The Effect of a Two-Week Physical Activity Smoking Cessation Fitness Plan on Addicts' Behavioural Control Beliefs, Exercise Habits and Cigarette Consumption

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Abstract

The purpose of this study was to investigate the effect of smokers' participation in two weeks of physical activity on their cigarette consumption, exercise habits and their attitude towards behavioural control. A total of 29 individuals took part in the study, where only 26 were retained (13 males and 13 females) whose ages ranged from 20 to 85. The participants were given a questionnaire package consisting of three assesments (lifestyle, health locus of control scale and locus of control of behaviour scale) to be completed before and after the 14 days of exercise. Results showed significant differences in cigarette consumption and physical activity. Before, they smoked more ($t(25) = 8.142$, $p < 0.001$ ($M_{prior} = 8.904$, $SD_{prior} = 6.6182$ and $M_{post} = 4.077$, $SD_{post} = 5.6898$)) and exercised less ($t(25) = 4.907$, $p < 0.001$ ($M_{prior} = 1.58$, $SD_{prior} = 0.504$ and $M_{post} = 1.096$, $SD_{post} = 0.2835$)). Furthermore, the results showed significant variances between internal and external smokers (on the LCB scale) in regard to cigarette consumption after the 14 days ($t(24) = 2.906$, $p = 0.013$). There were no significant changes concerning behavioural control attitudes on cigarette consumption nor gender differences. To conclude, physical activity is an ideal method when looking to help individuals decrease their cigarette addiction.

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Introduction

Worldwide, cigarette consumption is the main cause of illnesses and evitable deaths. In Quebec specifically, quantitative research has reported that smoking results in the death of thirty-five people per day because of the negative effects of nicotine which amounts to 12 775 victims per year (and 37 000 in Canada) (Québec Sans Tabac). In addition, cigarettes do not only affect those who consume them but their environment as well; secondhand smoke is just as aggressive as inhaling the toxins directly. From these pollutants, individuals are susceptible of developing one of sixteen cancers, or a third of all cancers. For example, 85% of lung cancers, for example, are triggered by inhaling chemicals produced by cigarettes. Moreover, cigarette nuisance increases the risk of twenty-one chronic diseases. The risk of developing diabetes is doubled and almost 15% of deaths in Canada related to heart diseases and strokes are associated to smoking (Québec Sans Tabac). Consequently, cigarette addiction decreases the average healthy life expectancy age by ten years.

Cigarette addiction

According to Rutter (2002) smoking is said to cause the death of 450 million people within the next fifty years and is an important worldwide health threat. Substances present in cigarettes such as nicotine are responsible for the addiction which people feel to this product. Becker and Murphy (1988) have developed the theory of rational addiction and they defined the term *additcion* as "[The potential addiction of a person] to *c* if an increase in [their] current consumption of *c* increases [their] future consumption of *c*" where *c* represents the substance. This happens only when the conduct exhibits 'adjacent complementarity' which is when present consumption habits are influenced by past consumption habits (Becker & Murphy, 1988). Thus, an individual is said to be addicted when their current consumption behaviours are increased and affected by past conducts regarding the substance.

Addiction is not limited to past and current habits, it also depends on other influencers, such as pleasure, which impact the impulse.

Addiction has been associated to a series of involuntary desires and cravings led by voluntary behavioural control (Baumeister, 2017). Subsequently, a smoker's will to cease their habit must be stronger than the recurrent yearning for the pleasurable effects of nicotine as in most cases, it is a lack of effort to prevent the urge to smoke. Thus, substance dependency results from finding pleasure in a good and requiring that feeling of satisfaction regularly (Baumeister, 2017). Guy Corneau, a psychoanalyst, said that an individual can break their bonds of addiction not by fighting against it but rather by freeing themselves from it through creativity (Abdessemed, 2009). Such creative activities can be arts, crafts, meditation and sports, to name a few.

Congruently, research investigating the reasons behind cigarette addiction elaborated a model which categorizes the main motives into twenty-five domains, thus creating the Smoking Inventory. This guide was used by Ho (1989) to identify the main motivations to remain addicted to tobacco in 128 regular smokers (59 males and 69 females). The study searched for the specific reasons, of the twenty-five, which explained their smoking habit, their perception about health risks, their daily nicotine intake and the perception they had on quitting. The experiment concluded that the sample was driven to smoke by four motives; social acceptance, addiction/habitual needs, pleasure and boredom. Moreover, a similar study done with 200 heavy smokers also identified stress reaction as a main motivator (Linn & Stein, 1985).

Cigarette addiction is also known to be different among males and females. According to Marcus (1999), the smoking habit is declining among both men and women but at different rates; women are ceasing to quit at a slower pace than men are.

Behaviour modification

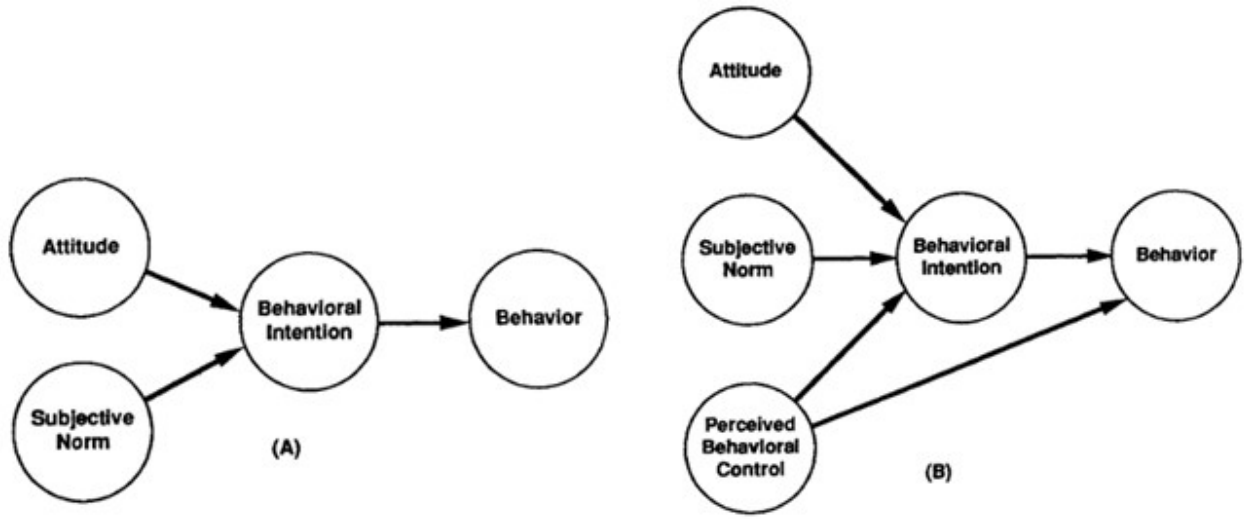
Finding the means to eliminate a certain habit through behaviour modification is challenging because it requires the input of multiple variables such as acknowledging the problem, measuring the

barriers and adverse effects of a new lifestyle and gathering the motivation to start changing (Winslow *et al.,* 1996). Social psychology has defined and refined theories such as Fishbein and Ajzen's (1975; 1980) theory of reasoned action to explain human behaviour. This model was used to both predict as well as to understand influential behavioural factors. It explains behavioural intentions which then lead to actions. Figure 1A illustrates the theory of reasoned action where behavioural intentions are influenced by two main components and where intentions are the only persuasive elements of action. These variables amount to one's belief that personal conducts will lead to specific outcomes (Madden *et al.,* 1992). According to this theory, one of the conditions which impacts the strength of the correlation between behavioural intentions and behaviours is the quantity of volitional control an individual possesses.

This construct was further extended when perceived behavioural control was added to the schema, as seen in Figure 1B, where this component has a direct impact on behavioural intentions as well as an indirect influence on behaviours. Compared to the theory of reasoned action, this component modifies the model as it influences both intentions and behaviours. By doing so, Ajzen (1985) established the theory of planned behaviours. This aspect argued that an individual's certainty of their available resources and opportunities to perform an action will increase their perceived behavioural control. Bandura, Adams, Hardy and Howells (1980) have supported that a person's perception of their aptitudes to complete a given action is strongly impacted by their confidence. As a result, intentions and self-efficacy are positively correlated. For example, the perception of having an unsatisfactory amount of control over the conduct, in terms of resources and skills, will produce a decrease in intentions to adequately perform the action regardless of positive attitudes and subjective norms towards the outcome (Madden *et al.,* 1992). Briefly explained, people are attracted to behaviours labelled to be favourable when control is optimal and shy away from situations where the outcomes of their actions are uncontrollable because "Individuals make behavioural decisions based on careful considerations of available information" (Conner & Armitage, 1998).

Figure 1

Directional illustration of the theory of reasoned action and the theory of planned behaviour



Note. Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and social psychology Bulletin*, *18*(1), 3-9.

Due to the addition of the perceived behavioural control component, the theory of planned behaviour is applicable to complex goals and outcomes which are dependent on the succession of various intricate actions (Conner and Armitage, 1998). Moreover, analyzing this new inclusion results in a subdivision; internal influencers (e.g., abilities) and external influencers (e.g., dependence on others). These ‘control beliefs’ facilitate or inhibit one’s will to act upon their intentions to create a specific behaviour (Conner & Armitage, 1998).

