

Addiction, Risk and Gender- Implications for the Anti-Smoking Movement

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Cigarette Smoking Addiction is a problem which impacts the lives of individuals and society at large. This paper is an attempt to find a new avenue that may contribute towards a reduction in the addiction to cigarette smoking. Over 1600 people were surveyed in 2011 in Israel. Three important factors were considered: whether or not the person smoked, the gender of the respondent and the level of risk that the respondent was willing to take (measured in terms of personal discount rates and risk aversion). The major finding of this research was that women smokers were willing to take significantly higher risks than men smokers (as well as than all non-smokers). When attempts to persuade people to stop smoking (whether through advertising or legislation) are generalized they can be useful but efforts to reduce addiction to cigarette smoking could be much more effective if they were to take into account that women and men need different approaches.

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1. Introduction

Addictive behavior is one of the issues that are investigated by behavioral economists. The related literature suggests two models and explanations to addictive behavior, such as smoking, alcohol and gambling: rational addiction and bounded rational addiction (Messinis 1999). The rational addiction model (Becker & Murphy 1988) captures the distinction between addictive consumption and non addictive consumption by recognizing that current consumption of addictive goods depends on the level of past consumption. On the other hand, the bounded rational addiction model assumes that many drug, tobacco, and alcohol addicts regret their reliance on these substances (Winston 1980; Akerlof 1991) and argues that addiction results from mistaken beliefs about the likelihood of being addicted (Orphanides & Zervos 1995, 1998).

The bounded rational addiction model suggests that one likely consequence is that smokers experience regret. Findings from a 2002 international tobacco control policy evaluation survey show that regret was more likely to be experienced by women rather than men (Fong et al. 2004).

Another factor that influences addiction is time preference that is represented by the personal discount rate. An individual who values the present more than the future will have a higher personal discount rate in comparison to a person who places more value on the future as opposed to the present. An important individual characteristic that may influence time preference is risk aversion, the tendency of an individual to refrain from taking risks or to take them.

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Differences between men and women as well as differences between smokers and non-smokers as regards personal discounting rates and risk aversion were found. These differences would have implications on the effectiveness of any anti-smoking campaigns. Anti smoking campaigns started in the USA in 1965 as a result of the release of a report by the Surgeon General regarding cigarette smoking.

Although Men always smoked at much higher rates than women, the difference between them become much smaller over the years. During the years, significant progress was made in reducing the fraction of men who smoked, with only limited progress made in reducing smoking participation among women (Chaloupka 1990).

Studies by economists which consider the demand for cigarettes by men and women show differences in responses to price and income changes. Those studies found that men are more responsive to negative publicity on cigarette smoking (Atkinson & Skegg 1973) and more responsive to changes in price (Mullahy 1985).

Our model suggests that smokers have a high personal discounting rate and low risk aversion. Because regret is more likely to be experienced by women than men, women with low personal discounting rates and high risk aversion levels quit smoking. The result is that women smokers have higher personal discount rates and lower risk aversion levels than men smokers. Women are therefore less responsive to anti-smoking campaigns, pricing and income changes.

A survey was developed and was distributed to 1665 participants over a one month period in 2012. The results supported the hypotheses formulated in this research. Previous studies (for example, Takanori & Rei 2009) found that the higher the time preference rate and the lower the risk aversion, the more likely individuals smoke. This finding is consistent with the findings of this research.

The added value contribution of our work, we believe, relates to the relationship of gender to the results. We will show that gender has an important impact. Few studies examined the impact of gender. The work by Breslin et al. (1999) however was interested in the impact of gender. They found that gender had no statistically significant effect on addiction levels. This is in stark contrast to what we found in this study.

This paper is organized as follows. In the Literature Review section 2 a discussion is included about the two models of addictive behaviour. An explanation is included about the possible relationship of time preference (the preference for the today as opposed to the tomorrow) and risk aversion (the amount of risk one is willing to accept) to addictive behaviours. In order to test our main thesis, which suggests differences in time preference and risk aversion between the genders, in the Methodology section 3 we discuss the data we collected and the hypotheses of the study. In the Findings/Discussion section 4 the results of testing the hypotheses is reported. Six hypothesis were proven; three hypotheses were not proven. Finally, in the Conclusions/Implications/Limitations section 5 we summarize the paper and explain why most of the hypotheses were proven (including all those relating to differences between women and men). We also suggest possible reasons why some of the hypotheses (relating to differences between smokers and non-smokers) were not proven.

