoc tests revealed significant pairwise differences between the Bilingual group and each of the English and Arabic groups (both $p < .001$, see Figure 7). There was no significant difference in number of gazes between Arabic and English warning labels within the Bilingual group $F(1, 15) = .45$, $p = .51$, $\eta p2 = .03$. The number of gazes was 3.14 (SD = .99) for Arabic labels and 2.92 (SD = 1.11) for English labels.
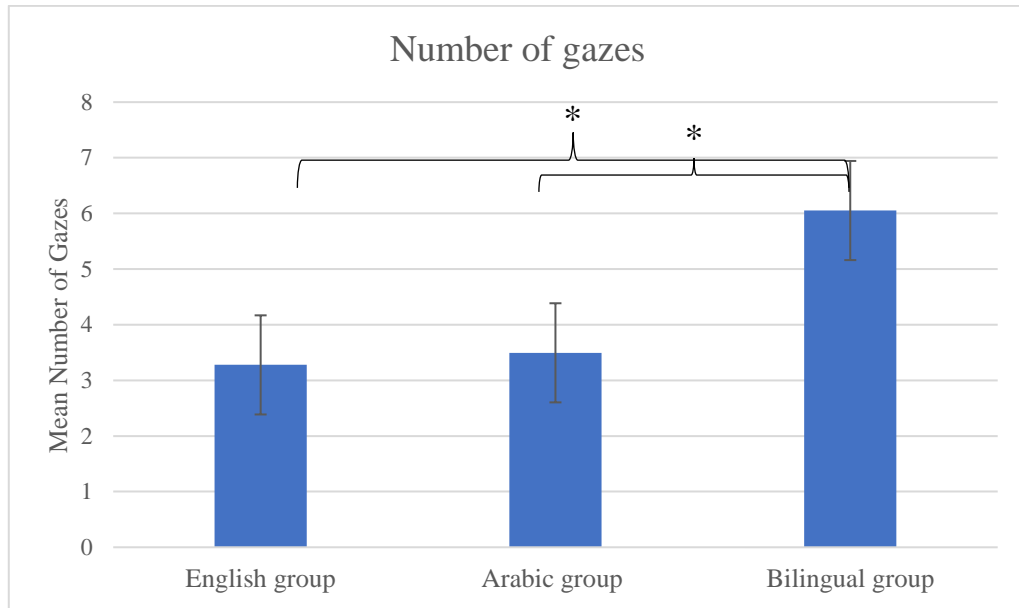
Figure 7: Mean number of gazes on health warning labels for the three groups

Total number of fixations. There was no significant difference between groups, $F(2, 41) = 2.112$, $p = .134$. The total number of fixations was 23.64 (SD = 11.86), 27.38 (SD = 12.65), and 34.53 (SD = 17.41) in the English, Arabic and Bilingual groups, respectively. There was no significant difference in total number of fixations between Arabic and English warning labels within the Bilingual group $F(1, 15) = 1.78$, $p = .20$, $\eta p2 = .11$. The total number of fixations was 18.82 (SD = 11.13) for Arabic labels and 15.71 (SD = 8.43) for English labels.

Percent fixation duration. There was no significant difference between groups, $F(2, 41) = 5.09$, $p = .011$. The percent fixation duration was 201.0 (SD = 94.8), 191.5 (SD = 60.5), and 286.1 (SD = 110.86) in the English, Arabic and Bilingual groups, respectively. There was no significant difference in percent fixation duration between Arabic and English warning labels within Bilingual group $F(1, 15) = .284$, $p = .602$, $\eta p2 = .019$. The percent fixation duration was 135.96 (SD = 66.45) for Arabic labels and 110.88 (SD = 49.8) for English labels.