Human behaviour is guided by three main beliefs, behavioural, normative and control (Ajzen, 2002) and these relate to an individual's environment and pre-disposition. The locus of control theory investigates the third component that influences behaviour; control. Here, there exists two directions, internal and external. According to Rotter's I-E scale (1961), a person is deemed internal when they score low on the locus of control scale. That is to say that they believe that matters are in their own

hands, they control their behaviours and guide the outcome in a favourable direction for them. On the other hand, high scores illustrate an external individual. These people judge that their environment governs their actions and leads them towards their future (Phillips & Gully, 1997). In terms of gender differences, Sherman, Higgs and Williams (1997) have concluded that internality is better correlated to achievement for males than for their counterparts.

Locus of control is comprised of four major themes: self-efficacy, self-esteem, autonomy and instrumentality (Kormanik & Rocco, 2009). In accordance, it is believed that a person who exhibits higher internal control also possesses high levels of self-efficacy (Phillips & Gully, 1997). The moment that personal conduct is depicted by external elements, outcomes become uncontrollable and negative consequences appear. When this point is reached, it is due to lack of self-confidence and trust in available resources. Hence, addiction is a loss of internal control as "Individuals addicted to alcohol or drugs might logically be predicted to be persons who do not perceive themselves in control of their own behaviours" (Obitz *et al.,* 1974).

A survey of 10 579 children aged 11 to 16 looking at the health locus of control and health beliefs in adolescent smoking showed variances between smokers and non-smokers. To demonstrate, personal control was believed to be an important skill to have by non-smokers whereas their counterparts had stronger belief in the importance of chance when it came to factors that can influence their health (Eiser *et al.,* 1989). Moreover, the Wisconsin Inventory of Smoking Dependence Motives (WISDM-68) is comprised of thirteen subscales one of which measures a smoker's loss of control. It states that if a smoker expresses loss of control over their behaviours then they will be less likely to attempt to quit their addiction. To illustrate this subscale, the WISDM-68 incorporated items such as "Cigarettes control me" and "Sometimes I feel like cigarettes rule my life" (Piper *et al.,*2004).

Congruently, a study based on the social learning theory was done by Kaplan & Cowles (1978) with thirty-five smokers taking part in a cessation program. They had the participants meet once a week for seven weeks and then had a follow-up procedure for eight weeks in addition to a five months

extended follow-up period. With data collected throughout this process, they found that behaviour modification in regard to smoking was greatly associated with smokers who exerted internally-oriented health locus of control beliefs (Kaplan & Cowles, 1978).

The Surgeon General's report studied a vast group of smokers one week after a governmental report on smoking and concluded that individuals who are not addicted to nicotine showcase better internal control than their counterparts. Also, it indicated that males who had managed to cease their smoking behaviour after the report had stronger internal locus of control than those who did not modify their habit (James *et al.,* 1965).

Quitting nicotine

Myers and Frost have found that two elements need to be properly developed for cessation interventions to be effective; they must be motivational and have an adequate treatment plan (Rutter, 2002). These two variables influence a smoker's will to attempt to cease their addiction along with their strength to overcome withdrawal effects. Evidence from past studies suggest that overcoming tobacco addiction is possible but in order to do so, motivation levels need to be high. Another important factor to consider is gender differences; cessation programs, including fitness-based programs, need to be tailored for both males and females seperately (Marcus *et al.,* 1999) to help accelerate the process and diminish the gender gap to have a general healthier population.

Cigarette cravings come and go frequently but do not last more than a few minutes. For this reason, taking a smoker's attention away from their need to light one up is a good tactic. Abdessemed (2009) encourages smokers looking to quit their habit to find strategies such as chewing gum, drinking water or exercising to take their focus off of their addiction. These will allow the cravings to pass by and decrease the number of daily consumed cigarettes.

Goal setting and cigarette cessation

A psychological technique that has been observed to improve behaviour is goal setting and commitment is one of the mediators that make this psychological skill successful. An individual is said to have a goal when they have an objective they wish to obtain, a target set to hit or a challenge needing to be overcome. According to Locke and Latham (1990), more than 90% of the studies done on this topic has demonstrated that it is an effective skill to apply when trying to influence one's behaviour positively. The reasoning behind these findings is that goal setting gives control and a sense of power to those who use it. Thus, when incorporated into a daily routine, goal setting enables focus and redirects attention towards a desired accomplishment.

The smart principle that goal setting is based on propel it to be a successful psychological skill. When used correctly, this principle enhances a person's chances of accomplishing their goal. Broken down into five components (specific, measurable, achievable, realistic and timely), the principle is a simple and effective guideline. As Figure 2 demonstrates, various factors impact the good functioning of this psychological skill, based on Locke (1996). It is important to find optimum ranges for all the variables as this will increase the chances of an individual achieving their targets.

Figure 2

Goal setting cycle

In addition to what is depicted in the diagram, a significant component which needs to be incorporated when aiming to achieving goals, is self-efficacy. It is evident that individuals need to have confidence in their abilities as well as the resources available to them when attempting to accomplishing a challenge. A person who has high self-efficacy will aim to complete a complex task and will show more commitment to their goals (Locke, 1996).

Various studies revealed that smoking cessation can be influenced by physicians because they have the opportunity to motivate smokers, who are seeking to quit, by explaining the benefits of exercise and they also have the possibility of helping smokers to set appropriate goals and specific exercise program (Winslow *et al.,* 1996). As explained previously, addiction to cigarettes is both a voluntary and an involuntary habit. Therefore, setting goals for smokers relies on a more complex schema. Due to the fact that it is simpler to control the voluntary action rather than the involuntary impulse of nicotine consumption, it is better to establish behavioural goals which in turn cope with the physiological effects of cigarettes. In order to cope with cravings, withdrawal symptoms and external influencers to smoke, it is recommended to use proximal goals or subgoals for specific behaviours regarding the problem (Strecher *et al.,* 1995). For example, smoking is believed to control weight and increase concentration so by adding a goal related to physical activity, then it balances the effects of cigarette withdrawal.

In addition, a study done with 110 smokers (where only 85 were retained) investigated the relationship of quality goal setting and the likelihood of smoking cessation (Lorencatto *et al.,* 2015). The participants took part in behavioural support sessions labelled pre-quit sessions where they would be encouraged to set a quit date up to two weeks after the meetings were completed. The researchers concluded that the probability of smokers to attempt to quit was increased in regard to the quality of the goal setting. They also found that specificity of the quit date and an adequate time period were significant influencers of the chances that a smoker would attempt to cease their addiction compared to a vague target. For example, elaborating on the day of the week, the date, the month and the year gives

the smoker a concrete vision of their goal rather than a certain amount of days later has a stronger impact on success. Moreover, they reported that setting a full quit date within one or two weeks of the intention is more successful than prolonging the process. The simplicity of this procedure also heightens the likelihood of achievement. Thus, quality of goal setting, specifically, unambiguous targets, such as start and end dates, and suitable time frames are crucial as they increase the chances of attempting to quit smoking by almost three times (Lorencatto *et al.,* 2015).

Also, it is recommended to monitor tobacco consumption rather than to completely erase the thought of smoking as research has shown that smokers who were told to not ponder on their addiction had more nicotine intake in three weeks compared to those who simply supervised their daily cigarette quantity (Erskine, Georgiou, & Kvavilashvili, 2010). Thus, by slowly decreasing quantities through goal setting, the smoker is kept aware of their habit rather than ignoring it.

Physical activity and cigarette consumption

Many studies have investigated ways that facilitate an individual's intention to decrease or eliminate their cigarette consumption. Rose (2006) found that sensory substitutions to cigarettes lead to the relief of cravings and it also enables cessation. Therefore, occupying the senses in a way which imitates the feeling of having a cigarette engages the placebo effect. When smokers inhale nicotine, it induces brain receptors to release dopamine and consequently increases pleasant sensations (West, 2009). Similarly to nicotine, the runner's high is reached when endorphins are secreted in the body to augment satisfaction and pleasure.

Exercise can aid in reducing withdrawal symptoms like anxiety and depression. This is because endorphins are released when a person practices sports which act as antidepressants (Abdessemed, 2009). Since smoking serves to increase concentration, Abdessemed (2009) proposes to use distractions like walks, sports and other similar activities to divert one’s attention from the craving that they have for cigarettes and to enhance concentration. Furthermore, he also suggests playing sports as this will be a reward to feeling the effects of cleaner lungs and the joy of not being addicted to cigarettes. In

addiction, it's stated that creativity will draw a smoker's attention away from cravings as well as help reduce their addiction as "The more [one] gets in touch with [their self], their deepest [them], the more the vicious cycle of addiction will undo itself" (Abdessemed, 2009).