2. Literature Review

Referring to the related literature, there are two models of research regarding addictive behaviors. The first is the rational addiction model advocated by Becker & Murphy (1988), where a consumer is assumed to think that an addictive product such as cigarettes increases current satisfaction but decreases future utility by damaging health. The individual is assumed to be fully rational, in contrast the other economic model of addictive behavior which treats addicts as myopic. This rational addictive model argues that utility maximizing consumers consider the future consequences of their past and current consumption of addictive substances (Stigler & Becker 1977).

The second is the irrational addiction model (otherwise as known as the bounded rationality addiction model) in which individuals neither recognize the true difficulty of quitting nor search for self-control devices to help them quit (Orphanides & Zervos 1995). One likely consequence is that smokers experience regret. Regret is an emotion that arises from a comparison of one's current reality and a possible alternative reality. Regret is related to, but distinct from, other emotions such as disappointment, remorse, and guilt (Landman 1993).

Regret by smokers was more likely to be experienced by women than men (Fong et al. 2004). A possible explanation for the difference is that women face additional health risks from smoking which are complicated by pregnancy. In particular, smoking during pregnancy leads to lower birth weight, a greater likelihood of spontaneous abortion and an increased incidence of bleeding during pregnancy. Children of women who smoke during pregnancy have greater neonatal and infant mortality than those born to nonsmokers, including an increased risk of sudden infant death syndrome. Also, there can be adverse effects on the child's long-term growth, intellectual development and behavioral characteristics due to the mother's smoking during pregnancy (Chaloupka 1990).

When investigating addictive behaviors, economic-psychological parameters including the rate of time preference and the coefficient of risk aversion play key roles. Over the last three decades, research in the field of inter-temporal choices has attempted to measure personal discount rates with studies that estimated the personal discount rates associated with choices for various durable items such as energy using home appliances (Gately 1980; Ruderman, Levine & McMahon 1987), and for non-durable items such as retirement plans (Warner & Pleeter 2001). Initial research in the field of time preferences focused primarily on monetary questions, and found that personal discounting rates vary with age, time delay, amount of money and direction of trade (Thaler 1981; Chapman & Elstein 1995; Prelec 2004).

Research on time preference has reported that smokers are more impulsive than non-smokers; furthermore, a significant positive correlation between the amount smoked per day and a higher discounting rate has been observed (Mitchell 1999; Odum, Madden & Bickel 2002; Reynolds et al. 2004). The research on risk preference remains inconclusive as to whether smoking and impulsive probability discounting are related (Mitchell 1999; Reynolds et al. 2003).

An important individual characteristic that may influence time preference is risk preference, the tendency of an individual to refrain from taking risks or to take them. A more risk-averse person can tolerate less uncertainty about future income, which may

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lead to a higher elicited personal discount rate and a demand for higher compensation for delaying consumption or a payment (Stevenson 1992). In an experiment that combined lotteries with delayed payments, Anderhub et al. (2001) found a positive correlation between the degree of risk aversion and the personal discount rate. In a more recent study that included both lottery questions and time preference questions, Andersen et al. (2008) found a low positive correlation between risk aversion and personal discount rates. Ida & Goto (2009) used lottery questions that included a time delay for one of the alternatives in their research regarding smoking behaviors. They found that smokers in Japan are more impatient and risk-prone than nonsmokers, pointing to a negative correlation between risk aversion and personal discount rate.

Studies on addictive behaviors other than smoking show that heavy drinkers highly discount delayed monetary rewards as opposed to social drinkers or non-drinkers (Madden et al. 1997). Pathological gamblers more readily discount monetary rewards than non-gamblers (Petry & Casarella 1999; Petry 2001; Alessi & Petry 2003).

We are aware that social interactions on decisions (such as smoking) differ between genders. Studies (such as Aristei & Pieroni, 2009) suggest that peer group effects are more relevant in explaining cigarette consumption and are a disincentive to quit in the case of women. This suggests that women would be less likely to give up smoking.