Time to first fixate. The mean time to first fixate showed a significant difference between groups, $F(2, 41) = 16.961$, $p < 0.001$, $\eta p2 = .453$. Bonferroni-adjusted post-hoc tests revealed significant differences between the Bilingual group as compared to the English ($p < .001$) and Arabic ($p < .001$; see Figure 8).
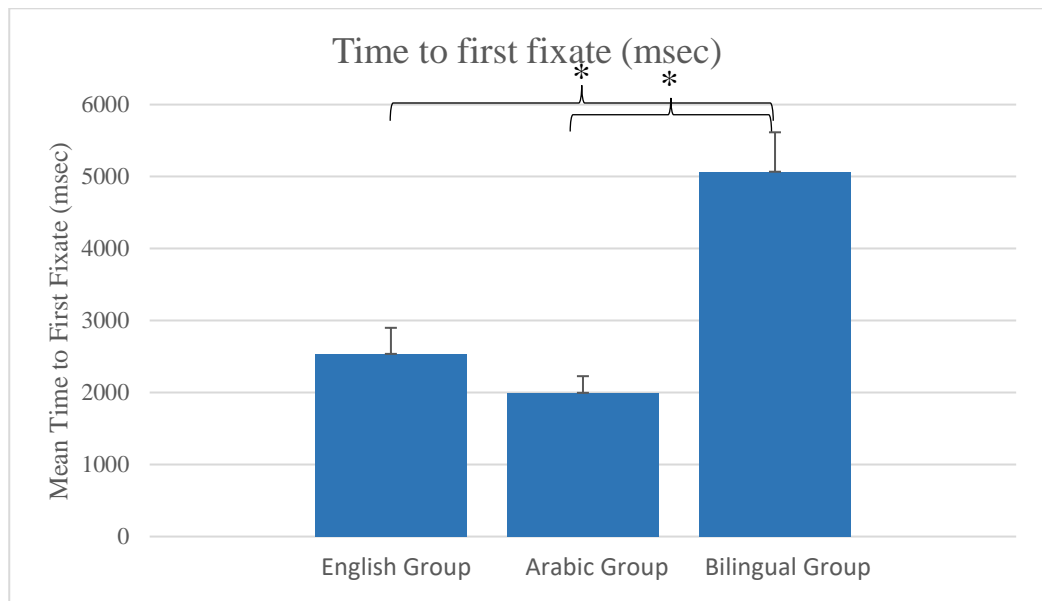

Figure 8: Mean time to first fixate on health warning labels for the three groups

Mean fixation duration. The mean fixation duration showed a significant difference between groups, $F(2, 41) = 4.422$, $p = .018$, $\eta p2 = .177$. Bonferroni-adjusted post-hoc tests showed a significant difference between the Arabic and Bilingual groups ($p = 0.016$; see Figure 9).

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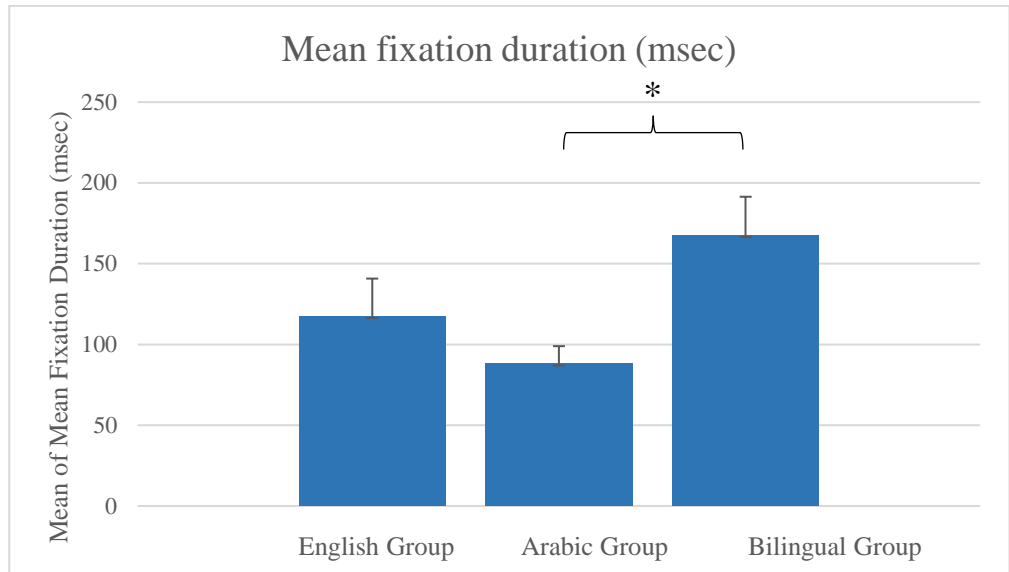
Figure 9: Mean of mean fixation duration on health warning labels for the three groups