According to West (2009), smokers believe that cigarettes are in control of their levels of stress, weight and concentration. In the same manner, sports have been deemed to reduce and maintain both healthy weight levels and stress as well as increase concentration and mimic the same physiological effects as nicotine. Understanding the physiological functioning of both nicotine and exercise results in the ability to substitute one for the other to seek positive behavioural changes. Techniques and skills, such as creative paths (e.g., arts & crafts and physical activity) to help control, escape, avoid and cope with the urges that tobacco gives an individual are crucial to develop when one is trying to cease cigarettes (West, 2009). Moreover, research has shown that when an adolescent participated in organized sports, they were 25% less likely to smoke cigarettes during that time (Castrucci *et al.,* 2004). Congruently, a study done on the smoking habits of 1003 Greek athletes from thirty sports concluded that only 10.4% of the sample smoked and that exercise is an important moderator of cigarette consumption in students as it demonstrates significant lower prevalence rates (Spanoudaki *et al.,* 2005).

According to a systematic review, exercise enhances a smoker's desire to quit by reducing their cravings. Stemming from these studies, findings have shown that cravings, withdrawal symptoms and negative affects associated with nicotine consumption decrease for as long as fifty minutes (as shown by seven studies) and as little as ten minutes after the workout. Furthermore, four studies (from this review) concluded that physical activity can double and even triple the time between cravings (Taylor *et al.,* 2007). Therefore, through such research, it is possible to extrapolate that regular exercise can help a smoker reduce and eventually cease smoking.

It is essential to understand the interaction between physical activity and smoking cessation as Peretti-Watel *et al.* (2002) had found. They investigated data from the French European School Survey

on Alcohol and other Drugs (ESPAD) looking at over 12 000 individuals aged 13 to 25 and concluded that there exists a U-shaped curve. Among male heavy smokers, there is an optimal zone required in order to lower nicotine intake; little to no physical activity and excessive exercise both result in hightened consumption. In heavy smoking females, there is also a turning point; more exercise results in an increase in cigarette consumption. Only in regular smokers, for both gender, is there a negative correlation, as illustrated in Figure B3 (in appendix B) (Peretti-Watel *et al.,*2002).

More research concluded that exercise is not always beneficial for smokers. According to the 2003 Health Survey for England, heavy drinking and heavy smoking was linked to physical activity in an 16 years or more English population (Mattila *et al.,*2012). Coherently, in 2008, a Danish study resulted in a negative correlation between exercise and smoking, but where the association was no longer valid when the covariates were taken into account (Mattila *et al.,*2012).

Physical activity and behavioural control beliefs

Exercise has been researched to help individuals change their behavioural control beliefs from external attitudes towards internal attitudes. According to a study done in 1975 with 74 boys and 35 girls who enrolled in the Emory University Sports Fitness Camp, the campers scored significantly different on the pre and post camp questionnaires after attending the eight-week fitness program (Duke & Nowicki, 1977). That is to say that the kids benefited from physical activity as they became more aware that their behaviours were not due to luck or to other outside factors but rather they are due to their own actions.

Purpose and need for the study

There are studies which have been done that do not conclude in parallele findings. That is to say that studies have shown that when taking part in physical activity, the likelihood of smoking are decreased but others contradict these results. There is some uncertainty in the proper amount of exercise needed as smoking habit is, to a certain extent, positively correlated to exercise habits. Also, there is little information on the effect that the type of exercise which a smoker chooses has on cigarette

habits. Therefore, the aim of this study is to investigate the effect that a fitness plan has on smokers' behavioural control beliefs which will affect their tobacco habits and their general active lifestyle. The main purpose of this study is to help smokers reduce their daily intake of nicotine through the use of psychological skills such as goal setting, rewards, self-talk and through the practice of a physical activity. In doing so, it is expected that the participants will increase their confidence (self-efficacy) and internality by seeing that they have the skills and resources available to change their habits. Also, many research have studied the relationship between addiction and behavioural control beliefs, the effects of goal setting on the reduction of cigarette consumption and the effect of substitutions and exercise separately but little have looked at the combination of these variables. That is to say that there exists a gap in the literature when it comes to specific elements that a fitness plan requires when trying to increase quitting attempts in smokers and this study looks to create a bridge within the literature to expand the knowledge on the benefits of physical activity in regard to cigarette addiction.

Variables

The variables which will be studied are the participants' number of consumed cigarettes (pre and post quantities), behavioural control beliefs (i.e. internality and externality) and exercise (i.e. frequency, habits and type). Exercise type will be an independent variable in this study to investigate the effect of various physical activities on cigarette consumption and behavioural control beliefs. Similarly, the frequency of exercise will serve as an independent variable to study its impact on the dependent variables. Also, self-efficacy is a discrete variable in this research as before and after confidence levels will be measured.

Hypotheses

The first hypothesis consists of observing a decrease in tobacco consumption per participants through the use of a proper active lifestyle. This will be tested by comparing self-reported quantity of consumed cigarettes at the beginning of the 14 days as well as at the end of it.

The second hypothesis states that two weeks of physical activity will increase participants' internal behavioural control beliefs because they will be made aware of the skills they possess as well as the resources they have to achieve and follow the goals they have set for themselves prior to exercising. Due to the fact that the perception of adequate skills and resources represents confidence and self-efficacy, this hypothesis also entails that an increase in self-efficacy is a result of an increase in perceived behavioural control.

The third hypothesis states that more smokers will become regular exercisers after adhering to two weeks of physical activity. This will be tested by questionning the individuals about their exercise habits (i.e. by asking if they exercise regularly before and after).

The fourth hypothesis states that, after exercising over the period of 14 days, internally-focused smokers will cease smoking at a greater rate than their counterparts. In order to test this, the percentage of before and after variance in cigarettes for both internal and external smokers will be compared.

Moreover, the type as well as the frequency of exercise is hypothesized to have an impact on the sample's cigarette consumption as well as their behavioural control beliefs. This will be tested by grouping the smokers into a low and high frequency group to compare them to both vairables. Similarly, the type of exercises in which the smokers take part will be analyzed in regard of their impact on both variables (i.e. nicotine intake and percieved behavioural control).

Finally, the last hypothesis argues that there will be a gender variance in behavioural control beliefs, exercise habits and smoking habits.

Methodology

Participants

An individual who had agreed to participate in the study was asked to reach out to more possible candidates. After receiving positive answers from the pool of available smokers, the participants received the questionnaire package through the use of emails. They then printed and properly completed the task before handing their data back to the intermediate individual. Once all the

paperwork was gathered, it was handed back to me. A preliminary verification of the dataset was conducted in order to ensure that there were no outliers. In doing so, it resulted in seeing that two files were not compatible with the study's criterias which led to their rejection because one participant was not a smoker and the other participant forgot to fill out the the post intervention program lifestyle assessment (i.e. first section of part B). Also, a third individual's information was rejected because they did not submit their package in time. Therefore, the individuals who took part in this study were smokers who were willing to exercise constantly over a two-week period in hopes to reduce the amount of cigarettes that they consume. The participants were adults whose ages ranged from 20 to 85 for a total of 26 individuals (N = 26, M= 34.5, SD = 12.500), where 13 were males and the other half were females. The individuals were healthy adults from Montreal, Canada and had to understand English as the questionnaires were not translated to French.

Procedure

The participants were briefed on the purpose of the study and were allowed to refuse to continue at any time as they were aware of the implications of participating. The Locus of Control of Behaviour scale (Craig e*t al.*, 1984) as well as the Health Locus of Control scale (Wallston *et al.,* 1976) were filled out by the participants in order to understand if they felt in control of their behaviours or if the sources are external. Furthermore, they were asked to complete a lifestyle assessment relating to their goals to reduce their cigarette consumption. This allowed to gain insight on the sample's perception of their addiction and thus show the impact of the fitness plan. The participants were instructed to work on setting goals regarding their fitness plan. That is to say that they had to create their own physical activity plan and use the goal setting sport psychological technique to help them focus on achieving their target.

Once this process was done, then the exercise plan began and lasted two weeks. At the end of the program, the Locus of Control of Behaviour scale and the Health Locus of Control scale were given

in addition to some follow up questions. The two sets of data, prior to the fitness plan and after, were compared to see the effect that physical activity had on cigarette addiction.

Data collection. A quantitative approach was used to investigate the purpose of this study because the aim of the experiment was numerically-oriented. In other words, the participants' target was to decrease their cigarette consumption. In doing so, it two separate times were measured through the use of quantative questionnaires.

The questionnaire package needed for this study was prepared before reaching out to the participants. This short document was comprised of three components; instructions, part A and part B. A full page of clear and concise instructions were written and attached to the questionnaire package. This helped the contributors to understand the purpose and the procedure of the experiment.

Part A and part B of the file both had lifestyle assessment and questionnaires. Part A was to be completed before beginning exercising for two weeks, as this was used as baseline and part B was asked to be completed after the physical activity period. Each part demanded ten to fifteen minutes of the participants' time to complete. The files, once gotten back, were numbered to facilitate the transcription of the data into the data analysis software (i.e. SPSS).

Every element in the given file reinforced the aim of the study which was to investigate the effect of physical activity on cigarette addiction, exercise habits and behavioural control beliefs. Consequently, the quantitative information gathered through this document helped investigate the relationship of the variables.

