ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master Thesis in Behavioral Economics

Smokers' Blindness: An Analysis on the way Smokers Engage with Dissonant Information.

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Date Final Version: 28/08/2018

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Abstract

The main purpose of this study is to determine whether smokers tend to avoid information about the negative consequences of smoking. To this end, an experiment was designed to capture smokers' potential lack of receptivity to dissonant information. The manner in which this study attempts to identify the presence of information avoidance is by comparing non-smokers' and smokers' behavior when presented with content which takes an anti-smoking stance.

In the experiment, all respondents are rewarded commensurate to their performance on a quiz comprising of logic and comprehension questions. The comprehension questions are based on content which highlights the negative consequences of smoking and binge-watching. For each topic, a video and a text are presented. Before accessing the content, respondents are shown the title of the video or text and are asked to state their preference between: 1) read or view the content and access questions, which, if answered correctly yield lottery tickets used to determine three winners of a non-monetary prize; or 2) avoid the content at a penalty cost of 6 lottery tickets. The preference of paying to avoid the content is recorded as a preference to actively avoid information. A Fisher Exact Test is used to test whether active information avoidance and smoking have an independent relationship; thus, testing whether smokers are more prone to actively avoid information than non-smokers. Additionally, a Mann-Whitney U Test is conducted to test whether smokers perform similarly to smokers; thus, testing for signs of passive information avoidance among smokers.

The results of the experiment demonstrate that smokers are not more likely than non-smokers to engage in active information avoidance. However, smokers score lower on average than non-smokers when answering questions on text content about the negative consequences of smoking; symptomatic of passive information avoidance. Additional findings show that habit smokers engage in active information avoidance and smokers who have never attempted to quit engage in passive information avoidance. Interestingly, when changing the treatment groups, from smokers and non-smokers, to binge watchers and non-binge watchers, no behavioral differences are observed in terms of receptivity to dissonant information; reinforcing the idea that not all dissonant information is undesirable. To conclude, the results of this study support the need to push for 'de-normalization' of tobacco and increase the reliance on nudging strategies through behavioral change rather than through information provision.

Motivation

Smoking as an Issue

The tobacco industry has been and continues to be one of the most profitable commercial enterprises in business history. Yet, this economic feat is mired by controversy as the products that have led to its success are the direct cause of death of their most loyal customers: tobacco is the deadliest legal commercial product available to individuals (Chaloupka & Warner, 2000). However, the consequences of smoking are not a novel fact. More than 50 years have passed since U.S. Surgeon General's 1964 Report on Smoking and Health concluded that smoking is a cause of lung cancer and chronic bronchitis (Schroeder, & Koh, 2014). Although the report was not the first of its kind, with some studies dating back to the 1920's (White, 1990), it was one of the most influential in convincing governments that action was needed to reduce tobacco consumption (Musk & De Klerk, 2003). Since, an increasing body of studies have found smoking to be a major cause of illnesses such as heart disease, strokes, peripheral vascular disease, chronic obstructive pulmonary disease and a cornucopia of cancers (US Department of Health and Human Services, 2014). Today, it is indisputable that tobacco is one of the leading causes of death in developed countries and has been for the past five decades (Musk & De Klerk, 2003). The dangers of consuming tobacco products have been officially recognized by governments, international health organisations such as the World Health Organisation and more recently by 'Big Tobacco' companies (Fox, 2017).

Despite the long-established irrefutability that tobacco is unhealthy for all who consume it, the omnipresence of "smoking kills" messages, the increase of tobacco prices through excise taxes, and other government regulation with the intention to curb its purchase and consumption, smoking tobacco remains a prevalent action. It is true that since the 1980's the pervasiveness of smoking has largely reduced for both men and women at a global level, yet 6 million people across the world are expected to die from tobacco use every year; 10% of which will be due to the adverse effects of second-hand smoking (World Health Organization, 2017). Moreover, current trends predict that the number of deaths will increase to 8 million by 2030. Even if the percentage of smokers has reduced, the number of smokers has increased significantly due to population growth (Ng et al., 2014), which will lead to further preventable strains on healthcare budgets if the trend continues. The sum of healthcare expenditure used to treat diseases linked to smoking totalled 422 billion USD in 2012, equivalent to 5.7% of global health expenditure; while the total economic cost (from healthcare costs and loss of productivity) is estimated to be a staggering 1.4 billion USD, equivalent to nearly 2% of the world's annual GDP (Goodchild, Nargis & d'Espaignet, 2017). A lion share of these healthcare costs is financed by public funds and programs; in the United States alone, 60% of the costs are absorbed by Medicaid, Medicare or other federally sponsored programs (Xu, Bishop, Kennedy, Simpson & Pechacek, 2015). Subsequently, it is increasingly difficult to maintain that the decision to smoke only affects the smoker, since it is also borne by those around them (mainly second-hand smokers) and taxpayers.

With the accumulation of studies that continue to link smoking to a plethora of preventable diseases and the cost that these illnesses bear on societies, it is unsurprising that there is greater political action aimed at containing healthcare expenses through preventable healthcare measures (Cohen, Neumann & Weinstein, 2008). This political change partially stems from a radical redefinition of tobacco culture in many nations, especially in Western countries; where the

transformation is due to shifts in public attitude and social norms along with the introduction of a blend of legal controls and educational programs (Alemanno, 2012). “De-normalization” is a popular method used by anti-tobacco advocates, where the goal is to “change the broad social norms around using tobacco – to push tobacco use out of the charmed circle of normal desirable practice to being an abnormal practice” (Hammond et al., 2006). This has resulted in a number of anti-smoking tobacco measures such as taxation, smoking bans and the presence of warning signs covering tobacco packages. However, these policies that have been implemented in the name of ‘libertarian paternalism’ have been heavily criticized by proponents of freedom of choice; who contend that individuals are capable of making rational decisions when left to their own devices. As a result, public authorities are not ready to completely ban the consumption of tobacco. With studies suggesting that individuals would quit if they were given the opportunity, governments are leaning towards ‘nudging’ strategies that aim at skewing decisions without infringing significantly on the freedom of choice (The Economist, 2006). For example, a recent wave of nudging policy within the European Union has aimed at improving the effectiveness of pictorial health warnings on tobacco products to try to further dissuade smoking. Their effectiveness, however, is contingent on the attention that the target demographic gives to these warnings (Bogliacino et al., 2015).

The controversy behind the success of the tobacco industry and the consequences of smoking make it one of the most researched addictions in economics (Chaloupka & Warner, 2000). Factors such as the costs borne by governments and individuals, and the conscious consumption of a harmful product have pushed economists to develop frameworks that attempt to shed light on the decision process behind the willingness to smoke, as well as the policies required to curb its consumption and compensate for the negative externalities of increased health costs and loss of productivity. Three main schools of thought currently exist: the perfectly rational model, the imperfectly rational model and the irrational model. These models have been developed to shape the policies that have been and will be implemented in the tobacco industry.

Economic Models of Smoking Behavior

Perfectly Rational Model of Addictive Behavior

In traditional economics, individuals are rational agents when they consider all available information on the future consequences of their choices (Hammond, 1997). This view holds that individuals consume tobacco like they consume any other good in the market. Therefore, like with the consumption of any other product, the costs and benefits of consuming tobacco are incorporated by its consumer and should, therefore, not be subject to government intervention. However, with advances in the economic literature on habit formation, nuanced distinctions have been defined between the consumption of addictive and non-addictive goods. In the case of addictive good consumption, government intervention in the form of taxation is warranted up to the point where net negative externalities, such as greater medical costs, reduced economic performance and damages caused to second-hand smokers, are covered (Gruber & Koszegi, 2008).

The idea that consumption of addictive goods, like cigarettes, could enter the domain of rational economic behavior was introduced by Becker and Murphy (1988). They developed a rational addiction model in which rationality means to have a “consistent plan to maximize utility over time”. In other words, addictions are rational in the sense that addicts exbibit forward-looking

maximization and have stable preferences. In this framework there are three important features: 1) tolerance: where current satisfaction is derived from higher levels of past consumption, 2) withdrawal: discontinuing consumption of the good makes the addicted individuals feel worse, and 3) reinforcement: greater consumption of the addictive product leads to greater satisfaction.

The Becker-Murphy model expounds that individuals who consume addictive goods, such as cigarettes, exhibit forward-looking behavior and use all available information to make rational cost-benefit analyses. Individuals who are likely to become addicted to cigarettes (or any other drug) are those who discount the future heavily, yet this makes them no less rational than individuals who do not become addicted (Becker & Murphy, 1988). The observation that permanent changes in pricing of addictive goods may have modest short-term and long-term effects indicates that even those addicted to a certain good can correctly incorporate information about the product, and thus are fully capable to rationally process information. The framework suggests that smokers and non-smokers both interpret information rationally, they simply differ in the valuation of future costs and benefits.

The most prominent empirical evidence for the rational framework derives from the finding that price increases of addictive products are negatively correlated to its consumption. In the context of smoking, the hypothesis that higher prices today lead to simultaneous lower consumption was tested and supported (Sloan & Wang, 2008). This evidence, reinforces the idea that individuals are forward-looking and, thus, are able to rationally analyze the trade-offs of consumption and adjust to an optimal level of consumption (Becker, Grossman & Murphy, 1994). Moreover, the model predicts that gradual quitting does not yield any results due to the reinforcement feature of addictive goods consumption; the only strategy that leads to successful quitting is going 'cold turkey', a method consistent with rational behavior. Interestingly, it has been found that 'cold turkey' tobacco quitters are more likely to succeed than those who try to stop smoking in a gradual fashion (Lindson-Hawley et al., 2016). These findings strengthen the framework's recommendation that taxes or price hikes are the most efficient way of combating the negative externalities associated to smoking. It then follows that governments should only intervene in the pricing of tobacco products up to the point where the costs to society are covered. Other policies are considered as too intrusive and would not necessarily address the negative externalities of smoking; thus, the new wave of nudging policies, discussed previously, would be considered to be unnecessary.

Imperfectly Rational Model of Addictive Behavior

Imperfect rationality is a parallel interpretation of the level of rationality that addictive goods' consumers exhibit. This framework, covered extensively in economic literature, assumes that individuals have inconsistent short-run and long-run preferences (Elster 1979; Fudenberg & Levine, 2006; Gruber & Koszegi, 2001; O'Donoghue & Rabin, 1999; Orphanides & Zervos, 1995; Wang, 2007). In this framework consumers may also: a) attribute incorrect probabilities to risks or costs of consumption and do not learn from experiences of others; and b) underestimate the probability of becoming addicted to the good (Orphanides & Zervos, 1995; Wang, 2007). These models of imperfect rationality are useful to explain observed failures of the rational addiction framework that have been labelled as 'unhappy addicts' or 'failed attempts to quit smoking' (Sloan & Wang, 2008).

In agreement with the rational model, Gruber and Koszegi (2001) find results consistent with the observation that consumers of addictive products are forward-looking maximizers. They observed that tax increases that are announced, yet not implemented, lead to increased sales and decreased consumption of cigarettes, suggesting that smokers are sensitive to price effects. However, Gruber and Koszegi (2008) further reexamine the traditional framework of taxation by using a more accurate model of human behavior, where individuals are identified to be time inconsistent. At every period, individuals are faced by two conflicting decisions; to either gratify their short-term desires, or achieve their long-term goals such as reduce or stop their consumption of tobacco products; thereby putting into question the rational premise of stable preferences. By incorporating time-inconsistent preferences to the Becker-Murphy framework they find similar predictions for price changes. However, their implications and interpretations differ. Rather than focus solely on the externalities of cigarette consumption, they also observe the effects of internalities; which also warrant for greater government intervention than proposed in the former model. Internalities in this context are the differences in short-term and long-term preferences. Individuals who have unaligned short and long-term preferences would require additional commitment devices to reach their long-term goals, such as quit smoking (Gruber & Koszegi, 2008). In this case, taxes on tobacco products should significantly increase to act as an effective commitment mechanism. Gruber and Koszegi (2008) argue that the key feature of smoking is that its internal costs surpass its external ones: it is the consumer of the cigarette who suffers the most from its consumption and should be assisted through mechanisms such as increases in excise taxes. Although they do not prove that smokers are time inconsistent, they do credibly challenge the rational addiction model's recommendation that taxes should only cover the cost of negative externalities.