C. Subjective Results

The following are the subjective measures results, which was collected by means of a post-experiment debriefing questionnaire. Figure 10 shows how frequently do smokers (daily, non-daily and social) read the warning labels on tobacco packages.
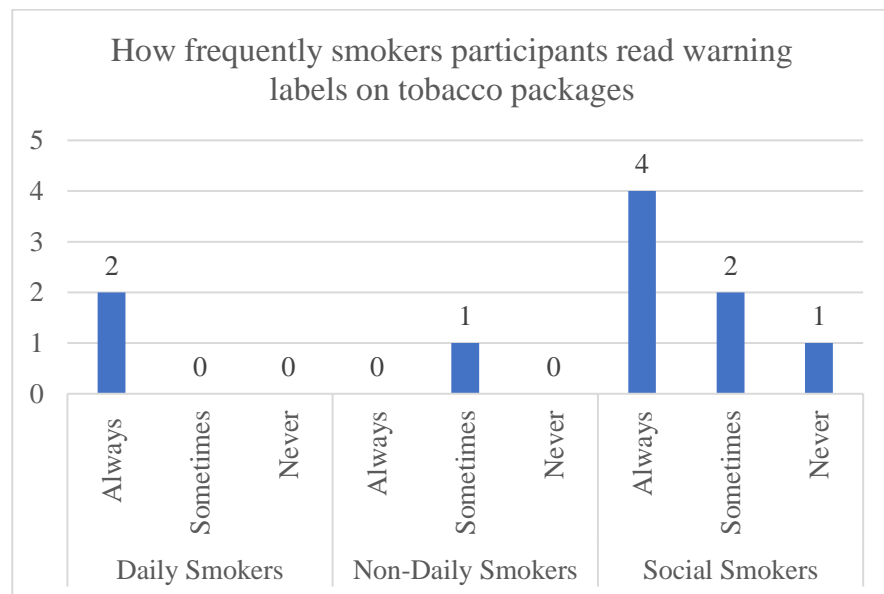

Figure 10: The frequency of reading warning labels for daily, non-daily and social smoker participants

Figure 11 shows what features of the tobacco packages, used in the experiment, most drew participants' attention while viewing the stimuli.
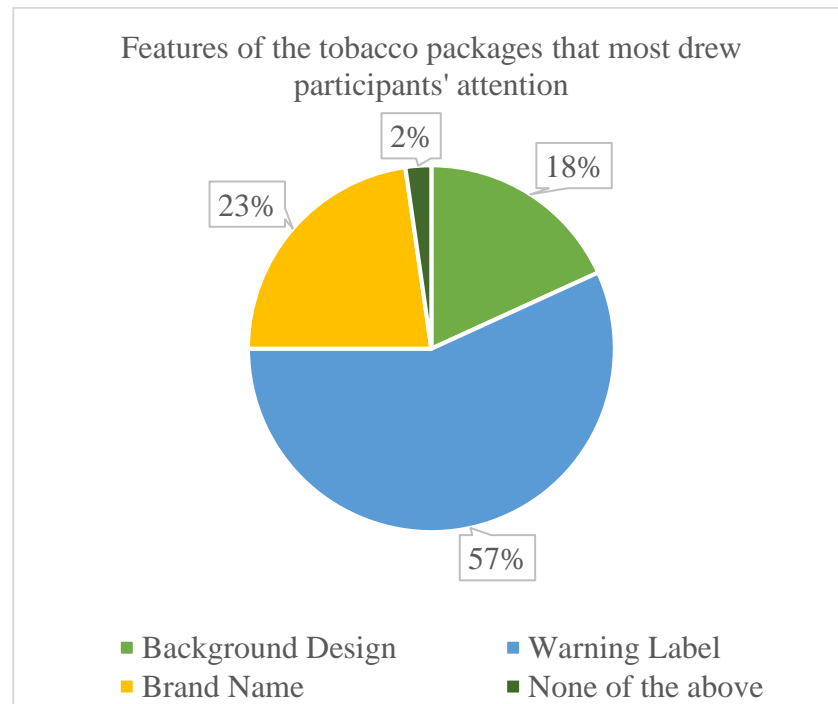