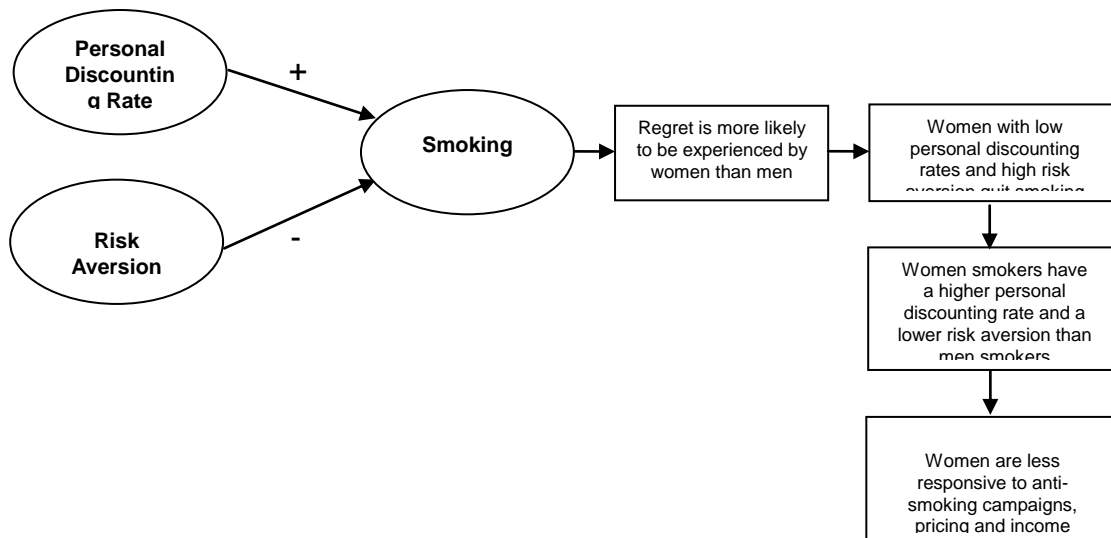
The results however tell us nothing about the difference in the impact of social interactions on smokers versus non-smokers. Furthermore, the article concludes that advertising may in fact be more effective in modifying individual smoking practices. It does not however make any suggestions as to whether or not advertising needs to be geared specifically (as we recommend) to a specific gender.

3. Methodology

Our model suggests that smokers have a high personal discounting rate and low risk aversion. Because regret is more likely to be experienced by women than men, women with low personal discounting rates and high risk aversion levels quit smoking. The result is that women smokers have higher personal discount rates and lower risk aversion levels than men smokers. Women are therefore less responsive to anti-smoking campaigns, pricing and income changes (figure 1).

A survey was developed and was distributed to 1665 participants over a one month period in 2011. The objective of the questionnaire was to determine if there was a relationship between an addictive action of theirs (cigarette smoking) and their risk related attitudes. Two 'risk attitudes' were examined. The first related to whether (and the extent to which) the respondent preferred the present or the future. The second related to whether (and the extent to which) the respondent liked risk or tried to avoid risk.

Figure 1: Personal Discounting Rate, Risk Aversion and Responsiveness to Anti-Smoking Campaigns, Pricing and Income Changes



Research has been done in these fields in the past. This research is unique and new for two reasons:

1) The questionnaire was developed with a slant which would have suggested to the respondent that the main issue under discussion had nothing to do with addiction and risk issues. The questionnaire related to the 2011 protest movement in Israel in the summer of 2011 and focussed on the protest itself and governmental reactions.

2) Prior research has not focussed on the impact of gender. In this research we were particularly interested not only in the relationship between addiction and risk but also in any gender-related differences.

Respondents were given two questions that relate directly to this research:

Question 1

Assume that you worked at a shop and were contracted to receive 1000 shekel. The shop is doing well financially. How much money would you need to be offered by the shop owner in order for you to agree to receive your payment not now but in one month's time?

This question measures your preference for today as opposed to tomorrow. The higher the amount you would insist on receiving next month, the higher is your 'personal discounting rate'. A high 'personal discounting rate' suggests a strong preference for the present as opposed to the future. This is because the higher the amount you would want in a month, the lower is the chance of the shop owner agreeing to paying you in the following month. . A low 'personal discounting rate' suggests a strong preference for the future as opposed to the present. This is because the lower the amount you would want in a month, the higher is the chance of the shop owner agreeing to paying you in the following month.

We developed three hypotheses to measure 'personal discounting rate' and its relationship to addiction:

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H1: Women smokers have a statistically significant higher personal discounting rate than Men smokers

H2: Women non-smokers have a statistically significant higher personal discounting rate than Men non-smokers

H3: Smokers have a statistically significant higher personal discounting rate than Non-Smokers

Question 2

Assume that you have been offered a lottery ticket. You have a 1:10 chance of winning 1000 shekel. How much money would you be prepared to pay for the ticket?