Empirical studies that have investigated the imperfectly rational model exist. Khwaja et al. (2007) collected data on propensities to plan in several domains. They found a positive relation between the propensity to plan and wealth, yet no relation with smoking. Most attempts to quit smoking have been recorded as unplanned and are often engendered due to poor health. These results highlight that the difficulty in carrying out plans, such as quit smoking, can originate from time-inconsistent behavior. It has also been found that a smoker who wants to quit signals that she has a demand for self-control devices, for example, in the form of excise taxes. These results support the idea that smokers do exhibit time-inconsistent preferences (Kan, 2007). However, time inconsistency is strongly suggested and not proved among smokers. If the presence of time inconsistent preferences were to be confirmed then the presence of heavier levies on tobacco products would act as an even more powerful mechanism, helping price-sensitive consumers make their preferred choice. The purpose of this new model is to rethink the reasoning behind the "optimal" tobacco taxation and should be made to tailor the needs of imperfectly rational individuals. The empirical evidence that supports the presence of imperfect rationality is the observation that taxes on tobacco products have helped to reduce its consumption and can be argued that they act as an effective instrument against an over-consumption problem (Gruber & Koszegi, 2008). The imperfectly rational model does support the use of nudging strategies to aid smokers in their cost-benefit decision analyses when considering the consumption of tobacco products. Raising the taxes proposed by the rational model would not only cover the negative externalities of smoking but would also address the negative internalities suffered by smokers.

Effectiveness of Taxes

The rational and imperfectly rational models both concur that quitting costs are very high for smokers. Ultimately, both models agree that the best strategy to compensate for the costs of consumption, whether external or internal, are taxes. Smokers have different underlying preferences than non-smokers; and overall, current and future prices of tobacco products influence current consumption decisions. However, the models disagree on the optimal level of taxation. Proponents of the Becker-Murphy framework (rational model) believe that current levels of taxation are too high compared to its optimal level, while advocates of the imperfectly rational model believe that it is too low. Optimal taxation level aside, the use of excise taxes and increased retail prices have been recorded to successfully reduce consumption by dissuading potential users from starting to smoke and have helped current users reduce their consumption or even quit; thus, demonstrating that taxes are an effective tool, especially to discourage young consumers who are generally more sensitive to price changes than older ones (U.S. National Cancer Institute and World Health Organization, 2016). The World Health Organization (2017) also confirms through their studies that taxes lead to fewer individuals consuming tobacco; those who continue to smoke are reported to smoke less and those who quit are less likely to start again.

Yet, the general consensus among policymakers that raising taxes leads to improved health conditions is not unquestionably shared by all economists. Evans & Farrelly (1998) found that taxes do indeed shift the behavior of smokers, but not in the expected way. The economists find through their dataset, spanning 8 years, that smokers do consume less cigarettes as taxes increase but have a tendency to switch to cigarettes with higher nicotine and tar content. The tax-induced 'compensation' behavior eliminates a significant portion of the health-benefits generated by reduced consumption. Moreover, a more recent study found that cigarette taxes have little to no statistical significance. Evidence suggests that increases in taxes lead to minor reductions in consumption and estimate that only sizable taxes, on the order of 100%, will lead to a 5% reduction in adult smoking (Callison & Kaestner, 2014). Furthermore, the World Health Organization and the U.S. National Cancer Institute (2016) agree that only "significant increases in tobacco taxes and prices reduce tobacco use". Taxes, therefore, do not necessarily have a linear relationship with smoking rates. Given these findings and a greater will to reduce tobacco consumption, policymakers are diminishing their reliance on rules and regulations as measures of altering behavior and are increasingly designing policies that reflect how smokers truly behave (Alemanno, 2012).

With a shifting paradigm in tobacco control policies, governments are moving away from using solely first-generation measures such as excise taxes. Individuals previously were seen as free, responsible, and autonomous subjects who were capable of making rational choices as long as they received the right information. However, as discussed above, this assumption is being challenged and governments are moving towards frameworks that influence choices through physical and moral obstacles. In the past governments have even resorted to reduce the information found on tobacco products as consumers have been found to not always react rationally to warnings (Kirby & Herrnstein, 1995). There is an increasing demand to understand how smokers perceive and understand the consequences of smoking in order to address the epidemic of smoking more effectively without officially banning tobacco products. The third and most recent addiction model attempts to capture this observed irrational behavior.

Irrational Model of Addictive Behavior

The third model of addictive good consumption is one where consumers have abandoned all notion of rationality. In this framework consumption is influenced heavily by the emotions experienced when consumption decisions are made (Loewestein, Weber & Hsee, 2001). Emotions influence the perception of risky situations and often lead to discrepancies in the objective assessments of risk. In the cost-benefit stage of consuming addictive products, emotions take a dominant position and take precedence over rational decision-making (Sloan & Wang, 2008).

Bernheim & Rangel (2004) formalized the idea that individuals engage in decision-making in two states: "hot" and "cold". Upon exposure to external cues, a consumer may enter into a "hot" state where he or she will always choose to consume the addictive product disregarding his or her true preferences. The "hot" mode may be exacerbated by past experiences, such as having already smoked. On the other side of the spectrum is the "cold" state, where decision-makers take the time to consider all the alternatives and correctly assess the cost and benefits of their decisions, which include the effects of current choices on entering a "hot" mode in the future. Therefore, individuals are faced with a dual-faced decision-maker: one who is in the "cold" mode and selects his most preferred alternative (i.e. exhibits rational decision-making) and decides rationally whether to abstain or indulge in the consumption of the addictive good. The other is a dysfunctional "hot" mode in which decision-making and preferences diverge; in this state, the individual will always consume the product even though the decision-maker is aware that this is not the optimal decision or even his or her true preference. This model helps explain relapses in addictive goods consumption after individuals have quit.

Due to the relative novelty of the irrationality model there exists little empirical evidence that tests it. So far, experimenters have tested the perception of time that smokers with high craves (nicotine deprived) exhibit when compared to low-crave smokers. Those with high cravings tended to overestimate the time elapsed between the moment they were told they could smoke and the moment they were allowed to smoke. These results suggest that smokers underestimate their future cravings, indicating that smokers may have a different manner of assessing information about smoking than non-smokers. This might undermine efforts to quit and can affect the way in which smoking-related information is evaluated by smokers; yet more research is needed on this topic (Sayette, Loewenstein, Kirchner & Travis, 2005). The model calls for government policy which helps limit the purchase of tobacco products such as effective health warnings, limitations of points of sales and smoking bans in public areas in addition to excise taxes which cover the internalities and externalities of smoking. The irrationality framework would be useful in justifying the implementation of nudging policies to aid individuals to stick to their preferred option at all times.

Gap in the Literature

The behavioral models of rationality and imperfect rationality assume that smokers are willing and are able to fully incorporate the available information about smoking. In other words, conditional on the information being available, those who decide to engage in smoking tobacco fully acknowledge the consequences of smoking. However, this idea has been challenged time and again in the field of medical psychology and neurology (Chiu, Lohrenz & Montague, 2008).

This is a component that is briefly discussed in the irrational model: smokers may have a different way of evaluating smoking-related information. The implications are that current economic models attempting to capture patterns in addictive behavior are incomplete. Moreover, there is a gap in the current economic literature when it comes to research on information receptivity by those who consume addictive goods, as most of the experiments have been conducted by non-economists (Sloan & Wang, 2008). This is why I believe that it is important to address the topic of information interpretation, or lack thereof, among consumers of addictive goods; and more specifically among tobacco consumers.

According to rational choice theory, agents have stable preferences, form beliefs given the available information and make the best choice given these conditions. Individuals should, therefore, act as perfect Bayesians by processing all information perfectly, and always arriving at the best conclusions that can be drawn from data (Charness & Levin, 2005). Yet, the general population does not seem to seek or engage with publicly available information to make the best choices (Choo, 2009). This finding is consistent with a growing body of theoretical and experimental studies in economics which suggest that an individual's utility function may be directly influenced by information. Consequently, individuals have a motivation to ignore information in order to maximize their utility, even when it is in the individual's best interest to obtain it (Golman, Hagmann & Loewestein, 2017). Additionally, Karlsson, Loewenstein & Seppi (2009) developed and tested a model which observes the relation between the hedonic utility of information and information acquisition decisions. Their model predicts that individuals will reveal asymmetric preferences to different types of information; where individuals should actively attend information, which is considered as desirable, and "put their heads in the sand" and ignore information that is adverse in order to maximize their hedonic utility of information. In an interview, economists Golman, Hagmann & Loewestein explain how in a time where we have almost boundless access to information, individuals are "unshackling their deepest psychological tendencies" allowing biases like selective skepticism, confirmation bias, back-fire effect, filter bubbles and information avoidance to flourish (McRaney, 2018).

The premise that individuals derive utility from beliefs and information provides support to an obvious concept: "what matters most happens inside of our heads" (Golman, Hagmann & Loewestein, 2017). The blossoming wave of economic literature dealing with information utility demonstrates that there is a growing interest by economic scholars to explain the complexities of assimilation and interpretation of the objective content of information (Bogliacino et al., 2015; Caplin & Leahy, 2001; Golman, Hagmann & Loewestein, 2017; Karlsson, Loewestein & Seppi, 2009; Koszegi, 2010; Sloan & Wang, 2008). Further investigation on information avoidance could provide clarity to the intricacies of information processing among smokers and consequently the ideal set of interventions to help smokers quit; or at least help them make rational cost-benefit decisions.

Active Information Avoidance

Information avoidance is any behavior that prevents or delays the acquisition of available information. Information avoidance can be displayed in two manners: passively or actively (Sweeny, Melnyk, Miller & Shepperd, 2010). Passive information avoidance is displayed when individuals exhibit subtle inattentiveness, forgetfulness or selectivity to information which they have recently been exposed to. On the other hand, an instance of avoidance is required to fulfil

two criteria in order to be labelled as "active"; (1) the individual knows the information is available, and (2) the individual knows that the accessing the information is costless. Even when the content of the information is known, individuals have also been recorded to avoid attending the information (Golman, Hagmann & Loewenstein, 2017). This phenomenon of intentional ignorance has been observed among financial investors who avoid looking at their portfolios when the stock market is performing poorly, potential at risk individuals who avoid medical tests (for example, to test for STDs), and managers who ignore information that clashes with their decisions. In these mentioned examples, information is costless and would help these individuals make better decisions (Ganguly & Tassof, 2016; Karlsson, Loweinstein & Seppi, 2009; Schulz-Hardt, Frey, Lüthgens & Moscovici, 2000; Thornton, 2008).

In their meta-analysis of information avoidance (Golman, Hagmann, Loewenstein, 2017), the only mention of behavioral receptivity of dissonant information among smokers comes from a study that was published more than 50 years ago. Brock & Balloun (1967) find in four psychological experiments that smokers are more likely than non-smokers to demonstrate interest and affinity for information which refutes the links between smoking and cancer, yet are much more willing to avoid information which establishes a link between smoking and various diseases. This finding strongly suggests that smokers tend to ignore the irrefutable evidence that smoking is adverse for one's health. It is important to note that an individual's preferences are revealed through their choices, and by observing them we are able to create models which predict these choices. Understanding to what extent smokers exhibit active information avoidance tendencies could help future anti-tobacco campaigns identify more effective interventions that reduce the willingness to avoid information that should, in principle, be attended to by smokers. Therefore, information receptivity to dissonant information among smokers needs to be further studied. In this study, I explore smokers' tendency to avoid information and their willingness to pay to avoid receiving information, thereby exhibiting a tendency to actively avoid dissonant information. This leads to the question: *Do smokers exhibit a tendency to actively avoid information about the negative consequences of consuming tobacco products*?

This research paper comes at a time where governments are revising their strategies on preventive healthcare and testing new ways of nudging individuals into making healthier decisions. While the courts in the U.S. have refused the introduction of new pictorial health warnings submitted by the FDA due to insufficient evidence of their capacity to achieve their intended goals (Orentlicher, 2013), the European Union has commissioned studies that revise the effectiveness of 84 combined warnings on the health and the social consequences of smoking. The European study provides evidence that the health warning signs designed by the European Commission are effective in dissuading smoking (Bogliacino et al., 2015). However, as mentioned previously, the effectiveness of the information contained in health warning is contingent upon the attention that smokers give them. This study attempts to shed light on this matter through an online experiment.

Methodology

Experimental Design

The main purpose of this study is to determine whether smokers tend to actively avoid information that paints a negative light on the act of smoking, such as the one found on cigarette

packs. To this end, an experiment was designed to capture, if present, smokers' lack of receptivity to dissonant information. The manner in which this study attempts to identify the presence of active information avoidance is by comparing non-smokers' and smokers' behavior when presented with content which takes an anti-smoking stance. In this scenario, non-smokers act as a control group and smokers as a treatment group; if smokers and non-smokers treat information about smoking in a similar fashion, as is assumed in classical and more recent economic theory on addictive behaviors (Sloan & Wang, 2008), then no differences should be observed between these two groups. However, a statistically significant difference in behavior could suggest that active information avoidance is a cognitive phenomenon present among smokers.