Figure 11: Features of the tobacco packages stimuli designed for the study that drew the most attention of the participant during the experiment whether it is the background, warning label or brand name

Figure 12 shows the opinion of the participants on what is the most effective language that should be used on the tobacco warning labels to perceive the message.
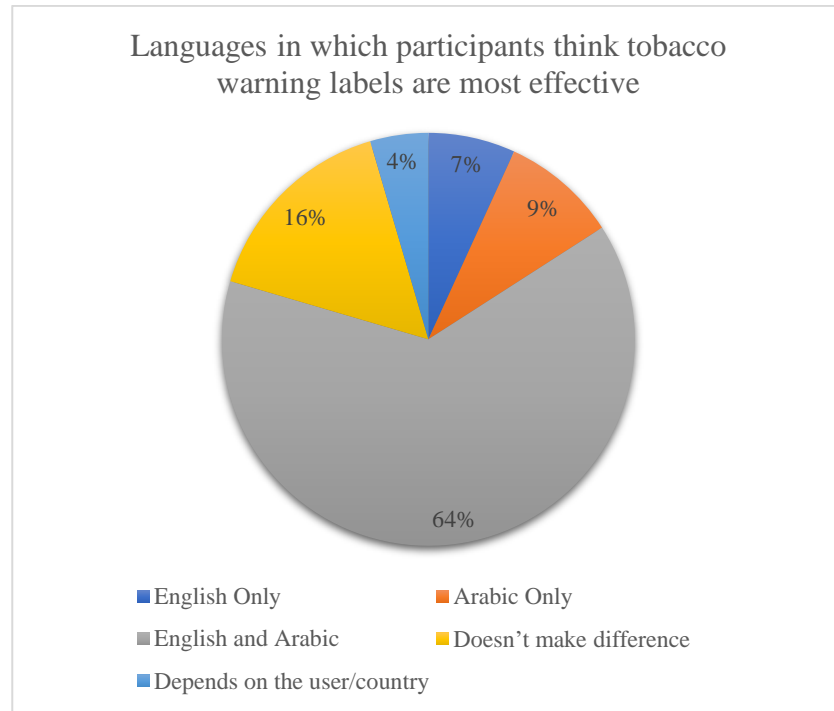
Languages in which participants think tobacco warning labels are most effective

- English Only
- Arabic Only
- English and Arabic
- Doesn't make difference
- Depends on the user/country

4% 7% 9% 16% 64%

Figure 12: Languages that participants think is most effective in perceiving the messages of the warning labels on tobacco packages

Figure 13 shows the opinion of the participants on the effectiveness of the tobacco warning labels on people's tendency to buy cigarettes.
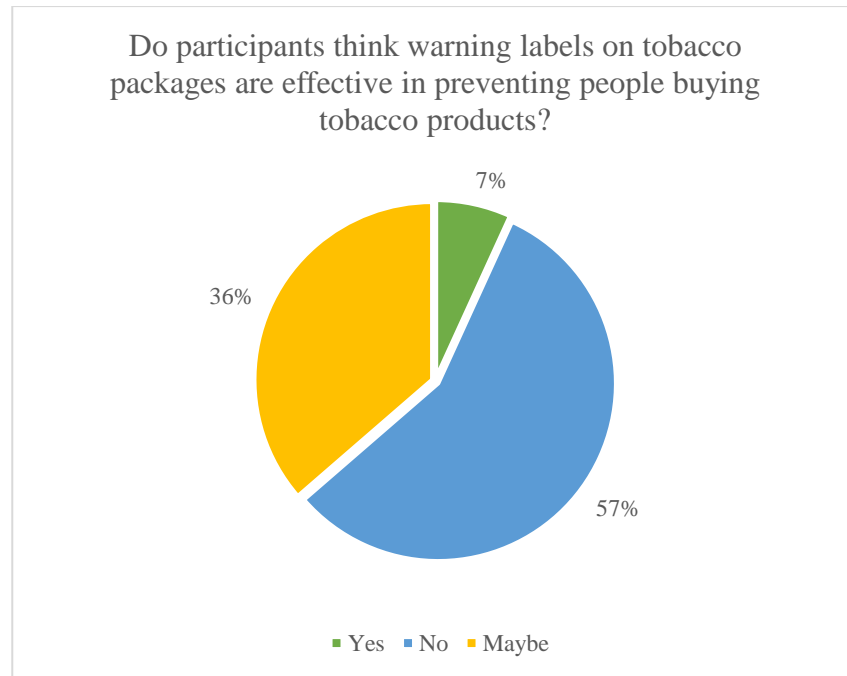