This question measures your attitude towards risk. The lower the amount you are willing to pay for a ticket the higher is your 'risk aversion'. A high 'risk aversion' suggests a strong dislike for risk. In this case you would be prepared to pay a relatively small amount of money because you do not want to (and therefore do not like to) take the risk of losing the money you paid for the lottery ticket. A low 'risk aversion' suggests that you like taking risks. In this case you would be prepared to pay a relatively large amount of money because you want to (and therefore like to) take the risk. You have a strong feeling that you will win the 1000 shekel.

We developed three hypotheses to measure 'risk aversion' and its relationship to addiction:

H4: Women smokers have a statistically significant lower risk aversion than Men smokers

H5: Women non-smokers have a statistically significant lower risk aversion than Men non-smokers

H6: Smokers have a statistically significant similar risk aversion to Non-Smokers

We would expect, as a consequence of our six hypotheses above, that there would be a statistically significant negative correlation between personal discounting rate and risk aversion. This indeed was found to be the situation as regards all four groups of respondents.

H7: Women Smokers: there is a statistically significant negative correlation between personal discounting rate and risk aversion

H8: Women Non-Smokers: there is a statistically significant negative correlation between personal discounting rate and risk aversion

H9: Men Smokers: there is a statistically significant negative correlation between personal discounting rate and risk aversion

H10: Men Non-Smokers: there is a statistically significant negative correlation between personal discounting rate and risk aversion

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In order to test our hypotheses, we conducted a survey among 1665 subjects. Table 1 presents some summary statistics. The table show that approximately half of the respondents were men and half were women. The table also shows that about 30% of the men and the women smoked. The mean age was just under 30 years old.

Gender	Men	53.0%
	Women	47.0%
Percentage of smokers	Smoking Men (among men)	31.9%
	Smoking Women (among women)	30.5%
Mean Age	Men	29.0
	Women	27.9

No statistical testing was done as regards the quantitative impact of an advertising campaign. In order to do so one would have to compare groups exposed to advertising with groups not exposed to advertising. This becomes more complicated (and therefore the results become more questionable) because people absorb advertising messages at different paces and with different strengths.

An important conclusion of this study however is that different advertising strategies should be used for women and men. Previous studies have tried to actually measure the impact of advertising on gambling but they conclude (as was done most recently in Planzer & Wardle 2012) that evaluating the impact of gambling advertising is highly complex. This paper makes conclusions about advertising based upon results regarding personal discount rates and risk aversion measures for both genders separately (separating between the smokers and the non-smokers). This paper therefore avoids dealing with 'difficult to prove' statistical conclusions.

4. Findings/Discussion

In the case of 'Personal Discounting Rate' we believe:

- That neither gender is actually more or less inclined towards addiction than the other gender. This would be a logical default.
- That women exhibit regret to a larger extent than men. Women are the ones who carry babies. They are therefore the ones whose personal habits would directly affect another human being. This does not apply to men.
- That the women who are more likely to exhibit regret would be those who are more inclined to be concerned with the future than the average woman. People who are more concerned with the future (as opposed to people who are more interested in the present) would be more likely to stop (or never start) smoking. This would be a logical default.

H1: Women smokers have a statistically significant higher personal discounting rate than Men smokers

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The statistics proves this hypothesis (p-value=0.042).

The example that follows illustrates this matter:

man smoker #1 pdr=0.10
man smoker #2 pdr=0.30
man smoker #3 pdr=0.50
man smoker #4 pdr=0.65
man smoker #5 pdr=0.80
man smoker #6 pdr=0.95

woman smoker #1 pdr=0.10
woman smoker #2 pdr=0.30
woman smoker #3 pdr=0.50
woman smoker #4 pdr=0.65
woman smoker #5 pdr=0.80
woman smoker #6 pdr=0.95

The average personal discounting rate (pdr) for men or women is 0.55
<(0.10+0.30+0.50+0.65+0.80+0.95)/6>

Woman smoker #2 regrets her addiction and stops smoking. She therefore becomes a 'non-smoker'. The new average pdr for women is now 0.60
<(0.10+0.50+0.65+0.80+0.95)/5> whereas the pdr for men remains at 0.55.

H2: Women non-smokers have a statistically significant higher personal discounting rate than Men non-smokers

The statistics proves this hypothesis (p-value=0.002).