In this experiment, receptivity, the lack thereof, or active avoidance of dissonant information in an economic context is measured by comparing smokers' and non-smoker's performance in completing specific tasks in the form of a quiz. The quiz is composed of sections of questions where performance is recorded. Questions take the form of: demographic questions, logic questions and content comprehension questions. Each question section is rewarded either through the successful completion of the section or by correctly answering questions. For instance, upon the completion of the demographic questions, respondents are given 24 lottery tickets which represent 25% of the total number of tickets that can be won. On the other hand, in the logic and content comprehension sections, rewards which also take the form of lottery tickets are only granted if questions are correctly answered. Respondents are exposed to 4 logic questions which they are prompted to answer, each yielding 6 lottery tickets if correctly answered. Thus, giving respondents the chance to win additional tickets which also represent 25% of the total tickets. A similar compensation rule is applied to content comprehension questions. The content comprehension section is composed of 2 subjects: the negative consequences of smoking and the negative consequence of binge-watching (the overconsumption of video-streaming services). Each subject matter has a text and a video, each followed by 4 questions resulting in 2 videos, 2 texts and 16 questions. Before accessing the content or the questions, respondents are shown the title of the video or reading that will follow and are asked whether: 1) they prefer to access the content and, therefore, the opportunity to answer questions which yield additional tickets if answered correctly or 2) entirely skip the content and the ensuing questions at a cost of 6 tickets. If respondents choose the option to access the content they are first shown a video or text highlighting the negative consequences of smoking or binge-watching, and then they can answer questions which each yield 3 tickets. Since each content type has 4 questions respondents can gain an additional 48 tickets, which represent 50% of the total tickets to be won. However, if respondents choose to avoid the content they are deducted 6 tickets and can therefore lose a maximum of 24 tickets on top of foregoing 48 tickets. Respondents who choose this option would be revealing a preference to pay to not be exposed information which they are aware of and that is economically costless and beneficial to have; qualifying as a preference to actively avoid the information. Respondents can accumulate up to a maximum of 96 tickets. These tickets are then used to determine three winners of a non-monetary prize, taking the form of Neuhaus' *Timeless Masterpieces Ballotin* gift-box containing 17 pieces of premium Belgian chocolate; each box has a value of €30. Further details on how the prize and lottery system are presented to respondents are provided in Sections 1 through 6.

The role of a compensated performance-based survey is a way to quantify receptivity in an economic context and thus compare how smokers and non-smokers treat information that depicts the negative consequences of smoking. If there is no presence of active information avoidance then smokers and non-smokers will not exhibit a distributional difference in the number of times each group skips the comprehension content. Moreover, if there is no presence of passive information avoidance then the average number of tickets should be equal for both non-smokers and smokers, suggesting that both groups work to maximize the number of tickets. However, if a distributional difference between smokers' and non-smokers' number of content skips or ticket averages is observed it could suggest that smokers and non-smokers exhibit different behavior when exposed to content which highlights the negative consequences of smoking.

Survey Features

The survey with an embedded experiment was created using the web-survey service provider: *Qualtrics*. The reason for creating a web-survey is that web-based surveys have been established to be inexpensive and efficient data generation tools, with relatively short response times and have the capability to deliver substantial response rates in comparison to more classical data generating methods such as lab experiments and mail-based surveys (Ganassali, 2008).

The survey was composed of 6 sections which are described below, a visual representation of the flow of the survey can be found in the Appendix:

Section 1- Introduction

The survey starts by thanking the respondent for taking the time to start the experiment. A meme, a "piece of media that spreads, often as mimicry or for humorous purposes, from person to person" (Blackmore, Dugatkin, Boyd, Richerson & Plotkin, 2000), is used to set the tone of the experiment. The survey is designed to have an informal feel to it and feel less like a task and more like an opportunity to win a prize.

Section 2 - Demographic Questions

A set of short demographic questions are asked which include: gender, age and place of residence. Respondents are then prompted to report whether they have ever consumed tobacco products. If they have smoked in the past, they are further asked whether they currently smoke. Finally, respondents who report to be current smokers are asked whether they have ever attempted to quit smoking, the length of time they have been a smoker, how many cigarettes per day they currently smoke, and if they ever consciously think about the labels on tobacco product. The collection of specific information about smokers was used to segment responders into smokers and non-smokers. A similar set of questions is asked about attitudes and behavior associated with video streaming services, the comparative subject. The respondents are asked whether they own a streaming account or have access to one; if they do, they are asked how often they access such accounts, the average time spent per streaming session, if they have ever binge-watched and whether they have ever disabled the account. Respondents are then classified into binge watchers and non-binge watchers.

Non-smokers are defined as individuals who have reported to never have smoked, and smokers refer to individuals who have at one point or who currently smoke. This strict

distinction between smokers and non-smokers was made in order to avoid a bias on the ticket levels of non-smokers, as ex-smokers could be prone to avoid information on their past habit, potentially causing a downward bias, or they could be more attentive to the information than any other group as a part of a commitment bias to prevent a relapse, potentially causing an upward bias. Similarly, binge watchers refer to the number of respondents who reported to have binge-watched or continue to do so, while non-binge watchers are those who have reported never having watched multiple episodes of a TV series in one sitting. The demographic questions were included at the start of the survey in order to avoid underreporting of smoking and binge-watching after having been exposed to the negative content about these topics.

Section 3 - Introductory Video to the Experiment

In this section, respondents are shown a video where I recorded myself thanking respondents for taking the time to answer the survey, and I reveal the details of the prize while attempting to make it as appealing as possible. As the prize is a Neuhaus chocolate box coming directly from the factory I film myself in the factory grounds showing the prize. The purpose of the video was to increase the motivation of the respondents to complete the survey by making the web-survey more personal and reduce the mundanity of the procedure. Also, in the video the respondents are informed that they are given an endowment of 24 lottery tickets as compensation for their effort to start the survey and answer the demographic questions. A text below the video recapitulates the information. Moreover, respondents are informed that the endowment represents 25% of the total number of tickets that can be obtained in the survey. The purpose of the endowment is twofold: 1) to motivate respondents to continue the survey in order to maximize their payout, thus maximizing their chances of winning the non-monetary prize; and 2) to act as a buffer so that respondents do not enter into a negative reward medium space. The maximum number of tickets that a respondent can "spend" in the survey is 24 tickets. Since a negative ticket reward medium is not applicable in the context of this experiment it was decided that the minimum payout possible should be of zero tickets. Moreover, in the text provided the conditions of winning and receiving the prize are clearly highlighted so as to avoid confusion and potential feelings of deception.

A set of instructions was presented in the text outlining what types of questions the respondent will encounter for the rest of the survey. Moreover, added to this outline is the motivational relevance of answering the questions that follow. Respondents are made aware that they are able to make a total of 96 tickets. The point of revealing the maximum payout is to make the respondent aware that he or she is able to maximize their 'earnings' by putting the most effort into answer the questions that follow. It is also clearly written that greater effort will induce better results.

Section 4 - Logic Questions

The logic questions were inspired by riddles and simple mathematical questions appropriate for individuals from ages 14 and above. Respondents were given 90 seconds to answer each question to prevent respondents from lingering on these questions. Respondents were also informed that they were allowed to use pen, paper and a calculator in order to ease the process of solving the questions. The questions took the

form of multiple choice questions or fill-in the blank questions. Moreover, the order of the questions was randomized to prevent order effects (Iyengar & Kinder, 1987). Examples of the questions can be found in the Appendix.

Memes are used to give direct feedback to respondents after each question. If questions were answered correctly, a meme with a positive message was shown confirming the correct answer. If questions were answered incorrectly a meme with an encouraging message was shown, and the correct answer was explained to respondents. An example of the memes used can be found in the Appendix. Memes were used as a stylistic tool to encourage respondents to enjoy the survey, and thus incentivizing them to complete it while providing their information on their true preferences.

The reason for the presence of the logic questions is two-fold. The first and principal motive is that it acts as an entertaining exercise that allows respondents to earn their compensation. An explanation for the need for earned compensation in this experiment will follow. The second reason is that it acts as a neutral comparative base of information receptivity between smokers and non-smokers. If smokers and non-smokers process information in the same way then the average number of correctly answered questions should be the same for both groups if it can be assumed that smoking does not have an effect on cognitive capabilities.

Section 5 - Reading Comprehension Questions

The reading comprehension section is where the variable of interest, tickets won or foregone concerning the topic of smoking, is captured. Respondents are given the following instructions:

> "Next up is the reading comprehension component. You will be exposed to videos and articles on two topics: smoking & online video streaming. You can decide to either:
>
> 1. Read the short article and answer questions
> *By reading the articles you will gain access to questions. If you answer the questions correctly you gain more lottery tickets, and so increase your chances to win the prize.*
>
> OR
>
> 2. Skip the reading.
> *You can skip the reading at the cost of 6 lottery tickets per reading skipped.*
>
> In this section you can win up to 48 tickets which represents 50% of the number of tickets that you can win."

In order to pique the attention of all respondents, the content was chosen based on its originality. The intention was to make the topics salient to entice potential readers, rather than provide them with the general and widely known fact that "smoking kills". The titles

of the smoking content were: *5 Weird Reasons Not to Smoke* (video) and *Smokers Are More Likely to Suffer from Anxiety and Depression* (text). The titles of the binge-watching content were: *Is Binge-Watching Bad for You* (video) and *Binge-Watching is Making you Lonely and Depressed* (text). Binge-watching was chosen as a comparative base due to the parallels that it has with smoking, and more importantly, since it is reasonable to assume that smoking and binge-watching are independent from each other. Binge-watching is increasingly being diagnosed as addictive behavior (Matrix, 2014). By the beginning of 2020, more than 10% of the worldwide population is expected to subscribe to one of the video-on demand streaming services, such as Hulu, Netflix and HBO (Willens, 2015). The adoption rate of these services and the diagnosis on overconsumption as addictive behavior make it a suitable topic to use as a comparison to the topic of smoking as users who engage in binge-watching might also exhibit tendencies to avoid information that negativizes their habit.

The topics were randomly distributed, so respondents would either first be exposed to the binge-watching and then the smoking content, or vice versa. Due to restrictions in the randomization engine the video content was shown first followed by the text content. If respondents chose to skip the video content they were deducted 6 lottery tickets and were then shown the text content. If they again chose to skip the text content they were further deducted 6 lottery point and then subsequently were shown the next topic's video title and so forth. If respondents chose the option to view the video content they were redirected towards the video. When ready respondents were then shown the first question, out of four. Since the questions were designed to be specific and difficult to answer if little attention was given to the content, respondents were given the option to review the video or reread the text before answering the question. This option to revisit the content was given at every question, thus giving the opportunity to those who expelled the most effort (revisiting the content to the correct answer at every occasion) to have the highest chance to win the final fixed prize. All questions were multiple choice taking the form of one question on facts and figures mentioned in the content, one true or false question and two other questions based on the content. All questions were presented with five choices (except the true or false questions where they were given 2 options: true or false) plus one option to skip the question at the cost of 1 lottery ticket. This option was introduced to observe potential active information avoidance behavior after having been introduced to the content. Otherwise, if the respondent answered the question correctly they were given three tickets, or zero if answered incorrectly. The order of the questions and their subsequent answer choices were randomized to avoid order effects, except for the option to skip the question which was always presented last. As with the logic questions, memes were used as ways to communicate feedback to respondents. Moreover, respondents had at all times an updated view on the number of tickets they had accumulated.

Section 6 - Conclusion

To conclude the experiment, respondents were asked to provide their email so that they could be contacted in case they won. The last request of the online experiment asked respondents to rate their experience. The purpose of this request stems from suggestions that respondent satisfaction can act as an assessment of the quality of the data collected, with higher ratings equating to better quality data (Ganassali, 2008).

The timing of the web-based experiment was limited to 20-25 minutes as the optimal length for self-administered questionnaires has been recommended to be of 15-30 minutes (Ganassali, 2008; Laguilles et al. 2010). Since the length of a web-survey has been stressed as the most significant factor influencing survey incompletion rates (Manfreda, Batagelj & Vehovar, 2002), it was important to make the survey appealing in other ways. Therefore, the inclusion of an earned compensation mechanism linked to non-monetary incentives, a combination of visual illustrations, videos and text-based content and more broadly attention to the experience of the web-survey were important factors to take into account in order to maximize the generation of relevant data.