Figure 13: Participants' point of view towards the effectiveness of warning labels on people buying tobacco products

Figure 14 shows whether the participants think that graphical warnings are more effective than text-only warning labels or not.
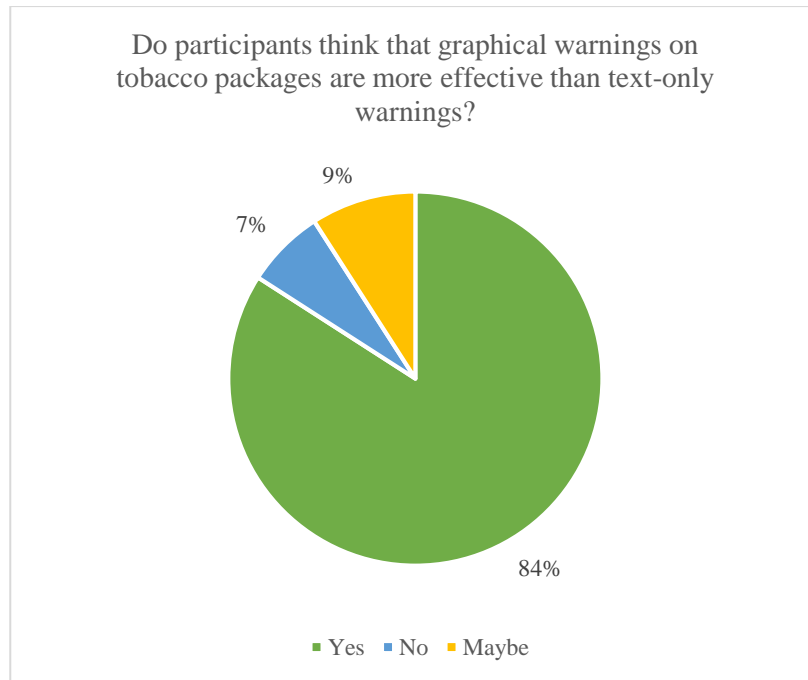

Figure 14: Participants' opinion on whether graphical warning labels are more effective than text-only warning labels

Table 7 list the suggestions of the participants on how do they think warning labels should be designed to make it more effective.

Table 7: Suggestions of the participants to improve the effectiveness of the warning labels on users

1. Put the warnings to cover all of the tobacco package.
2. Use graphical warnings.
3. Use different style of the warnings on all brands to make it more appealing.
4. Removing the names of the brands.
5. Include statistics about cancer, death and diseases etc.
6. Use plain packages.
7. Change the color of the text warnings and larger in size.
8. Find more innovative text warnings rather than the classical ones.
9. Not using formal language, keep it local slang.
10. Make the text targeted to the young population who are at the early stage of smoking.
11. Put motivational text warnings not threatening.

A multiple linear regression was run for the recall rate (both long- and short-term) as the dependent variable and with the following five independent variables: gender, age, first language, smoking status and warning label. The results of the regression showed no significant relationship between the predictors and the independent variables.