The example that follows illustrates this matter:

man non-smoker #1 pdr=0.01
man non-smoker #2 pdr=0.03
man non-smoker #3 pdr=0.04
man non-smoker #4 pdr=0.06
man non-smoker #5 pdr=0.07
man non-smoker #6 pdr=0.09

woman non-smoker #1 pdr=0.01
woman non-smoker #2 pdr=0.03
woman non-smoker #3 pdr=0.04
woman non-smoker #4 pdr=0.06
woman non-smoker #5 pdr=0.07
woman non-smoker #6 pdr=0.09

The average personal discounting rate (pdr) for men or women is 0.05
<(0.01+0.03+0.04+0.06+0.07+0.09)/6>

Woman smoker #2 regretted her addiction and stopped smoking. She therefore became a 'non-smoker'. The new average pdr for women is now 0.12
<(0.30+0.01+0.03+0.04+0.06+0.07+0.09)/5> whereas the pdr for men remains at 0.05.

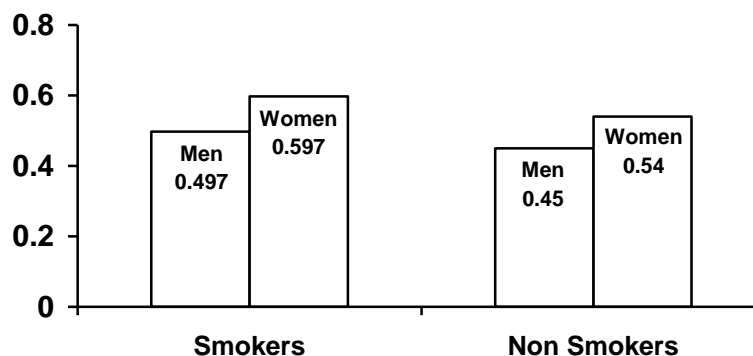
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H3:Smokers have a statistically significant higher personal discounting rate than Non-Smokers

The statistics proves this hypothesis (p-value=0.056).

People who are more concerned with the present as opposed to people who are more interested in the future would be more likely to smoke. This would be a logical default.

**Chart 1: Personal Discounting Rate
Smokers and Non-Smokers**



In the case of 'Risk Aversion' we believe:

- That neither gender is actually more or less inclined towards addiction than the other gender. This would be a logical default.
- That women exhibit regret to a larger extent than men. Women are the ones who carry babies. They are therefore the ones whose personal habits would directly affect another human being. This does not apply to men.
- That the women who are more likely to exhibit regret would be those who are more risk averse (dislike risk more) than the average woman. People who are more risk averse (as opposed to people who are less risk averse) would be more likely to stop (or never start) smoking. This would be a logical default.

H4:Women smokers have a statistically significant lower risk aversion than Men smokers

The statistics proves this hypothesis (p-value=0.010).

The example that follows illustrates this matter:

man smoker #1 ra=5
man smoker #2 ra=25
man smoker #3 ra=55
man smoker #4 ra=70
man smoker #5 ra=85
man smoker #6 ra=120

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woman smoker #1 ra=5
woman smoker #2 ra=25
woman smoker #3 ra=55
woman smoker #4 ra=70
woman smoker #5 ra=85
woman smoker #6 ra=120

The average risk aversion (ra) for men or women is 60 $\langle(5+25+55+70+85+120)/6\rangle$

Woman smoker #2 regrets her addiction and stops smoking. She therefore becomes a 'non-smoker'. The new average ra for women is now 67 $\langle(5+55+70+85+120)/5\rangle$ whereas the ra for men remains at 60.

H5: Women non-smokers have a statistically significant lower risk aversion than Men non-smokers

The statistics proves this hypothesis (p-value=0.003).

The example that follows illustrates this matter:

man smoker #1 ra=0.5
man smoker #2 ra=1.1
man smoker #3 ra=2.0
man smoker #4 ra=2.6
man smoker #5 ra=2.7
man smoker #6 ra=3.1

woman smoker #1 ra=0.5
woman smoker #2 ra=1.1
woman smoker #3 ra=2.0
woman smoker #4 ra=2.6
woman smoker #5 ra=2.7
woman smoker #6 ra=3.1

The average risk aversion (ra) for men or women is 2 $\langle(0.5+1.1+2.0+2.6+2.7+3.1)/6\rangle$

Woman smoker #2 regretted her addiction and stopped smoking. She therefore became a 'non-smoker'. The new average ra for women is now 2.18 $\langle(0.5+2.0+2.6+2.7+3.1)/5\rangle$ whereas the ra for men remains at 2.