Leverage-Salience Theory and Smith's 5 Precepts of Induced Value

In order to collect the greatest amount of relevant data, the structure of the web-based experiment was designed using the Leverage-Salience Theory (LST). The theory, proposed by Groves, Singer and Corning in 2000, and since supported by other studies (Dillman, 2011; Fan & Yan, 2010; Groves, 2006; Groves et al., 2011; Neuman, 2013) identifies survey features that participants weigh negatively and positively. For example, respondents give varying importance to features such as survey length, topic, reward medium and confidentiality; based on these, participants then decide whether to start the survey and whether to take the time to answer questions truthfully: an essential factor for the analysis of this experiment. The theory suggests that negative aspects of the survey such as undesirable topic and lengthiness (coincidentally the two 'negative' aspects of the experiment) can be compensated by "heightening the salience of favorable survey features" (Marcus et al., 2007). In addition, as academia has recognized that web survey responses are usually low (Laguilles Williams, & Saunders., 2011), it was important to consider how to maximize survey responses while preserving control over the experiment and incentivizing respondents to reveal their true preferences. In order to maintain control over preferences, the experimental design also takes into account Vernon Smith's (1976) 5 precepts to achieve control: non-satiation, salience, dominance, privacy and parallelism. A discussion of the relevant precepts will follow. The experimental design, therefore, comprises two main considerations: 1) the Leverage-Salience Theory, in order to incentivize prospective experimental subjects to start and complete the online experiment; and 2) Vernon Smith's (1976) 5 precepts of induced value in order to achieve control over preferences. In other words, the experiment is designed in a way that maximizes the response rate while preserving the quality of these responses. Each of the aspects of the experimental design will be discussed further below.

The Logic of Incentives

The Leverage-Saliency Theory suggests that material incentives (whether monetary or non-monetary) motivates greater survey participation among individuals who would normally take no interest in responding a survey. The implication of this theory is that, in general, incentives whether monetary or non-monetary, conditional (paid post-completion) or unconditional (paid pre-completion), positively influence the number of survey responses (Laguilles et al., 2011). The suggestion that incentives have a positive impact on the quantity and quality of responses led to the inclusion of a binary lottery incentive linked to a fixed conditional non-monetary prize. The need to use an incentive mechanism stems from the awareness that an online experiment that takes on average 20-25 minutes to complete and includes content that may be deemed undesirable for some respondents can be discouraging (Golman, Hagmann, Loewenstein, 2017).

Also, it is common practice to offer material incentives to participants who are asked to engage in long and burdensome exercises (Tourangeau, 2004). The incentive is a way to add a positive feature which acts as a counterbalance to the negative features of the survey. Moreover, research has found that incentives matter for decision tasks (Fiore, 2009). Since a significant portion of the experiment asks respondents to make the choice between accessing content or skipping it, lottery tickets are a way for respondents to measure the impact of their choices making it clear what their preference is.

Binary Lottery Incentive

A binary lottery is a compensation scheme where subjects earn 'rewards' in the form of lottery tickets to win a fixed prize at the end of an experiment. The reward, or lottery tickets, are earned only if a subject successfully completes a specific task, such as answering questions correctly in a quiz, otherwise, no rewards are earned. It then follows that the more rewards a respondent collects the greater his or her chances are of winning the fixed prize. Therefore, the way to incentivize these tasks is to translate the lottery tickets into probabilities of winning the revealed prize - where subjects either win the prize or nothing at all (Bardsley et. al., 2010). In the case of this experiment, lotteries are conceded if subjects answer questions correctly and the conditional non-monetary fixed prize consists of a box chocolate Neuhaus chocolate pralines worth €30 to be won by three separate subjects. The limitations of resources in the deployment of this experiment make a binary lottery incentive system attractive as it has been observed that attitudes towards binary lottery systems are not fundamentally different from those towards money. Both kinds of stimuli are processed in similar fashions; thus, resulting in similar patterns of behavior (Selten, Sadrieh & Abbink, 1999). This suggests that a binary lottery ticket scheme respects Smith's (1976) non-satiation precept as it can be maintained that all things being equal lottery tickets have a similar effect to money on the utility function of respondents (Slovic, 1995), meaning that there is the possibility of a monotonic increasing function between utility and the reward. Simply put, more is preferred to less. Additionally, each task is simple: if respondents answer questions correctly they receive a designated number of tickets. Each section of the experiment clearly states the number of available tickets to be won in that section. For example, before accessing the logic question section it is made salient that 24 tickets, representing 25% of total tickets, can be won conditional on correctly answering the questions. Thus, the motivational relevance per task is made evident: the reward (lottery tickets) are tied to outcomes (correctly answering questions), where, the better respondents perform the more they are rewarded. This construction is in line with the saliency precept where rewards must be associated to tasks so that rewards have motivational relevance (Smith, 1976).

Earned Compensation

There is a dual-purpose to the inclusion of a compensation mechanism. The first is because lottery incentives are recognized as effective tools to motivate respondents from start to finish (Heerwegh 2006, Laguilles et al. 2011). The second reason is to capture the revealed preferences of the respondents when given a task. These preferences can be measured by taking into account the previously mentioned non-satiation and saliency precepts. According to Smith (1976) "Given a costless choice between two alternatives, identical except that the first yields more of a reward medium, the first will always be chosen over the second, by an autonomous individual". Although the choice between accessing the texts or videos and entirely skipping the content are not the identical only the option to skip has an economic cost. Since the experiment is designed

in a way that greater effort leads to more rewards, it can be reasonably assumed that rational respondents will tend to prefer more over less tickets. However, there are three opportunity costs associated to obtaining the information needed to correctly answer the questions: effort, time and cognitive dissonance.

The opportunity cost of effort and time are partially attended to by the reward space medium. Providing a payout that is linked to effort can act as an effective stimulus for exertion and taking the time to complete the survey. Nevertheless, it is important that Smith's (1976) precept of dominance is taken into consideration. The precept of dominance requires that the reward structure dominates any subjective costs associated with participation in tasks in the experiment. The typical way to achieve dominance is to provide subjects of an experiment with high payoffs. If payoffs are high then they will dominate any costs associated to the task. However, high payoffs are a relative concept. Individuals answering the survey come from different backgrounds and have subjective costs; for example, an undergraduate might suffer from less subjective costs to answering the survey than a young professional or even a company executive. Therefore, dominance might or might not be satisfied; this precept will be discussed further in the limitations section of the study.

Moreover, the opportunity costs of time and effort are further attended to by linking effort to a payout so that respondents also feel like they are earning the reward. Rather than supplying respondents with a laboratory endowment, they must invest themselves in the procedure of the experiment to maximize their chances of winning the fixed prize. This is done to curb the *House Money Effect* identified by Thaler & Johnson (1990) in lottery choice experiments. They found that subjects were more likely to be risk-seeking when rewards were freely given away by the experimenters. Moreover, there is evidence that subjects are less likely to part from their money when they have earned it by accomplishing a task such as participating in a hash mark game, folding envelopes, adding numbers and, more pertinently, answering questions in a quiz (Cherry, Frykblom & Shogren 2002, Konow 2000, Oxoby & Spraggon 2008, Reinstein & Reiner 2009). The reward medium space is a tool to create an environment dictated by Smith's (1976) five precepts, "where real people earn real [compensation] for making real decisions". Therefore, as the costs of time and effort are partially attended to, the decision to avoid the content can convincingly be related to an unwillingness to be inflicted by cognitive dissonance.

Lastly, the survey takes into consideration the privacy precept – where individuals may not be autonomous own-reward maximizers, this means that subjects are given information about their own payoff alternatives. The experiment follows a single-blind procedure where respondents are anonymous towards other subjects and therefore only know their own payout. This condition allows for further control on the preferences of the respondents. The fifth and last precept of parallelism will be discussed in the discussion section.

Other Aspects of the Design

Aside from an incentive other positive features were included in the experiment to compensate for the length and nature of the topic. Dillman (2011) argues that the experience of completing the survey transcends the material reward of completing it; there also exist non-monetary rewards such as the intellectual stimulation of the experience, the satisfaction of providing information for research or even be helpful to an organization, person or cause that subjects

associate themselves with. Which is why the survey includes logic questions and salient articles and videos that attempt to pique the interest of respondents. Moreover, it is made clear that the purpose of this study is to advance research in behavioral economics.

To further compensate for the length of the survey and the topics, the survey included videos and memes to vary the way content was delivered in the experiment and make the survey more visually appealing, an important factor to include when delivering an experiment (Dillman, 2011). Moreover, according to the Leverage-Saliency Theory, a negative or uninteresting topic may be compensated by non-tangible incentives, namely feedback (Marcus et. al, 2007). To this end, a series of memes were included to notify the respondent whether he or she selected the correct answer on both the logic and reading comprehension questions with an explanation revealing the correct answer. Finally, the need for an email was used not only as a mechanism to deliver the prize but also served as an assurance that respondents will be contacted in case they win. Dillman (2011) describes surveys as a social exchange where subjects' motivation to complete a survey depends on the perceived rewards versus the costs of completing the survey and truthful completion is contingent on the trust subjects place on receiving the reward; the email was a way to build that trust between respondents and the experimenter.

Hypotheses

To recapitulate, this study explores the tendency smokers may have to actively avoid information. The experiment gives smokers and non-smokers the opportunity to maximize their chances to win a fixed prize by revealing their preferences concerning information. Respondents are given a choice between reading or viewing content on smoking and then binge-watching, and vice versa, or to pay (with tickets) to skip the reading. As was defined earlier, active information avoidance is the deliberate avoidance of information that is known to exist and is freely available. In the experiment the respondent is both made aware of the title of the article or video and that accessing the content is not only free but also economically beneficial. The following null and alternative hypotheses on active information avoidance among smokers are tested:

H1
- **H1o:** *Smoking and active information avoidance have an independent relationship when the content concerns the adverse effects of smoking.*
- **H1a**: *Smoking and active information avoidance have a dependent relationship when the content concerns the adverse effects of smoking.*

Hypothesis *H1o* is the null hypothesis that tests whether smokers and non-smokers have an equal tendency to actively avoid the content on the negative consequences of smoking. Failing to reject this hypothesis would mean that there is no link between smoking and active information avoidance of smoking content. Alternatively, hypothesis *H1a* tests whether there is a dependent relationship between being a smoker and actively avoiding information on smoking. The rejection of the null hypothesis would suggest that there is a positive relationship between being a smoker and consciously refusing to acknowledge information on the consequences of being a smoker.

H2 —
- **H2o**: *Smoking and active information avoidance have an independent relationship when the content concerns the adverse effects of binge-watching.*
- **H2a**: *Smoking and active information avoidance have a dependent relationship when the content concerns the adverse effects of binge-watching*.

Similar to hypothesis *H1o*, *H2o* is the null hypothesis that tests whether smokers and non-smokers have an equal tendency to actively avoid the content on the negative consequences of binge-watching. Failing to reject this hypothesis would mean that there is no link between smoking and active information avoidance of binge-watching content. Else, hypothesis *H2a* tests whether there exists a dependent relationship between being a smoker and actively avoiding information on binge-watching. The rejection of the null hypothesis *H2o* would suggest that there is a link between being a smoker and the conscious refusal to acknowledge information on the consequences of binge-watching.

Choosing to attend information does not mean that it is incorporated. Even when individuals have access to information and express an interest in obtaining it, there are subtle ways in which they can avoid it. In contemporary literature this phenomenon is known as passive information avoidance. Cognitive psychologists have long established that attention is a resource, and like all resources, it is limited in its availability (Broadbent, 2013; Shiffrin & Schneider,1977). Economists have expanded on this idea by proposing that attention can be efficiently and optimally allocated. As discussed earlier, information can be a source of utility (Karlsson, Loewenstein & Seppi, 2009), and so individuals have 'rational' motives to avoid information that could lead to suboptimal levels of utility. For example, people may be inclined to be attentive to positive information while being, consciously or subconsciously, inattentive to negative or threatening information, even when the information provided is useful (Golman, Hagmann & Loewestein, 2017). Moreover, even when information has been attended to individuals can exhibit concentrated forgetfulness. In other words, people may engage in selective failure to retain negative information thus rapidly forgetting the content of the information they have recently attended to (Bénabou & Tirole, 2002). This type of forgetfulness is a strategy that may help individuals diminish their level of cognitive dissonance (Akerlof & Dickens, 1982).

This study posits that smokers do engage in information avoidance, if not actively then passively. The intensification of public information campaigns and the presence of health warning signs on tobacco products are reflections of the underlying assumption that smokers misperceive the negative information about smoking (Khwaja, Silverman, Sloan & Wang, 2009). Misperception can come from, conscious and subconscious, strategies to avoid cognitive dissonance. These findings and suggestions on attentiveness and incorporation of information along with the wealth of studies that causally link smoking to a plethora of diseases, lead to the speculation that smokers are less receptive than non-smokers to the negative consequences of consuming tobacco products. The manner in which passive information avoidance is tested in this experiment is through the number of tickets that respondents successfully obtain per question section. A substantial difference in averages of number of tickets can be indicative of inattention or motivated forgetting on the part of non-smokers or smokers. From this experimental setup, the following hypotheses on subtle information avoidance are tested:

H3
- **H3o**: *Ticket scores of smokers and non-smokers on the smoking comprehension questions come from the same ticket score distribution.*
- **H3a**: *Ticket scores of smokers and non-smokers on the smoking comprehension questions come from different ticket score distributions.*

Hypothesis *H3o* is the null hypothesis that tests whether smokers and non-smokers score similarly on questions concerning the smoking content. Failing to reject this hypothesis would mean that there is no relationship between smoking and passive information avoidance of smoking content. Otherwise, hypothesis *H3a* tests whether smoker and non-smokers significantly differ in their scores when answering questions about smoking content. Rejecting the null would suggest that smokers and non-smokers do not process information about smoking in the same manner.