Data analysis. In order to examine the hypotheses of this study, a Paired sample T-Test was used. This allowed the investigation and comparison of the means of various variables which provided insight on the effectiveness of exercising regularly for two weeks. This statistical test was chosen because of the study's layout. The same sample was tested a two different times; the first assessment was conducted before starting two weeks of physical activity and the second assessment was done after the 14 days period. Also, since the purpose of the experiment was to explore the effect of exercise on a

few variables, it was necessary to use the Paired-samples T-Test. The beforehand dataset was used as baseline and the post period dataset served as comparison.

Moreover, an Independent Samples T-Test was used because the possible existance of group variances needed to be looked into. To create internal smokers and external smokers groups, the scores for both the HLC scale and the LCB scale were divided into high and low. That is to say that HLC scores ranging from 11 to 38,49 were labeled internal and scores ranging from 38,5 to 66 were labeled external. Similarly, the LCB scores were grouped as follow; the internal label ranged from 0 to 42,49 and the external label represented scores from 42,5 to 85. Furthermore, the frequency at which the participants exercised was also categorized resulting into 2 groups; high and low. Smokers who exercised 0 to 3 times per week were part of the low group and those who exercised 4 to 7 times per week were put in the high group.

A third statistical test was used in order to compare and investigate the interaction of variables. The One-Way ANOVA was chosen to understand how the type of exercise impacts both final cigarette consumption and behavioural control beliefs. To do so, the physical activities that the participants chose were categorized into 3 groups; 1-cardio (i.e. swimming, ice hockey, running and biking), 2-low impact (i.e. yoga, waling, doing nothing and pilates) and 3-muscle gain (i.e. weight lifting, crossfit, gym and home exercises).

Instruments

Health Locus of Control Scale (HLC scale). This "Is an area-specific measure of the expectancies regarding locus of control developed for prediction of health-related behaviour" (Wallston *et al.,* 1976). It consists of 11 items which are measured on a 6-point Likert scale going from strongly disagree (1) to strongly agree (6), as seen in Appendix A. Items 1, 2, 8, 10 and 11 are linked to internal factors whereas the other six items are said to be external. The internally directed items are reversed scored when calculating the total ranging from 11 to 66. Thus, a high total score results in an external

person, an individual who believes that their behaviours and fate are not in their control (Wallston e*t al.,* 1976).

Locus of Control of Behaviours Scale (LCB scale). This "Measures the extent to which subjects perceive responsibility for their personal problem behaviour" (Craig *et al.,* 1984). It has 17 items which are rated on a 6-point Likert scale ranging from strongly disagree (0) to strongly agree (5), as seen in Appendix A. Low scores on this scale indicate that the individual believes that they are in control of their behaviours and of their outcome (scores range from 0 to 85). From the 17 statements, ten represent external factors and the remaining seven (1, 5, 7, 8, 13, 15, 16) are related to internal factors. In order to tally the scores, the internal statements need to be reversed scored then the sum is taken to see if the participant is internal or external (Craig et al., 1984).

Lifestyle assessment. A few background questions such as age, gender and nationality needed to be answered by the participants. This will allow to further investigate differences in age groups, difference that may exist between genders as well as any cultural influences if needed. A set of questions was used to be able to have a baseline to compare to the data collected after the fitness plan. Such questions relate to the number of cigarettes currently consumed, their target number and what they have achieved after the plan. Furthermore, some questions were used to guide the participants to set their physical activity program. Examples of these are how many times per week will they exercise, how long will each session last and what will they choose to use substitute their cigarettes (the questionnaire package can be seen in Appendix A). Also, goal setting was used to help the participants adhere to their intention to decrease their cigarette consumption (i.e. the exercise of choice, time of day of session, weekly frequency, the length of the sessions, a replacement to cigarettes, a motivative word or reward and target number of tobacco for the end of the fitness plan). Such strategies were used because "Persuasion may include not only verbal expressions of confidence but also giving people information regarding what task strategies to use" (Locke, 1996) as these increase self-efficacy.

Results

Quantity of cigarettes

The Paired Samples T-Test showed that the intervention program resulted in a statistically significant difference when looking at the prior and post number of consumed cigarettes, $t(25) = 8.142$, $p < 0.001$. Before the participants exercised over the period of 14 days, they averaged 8.904 (SD = 6.6182) cigarettes per day. Once the two weeks were completed, the average number of consumed cigarettes dropped to 4.077 (SD = 5.6898).

Confidence (self-efficacy) and behavioural control beliefs

Before the exercise period, participants were asked to rate how confident they were in achieving their objective and how confident they were in continuing with their fitness plan after the study was completed. The results showed no statistical significance between the scores, $t(25) = 0.000$, $p = 1$. This was because both times averaged a score of 8.27.

Similarly, the Paired Samples T-Test showed no statistical significance between the baseline behavioural control beliefs and the final behavioural control beliefs. More specifically, the HLC scores were not significant, $t(25) = 1.549$, $p = 0.134$ (where pre scores had $M = 35.85$, $SD = 6.540$ and post scores were $M = 34.38$, $SD = 7.072$). In the same manner, the LCB scores showed non statistical significance, $t(25) = 1.737$, $p = 0.095$ (where the before fitness plan scores averaged 37.35, SD = 15.456 and the post averages were 35.12, SD = 15.976).

More active smokers after 14 days

On the other hand, the Paired Samples T-Test showed that there was a statistical significant difference between how many individuals participated in regular physical activity before and after the fitness plan, $t(25) = 4.907$, $p < 0.001$. Smokers exercised more regularly after 14 days ($M = 1.096$, $SD = 0.2835$) than before adhering to their fitness plan ($M = 1.58$, $SD = 0.504$) (where a lower mean indicates more participation).

To illustrate the results of the Paired Samples T-Test mentioned above, Table 1 represents the outcome of the statistical test in regard to various timely-combined variables.

Table 1
Before and after fitness plan data comparisons

		Amount of smokers	Mean	Std. Deviation
Pair 1	Before consumed cigarettes	26	8,904	6,6182
	Final consumed cigarettes		4,077	5,6898
Pair 2	Before Confidence	26	8,27	1,185
	After Confidence		8,27	1,402
Pair 3	Before HLC scores	26	35,85	6,540
	After HLCscores		34,38	7,072
Pair 4	Before LCB scores	26	37,35	15,456
	After LCB scores		35,12	15,976
Pair 5	Before active smokers	26	1,58	0,504
	After active smokers		1,096	0,2835

		Mean	Std. Deviation	t	ddl	Sig. (2-tailed)
Pair 1	Before consumed cigarettes – Final consumed cigarettes	4,8269	3,0231	8,142	25	,000
Pair 2	Before Confidence – After Confidence	,000	1,265	,000	25	1,000
Pair 3	Before HLC scores – After HLCscores	1,462	4,810	1,549	25	,134
Pair 4	Before LCB scores - After LCB scores	2,231	6,550	1,737	25	,095
Pair 5	Before active smokers – After active smokers	,4808	,4996	4,907	25	,000

Pre HLC scores and cigarettes

The Independent Samples T-Test showed no significance for the before HLC scores in regard to the start daily amount of cigarettes smoked. Table 4 demonstrates that volunteers categorized as internally-oriented averaged higher cigarette consumption prior to the program (M = 9.400, SD = 7.2486) whereas smokers characterized as externally-oriented smoked on average less cigarettes (M = 8.227, SD = 5.9218) with t(24) = 0.439, p = 0.665.

Table 4
Differences in cigarettes smoked before 14 days of PA among internal-external smokers (bHLC scale)

	Behavioural control beliefs	Amount of smokers	Mean	Std. Deviation
Daily consumed cigarettes	internal	15	9,400	7,2486
	external	11	8,227	5,9218

	F	Sig.	t	ddl	Sig. (2 tailed)
Daily consumed cigarettes	,249	,623	,439	24	,665

Post HLC scores and cigarettes

The Independent Samples T-Test showed no significant differences in behavioural control beliefs in regard to final consumed cigarettes, t(24) = 0.829, p = 0.416. As represented in Table 5, smokers who scored low on the HLC scale after the two weeks smoked more tobacco (M = 4.813, SD = 5.5132) than their externally-oriented counterparts (M = 2.900, SD = 6.0636).

Table 5

Differences in cigarettes smoked after 14 days of PA among internal-external smokers (pHLC scale)

	Behavioural control belief	Amount of smokers	Mean	Std. Deviation
Final amount of consumed cigarettes	internal	16	4,813	5,5132
	external	10	2,900	6,0636

	F	Sig.	t	ddl	Sig. (2 tailed)
Final amount of consumed cigarettes	,138	,714	,829	24	,416

Although the means of the data presented reflected that the participants who were grouped as internally-focused smoked more cigarettes at both periods, the variance between the averages for each group showed that having internal behavioural control beliefs showed to be more effective in reducing nicotine intake compared to external behavioural control beliefs. The baseline results, when compared to the results from after the fitness plan, presented internal smokers as more capable at decreasing their habit as they saw a 51.39% drop in consumption versus a 35.25% reduction for externally-based participants.