H6: Smokers have a statistically significant lower risk aversion than Non-Smokers

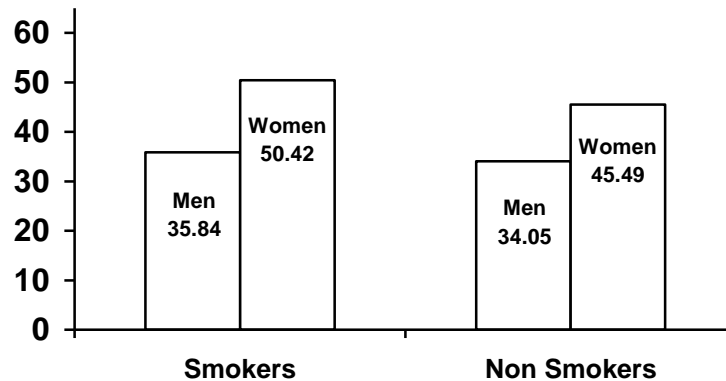
The statistics does not prove this hypothesis.

People who are less risk averse as opposed to people who are more risk averse were expected to be more likely to smoke. This would be a logical default but this result was not found. Why? We believe that there is a big difference between financial (money related) risk and non-financial (health related) risk. We believe that whereas smokers may have a lower health-related aversion to risk than non-smokers they have, at the same time, a higher money-related aversion to risk caused by the increasingly high cost of smoking. The two 'risk aversions' net each other off and for this reason smokers and non-smokers are found to have a statistically similar risk aversion.

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Another reason why no statistically significant difference was found could simply be the sample size. Looking at the chart, people who are less risk averse were the smokers but when statistical tests were used a difference between smokers and non-smokers was not found.

**Chart 2: Risk Aversion
Smokers and Non-Smokers**



H7: Total Respondents: there is a statistically significant negative correlation between personal discounting rate and risk aversion

The statistics does not prove this hypothesis.

H8: Smokers Only: there is a statistically significant negative correlation between personal discounting rate and risk aversion

The statistics proves this hypothesis (p-value=0.004).

H9: Non-Smokers Only: there is a statistically significant negative correlation between personal discounting rate and risk aversion

The statistics does not prove this hypothesis.

We would expect, as a consequence of our above mentioned six hypotheses, that there would be a statistically significant negative correlation between personal discounting rate and risk aversion. We would expect that this be the situation when considering all respondents (hypothesis #7), when considering smokers only (hypothesis #8) and when considering non-smokers only (hypothesis #9). Whilst negatively correlated relationships between personal discounting rate and risk aversion was found for all these hypotheses, only in the case of smokers was this negative correlation statistically significant.

The reason why no statistically significant difference was found for Hypothesis #9 could simply be the sample size. When the results of Hypothesis #8 (which was proven) and Hypothesis #9 (which was not proven) are taken together (Hypothesis #7) again no statistically significant difference was found (likely because the data in hypothesis #8 was stronger than the data in hypothesis #9).

5. Conclusion, Implications and Limitations

Addiction has attracted considerable attention in health and behavioral economics, and economists have tried to understand addiction from the viewpoints of decision making over time and under risk.

This study was our attempt to understand risk related differences on the one hand between Smokers and Non-smokers and on the other hand between Women and Men.

We found, as regards both Personal Discounting Rates and Risk Aversion, statistically significant differences between genders. Women had (statistically significantly) higher personal discounting rates and lower aversions to risk than Men. This very important result is what allows us to conclude that current anti-smoking campaigns, rather than being focused equally to both genders should be directed more towards men. This is because Men would likely be more inclined to 'change their mind' and stop smoking.

As regards Personal Discounting Rates, Smokers had (statistically significantly) higher personal discounting rates than Non-Smokers. As regards Risk Aversion, even though Smokers had a lower risk aversion than Non-Smokers this could not be statistically proven.

We believe that the reason for these results may have been our not requesting additional information from respondents as regards their 'smoking' or 'non-smoking' habits. For example, we could (and should) have asked smokers about how long they have been smoking and the quantity they smoke. In addition, we should have asked non-smokers if they have never smoked or whether and when they stopped smoking.

Despite these limitations we believe that even the smokers versus non-smokers part of this study is an important contribution to the addiction literature.

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