H4
- **H4o**: *Ticket scores of smokers and non-smokers on the binge-watching comprehension questions come from the same ticket score distribution.*
- **H4a:** *Ticket scores of smokers and non-smokers on the binge-watching comprehension questions come from different ticket score distributions.*

Hypothesis *H4o* is the null hypothesis that tests whether smokers and non-smokers score similarly on questions concerning the binge-watching content. Failing to reject this hypothesis would mean that there is no relationship between smoking and passive information avoidance of binge-watching content. Alternatively, hypothesis *H4a* tests whether smoker and non-smokers significantly differ in their scores when answering questions about binge-watching content. Rejecting the null would suggest that smokers and non-smokers do not process information about binge-watching in the same manner.

Data

The data collected for this study were obtained from a web-survey experiment conducted during the period spanning from the 25th of June to July 15th of 2018. The web-link to the experiment was administered to potential respondents via social media, namely Facebook, and emails. The targeted audience comprised of smokers and non-smokers willing to partake in a 20-25-minute experiment in exchange for the chance of winning premium Belgian chocolates. In total, 115 individuals started the survey with 62 (54% of all respondents) fully completing the survey. The 53 respondents who did not complete the survey were not considered in the analysis of this study, therefore observations associated to these individuals were dropped. The average time it took to complete the survey was 33 minutes which is above the estimated time that was communicated to respondents, while those who did not complete the survey spent an average of 6 minutes answering questions. As was discussed previously, the length of the survey was the greatest negative aspect of the survey design. However, the 62 individuals who completed the survey gave an average of 4.46, out 5, star rating to the survey. As mentioned earlier, high rating of a survey is indicative of good quality data; propounding that the data collected from these individuals likely reveal their true preferences.

Respondents who completed the survey can be divided by the following characteristics:

Table 1: Characteristics of Web-survey Respondents

	N	%
Female	27	43.55
Male	35	56.45
Non-Smokers	19	30.65
Smokers	43	69.35
Non Binger-watchers	16	25.81
Binge-watchers	46	74.19

While male and female respondents are relatively well-balanced; there are slightly over twice as many smokers as there are non-smokers and slightly less than three times as many binge-watchers as there are non-binge-watchers. Out of 43 smokers, 25 no longer smoke. Furthermore, out of the 18 individuals who currently smoke: 10 have attempted to quit in the past, 10 reported to be conscious of the warning signs on tobacco products, and 8 of them can be classified as habit smokers. Current smokers dichotomously reported to either smoke on average slightly above 7 cigarettes a day or being occasional smokers. Moreover, they have either been smoking an average of 6 years or slightly less than a year. This wide range of smoking "experience" will provide an insight on the behavior of smokers in general. On the other hand, streaming is a more popular activity with 51 respondents reporting that they either had a personal video streaming account or had access to one, with the majority using the services on a daily to weekly basis. Those who have access to streaming accounts would on average use the service for 1.5 hours. Only 9 individuals reported having unsubscribed from streaming services, with 31 identified as habit streamers. The association between smoking and binge-watching is shown below in Table 5.

Table 2: Smoker & Binge-watcher Matrix

	Smokers		Non-Smokers	
	N	%	N	%
Non Binge-watchers	10	16%	6	10%
Binge-watchers	33	53%	13	21%

Smokers who have binge-watched represent the largest group of individuals, while non-smokers who have never binge-watcher represent the smallest group. The results therefore might overrepresent the behavioral tendencies of smokers who binge watch. However, when running a correlation analysis on the attributes of smoker and binge-watcher yield a weak positive relationship ($r = 0.0479$). Therefore, the assumption that smoking and binging are independent actions is maintained for the analysis of the data.

Analysis

There were four different ways that respondents were able to accumulate tickets: by answering all demographic questions, and by correctly answering the logic, smoking and binge-watching

content questions. For the content questions, respondents were given the option to read or view the content and then answer the questions. Therefore, respondents can further be divided into active information avoiders and respondents who are willing to access the content. Information avoidance is recorded as the choice to skip the content. Skipping the content qualifies as active information avoidance as respondents are made aware that the information is available and they are given free access to the information. Moreover, revealing a desire to pay to avoid freely available information constitutes as a strong preference to circumvent it. Differences of active information avoidance among smokers and non-smokers are examined by comparing the distribution of instances of active information avoidance (skipping the video or text contents) among smokers and non-smokers who actively avoided the content. To determine whether active information avoidance is independent of being a smoker or non-smoker a 2x2 Fisher Exact Test is used.

Additionally, smokers who chose to read or view the information could engage in more subtle forms of information avoidance that do not include paying to avoid information. In their metanalysis Golman, Hagmann & Loewenstein (2017) describe a number of ways in which individuals can avoid information, these include but are not limited to: inattention, biased interpretation of information and forgetting. To test for the presence of passive information avoidance the average performance (the number of tickets won) of smokers are compared to that of non-smokers per question section (logic, smoking video, smoking reading, binge-watching video and binge-watching reading). To assess whether the smoker and non-smoker samples come from the same population the Mann-Whitney U test is conducted on the mean scores for each of the question sections.

Results

Descriptive Statistics

Table 3 is a cross-tabulation which compares smokers' and non-smokers' tendency to skip the content. In other words, the table contains the number (*N*) of instances smokers and non-smokers decided to skip each content type; the figure in parenthesis represents the percentage (*%*) of respondents who decided to skip the content within each treatment group. It appears that the relative skipping frequency for the smoking video content is similar for smokers (*N = 11, % = 25.48*) and non-smokers (*N = 5, % = 26.32*). Correspondingly, the relative skipping frequency for the binge-watching video content is similar for smokers (*N = 11, % = 25.48*) and non-smokers (*N = 6, % = 31.58*). However, a greater difference is observed in the relative skipping rates for the smoking written content, when smokers (*N = 10, % = 23.26*) are compared to non-smokers (*N = 1, % = 5.26*). An analogous rate is observed for the binge-watching written content when comparing smokers (*N = 7, % = 16.28*) to non-smokers (*N = 1, % = 5.26*). As there is no option to skip the demographic and logic question sections they are by design the same across all groups.

Table 3: Instances of Information Avoidance by Smokers and Non-smokers by Content Type

	Non-Smokers (19)	Smokers (43)
Smoking (Video)	5 *(26.32)*	11 *(25.58)*
Smoking (Reading)	1 *(5.26)*	10 *(23.26)*
Binge-Watching (Video)	6 *(31.58)*	11 *(25.58)*
Binge-Watching (Reading)	1 *(5.26)*	7 *(16.28)*

Table 3 shows the number of respondents who chose the option to skip, by content type. Respondents are segmented into smokers and non-smokers. The content type includes smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the number of individuals who skipped the question. In parenthesis, the percentage of individuals who decided to skip the question is presented. Each skip is counted as an instance of information avoidance.

Table 4 compares the mean tickets of smokers to those of non-smokers, the standard deviation of the mean tickets per treatment group is shown in parenthesis below the mean scores. Since only responses from completed surveys are considered in the analysis of this study, all groups have the same mean of 24 tickets for the demographic question section. When looking at the total score, non-smokers seem to, on average, score higher than smokers. Additionally, there are slight differences across groups for the mean results for the logic question section (smokers $\mu = 15.21$, non-smokers $\mu = 17.68$). Smokers' mean tickets for both video sections seem to be similar to those of non-smokers, however, non-smokers appear to have a greater number of tickets for the written content.

Table 4: Median and Average Number of Tickets by Smokers and Non-smokers

	Non-Smokers (19)	Smokers (43)
Total	67.79 (18.27)	59.63 (22.41)
Logic	17.68 *(1.48)*	15.21 *(0.67)*
Smoking (Video)	7.11 *(1.15)*	7.11 *(0.74)*
Smoking (Reading)	8.53 *(2.70)*	6 *(4.10)*
Binge-Watching (Video)	6.11 *(5.93)*	6.49 *(4.48)*
Binge-Watching (Reading)	8.47 *(3.10)*	6.53 *(3.86)*

Table 4 shows the average number of tickets won by respondent types in each of the content types. Respondents are segmented into smokers and non-smokers. The content type includes total, logic, smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the average number of tickets won; the standard deviation of the mean number of tickets won is shown, in parenthesis, below the mean.

Active Information Avoidance Among Smokers

The question that can be asked when examining the results from Table 1 is the following: do smokers exhibit a greater tendency to actively avoid information than non-smokers? To answer this question, a 2x2 Fisher Exact Test is used to determine whether there are dependent links between two categorical values: smoking and active information avoidance. The null hypothesis is that rates of active information avoidance are independent from being a smoker. The Fisher Exact Test provides the probability that the given distribution or a more extreme one may occur by random chance (Upton, 1992). The test was chosen as the appropriate statistical method due to the limited number of observations in the study (Bruin, 2006). Table 5 shows the p-values resulting from the statistical test when cross-tabulating active information avoidance and smoking for all content types.

Table 5: P-values of Fisher Exact Test: Testing for Statistically Different Tendencies of Active Information Avoidance Among Smokers and Non-smokers

	P-Value
Smoking (Video)	1.000
Smoking (Reading)	0.149
Binge-Watching (Video)	0.759
Binge-Watching (Reading)	0.224

*Table 5 shows the likelihood smoking and active information avoidance are independent from each other when considering all content types. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

The p-values shown in Table 5 can be interpreted as the sum of evidence provided by the observed data or any more extreme values for the null hypothesis (McDonald, 2014). The sum of evidence shows that there is no difference in the proportions of active information avoidance among smokers and non-smokers, regardless of content (smoking or binge-watching) and media type (video or text). With all p-values > 0.10 there is strong evidence in favor of the null hypothesis of independence. Therefore, hypothesis *H1o* which stipulates that smoking and active information avoidance have an independent relationship when the content concerns the adverse effects of smoking is not rejected. Similarly, hypothesis *H2o* which posits that smoking and active information avoidance are independent from each other when the content concerns the adverse effects of binge-watching is not rejected. The results suggest that non-smokers are as likely as non-smokers to actively avoid information.

Passive Information Avoidance Among Smokers

Respondents who chose the option to view or read the content, and consequently have access to the questions, made a conscious decision to access the information being presented to them. However, reading or viewing the article does not translate into answering questions correctly. The number of correct answers per question section can be indicative of the behavior of respondents vis-à-vis the information. As explained in Section 5, respondents were faced with specific multiple-choice questions with 5 options: 1 correct answer, 3 incorrect answers and 1 option to refrain from having to answer the question at a cost of 1 ticket. Since the option to refrain from answering the question was only used 4 times it cannot be suggested that respondents tend to actively avoid information once they have revealed a preference to have access to it. Therefore, in almost all cases, respondents decided to answer the questions once they decided to access the content. A Mann Whitney U test, also known as Wilcoxon's Rank Sum Test, is conducted on the average tickets of each of the question sections to compare the performance of the treatment group, smokers, to the control group, non-smokers. The Mann–Whitney U test is a nonparametric test with the purpose of determining if there are statistically significant differences between the groups. The test is most appropriately used when noticeable differences exist in the number of subjects between two comparative groups (MacFarland & Yates, 2016), as is the case in this experiment.

Table 6: P-Values of Mann-Whitney U Test: Testing for Passive Information Avoidance Among Smokers and Non-smokers

	P-Value
Total Score	0.2150
Logic Tickets	0.0270**
Smoking Video Tickets	0.6536
Smoking Reading Tickets	0.0933*
Binge-Watching Video Tickets	0.1672
Binge-Watching Reading Tickets	0.2207

*Table 6 shows the likelihood the mean scores of smokers and non-smokers come from the same distribution. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

The results demonstrate that, the total scores are not statistically different from each other suggesting smokers and non-smokers do not exhibit fundamentally different behavior in general regarding answering questions. In the logic question section, smokers seem to score lower, in terms of average number of tickets received, than non-smokers. The p-value of 0.0270 for the Rank Sum Test is convincing enough to recognize that the number of tickets won by smokers and non-smokers are different from each other, which could be indicative of differences in ability to answer logic questions. For the binge-watching video and text questions the null

hypotheses, *H4o* could not be rejected: smokers and non-smokers mean scores come from the same distribution – consequently smokers and non-smokers answer questions about the negative consequences of binge-watching in the same way no matter in what format the information is delivered. Consequently, hypothesis *H4o* which states that scores of smokers and non-smokers on the binge-watching comprehension questions come from the same score distribution is rejected. The same suggestion can be made when looking at the differences in average scores of smoking video questions: smokers and non-smokers exhibit the same behavior when answering questions about the negative consequences of smoking when the information is presented in video format. However, in the smoking reading section non-smokers and smokers have significantly different mean scores. The Rank Sum test's p-value of 0.0933 shows that there is weak evidence to reject the null hypothesis *H3o*, which tests that smokers and non-smokers score similarly provided that they choose to access the content on smoking. Hence, the results from Table 6 propound that smokers and non-smokers behave differently concerning smoking media when presented in text format, but behave similarly when exposed to information on smoking if delivered in video format or when exposed to information which does not concern smoking.