An independent samples t-test was conducted to check for significant differences in performance results between participants of different gender. For the checklist recall performance, results showed that there was no significant differences between men (M = 4.00, SD = 1.31) and women (M = 3.95, SD = 1.84); t(42) = .094, p = .94. Also, for the total interview recall performance, results showed that there was no significant differences between men (M = 2.91, SD = 1.93) and women (M = 3.00, SD = 1.48; t(42)

= .176 p = .861, nor was there for the total email recall performance, between men (M = 1.79, SD = 1.42) and women (M = 1.74, SD = 1.33); $t(31)$ = .101 p = .920.

CHAPTER V

DISCUSSION AND CONCLUSION

The aim of the study was to analyze the effects of monolingual and bilingual tobacco warning labels on young people's ability to recall warning information in the short- and long term as well as on their visual attention using eye metrics.

It was expected that bilingual warnings will lead to better short- and long-term recall performance than having Arabic-only or English-only text warnings, with the presence of two languages (and, as a result, more data) not negatively impacting performance. It was hypothesized that, despite the presence of more data and possibly more clutter in the case of bilingual labels, the amount of attention to the warning labels will be more for bilingual labels than for Arabic-only or English only labels.

In terms of performance, the results did not reveal any clear pattern. In general, the recall rate across all types of recall was very low. In general, however, there seemed to be a better ability to recall Arabic warning labels. Even in the cases where the bilingual labels showed higher recall, this was mainly due to the Arabic labels, as evidenced by the significantly higher number of Arabic labels remembered in the Bilingual group for short-term recall. Thus the hypothesis about bilingual labels was refuted in the case of performance. It seems that bilingual labels, rather than enforcing a message, made it more difficult for participants to remember anything from the label. Moreover, it would seem that young people in Lebanon, despite anecdotally claiming to be more comfortable in English, still recall Arabic warnings better. This would seem to make sense given that most participants considered their first language to be Arabic (Papafragou, Hulbert, & Trueswell, 2008); however, that was not expected to translate to written labels, especially

for college students at AUB. It could be that participants are more familiar with these labels from advertisements they see regularly. Another explanation is that the clutter caused by more text led to interference between the different languages and, in turn, a compromised ability to recall any of the information (Bialkova et al., 2013).

In terms of attention allocation, the results reinforced the idea that bilingual labels are not beneficial in terms of getting people to read and absorb them more. While the number of gazes was higher for the Bilingual group, meaning that they revisited them more times, that did not really translate into better recall performance. This could be explained by the fact that the time to first fixate the bilingual labels was longer than then monolingual ones. In other words, participants were reading the bilingual labels later than they were the monolingual labels. Moreover, the mean fixation duration was longer in the case of bilingual labels, suggesting that participants were struggling to read the information there – even though the font type and size were exactly the same as the monolingual case. These results once again refute our hypothesis about bilingual labels and are in line with research on clutter in warning labels, where people paid less attention to more cluttered labels (Bialkova et al., 2013; Wogalter et al., 1991). It does not seem like bilingual text is any different than other forms of clutter; more text, in whatever language, led to worse attention and performance.

In addition, it is interesting that when asked about what language(s) they thought would be best for warning labels, 64% of participants said that Arabic and English together would be best. This is similar to the one previous study on bilingual labels (Lim and Wogalter (2006) where participants preferred to have both languages. It would seem that people's subjective preferences are not aligned with their actual performance and

attention, providing further evidence for the use of objective measures such as performance and eye tracking, as used here.

In conclusion, the findings of this thesis suggest that Arabic warning labels are best for the Lebanese population, even the young population. The addition of graphic labels, as also suggested in the survey, would be something that is likely to improve the recall rate and attention to labels, as established in previous studies (e.g., Klein et al., 2017). In terms of intellectual merit, this study filled a gap in the literature on the benefits and limitations of bilingual warning labels and established that they resulted in clutter in this context. In terms of broad impact, the results of this study confirmed the most effective language to use for tobacco warning labels in Lebanon, and similar countries like Syria and Tunisia, as well as potentially in other multilingual contexts. This could then contribute to decreasing the number of people – particularly young people – who take up smoking or continue to smoke. In addition, the results of the study can also be used to inform the design of other warning labels for potentially dangerous and addictive products, such as alcohol.