Pre LCB scores and cigarettes

On the other hand, Table 6 shows that the Independent T-Test of the before LCB scores (internals vs externals) were statistically significant, $t(24) = 2.714$, $p = 0.015$ in regard to their daily nicotine intake. It states that internally-focused participants had more cigarettes ($M = 12.417$, $SD = 7.4524$) than externally-focused participants ($M = 5.893$, $SD = 4.0105$).

Table 6

Differences in cigarettes smoked before 14 days PA among internal-external smokers(bLCB scale)

	Behavioural control beliefs	Amount of smokers	Mean	Std. Deviation
Daily consumed cigarettes	internal	12	12,417	7,4524
	external	14	5,893	4,0105

	F	Sig.	t	ddl	Sig. (2 tailed)
Daily consumed cigarettes	4,698	,040	2,837	24	,009
			2,714		,015

Post LCB scores and cigarettes

Similarly, post LCB scores (internals vs externals) concluded in statistical significant difference in the number of final consumed cigarettes, $t(24) = 2.906$, $p = 0.013$, as shown in Table 7. From these results, low scores on the post LCB scale reflected a higher cigarette consumption after fourteen days of exercise ($M = 6.923$, $SD = 6.9906$) whereas high scores had fewer cigarettes ($M = 1.1231$, $SD = 1.0127$).

Table 7
Differences in cigarettes smoked after 14 days PA among internal-external smokers (pLCB scale)

	Behavioural control beliefs	Amount of smokers	Mean	Std. Deviation
Final consumed cigarettes	internal	13	6,923	6,9906
	external	13	1,231	1,0127

	F	Sig.	t	ddl	Sig. (2 tailed)
Final consumed cigarettes	15,359	,001	2,906	24	,008
			2,906		,013

Although the means of the data presented in the previous two tables show that externally-oriented smokers consumed less cigarettes before and after the fitness plan, the variance between the averages for each group showed that internal believers were more effective in reducing their nicotine intake compared to external believers. From the baseline scores compared to the post fitness plan scores, internal smokers saw a decrease of 55.75% in cigarette consumption whereas their externally-

oriented counterparts had a 20.89% drop. In addition, results showed that the number of internal and external smokers had changed. At the start of the study, there were more externally-oriented participants (N = 14 and N = 12 internal smokers) whereas the end results showed that the groups were equal.

Exercise frequency and behavioural control beliefs, cigarettes and confidence

The quantity of exercise per week of the sample was linked to only the post program variable (i.e. after HLC scores, after LCB scores and final cigarettes consumption) because the study was looking to change baseline scores with the use of this. Therefore, to analyze the effect that the regularity of physical activity had on the participants' behavioural control beliefs, smoking habits and confidence, an Independent-Samples T-Test was done and represented in Table 8.

This statistical test showed no significant differences in post HLC behavioural control beliefs, $t(24) = 0.165$, $p = 0.870$. The results showed that the participants who were exercising three or less times per week scored higher on the post HLC scale ($M = 34.53$, $SD = 6.963$) whereas avid exercisers showed an internal belief tendency ($M = 34.00$, $SD = 7.916$). Similarly, there was no significant differences in LCB behavioural control beliefs, $t(24) = 0.540$, $p = 0.594$, where smokers who did not take part in frequent physical activity (i.e. 0-3 times per week) exhibited higher beliefs in external control factors ($M = 36.16$, $SD = 16.331$) compared to active participants ($M = 32.29$, $SD = 15.829$).

As for the number of cigarettes the sample consumed by the end of the fitness plan, there was no significant differences, $t(24) = -0.986$, $p = 0.358$. Smokers training for less than half of the days of the week displayed better self-control by averaging $M = 3.132$ ($SD = 3.6812$) cigarettes per day rather than an average of $M = 6.643$ ($SD = 9.1502$) for enthusiastic exercisers.

Finally, the test showed no significant differences in confidence, $t(24) = -0.346$, $p = 0.733$. Smokers who exercised 4 to 7 times per week averaged 8.43 ($SD = 1.813$) whereas the individuals who exercised less than 3 times per week had an average confidence level of 8.21 ($SD = 1.813$).

Table 8

The effect of 14 days of exercise on behavioural control beliefs, smoking habits and confidence

	Frequency (per week)	Amount of smokers per group	Mean	Std. Deviation
After HLC scores	0-3 times	19	34,53	6,963
	4-7 times	7	34,00	7,916
After LCB scores	0-3 times	19	36,16	16,331
	4-7 times	7	32,29	15,829
Final consumed cigarettes	0-3 times	19	3,132	3,6812
	4-7 times	7	6,643	9,1502
After confidence	0-3 times	19	8,21	1,273
	4-7 times	7	8,43	1,813

	F	Sig.	t	ddl	Sig. (2 tailed)
After HLC scores	,280	,601	,165	24	,870
After LCB scores	,739	,398	,540	24	,594
Final consumed cigarettes	14,735	,001	-1,424	24	,167
			-,986		,358
After confidence levels	,671	,421	-,346	24	,733

Exercise type on smoking habits and behavioural control beliefs

The One-Way ANOVA test showed no significant differences in final cigarettes consumption between types of exercise with F(2, 23) = 0,387, p = 0,683. Similarly, it resulted in no significant differences in post LCB scale scores between type of exercise with F(2, 23) = 2,762, p = 0,084. On the other hand, the One-Way ANOVA test showed significant differences in post HLC scale scores between exercise types with F(2, 23) = 4,121, p = 0,030. The post hoc Bonferroni test showed that types 2 (i.e. low impact) and 3 (i.e. muscle gain) as well as 1 (i.e. cardio) and 2 (i.e. low impact) did not have significant differences, whereas type of exercise 1 (i.e. cardio) had siginificant differences between type of exercise 3 (i.e. muscle gain), as can be seen in Table 10.

Table 10

Analysis of Variance: Exercise type, behavioural control beliefs and cigarette consumption

	Exercise type	Amount of smokers	Mean	Std. Deviation	F	Sig.	Bonferroni's post hoc test		
							1	2	3
Final cigarette consumption	1-Cardio	8	3,250	6,7981	0,387	0,683	-	-	1
	2-Low impact	8	3,313	4,8325			1	-	-
	3-Muscle gain	10	5,350	5,7351			-	1	-
Post LCB scores	1-Cardio	8	44,38	12,928	2,762	0,084	-	-	0,083
	2-Low impact	8	35,13	15,375			0,686	-	-
	3-Muscle gain	10	27,70	16,056			-	0,918	-
Post HLC scores	1-Cardio	8	39,38	3,462	4,121	0,030	-	-	0,027
	2-Low impact	8	33,88	8,254			0,286	-	-
	3-Muscle gain	10	30,80	6,321			-	0,948	-

Gender and cigarette habits

An Independent-Samples T-Test did not show any significant differences between genders for baseline cigarette consumption, $t(24) = 0.481$, $p = 0.635$. Here, the results showed that females smoked more $M = 9.538$ ($SD = 6.6754$) on a daily basis than their male counterparts $M = 8.269$ ($SD = 6.7688$). Similarly, the baseline data showed no significant differences in quitting attemps, $t(24) = 0.238$, $p = 0.814$ (where females had $M = 1.77$, $SD = 1.739$ and males had $M = 1.62$, $SD = 1.557$). Likewise, there was no significant differences in the final amount of cigarette consumption, $t(24) = 0.305$, $p = 0.763$ (where males had $M = 3.731$, $SD = 5.4030$ and females had $M = 4.423$, $SD = 6.1639$) for females.

Gender and behavioural control beliefs

In the same manner, an Independent-Samples T-test was performed to investigate the gender differences that may exist regarding behavioural control beliefs. The analysis showed no statistical significant differences in the baseline HLC scores, t(24) = 0.592, p = 0.559 (where males had lower scores with M = 35.08, SD = 7.017 and females had M = 36.62, SD = 6.212), and LCB scores, t(24) = 0.742, p = 0.465 (where males had lower scores with M = 35.08, SD = 16.044 and females had M = 39.62, SD = 15.136). Likewise, the results showed no significant differences in post behavioural control beliefs; HLC scores had t(24) = 0.547, p = 0.590 (where males had more internal scores with M = 33.62, SD = 6.850 and females had external tendencies with M = 35.15, SD = 7.482) and LCB scores had t(24) = 0.569, p = 0.575 (where males had lower scores with M = 33.31, SD = 16.260 and females had higher scores with M = 36.92, SD = 16.132). The above information can be seen in Table 11.

Table 11
Independent T-Test: gender differences among cigarette consumption and behavioural control beliefs

	Gender	Mean	Std. Deviation	t	ddl	Sig.
Before daily cigarette consumption	Males	8,269	6,7688	0,481	24	0,635
	Females	9,538	6,6754			
Quitting attempts	Males	1,62	1,557	0,238	24	0,814
	Females	1,77	1,739			
Final cigarette consumption	Males	3,731	5,4030	0,305	24	0,763
	Females	4,423	6,1639			
Baseline HLC scores	Males	35,08	7,017	0,592	24	0,559
	Females	36,62	6,212			
Baseline LCB scores	Males	35,08	16,044	0,742	24	0,465
	Females	39,62	15,136			
Post HLC	Males	33,62	6,850	0,547	24	0,590

scores	Females	35,15	7,482			
Post LCB scores	Males	33,31	16,260	0,569	24	0,575
	Females	36,92	16,132			

Discussion

Overview

The purpose of this study was to help smokers decrease their daily nicotine intake along with helping them shift their behavioural control beliefs towards internal tendencies and to increase their general exercise habits through the use of a personalized fitness plan. With this, six hypotheses were formulated.