Additional Results

The data collected in the demographic question section, detailed in Section 2, allowed to section the respondents that qualified as smokers into more detailed classifications such as ex-smokers and current smokers. Ex-smokers are those who have consumed tobacco products in the past but do not presently, while current smokers are those who have and continue to consume such products. Current smokers could further be segmented into smokers who have attempted to quit (and those who have not), smokers who claim to consciously think about the health warning signs on tobacco products (and those who do not) and whether they are occasional or habitual smokers. This last definition of habit was constructed by interacting the following variables: number of cigarettes smoked daily and number of years smoking. Since habits have been found to be formed between 18 to 254 days (Lally, Van Jaarsveld, Potts, & Wardle, 2010), only those who have smoked for more than a year (>365 days) and at least one cigarette a day are considered as habit smokers in this study. The generation of different types of smokers allows for a comparison of active information avoidance behavior among smokers and non-smokers, ex-smokers and current smokers, current smokers who have attempted to quit and those who have not (henceforth quitters and non-quitters), current smokers who claim to pay attention to the health warnings on tobacco products and those who do not (henceforth aware and unaware smokers), and occasional smokers and habit smokers. Detailing the types of smoking habit can help identify which type of smoker is prone to passively avoid reading dissonant information on smoking identified in Table 6.

Ex-Smokers vs. Current Smokers

Ex-smokers comprise almost 60% of the treatment group, whereas current smokers are a large minority, as is shown in Table 7. Table 8 displays a cross-tabulation which compares the number of instances (*N*) that ex-smokers and current smokers revealed a preference to actively avoid the content; in parenthesis the percentage (*%*) of active avoiders is shown. For the binge-watching video, ex-smokers' active avoidance rate (*N = 7, % =28.00)* is similar to that of current smokers (*N = 4, % =22.22).* Analogously, the avoidance rates concerning the binge-watching reading are closely related between ex-smokers (*N = 4, % =16.00)* and current smokers (*N = 3, % = 16.67).* Moreover, avoidance of the smoking video is comparable between ex-smokers (*N = 7, %*

=28.00) and current smokers (*N = 4, % =22.22).* However, a visible difference can be observed when considering the smoking reading skipping rates of ex-smokers *(N = 7, % =28.00)* and current smokers (*N = 3, % = 16.67).* This could suggest that ex-smokers are the ones that most strongly exhibit avoidance tendencies when exposed to texts that discuss the negative consequences of smoking.

Table 7: Segmentation of Smokers

	N	%
Ex-smoker	25	0.58
Current Smokers	18	0.42

Table 8: Instances of Active Information Avoidance Among Ex-Smokers and Current Smokers

	Ex-Smokers (25)	Current Smokers (18)
Smoking (Video)	7 *(28.00)*	4 *(22.22)*
Smoking (Reading)	7 *(28.00)*	3 *(16.67)*
Binge-Watching (Video)	7 *(28.00)*	4 *(22.22)*
Binge-Watching (Reading)	4 *(16.00)*	3 *(16.67)*

Table 8 shows the number of respondents who chose the option to skip, by content type. Respondents are segmented into smokers and non-smoker. The content type includes smoking video, smoking reading, binge watching video and binge-watching reading. The figure at the top indicates the number of individuals who skipped the question. In parenthesis, the percentage (%) of individuals who decided to skip the question is presented. Each skip is counted as an instance of information avoidance.

Table 9, displays the average of total tickets accumulated as well as tickets accumulated per question section among ex-smokers and current smokers. Although ex-smokers ($\mu = 57.68$) tended to score lower than current smokers ($\mu = 62.33$), they tended to score similarly in the content comprehension questions; suggesting that ex-smokers and current smokers who stated a preference to access the content did not necessarily differ in their tendencies to passively avoid information.

Table 9: Mean number of tickets won by Ex-Smokers and Current Smokers

	Ex-Smokers (25)	Current Smoker (18)
Total	57.68 (22.60)	62.33 (22.51)
Logic	14.4 (4.24)	16.33 (4.51)
Smoking (Video)	6.48 (4.95)	7.33 (4.74)
Smoking (Reading)	6 (4.24)	6 (3.99)
Binge-Watching (Video)	6.36 (4.69)	6.67 (4.31)
Binge-Watching (Reading)	6.44 (3.98)	6.67 (3.79)

Table 9 shows the average number of tickets won by respondent types in each of the content types. Respondents are segmented into ex-smokers and current smokers. The content type includes total, logic, smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the average number of tickets won; the standard deviation of the mean number of tickets won is shown, in parenthesis, below the mean.

Active and Passive Information Avoidance Among Ex-Smokers & Current Smokers

Table A5 in the Appendix shows that ex-smokers and current smokers do not differ in skipping rates. Both groups have equal tendencies to actively avoid information. Analogous to the active information avoidance analysis, ex-smokers and current smokers do not display significant differences in mean scores when do they do decide to access the information. Table A6 in the Appendix shows that the results testing for differences in the distribution of scores are not statistically significant for ex-smokers and current smokers. Therefore, having quit smoking does not affect receptivity to dissonant information. Ex-smokers could be avoiding negative emotions related to their past habit (Bogliacino et al., 2015) thus exhibit a similar propensity to actively or passively avoid information as current smokers.

Types of Current Smokers

By further segmenting the current smoker group into current smokers who have quit in the past (or have not), those who stated being conscious of the health warning signs on tobacco products (or have not), and whether they are occasional or habit smokers, it can be observed that current smoker types are relatively equally spread among these specifications.

Table 10: Segmentation of Current Smokers

	N	%
Quitters	10	0.56
Non-quitters	8	0.44
Aware	10	0.56
Unaware	8	0.44
Occasional smokers	9	0.5
Habit smokers	9	0.5

Table 11 shows that quitters seem to skip the smoking content more frequently than non-quitters. The same can be observed when comparing habit smokers to occasional smokers. While aware and unaware smokers seem to skip content with the same frequency.

Table 11: Instances of Information Avoidance Among Types of Current Smokers

	Quitters (10)	Non-Quitters (8)	Aware (10)	Unaware (8)	Occasional (9)	Habit (9)
Smoking (Video)	3 *(30.00)*	1 *(12.50)*	2 *(20.00)*	2 *(25.00)*	0 *(0.00)*	4 *(44.44)*
Smoking (Reading)	3 *(30.00)*	0 *(0.00)*	2 *(20.00)*	1 *(12.50)*	0 *(0.00)*	3 *(33.33)*
Binge-Watching (Video)	2 *(20.00)*	2 *(25.00)*	1 *(10.00)*	2 *(25.00)*	1 *(11.11)*	3 *(33.33)*
Binge-Watching (Reading)	2 *(20.00)*	1 *(12.50)*	2 *(20.00)*	2 *(25.00)*	0 *(0.00)*	3 *(33.33)*

Table 11 shows the number of respondents who chose the option to skip, by content type. Respondents are segmented into quitters & non-quitters, aware & unaware smokers, and occasional & habit smokers. The content type includes smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the number of individuals who skipped the question. In parenthesis, the percentage (%) of individuals who decided to skip the question is presented. Each skip is counted as an instance of information avoidance.

Table 12 displays the of average scores. Quitters and non-quitters seem to score similarly in general, except for the logic questions. Aware smokers seem to score better in both video contents (binge-watching and smoking) than unaware smokers; otherwise they seem to score similarly in all other sections. Finally, occasional smokers tend to score better in all question sections than habit smokers.

Table 12: Mean number of tickets won by Types of Current Smokers

	Quitters (10)	Non-Quitters (8)	Aware (10)	Unaware (8)	Occasional (9)	Habit (9)
Total	59.4	66	64.2	60	72	52.67
	(26.75)	*(16.82)*	*(22.10)*	*(24.32)*	*(7.65)*	*(28.43)*
Logic	13.8	19.5	15	18	17.33	15.33
	(4.05)	*(2.78)*	*(4.25)*	*(4.54)*	*(5.57)*	*(3.16)*
Smoking (Video)	7.5	7.125	8.4	6	9.33	5.33
	(5.52)	*(3.91)*	*(5.06)*	*(4.24)*	*(3.16)*	*(5.36)*
Smoking (Reading)	6	6	6.3	5.63	6.33	5.67
	(5.10)	*(2.27)*	*(4.57)*	*(3.38)*	*(2.78)*	*(5.07)*
Binge-Watching (Video)	7.8	5.25	7.5	5.63	7	6.33
	(4.52)	*(3.85)*	*(4.53)*	*(4.07)*	*(3.67)*	*(5.07)*
Binge-Watching (Reading)	6.3	7.13	7.2	6	8.67	4.67
	(3.86)	*(3.91)*	*(3.22)*	*(4.54)*	*(2.78)*	*(3.71)*

Table 12 shows the average number of tickets won by respondent types in each of the content types. Respondents are segmented into quitters & non-quitters, aware & unaware smokers, and occasional & habit smokers. The content type includes total, logic, smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the average number of tickets won; the standard deviation of the mean number of tickets won is shown, in parenthesis, below the mean.

Active and Passive Information Avoidance Among Types of Current Smokers

Aware and unaware smokers as well as quitters and non-quitters exhibit similar rates of active information avoidance, the results of the Fisher Exact Tests are also displayed in Tables A7 and A8 in the Appendix, respectively. However, habit smokers and occasional smokers differ in their propensity to actively avoid information when considering the video smoking content; with occasional smokers exhibiting greater receptivity to dissonant information than habit smokers. Table 13 shows that the rates of actively avoiding information and the level of smoking habit (occasional versus habitual) are not independent from each other. The p-value of 0.082 is enough evidence to reject a hypothesis of independence and thus suggest that habitual smokers are prone to actively avoid videos on the negative consequences of smoking. In the other three content sections, instances of active information avoidance are distributed randomly over occasional and habit smokers.

Table 13: P-values of Fisher Exact Test: Testing for Statistically Different Tendencies of Active Information Avoidance Habit and Occasional Smokers

	P-Values
Smoking (Video)	0.082*
Smoking (Reading)	0.206
Binge-Watching (Video)	0.576
Binge-Watching (Reading)	0.206

*Table 13 shows the likelihood smoking and active information avoidance are independent from each other when considering all content types when comparing habit and occasional smokers. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table 14 shows that non-quitters and quitters score similarly when considering the entire survey. However, a significant difference is observed in the logic question section. The p-value of 0.0056 means that there is a high probability that there exist differences in logic question performance between quitter and non-quitters, with non-quitters generally scoring higher. As suggested earlier, differences in the logic section could be indicative of differences in cognitive abilities. However, non-quitters tended to score lower in the content delivered in video format: a p-value of 0.0925 for the difference in smoking video tickets and a p-value of 0.0512 for the difference in the binge-watching video tickets are weak evidence that quitters are inclined to score higher than non-quitters when the content is delivered in video format. These results could suggest that non-quitters simply did not want to review the video as much as quitters, signaling a difference in patience when acquiring dissonant information.

Table 14: P-Values of Mann-Whitney U Test: Testing for Passive Information Avoidance Among Non-Quitters and Quitters

	Rank Sum
Total Score	0.8582
Logic Tickets	0.0056***
Smoking Video Tickets	0.0925*
Smoking Reading Tickets	0.1468
Binge-Watching Video Tickets	0.0512*
Binge-Watching Reading Tickets	0.9492

*Table 14 shows the likelihood the mean scores of non-quitters and quitters come from the same distribution. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

The results displayed in Table 15 confirm that aware and unaware smokers score analogously overall in all question sections except for the smoking video section. The p-value of 0.0892 is weak evidence that aware smokers score higher on average than unaware smokers on video content about the negative consequences of smoking. The results indicate that unaware smokers demonstrate a tendency to be less attentive to information that condemns their smoking habit when delivered in video format; which is a subtle way of avoiding information. Finally, occasional smokers and habitual smokers do not show any significant differences in their mean scores as shown in Table A9 in the Appendix.