Further research will look into the design of warning labels in other contexts and also the addition of graphical warnings. In addition, further research can address some of the main limitations of this study. First, recall performance and eye tracking measurements from the dummy stimuli were not collected and included in the analysis. This study was limited to AUB students, who represent only a small subset of the young Lebanese population. Also, the sample size was smaller than planned due to the lockdown imposed by the COVID-19 pandemic. Future studies will look to expand on this subset and include young people from a variety of backgrounds and education levels. Another

limitation is that the way that the packages were displayed on a screen was not realistic;

however, given the limitations of the eye tracker this is the only way it could be done.

APPENDIX

A. Appendix A. Post-experiment Interview

1. List all the products that you recall.
2. List all the tobacco warning labels that you recall exactly as you saw them.

B. Appendix B. Post-experiment Checklist

Figure B. 1: Checklist of English warnings questionnaire

Figure B. 2: Checklist of English warnings questionnaire

Bilingual / لغتين

Smoking leads to addiction
التدخين يؤدي الى الادمان فلا تبدأ

Smoking leads to impotence
التدخين يؤدي الى العجز الجنسي

Smoking causes cervix cancer
التدخين يؤدي الى سرطان عنق الرحم

Smoking increase the risk of fertility problem
التدخين يزيد من مخاطر الخصوبة

Smoking during pregnancy harms the fetus
التدخين اثناء الحمل يؤذي الجنين

Smoking causes heart disease
التدخين يسبب امراض القلب

Smoking leads to serious and fatal diseases
التدخين يؤدي الى امراض خطيرة و مميتة

Smokers die early
المدخنون يموتون بسن مبكر

Stop smoking you can do it
يمكنك الاقلاع عن التدخين

Smoking causes type 2 diabetes
التدخين يسبب مرض السكري من الفئة الثانية

Smoking causes cancer of the mouth and throat
التدخين يسبب سرطان الفم و الحنجرة

Quitting smoking improves lung function
ترك التدخين يحسن من وظيفة الرئة

Smoking leads to blockage of arteries and veins
التدخين يؤدي الى انسداد الشرايين و الأوردة

Indirect smoking harms others
التدخين غير المباشر يؤذي الآخرين

Smoking causes cancer and lung disease
التدخين يسبب سرطان و امراض الرئة

Your doctor can help you stop smoking
يستطيع طبيبك بمساعدتك لإقاف التدخين

Smoking doubles the risk of stroke
التدخين يضاعف خطر الاصابة بالجلطة الدماغية

Smoking causes skin aging
التدخين يسبب شيخوخة الجلد

Back Submit

Figure B. 3: Checklist of bilingual warnings questionnaire (English first)

Bilingual / لغتين

التدخين غير المباشر يؤذي الآخرين
Indirect smoking harms others

يمكنك الاقلاع عن التدخين
Stop smoking you can do it

التدخين اثناء الحمل يؤذي الجنين
Smoking during pregnancy harms the fetus

التدخين يسبب شيخوخة الجلد
Smoking causes skin aging

التدخين يضاعف خطر الاصابة بالجلطة الدماغية
Smoking doubles the risk of stroke

التدخين يسبب سرطان الفم و الحنجرة
Smoking causes cancer of the mouth and throat

التدخين يؤدي الى انسداد الشرايين و الأوردة
Smoking leads to blockage of arteries and veins

التدخين يؤدي الى امراض خطيرة و مميتة
Smoking leads to serious and fatal diseases

التدخين يسبب امراض القلب
Smoking causes heart disease

التدخين يسبب مرض السكري من الفئة الثانية
Smoking causes type 2 diabetes

المدخنون يموتون بسن مبكر
Smokers die early

ترك التدخين يحسن من وظيفة الرئة
Quitting smoking improves lung function

التدخين يزيد من مخاطر الخصوبة
Smoking increase the risk of fertility problem

التدخين يسبب سرطان و امراض الرئة
Smoking causes cancer and lung disease

يستطيع طبيبك بمساعدتك لإقاف التدخين
Your doctor can help you stop smoking

التدخين يؤدي الى سرطان عنق الرحم
Smoking causes cervix cancer

التدخين يؤدي الى الادمان فلا تبدأ
Smoking leads to addiction

التدخين يؤدي الى العجز الجنسي
Smoking leads to impotence

عرض رجوع

Figure B. 4: Checklist of bilingual warnings questionnaire (Arabic first)