The first hypothesis stated that the 14 days fitness plan would significantly decrease the smokers' cigarette cumsption. After analyzing the data, results showed that two weeks of physical activity was sufficient in helping the participants lower their daily intake of tobacco.

The second hypothesis was not confirmed as the results were not significant. It stated that behavioural control beliefs would change from external tendencies to internal tendencies. A variance was observed in beliefs but the difference was not large enough to lead to a conclusive hypothesis. Furthermore, it declared that confidence in the ability to pursue with the fitness plan and cease smoking would increase as a result of an increase in behavioural control beliefs. From the statistical tests, this branch of the hypothesis cannot be confirmed as the data showed no significant differences.

The third hypothesis looked into the positive effect of a two-week fitness plan on smokers' general active lifestyle. From the results, the sample's percentage of participation in physical activities increased in comparison to the percentage of active smokers before the start of the fitness plan. Consequently, this hypothesis was confirmed.

The fourth hypothesis argued that an internal state of mind would be more effective in helping smokers decrease their cigarette consumption. The tests showed that there were significant differences between internal and external smokers (on the post LCB scale in regard to the final number of tobacco)

but the rate at which they lowered their tobacco intake was not significant. Thus, the hypothesis was not confirmed.

Moreover, the frequency as well as the type of exercise were hypothesized to have an impact on the sample's cigarette consumption as well as their behavioural control beliefs. The frequency showed no significant effect on the tested variables resulting in a rejection of that part of the hypothesis. In addition, the type of exercise in which the particpants adhered to showed to significantly affect the HLC scores but not the LCB scores nor the final number of cigarettes consumed. With this being said, the type of exercise partially impacted the variables resulting in a confirmation of the second part of the hypothesis.

Finally, the last hypothesis said that the males and females of the sample would differ in both smoking habits and in behavioural control beliefs. After analyzing the data, results showed that the differences were not significant thus not confirming the final hypothesis.

Discussion of the results

Cigarette consumption is personal to every smoker as it depends on various motivators such as their behavioural control beliefs which leads to intention and behaviour. As Garcia, Schmitz and Doerfler (1990) have discussed, anterior behaviours along with self-efficacy were strong predictors of the ulterior outcomes of smokers trying to quit on their own. Therefore, if they had higher self-efficacy then their addiction had less chances of continuing (Godin *et al.,* 1992). An example of previous behaviours is if the smoker has attempted to quit or if they have steered away from it. For this sample, the least amount of tries that the participants had of ceasing their habit was 0 and the most attempts was 6 times and their consumption ranged from 2 to 25 cigarettes per day. A main reason behind the anticipation of this fitness plan by the volunteers was that they were looking to challenge themselves to battle their addiction. Consequently, the enthusiastic smokers aimed to reach 0 cigarettes by the end of the exercise period whereas those who were heavier smokers targeted 15 cigarettes per day. Although

not everyone achieved their set goals, all the participants managed to decrease their daily consumptions (ranging between 0 and 20 per day) after the physical activity plan.

The 14 days fitness plan showed that it is possible to influence a smoker's behavioural control beliefs. Although the results from this study are not conclusive, it was observed that both scales saw a decrease in averages after the two weeks. That is to say that the participants got lower scores on the questionnaires, post fitness plan, compared to their initial scores. Consequently, this illustrates the positive effect which an active lifestyle can have on attitudes towards cigarette addiction. Internality is the result of the perception of one's control over their actions. Thus, creating a personalized fitness plan which is tailored to the smokers' capacities increases the belief and the awareness that they are able to follow guidelines to achieve personal goals. By doing so, they are able to expand their confidence into other domains of their lives and pair it with other aspects they would like to change, such as limiting their tobacco intake.

DiClemente (1986) observed that there is a negative correlation between confidence and smoking. He stated that as confidence concerning their ability to cease cigarettes increases, their temptations to smoke will decrease (Godin *et al.,* 1992). The results from this study showed no significant differences in before and after confidence levels but a shift was observed. Before the fitness plan, the participants' confidence average was the same as what they averaged after the plan. What had changed was the frequency of the scores (as can be seen in Figure B4 in appendix B). That is to say that, although the means remained equal, the bell-shaped curve shifted towards the right. Consequently, if a smoker's general confidence can be increased, then their chances of quitting their habit improves as well.

Prior to the fitness plan, 57.7% (N = 15 out of 26) of the participants had noted that they did not exercise on a regular basis. Once the two weeks were completed, only 2 individuals did not practice physical activity regularly during the 14 days period. As a result, the overall active habits of the sample increased to 92.3% as shown in Figure B5.1 and Figure B5.2 (in appendix B). Having written down

exercise guidelines helped the smokers adhere to physical activity for a given amount of time. Therefore, this study showed the participants that they are able to modify their behaviours in regard to exercise simply by turning their thoughts into concrete actions. That is to say that most individuals have the intentions of doing a behaviour but do not follow through because they do not have the will to do so. Thus, based on the planned behaviour theory, increasing perceived behavourial control can lead directly to actions which this study intended to do.

It had been said that internal behavioural beliefs are more efficient in decreasing an unwanted behaviour but in this study, external smokers showed more self-control as they consumed less cigarettes than their internal counterparts. When comparing cessation rates, internality had a higher coefficient than externality for both HLC scales and LCB scales. Smokers deemed to have internal behavioural control believe that they control their actions. This statement can explain the reason why internals in this study both smoked more but also had a greater cessation rate. Due to the fact that they are fully aware of what they are doing and who is in control of it, the participants were able to modify their behaviours. To illustrate this, a few participants, who are internally-focused, had mentioned reasons as to why they prefer to smoke on a regular basis even though they are aware of the negative consequences. For one individual, they had stated that "[Smoking] is simply a bad habit that is hard to stop" and is also environmentally influenced. Another person shared that it became pleasurable; for example, traffic jams are a time and place where smoking a cigarette brings delightful feelings. Furthermore, a third participant specified that tobacco consumption is the solution to relieve their stress, as West (2009) had observed. They added that "It did not decrease the stress. It is probably just an excuse, simply. We try to find moral support and we throw ourselves on that." As an internally-oriented smoker, they were able to find the underlying meaning behind their habit as they said that "It is always false pretexts to justify our actions." From these statements, it is possible to observe that although there is a will to quit and internality levels are adequate, the impulse may be stronger and the pleasure that it brings requires justifications to diminish the stigma around smoking.

The results demonstrated that those who exercised for 4 or more times per week smoke, on average, more than their less active counterparts. This observation showed the same tendency as in female heavy smokers where exercising for more than 4 hours per week resulted in an increase in smoking. Similarly in heavy male smokers, they had an increase in cigarettes after at the same amount of weekly physical activity (Peretti-Wattel *et al.,* 2002). In addition, the type of exercise has shown to influence the participants' post HLC scores. Although it did not show significant differences in post LCB scores and final cigarette consumption, the type of exercise in which smokers take part in can potentially impact their behavioural control beliefs. In this study, the physical activity was categorized into three (cardio, low impact and muscle gain). The analysis of the data has showed that, for HLC scores, cardio had a significant differences between muscle gain exercises. In all cases, low impact exercises showed to have no significant differences with the two other types of activities. Research showed that the benefits of an active lifestyle have shown to reduce cravings and withdrawal symptoms up to 30 minutes after the workout ranging from low intensity to high intensity (i.e. 80-85% heart rate) (Roberts *et al.,* 2012). According to Roberts' (2012) study, exercise had positive results on negative affects but to a certain extent. That is to say that low and moderate intensity workouts were beneficial for smokers whereas vigorous exercise was detrimental. Consequently, it is important to find each smoker's optimal range of exercise frequency and the proper type depending on their smoking habits (i.e. daily smokers or heavy smokers).

According to the collected data, females, on average, smoked more and attempted to quit more often than their male counterparts before they took part in the fitness plan. Similar tendencies emerged from the post fitness plan data showing that females also ended up smoking more than males did after two weeks of physical activity. In addition to these variances, males had lower scores on both questionnaires before and after the 14 days of exercise which means that the males in this study had higher internal behavioural control beliefs than females did. Research demonstrated that women have shown more distress about the consequences of quitting smoking such as weight gain, explaining the

cessation success difference between genders (Sorensen *et al.,* 1987). On the other hand, results from the present study showed that even though males were generally more active, females found confidence in pursuing their goals once the fitness plan was over and they also believed that goal setting was more efficient than males did. Therefore, it is a possibility that a personalized fitness plan can aid female smokers in quitting tobacco as well as keeping a healthy weight through the use of sports and goal setting.

Limitations

The physical activity plan of this study was done over two weeks which may have not been long enough to extrapolate significant differences in the datasets but some results concluded to be important significant variances despite the few days that the smokers were involved in the session. A longer fitness plan would help gather valuable information as well as significant changes which could then be used to further expand the knowledg for the use of smoking cessation techniques.