Table 15: P-Values of Mann-Whitney U Test: Testing for Passive Information Avoidance Among Aware and Unaware Smokers

	Rank Sum
Total Score	0.8233
Logic Tickets	0.1988
Smoking Video Tickets	0.0892*
Smoking Reading Tickets	0.4682
Binge-Watching Video Tickets	0.2101
Binge-Watching Reading Tickets	0.7952

*Table 15 shows the likelihood the mean scores of aware and unaware smokers come from the same distribution. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Binge Watchers vs. Non-Binge Watchers

The treatments can be defined in an alternative manner. Rather than defining the treatment groups by smokers and non-smokers, they can be defined by binge watchers and non-binge watchers to observe if changing the treatment shows persistence of resistance to text-form dissonant information. Table 1 shows that most of the respondents qualify as binge watchers representing nearly 75% of all respondents.

Table 16 displays the instances of active information avoidance (*N*) and their respective relative percentages (*%*) among binge watchers and non-binge watchers. The treatment groups seem to reveal reciprocal behavior in terms of active information avoidance for all video content. However, the groups seem to display different behavior for all reading content. Non-binge watchers (*N = 1, % =6.25*) seem to actively avoid information less frequently than binge watchers (*N = 10, % =21.74*) on the smoking content reading. Similarly, non-binge watchers (*N = 0, % =0.00*) appear to be actively avoid information less recurrently than binge watchers (*N = 8, % =17.39*) on the binge-watching content reading. This could suggest that binge watchers are less patient than non-binge watchers when dealing with content delivered in text format.

Table 16: Instances of Information Avoidance Among Non-Binge Watchers and Binge Watchers

	Non-binge watchers (16)	**Binge watchers (46)**
Smoking (Video)	4 *(25.00)*	12 *(26.09)*
Smoking (Reading)	1 *(6.25)*	10 *(21.74)*
Binge-Watching (Video)	5 *(31.25)*	12 *(26.09)*
Binge-Watching (Reading)	0 *(0.00)*	8 *(17.39)*

Table 16 shows the number of respondents who chose the option to skip, by content type. Respondents are segmented into non-binge watchers and binge watchers. The content type includes smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the number of individuals who skipped the question. In parenthesis, the percentage (%) of individuals who decided to skip the question is presented. Each skip is counted as an instance of information avoidance.

Table 17: Mean number of tickets won by Non-binge Watchers and Binge Watchers

	Non-binge watchers (16)	Binge watchers (46)
Total	65.44 (14.27)	60.98 (23.43)
Logic	16.88 (1.66)	15.65 (0.68)
Smoking (Video)	7.13 (5.00)	6.85 (4.84)
Smoking (Reading)	7.50 (3.29)	6.52 (4.06)
Binge-Watching (Video)	5.75 (5.39)	6.59 (4.80)
Binge-Watching (Reading)	7.94 (3.40)	6.85 (3.83)

Table 17 shows the number of respondents who chose the option to skip, by content type Respondents are segmented into non-binge watchers and binge watchers. The content type includes smoking video, smoking reading, binge-watching video and binge-watching reading. The figure at the top indicates the number of individuals who skipped the question. In parenthesis, the percentage (%) of individuals who decided to skip the question is presented. Each skip is counted as an instance of information avoidance.

Table 17 shows that non-binge watchers display greater total performance than binge watchers, conditional on having decided to access the content. Moreover, non-binge watchers outperform binge watchers in all question sections, except for the binge-watching video section; suggesting that in general non-binge watchers are more attentive to the content they decide to access than non-binge watchers.

Active and Passive Information Avoidance Among Binge and Non-Binge Watchers

For all content types, binge watchers and non-binge watchers do not exhibit evident differences in active information avoidance, Table A10 in the appendix shows the results from the Fisher Exact Test. Moreover, Table A11 also demonstrates that there are no differences in passive avoidance behavior. Thus, when changing the treatment from smoking to binging no differences are observed among treatment groups. This is indicative that only in certain circumstances, individuals are prone to avoid dissonant information. This is reinforced by the finding that not all dissonant information will lead to the purposeful absence of information receptivity. Instances of indifference or, even, preference for dissonant information have been recorded in earlier literature (Freedman, 1965).

Discussion

The results of this experiment demonstrate that smokers do not actively avoid information more frequently than non-smokers, even when the information is undesirable and could have a negative effect on smokers' information utility. Thus, smokers show behavior similar to non-smokers regarding active receptivity to dissonant information. Consistent with the perfectly rational and imperfectly rational models of addiction, smokers who partook in this experiment exhibited a sensitivity to economic costs showing that not all rationality is abandoned when individuals are faced with dissonant information. The findings of this study suggest that smokers are not particularly willing to pay to avoid information; instead smokers reveal a preference to access information when they are made aware of its existence and when it is freely available. These preliminary analyses are initial good news for political leaders advocating for a diverse set of health warnings on tobacco products to improve smokers' awareness on the consequences of smoking. However, further verification is needed to conclude whether the preference to access the provided content was motivated by the incentive, and whether similar behavior in terms of information avoidance would be exhibited when no incentive is provided. Besides, although smokers and non-smokers did not diverge in their preferences on information acquisition, more than 25% of respondents labelled as smokers decided to consciously ignore content on the negative consequences of smoking. There is a cause for concern for those who ignore free and beneficial information, as these individuals might be the hardest to reach and inform.

The sole analysis to have yielded significantly different behavior in terms of active avoidance of dissonant information is when comparing habit and occasional smokers. Habit smokers displayed a greater tendency to consciously ignore information which negativized their habitual consumption. This behavior is in line with the irrationality addiction framework; habit smokers may have abandoned all rationality when dealing with information about tobacco consumption. In the cost-benefit stage of deciding whether to access the dissonant content, emotions may have taken a dominant position and taken precedence over rational decision-making (Sloan & Wang, 2008). These are arguably the type of smokers who are the most affected, health-wise, by the consumption of tobacco and they might even be the ones that induce second hand smoking the most. Consequently understanding how habitual smokers make decisions about smoking needs to be better understood in order to implement more effective interventions. The fact that they willfully ignore information that they know is freely accessible is a signal to policymakers that taxation and warning labels need to be accompanied by more forceful measures such as smoking bans or restrictions on points of sale. Yet, as mentioned earlier, further analysis should be conducted on the effect of the incentive on the preference to actively avoid information to determine if occasional smokers are truly more receptive to dissonant information.

This study also found signs that smokers engage in passive information avoidance, even when they reveal a preference to read or view the information. Smokers in this experiment scored lower when the content about the negative consequences of smoking was presented in text format. Even though the text was made available when respondents were answering questions, smokers correctly answered, on average, 50% of the questions while non-smokers correctly answered 71% of the questions. The statistically significant difference between these two treatment groups hints at the difference in behavior towards information. This finding is consistent with Brock and Balloun's (1967) conclusion that smokers tend to 'block' dissonant information. In addition, this study contributes to the economic literature by showing that a

relationship exists between smoking and low receptivity to dissonant information even when economic rewards incentivize high receptivity of information.

Since the questions were multiple choice and respondents were able to access the reading or video when they were answering questions, passive information avoidance in the form of biased interpretation of information or forgetting can safely be excluded, suggesting that smokers engage in, conscious or subconscious, inattention. Additionally, the results concur with previous studies that selective attention occurs when individuals are confronted with dissonant information (Golman, Hagmann & Loewestein, 2017; Koszegi, 2010). The finding that smokers ignore text rather than video anti-smoking content is worrying, as most health warnings that smokers are exposed to on a daily basis are presented in text form. The results agree with previous findings showing that smokers may develop avoidance behavior to cope with unwanted information (Sweeny, Melnyk, Miller & Shepperd, 2010).

These results serve as signals that policy should move towards more intense nudging strategies that further push smokers to reconsider their decisions to smoke, since traditional warning signs might not be effective. Furthermore, selectivity to information is rational up to the point where individuals are accurate about how information makes them feel (Karlsson, Loewestein & Seppi, 2009). This is an important point that policymakers should be considering in their communication campaigns. Information will only be an effective tool to combat tobacco consumption if the intended target audience processes it. In a study commissioned by the European Union, Bogliciano et al. (2015) recommend that health warnings focus on messages that elicit strong emotions like distress, anxiety, shame and anger. The use of such strong negative affect could be detrimental to communication campaigns as these types messages could trigger smokers to engage in passive information avoidance, leading them to be less receptive to warnings. Furthermore, policymakers should identify how to address smokers who might be more prone to ignore information such as smokers who have never attempted to quit and those who admit to never think of warning signs. These types of smokers were identified in this study as being disposed to engage in passive information avoidance. However, to truly capture the presence of passive information avoidance, further research needs to be conducted in order to understand if this behavior persists among smokers when no incentive is provided.

Lastly, similar to smokers and non-smokers; binge watchers and non-binge watchers exhibit no differences in rates of active information avoidance. However, contrary to smokers and non-smokers, the binging treatment groups also do not display differences in mean scores when answering questions on the content provided. This is indicative that not all dissonant information is met with resistance (Freedman, 1965). Binge watchers are not as sensitive to dissonant information as smokers and so information on the dangers of overconsuming video streaming services might be more easily absorbed. This finding can also be important for policymakers, as it signals to them that smokers are more sensitive to dissonant information than consumers of other addictive products, making them less receptive to warnings. Proven strategies to curb consumption of other addictive like excise taxes or warnings might not be as effective on smokers.

Implications

The greatest implication of the results of this study is that smokers do not always engage in rational behavior. The findings show that there is reason to believe that smokers might be sensitive to discordant information. Smokers exhibit reactivity to economic penalties and so they do not display outright tendencies to block information that might be painful to access. However, under the same conditions and given full access to the information, smokers perform worse than non-smokers when answering multiple choice questions regarding text content on the consequences of smoking; characterizing a subtle reluctance to fully acknowledge the information they are reading. The design of the experiment was conducted in a way that would incentivize respondents to maximize the number of tickets, thus answer a maximum of questions correctly. By choosing to access dissonant information with the same frequency as non-smokers, smokers showed that their intention was to avoid the penalty of skipping the information; demonstrating that their initial goal was to maximize tickets. However, this maximization is abandoned by smokers when prompted to answer questions about the text-based smoking content. Smokers exhibited a short-term preference reversal when faced with having to retain information from dissonant content. Yet, smokers' behavior remained similar to that of non-smoker when answering questions about the video-based dissonant content or content on a different subject. These results are somewhat in agreeance with the imperfectly rational model of addiction. Individuals might be exhibiting time inconsistent behavior and thus smokers could be facing internal costs of retaining information on the consequences of smoking, even when their initial goal is to maximize their tickets. These internalities are displayed subtly through selectivity of attention. Thus, the general category of smokers (which include ex-smokers, current smokers, habitual smokers, occasional smokers and so on) could be displaying behavior that is consistent with the imperfectly rational addiction framework. Future policies should consider the concept of time inconsistency to aid smokers with the internal costs of quitting smoking; whilst covering the external costs.

When changing the treatment groups from smokers and non-smokers to habitual smokers and occasional smokers, results tell a different story. Habitual smokers showed a tendency to prefer to physically avoid access to dissonant information by skipping it in the web-survey. Moreover, they revealed a readiness to accept a penalty to do so. Anti-tobacco activists could argue that there is no cause for concern for smokers to actively avoid information as they have no option to willful ignore information, since warning signs cover a significant portion of the product packaging. For example, in the EU no less than 30% of the 'most' visible surface of tobacco product packaging has to be covered with general warning signs (such as "Smoking Kills") and an additional minimum 40% of the 'most' visible surface needs to be covered by images and messages rotate on a regular basis (Alemanno, 2012). Moreover, individuals are never given an option to pay to avoid these messages. Yet, even if smokers are not given the option to overtly actively avoid information such as paying to forfeit access to warnings, there are subtler ways to actively avoiding information. For instance, Maynard et al. (2014) found that regular cigarette smokers show a tendency to divert their gaze from warning signs to other parts of the cigarette package, such as the branding. The authors concluded that regular smokers might have learned to physically divert their attention away from warning labels, indicative of active information avoidance behavior. The fact that a similar result was found among habitual smokers in this study, reinforces the idea that more aggressive policies limiting access to smoking are needed, as is suggested in the irrational addiction framework.