C. Appendix C. Post-Experiment Questionnaire

Section 1 – General Information
1. Participant ID _____

2. How old are you? _____ years

3. What is your gender?
   a. Female
   b. Male

4. What do you consider your first language (i.e., the one you are most comfortable in speaking in your daily life)?

   _____

5. What do you consider your second language?
   _____

6. What other language(s) can you speak fluently? (Optional)

   _____

7. Which of the languages you specified are you most comfortable with when it comes to **reading**?

   _____

8. Which of the languages you specified are you second most comfortable with when it comes to **reading**?

   _____
9. Were you aware about our main goal in this study?
   a. Yes
   b. No

10. What is your current smoking status?
   a. Daily Smoker: smoke cigarettes-only everyday – **Go to section 2**
   b. Non-Daily Smoker: smoke cigarettes-only at least every couple days - **Go to section 3**
   c. Social Smoker: smoke cigarettes-only in social occasions (not more than twice per week) **– Go to section 3**
   d. Non-Smoker: do not smoke cigarettes - **Go to section 5**
   e. Quitter: stopped smoking at least more than one week- **Go to section 5**

11. What features of the tobacco packages drew your attention the most?

a. The brand name
b. The warning label
c. The background design
d. None of the above

Section 2 – Smokers Information (**after section 2 go to section 4**)
12. How many cigarettes do you smoke per day?
    a. 1 to 3
    b. 4 to 6
    c. 7 to 9
    d. 10 to 12
    e. More than 13

13. Would you like to quit smoking?
    f. Yes
    g. No
    h. Maybe

14. At what age did you start smoking?
    i. Younger than 15
    j. Between 15 and 18
    k. Between 18 and 25
    l. Above 25

Section 3 – Social and Non-Daily Smokers Information
15. How often do you usually smoke?
    a. Once or twice a month
    b. Three or four times a month
    c. Between 5 to 10 times a month
    d. Not more than 15 times a month
    e. Once or twice a week
    f. Three or four times a week

16. Do you usually buy your own cigarettes?
    g. Yes
    h. No
    i. Sometimes

17. When do you usually smoke? Check all that apply
    ☐ Hanging out with friends
    ☐ Family events
    ☐ Work meetings
    ☐. Meals
    ☐ Other: _____

Section 4 – Cigarettes Information

18. What brand(s) do you smoke? If more than one brand put a comma between each_____

_____

19. How frequently do you read warning labels on tobacco packages?
   a. Never
   b. Sometimes
   c. Always

Section 5 – Warning Labels Information & Packaging

20. Do you think warning labels on tobacco packages are effective in preventing people buying tobacco products?
   a. Yes
   b. No
   c. Maybe

21. In which language do you think tobacco warning labels are most effective?
   a. English only
   b. Arabic only
   c. English and Arabic
   d. It does not make a difference
   e. Other _____

22. Do you think that graphical warnings on tobacco packages are more effective than text-only warnings?
   a. Yes
   b. No
   c. Maybe

23. In general, how would you make tobacco warning labels more effective?

_____

Section 6

Do you need support to quit smoking? Visit the link:
https://www.aub.edu.lb/tobaccofree/Pages/Smoking-Cessation-Support.aspx

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D. Appendix D. Follow-up Email

Dear participant,

You are receiving this e-mail following your participation in a research study on warning labels conducted by the Department of Industrial Engineering and Management two weeks ago. During the experiment you were shown different warning labels for tobacco products.

Please reply to this e-mail and list all the tobacco warning labels that you recall exactly as you saw them during the experiment. If you cannot remember a warning label exactly, please try to mention as many words as possible that you recall.

Note: All collected data will be de-identified and will remain anonymous.

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