Moreover, for the convenience of this study, the sample was taken in the immediate environment meaning that the sample size was taken from a pool of available participants. Thus, the quantity of volunteers was limited and a larger group would have been ideal to have. Having a small sample size restrains the results which can be gotten because there is not enough available data.

Another limitation of this study was that the participants were not monitored and the lifestyle assessments were self-reported. This can result in faulty recollection of events as it depends on memory. For example, the number of cigarettes smoked per day can be an estimate since counting and keeping track of the amount of consumed tobacco might not come naturally to smokers.

Future research

The findings of this study can be used to further expand the knowledge on smoking cessation programs and help incorporate more effective techniques into them. Using a complete fitness-based plan to guide smokers to quitting is an overall healthy choice to explore. Furthermore, in order to keep stressing the importance of physical activity in cessation programs, more studies can investigate the

effect of interventions where there is a control group and three experimental groups (i.e. control group: no intervention; experimental group1: physical activity and goal setting; experimental group2: traditional quitting aids like nicotine patches; experimental group3: e-cigarettes). The combination of exercise and psychological skills can perhaps be the solution to smokers' addiction by giving them a general healthier outlook on their habit as well as their lifestyle.

Moreover, 'Québec sans tabac', an initiative project from the 'Conseil Québécois sur le tabac et la santé' in Canada, reports that endorphins are naturally present in the brain and are released when individuals take part in physical activity. Nicotine, on the other hand, forces the brain to depend on it and to produce endorphins which leads to an artificial state of relaxation. Once this stage is achieved, the symptoms become physical and appear as a lack of concentration or depression for example. Thus, exercise reduces these symptoms and helps the brain find its natural state and levels of endorphins resulting in less cigarette cravings. This study has shown that cravings are decreased by exercise as the sample lowered their daily tobacco consumption. Research can take this information and investigate the prevalence of depression and anxiety, for example, when smokers take part in regular physical activity.

Implications

Pierre Pradervand, a sociologist, trainer and author, said "Only the attitude consisting of completely assuming your responsibility in all domains is an adult attitude which enables us to grow […] Being responsible is a choice that we can make" (Abdessemed, 2009). Consequently, a smoker needs to enhance their internal behavioural control beliefs in order to understand that the situations and environments are not responsible for their addiction but rather that they, themselves, are. By becoming more internally based, through physical activity for example (a plausible tendency as shown by this study), a smoker will then realize that their addiction can be handled with the use of distractions and creative pathways. The significant differences shown in a matter of 14 days on the LCB scale in regard to final tobacco consumption has demonstrated that it is possible to break a smoking habit by acknowledging who and what is in control of personal behaviour.

A comment that was added by a participant on their dataset made it clear that for smokers, it is important to think about their decision as to when the right moment is to quit because timing is key. This participant had written that "The timing is essential also, [as they] want to quit but there's an upcoming party where [they] know that [they] will be smoking". In accordance to this, a tip to quit smoking is to avoid situations that are deemed risky for smokers. That is to say that parties, reunions, stressful environments, etc. can increase an individual's desire to smoke (Abdessemed, 2009). Therefore, a person who is attempting to reduce or eliminate their cigarette consumption should do so at specific periods of the year or by avoiding certain situations. If not, then the attempt to quit may take a hit in the sense that, if following a program like the one from this study, they may not achieve their target goals. This would be because the event will increase their intake and they will need to restart and work harder to get back on track. Thus, the statements from this study open a new line to investigate, timing and adherence and see the ways in which the physical activity plan needs to be altered to help the smoker adhere to their goal during these situations.

The participants were informed of the purpose and the results that the study was aiming to get (i.e. reduction in tobacco use). Hence, it is a possibility that the results that were obtained and analyzed are the consequence of informed smokers. In other words, maybe it was due to a placebo effect. It had been presented that enabling the placebo effect to trick the senses in feeling the same way as the effects of nicotine was an effective method. Thus, this study can be taken to further investigate the impact which this technique can have on smokers quitting attempts and success rates.

Finally, the results of this study showed that both the type and frequency of the exercise in which smokers choose to take part in are important factors to consider when creating a fitness-based smoking cessation plan. Thus, the findings need to be investigated in order to further explore the elements which account for the uncertainty in the effectiveness of physical activity on smoking. It is essential to find exercise's optimal zone in terms of how long workout sessions should last and which intensity is suitable for each smoker.

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Appendix A

Instructions and Questionnaires Package

This study is anonymous; thus you will not provide your name at any time. Demographic and background questions related to the research topic to have a fuller understanding of the results. Please fill out the form sincerely as this will improve the quality of the data analysis.

The purpose of this study is to investigate the relationship between Locus of control (the belief that one has that they control their behaviour) and addiction in smokers through a sports program intervention. Therefore, when analyzed, the results will allow me to observe whether an individual's Locus of control can influence their addiction. The sports program aspect of the research is the variable which is used to influence the Locus of control.

The procedure for this study consists of answering basic questions and filling out 2 short questionnaires prior to the sports program intervention. These will serve as baseline data to be able to compare the effects that the sports program intervention had on the Locus of control and the addiction to cigarettes. Once completed, you will be asked to follow your physical activity program which is set by you and is done over a period of 2 weeks (14 days). The exercise that you choose to follow is based on the smart principles (specific, measurable, achievable, realistic and timely). After the two weeks, you will need to fill out the questionnaires and answer some basic questions.

To help you stick to your program and to increase your chances of success, write down your target in various visible places. This will serve as a constant reminder which will increase your focus and determination. The program needs to be created by you and tailored to your abilities. Thus, the exercise must respect your skills. That is to say that you choose what you wish to do over the course of two weeks (walking, running, going to the gym, playing a sport, swimming, biking, etc.). Also, the

amount of time spent doing such exercises depends on your preferences. Make sure you pick an exercise and frequency suitable for you in order to increase your commitment to the program. Complete pages 2,3,4,5 first then exercise for two weeks. Once done, complete pages 6, 7, 8, 9.

Part A: Prior to the start of the sports program intervention

Age:

Country:

Gender:

How many times have you tried to quit in the past?

What is your current number of consumed cigarettes per day?

What is your target number of smoked cigarettes per day after the intervention (achievable-measurable)?

Do you exercise on a regular basis? If so, please specify the frequency.

What is the physical activity that you choose to do for the sport program intervention (specific)?

How many days per week will you perform the physical activity (realistic)?

How long will the physical activity last per day (realistic)?

At what time will you do this physical activity (please specify the day and the time-this can be done during times when you crave cigarettes the most)?

When will your first day be (timely)?

When will your last day be (timely-14 days after the start date)?

What will you use to replace the cigarette during this period, if possible (i.e. Eat a lollipop, drink a glass of water, chew on a toothpick, etc.)?

Choose a word that you will tell yourself or a reward that you will give yourself to motivate you to exercise and to stay away from cigarettes:

On a scale from 1-10, how confident are you/ how much do you believe in yourself to achieve this goal?

Please complete the following (2) questionnaires truthfully as there are no right or wrong answers. The statements relate to your beliefs.

HEALTH LOCUS OF CONTROL (HLC) SCALE

Items	**Strongly Disagree**	**Generally Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Generally Agree**	**Strongly Agree**
1. If I take care of myself, I can avoid illness.	1	2	3	4	5	6
2. Whenever I get sick it is because of something I've done or not done.	1	2	3	4	5	6
3. Good health is largely a matter of good fortune.	1	2	3	4	5	6
4. No matter what I do, if I am going to get sick I will get. sick.	1	2	3	4	5	6
5. Most people do not realize the extent to which their illnesses are controlled by accidental happenings.	1	2	3	4	5	6
6. I can only do what my doctor tells me to do.	1	2	3	4	5	6
7. There are so many strange diseases around that you can never know how or when you might pick one up.	1	2	3	4	5	6
8. When I feel ill, I know it is because I have not been getting the proper exercise or eating right.	1	2	3	4	5	6
9. People who never get sick are just plain lucky.	1	2	3	4	5	6

10. People's ill health results from their own carelessness.	1	2	3	4	5	6
11. I am directly responsible for my health.	1	2	3	4	5	6

Wallston, B. S., Wallston, K. A., Kaplan, G. D., & Maides, S. A. (1976). Development and validation of the health locus of control (HLC) scale. *Journal of consulting and clinical psychology*, *44*(4), 580.