The analysis yielded from this experiment are in accordance with the need to push for de-normalization of tobacco and increase the reliance on nudging approaches through behavioral change rather than through the provision of information. Pure provision of information might not be as effective as previously thought, as smokers could use subtle ways to avoid incorporating it. Exploiting patterns in behavior to avoid or ignore warnings should motivate policymakers to internalize observed 'irrational' behavior and improve on the flaws of traditional tobacco regulation. This experiment reveals that smokers prefer to ignore dissonant information passively even when accessing such information and correctly incorporating it yields economic benefits, showing that accessing dissonant information can be costly for certain individuals. These findings are indicative that stronger policy such as smoking bans need to be implemented if governments truly want to curtail the human and economic costs associated with smoking. Nudging policies to help smokers quit smoking should slant more towards a paternalistic approach than libertarian one. Moreover, policymakers should continue to develop and test the imperfectly rational and irrational models to improve their understanding of smokers and how they make decisions about the consumption of tobacco products.

Limitations

While the findings from this study are informative, it is important to note that the experiment was conducted using the experimenter's own network, which is not representative of smokers worldwide. Over 94% of respondents live in developed countries such as the United States, Canada or within the European Union. These are some of the countries where the most stringent anti-tobacco policies exist and where a lot of work has been done to dissuade individuals from smoking (Ng et al., 2014). Therefore, the results likely do not reflect the behavior of individuals living in developing countries, which is where most smokers currently reside (Ng et al., 2014), therefore, the results could be affected by selection bias. Future studies with greater access to respondents should consider better methods of randomization in the selection of the sample population.

Moreover, by using Facebook and email to reach potential respondents from the experimenter's personal network, the results might be affected by the response bias. The response bias occurs when respondents choose the socially desirable option rather than their true preference (Furnham, 1986). The presence of the response bias would imply that respondents understood that this study is related to active information avoidance among smokers and would reveal a preference in accordance with social norms and not their true preference. The incidence of such bias could mean that the instances of active information are biased, by accessing a more anonymous sample population more smoker respondents might have preferred the option to skip the content. Future studies should attempt to conduct double blind experiments to deal with this bias. Furthermore, the results could also be affected by participation bias. Those who decided to participate might be more disposed to want to answer surveys and therefore do not represent the average non-smokers and smokers. Further studies on the topic should consider eliminating this bias.

There are also concerns over the sample size used for the analyses of this experiment. The problem with small sample sizes is that they are associated with low statistical power and low reproducibility (Colquhoun, D. 2014; Forstmeier, Wagenmakers & Parker, 2016; Lakens & Albers, 2017). Therefore, future research on this topic should consider using a greater sample

size in order to convincingly confirm the findings of this experiment. Moreover, statistical differences in the number of correct answers in the logic section are difficult to explain, perhaps a more homogenous group should have been used to control for cognitive abilities, such as students from the same university. Yet, the preferences to actively avoid information or the tendency to passively ignore it are likely not affected by the heterogeneity of the sample.

Lastly, the articles and videos, and the overall experience of the experiment, were meant to be salient in order to attract respondents. In reality, the information that smokers face when buying tobacco products on a daily basis tends to less salient in nature and thus might not be as appealing as the one provided in the experiment. Smokers might be more prone to actively and passively avoid information that is harder to deal with emotionally, as the one currently printed on cigarette packs. The content provided in the experiment, which differs from the content encountered in reality, could put into question the external validity of the results. The concerns stated above cast doubt on the incorporation of the fifth precept of induced value: parallelism. In essence, parallelism is the proposition that the behavior of individuals that is tested in a laboratory setting can apply also to non-laboratory situations where ceteris paribus conditions hold (Smith, 1986). A heterogeneous small sized sample which could be affected by responder, selection and participation bias lessen the credibility that the results observed in this study will be observed in a non-laboratory setting. Therefore, an improved design that takes the structure of this experiment and reapplies it in a field setting could yield more revealing results. Additionally, since it is difficult to establish whether the incentive provided dominated all other subjective costs associated with answering the web-survey; it cannot be established that the results found in the experiment accurately capture the true behavior of respondents. Finally, since the web-experiment was administered using public distribution tools, the possibility that the experiment suffers from contamination effects cannot be ruled out. It is possible that there was interpersonal communication among respondents in both treatment groups.

Concluding Remarks

Using self-generated data collected via an online web-experiment, this study attempted to identify whether smokers engage in active information avoidance. Subsequently, the study tested whether smokers engaged in passive information avoidance when they decided to access the content. The results of the experiment show that smokers and non-smokers do not differ in their preference to access information about the negative consequences of smoking or other habits; suggesting that smokers do not engage in active information avoidance. In general, smokers are not more willing to pay to avoid access to information on the negative consequences of smoking than non-smokers. Upon closer inspection, habitual smokers display a preference to pay to avoid information which criticizes their habit when compared to occasional smokers. Additionally, smokers and non-smokers differ in their ability to process dissonant information. Non-smokers, on average perform better than smokers when answering questions on content that denigrates smoking even when the content is available when answering questions. Differences in performance are symptomatic of passive information avoidance. Therefore, smokers could be selectively attending information depending on its level of dissonance. The same behavior is seen among smokers who have never attempted to quit smoking when compared to those who have as well as smokers who claim to not consciously think of health warnings on tobacco products when compared to those who have. It is important to note that the results of the

experiment are suggestive and thus further research should focus on identifying whether there is a link between addictive behavior, such as smoking, and receptivity to dissonant information.

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Appendix

Figure A1: Survey Flow

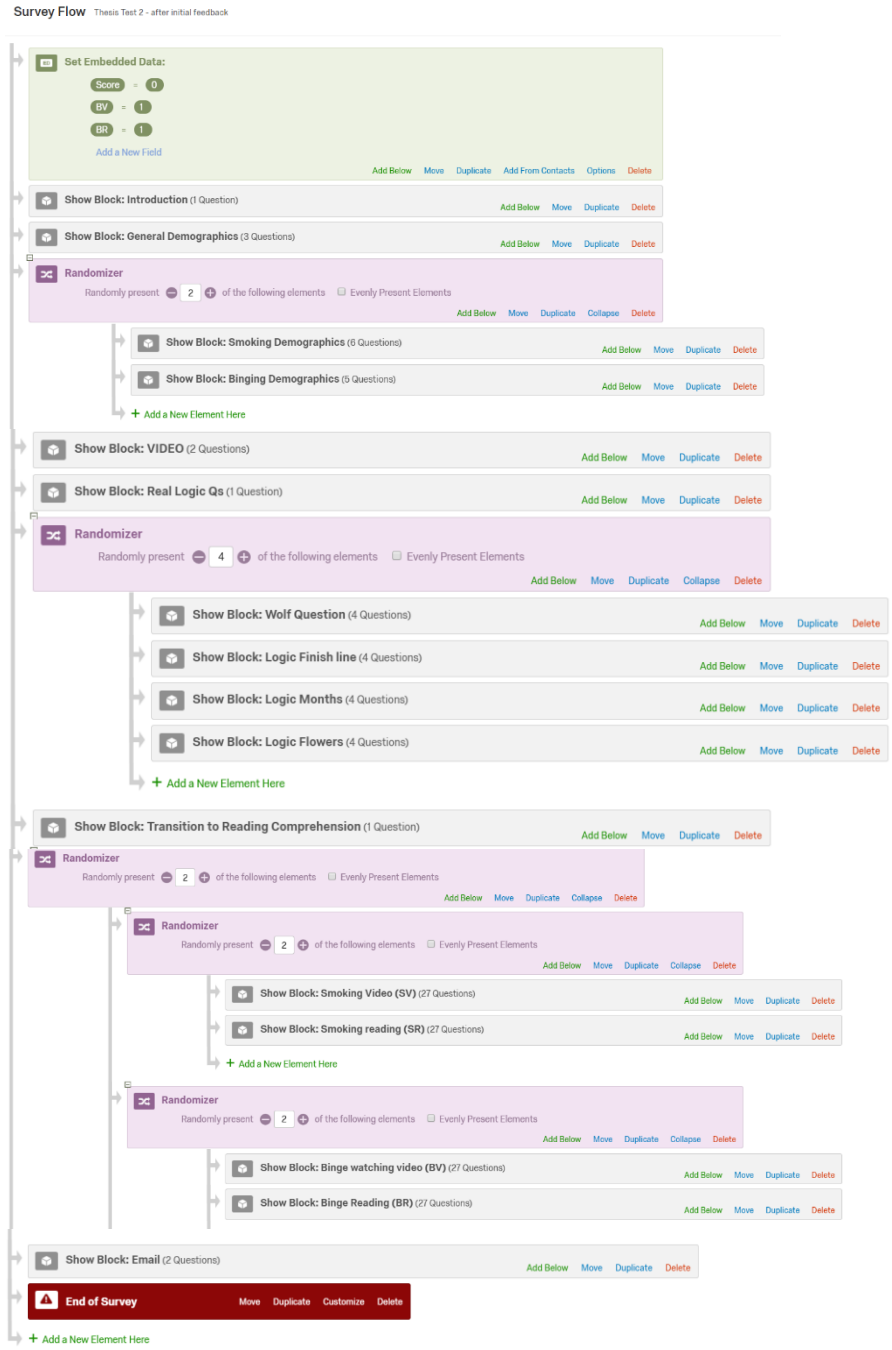

Figure A2: Example of Logic Questions

In the final stretch of a marathon, you quickly ran by the person who is in second place, what place are you in?

Input the number of the position you are in: for example 16 and **not** 16th

Figure A3: Example of a Correct Answer Meme

Correct! The answer is 2!

Figure A4: Example of an Incorrect Answer Meme

The answer is 2!

Explanation:
You replace the 2nd place runner and become 2nd place runner yourself!

Table A5: P-values of Fisher Exact Test: Testing for Statistically Different Tendencies of Active Information Avoidance Ex-Smokers and Current Smokers

	P-Values
Smoking (Video)	0.736
Smoking (Reading)	0.480
Binge-Watching (Video)	0.736
Binge-Watching (Reading)	1.000

*Table A5 shows the likelihood smoking and active information avoidance are independent from each other when considering all content types when comparing ex-smokers and current smokers. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table A6: P-Values of Mann-Whitney U Test: Testing for Passive Information Avoidance Among Ex-Smokers and Current Smokers

	Rank Sum
Total Score	0.4289
Logic Tickets	0.1807
Smoking Video Tickets	0.7444
Smoking Reading Tickets	0.2289
Binge-Watching Video Tickets	0.7787
Binge-Watching Reading Tickets	0.8518

*Table A6 shows the likelihood the mean scores of ex-smokers and current smokers come from the same distribution. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table A7: P-values of Fisher Exact Test: Testing for Statistically Different Tendencies of Active Information Avoidance Aware and Unaware Smokers

	Aware and Unaware
Smoking (Video)	1.000
Smoking (Reading)	1.000
Binge-Watching (Video)	1.000
Binge-Watching (Reading)	0.559

*Table A7 shows the likelihood smoking and active information avoidance are independent from each other when considering all content types when comparing current smokers who claim to pay attention to the health warnings on tobacco products (aware smokers) and those who do not (unaware smokers). P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table A8: P-values of Fisher Exact Test: Testing for Statistically Different Tendencies of Active Information Avoidance Quitters and Non-Quitters

	Quitter and Non-Quitters
Smoking (Video)	0.588
Smoking (Reading)	0.216
Binge-Watching (Video)	1.000
Binge-Watching (Reading)	1.000

*Table A8 shows the likelihood smoking and active information avoidance are independent from each other when considering all content types when comparing current smokers who have attempted to quit smoking (Quitters) and those who have not (Non-Quitters). P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table A9: P-Values of Mann-Whitney U Test: Testing for Passive Information Avoidance Among Occasional and Habit Smokers

	Rank Sum
Total Score	0.9037
Logic Tickets	0.2071
Smoking Video Tickets	0.7985
Smoking Reading Tickets	0.8334
Binge-Watching Video Tickets	0.9226
Binge-Watching Reading Tickets	0.8419

*Table A9 shows the likelihood the mean scores of occasional and habit smokers come from the same distribution. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table A10: P-values of Fisher Exact Test: Testing for Statistically Different Tendencies of Active Information Avoidance Binge and Non-Binge Watchers

	Non-Binge and Binge Watchers
Smoking (Video)	1.000
Smoking (Reading)	0.261
Binge-Watching (Video)	0.750
Binge-Watching (Reading)	0.100

*Table A10 shows the likelihood the smoking and active information avoidance are independent from each other when considering all content types when comparing binge and non-binge watchers. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*

Table A11: P-Values of Mann-Whitney U Test: Testing for Passive Information Avoidance Among Non-Binge Watchers and Binge Watchers

	Rank Sum
Total Score	0.2672
Logic Tickets	0.2385
Smoking Video Tickets	0.9417
Smoking Reading Tickets	0.1961
Binge-Watching Video Tickets	0.2652
Binge-Watching Reading Tickets	0.2429

*Table A11 shows the likelihood the mean scores of non-binge watchers and binge watchers come from the same distribution. P-values with a *, **, *** denote 10%, 5% and 1% level of statistical significance, respectively.*