LOCUS OF CONTROL OF BEHAVIOUR (LCB) SCALE

Items	**Strongly Disagree**	**Generally Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Generally Agree**	**Strongly Agree**
1. I can anticipate difficulties and take action to avoid them.	0	1	2	3	4	5
2. A great deal of what happens to me is probably just a matter of chance.	0	1	2	3	4	5
3. Everyone knows that luck or chance determines one's future.	0	1	2	3	4	5
4. I can control my problem(s) only if I have outside support.	0	1	2	3	4	5
5. When I make plans, I am almost certain that I can make them work.	0	1	2	3	4	5
6. My problem(s) will dominate me all my life.	0	1	2	3	4	5
7. My mistakes and problems are my responsibility to deal with.	0	1	2	3	4	5
8. Becoming a success is a matter of hard work, luck has little or nothing to do with it.	0	1	2	3	4	5

9. My life is controlled by outside actions and events.	0	1	2	3	4	5
10. People are victims of circumstance beyond their control.	0	1	2	3	4	5
11. To continually manage my problems, I need professional help.	0	1	2	3	4	5
12. When I am under stress, the tightness in my muscles is due to things outside of my control.	0	1	2	3	4	5
13. I believe a person can really be the master of his fate.	0	1	2	3	4	5
14. It is impossible to control my irregular and fast breathing when I am having difficulties.	0	1	2	3	4	5
15. I understand why my problem(s) varies so much from one occasion to the next.	0	1	2	3	4	5
16. I am confident of being able to deal successfully with future problems.	0	1	2	3	4	5
17. In my case, maintaining control over my problem(s) is due mostly to luck	0	1	2	3	4	5

Craig, A. R., Franklin, J. A., & Andrews, G. (1984). A scale to measure locus of control of behaviour. *British Journal of Medical Psychology*, *57*(2), 173-180.

Part B: After the 2 weeks sports program intervention

What was your target number of smoked cigarettes per day for after the intervention?

What is your current number of consumed cigarettes per day after the intervention?

Did you follow your physical activity program?

On a scale of 1-10, how confident are you/ how much do you believe in yourself that you can keep doing this?

On a scale of 1-10, how successful is setting goals?

Please complete the following (2) questionnaires truthfully as there are no right or wrong answers. The statements relate to your beliefs.

HEALTH LOCUS OF CONTROL (HLC) SCALE

Items	**Strongly Disagree**	**Generally Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Generally Agree**	**Strongly Agree**
1. If I take care of myself, I can avoid illness.	1	2	3	4	5	6
2. Whenever I get sick it is because of something I've done or not done.	1	2	3	4	5	6
3. Good health is largely a matter of good fortune.	1	2	3	4	5	6
4. No matter what I do, if I am going to get sick, I will get. sick.	1	2	3	4	5	6
5. Most people do not realize the extent to which their illnesses are controlled by accidental happenings.	1	2	3	4	5	6
6. I can only do what my doctor tells me to do.	1	2	3	4	5	6
7. There are so many strange diseases around that you can never know how or when you might pick one up.	1	2	3	4	5	6

8. When I feel ill, I know it is because I have not been getting the proper exercise or eating right.	1	2	3	4	5	6
9. People who never get sick are just plain lucky.	1	2	3	4	5	6
10. People's ill health results from their own carelessness.	1	2	3	4	5	6
11. I am directly responsible for my health.	1	2	3	4	5	6

Wallston, B. S., Wallston, K. A., Kaplan, G. D., & Maides, S. A. (1976). Development and validation of the health locus of control (HLC) scale. *Journal of consulting and clinical psychology*, *44*(4), 580.

LOCUS OF CONTROL OF BEHAVIOUR (LCB) SCALE

Items	**Strongly Disagree**	**Generally Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Generally Agree**	**Strongly Agree**
1. I can anticipate difficulties and take action to avoid them.	0	1	2	3	4	5
2. A great deal of what happens to me is probably just a matter of chance.	0	1	2	3	4	5
3. Everyone knows that luck or chance determines one's future.	0	1	2	3	4	5
4. I can control my problem(s) only if I have outside support.	0	1	2	3	4	5
5. When I make plans, I am almost certain that I can make them work.	0	1	2	3	4	5
6. My problem(s) will dominate me all my life.	0	1	2	3	4	5

7. My mistakes and problems are my responsibility to deal with.	0	1	2	3	4	5
8. Becoming a success is a matter of hard work, luck has little or nothing to do with it.	0	1	2	3	4	5
9. My life is controlled by outside actions and events.	0	1	2	3	4	5
10. People are victims of circumstance beyond their control.	0	1	2	3	4	5
11. To continually manage my problems, I need professional help.	0	1	2	3	4	5
12. When I am under stress, the tightness in my muscles is due to things outside of my control.	0	1	2	3	4	5
13. I believe a person can really be the master of his fate.	0	1	2	3	4	5
14. It is impossible to control my irregular and fast breathing when I am having difficulties.	0	1	2	3	4	5
15. I understand why my problem(s) varies so much from one occasion to the next.	0	1	2	3	4	5
16. I am confident of being able to deal successfully with future problems.	0	1	2	3	4	5

17. In my case, maintaining control over my problem(s) is due mostly to luck	0	1	2	3	4	5

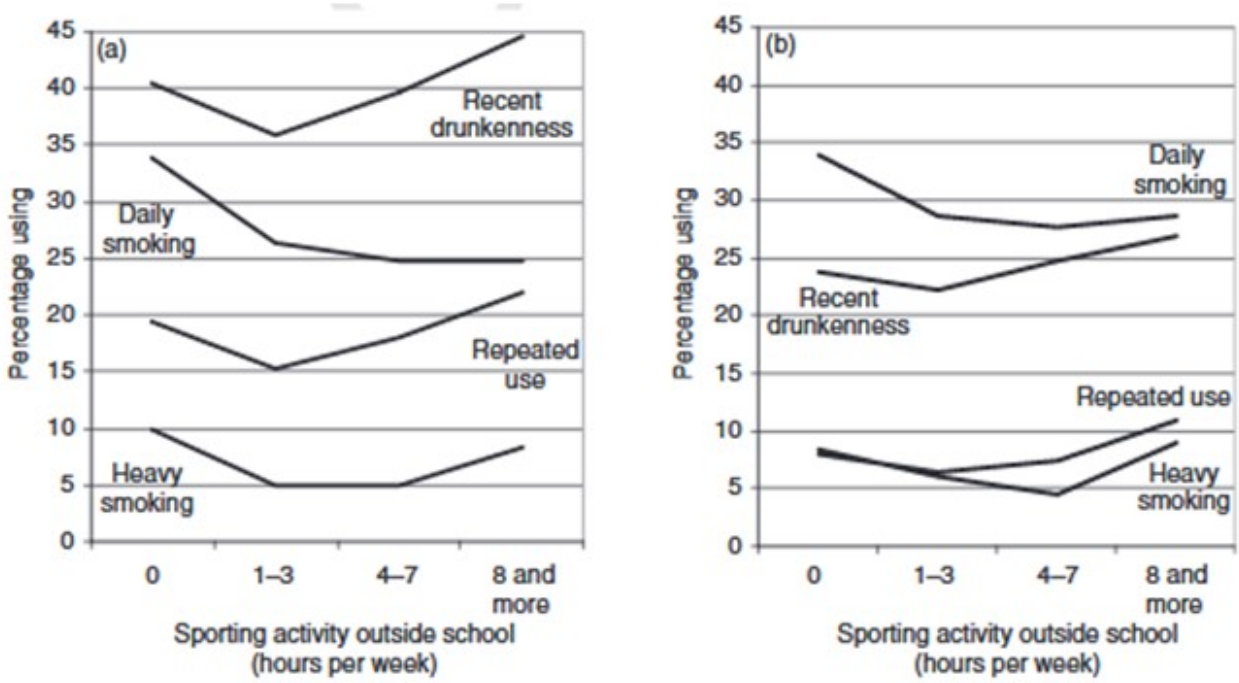
Craig, A. R., Franklin, J. A., & Andrews, G. (1984). A scale to measure locus of control of behaviour. *British Journal of Medical Psychology*, *57*(2), 173-180.

Thank you for your participation!

Appendix B

Supportive Statistical Figures

Figure B3
Relationship between cigarette consumption and PA frequency among boys (a) and girls (b)



Note. Peretti-Watel, P., Beck, F., & Legleye, S. (2002). Beyond the U-curve: the relationship between sport and alcohol, cigarette and cannabis use in adolescents. *Addiction*, *97*(6), 707-716.

Figure B4

Shift in confidence tendencies from pre and post intervention data

Note. The x-axis represents the level of confidence of the participants ona scale from 1 to 10. The y-axis illustrates the frequency for each score.

Figure B5.1

Smokers who practiced regular PA before the fitness plan

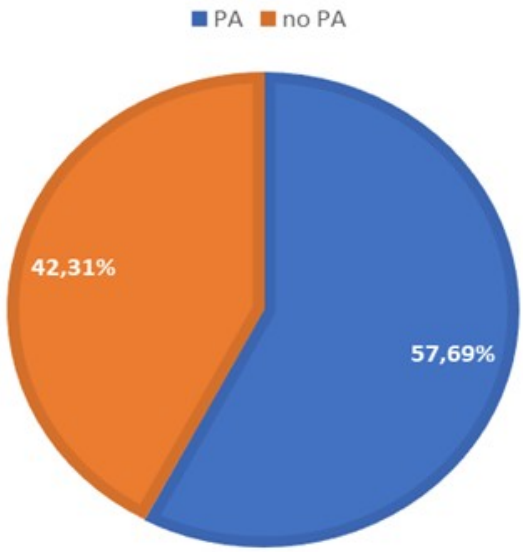


Figure B5.2
Smokers who practiced regular PA after the fitness plan