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Lowering the Risk of Nicotine Dependence in Cannabis Users:

An approach to assess Determinants of Cannabis Users Willingness

to use nicotine free Tobacco

Bachelorthese

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Summary

In the past a lot of research has been done on the co-use of tobacco (TB) and marijuana (MJ). Most MJ users smoke their cannabis with TB and recent literature suggest that the highest risk of dual use may be an increased risk of becoming nicotine dependent. Within our present two studies we wanted to find out whether a nicotine free TB could be a possible alternative for MJ users. In 2013 a new nicotine free TB called 'Gold Magic' (GM) entered the market in Luxemburg and in the Netherlands. Within the second part of our study we gave a sample of this brand to 13 people who tested it. Before that we conducted an online survey and found 37 respondents (n=37) who filled in our questionnaire. The aim of the first study was to examine determinants that constitute respondents willingness to test nicotine free TB. We adopted determinants from 'Theory of Planned Behavior' (TPB) and the 'Prototype Willingness Model' (PWM). To measure respondents potential interest in GM we used three items that assessed willingness, instead of adopting items that measure intention like in the TPB. Since nicotine free TB is very new and probably not very prominent nowadays we thought that respondents cannot have a direct intention to use it yet. So we asked them in a hypothetical way how they would react when someone offered them nicotine free TB for smoking a joint at a friends party. Most items were taken from Solinski (2012) who attempted to identify differentials between different types of consumers using a sequential “career approach”. Furthermore we added a scale for outcome expectancies which are believed to influence attitude. Six respondents were found in a coffee shop in Enschede and for the other 31 we used snowball sampling strategy. The results revealed that MJ users willingness to test nicotine free TB for smoking a joint was rather low and that most were daily cigarette smokers. Means for other constructs were mostly average and respondents were often located in the 'undecided' category. Willingness was positively related to attitude (affective) and to perceived behavioral control (PBC) indicating that the more enjoyable respondents rated the use of nicotine free TB and the more control they felt over using it instead of common TB for smoking joints the more willing they were to test it. Furthermore we tested the relation between willingness and several distal determinants. 'Joints smoked per week' was negatively and 'intention to stop or reduce smoking MJ' was positively correlated to willingness. Thus, the more joints respondents smoked, during a normal week the less willing they were to use nicotine free TB for smoking a joint and the stronger the intention to stop or reduce smoking MJ the more willing they were. We performed multiple regression analysis to find out whether the proximal variables attitude (affective) and PBC added significant value to the prediction of willingness compared to when only distal variables were used. In the first model 'intention to stop or reduce smoking MJ' had unique explanatory value to the prediction of willingness, but was the overall contribution not significant. In the second model proximal variables significantly contributed to the variation in willingness. The significance of 'intention to stop or reduce

smoking MJ' in the second model was decreased indicating a mediation effect via attitude (affective) or PBC which could not be confirmed by results of bivariate analysis in which we correlated these variables. However, we had a very small sample (n=37). In a greater sample effects that were found to be non significant within our sample could turn out significant. Eventually, the only determinant that had unique explanatory value for predicting willingness was PBC. PBC seems to have great influence on people's willingness and since most respondents were daily smokers we presume that most were addicted to nicotine already and felt therefore not very much in control over using nicotine free TB instead of common TB for smoking joints.

In the second study we planned to give a sample of GM to a small group of MJ users and asked them to use it for a time period of one week for smoking joints. We found these people on two occasions at private parties and after each of them had smoked one joint with GM no one wanted to take the small sample of GM we offered to them in advance. They said that it tasted so bad and that they did not want to smoke any more joints with GM. In conclusion, neither were respondents willing to use nicotine free TB for smoking joints nor were they willing to sustain using it for a while after they had tested it.

Due to several limitations such as sample size and sampling strategy we do not claim results to be representative of the whole research population. Furthermore, the nature of our study was exploratory, since it is a new study field and so our aim was not representativeness of the results, but to gain first insights into this new area. Therefore more research on this topic is needed.

Contents

Introduction

In the past few decades there has been a vivid discussion about the co-use of tobacco (TB) and other psychoactive substances. The co-use of TB and marijuana (MJ) seems to be one of the most common forms (Agrawal and Lynskey, 2008). Smit, Monshouwer and Verdurmen (2002) found that TB and MJ co-use represents the third most common combination among Dutch adolescents. A majority of MJ users seems to smoke MJ always in combination with TB (Hammersley and Leon, 2006) and does the majority report joints to be the main form of consumption.

The use of TB, especially through inhalation is strongly associated with the onset of cardiovascular diseases, chronic obstructive pulmonary disease and lung cancer and is found to be one of the major causes of preventable death worldwide (World Health Organization, 2009). Peto and Lopez (2001) concluded that the use of tobacco and other nicotine containing products, such as cigars and cigarillo's is believed to kill over a billion people or more by the end of the century. Nicotine is the major psychoactive ingredient that is responsible for the initiation and continuation of TB addiction (Viveros, Marco, File, 2005). Recent study findings suggest that frequency, early-onset (<13 years) of use and recency are crucial factors in predicting nicotine dependence (Timberlake et al.,2012).

The major psychoactive ingredient in MJ is tetrahydrocannabinol (THC) which is believed to exert various short- and long-term side effects. Short-term side effects include memory and learning problems, distorted perception, difficulty in thinking, solving problems and symptoms of anxiety (Viveros, Marco, File, 2005). Long term side effects of heavy and regular marijuana use include lung disease, chronic cough lack of motivation and potentially various types of cancer. MRI tests reveal that giving patients the active cannabis compound tetrahydrocannabinol (THC) leads to a reduced function in the inferior frontal cortex brain region which is associated with controlling inappropriate emotional and behavioral responses to situations. A group highly susceptible to the damaging effects are early onset users. The use of MJ may be rewiring the brains of adolescents by causing structural changes to brain regions that are associated with motivation, emotion and reward. In sum, early onset of use and heavy use are the main factors associated with various physiological and mental health problems potentially caused by the use of MJ.

However, from a number of studies it can be concluded that one of the greatest public health concerns about using MJ is an increased risk of becoming addicted to nicotine and therefore a regular smoker (Ramo, Liu & Prochaska, 2012). Frequent (>10 times) and recent (past month) cannabis use increased the odds of becoming a daily cigarette smoker and nicotine dependent in those who started early (< 13 years of age) significantly, while later onset use (>13 years of age and first use) was associated with a significantly decreased risk of nicotine dependence (Timberlake et al., 2007).

Agrawal and Lynskey (2008) presume that the high rate of co-use between MJ and TB might be due to a shared route of administration. One study was used to analyze whether MJ use/abuse and dependence were linked to smoked (cigarettes, cigars, pipes) or smokeless (snuff or chewed tobacco) forms of tobacco consumption. As the results indicate MJ use/abuse and dependence was most common in those who reported any TB use compared to those who had never smoked TB regularly and was highest in those who administered TB via inhalation.

Another possible explanation for the high rate of co-use is that nicotine and THC interact with each other in ways that each substance increases the rewarding effects of the other as well as lessens the unpleasant effects. Viveros et al., (2005) presented an overview of the potential consequences of a joint consumption between MJ and TB. The two substances share several contrasting effects on the regulation of food intake and on cognitive processes. Nicotine reduces appetite and increases the metabolic rate, whereas THC has the opposite effect. Moreover nicotine is improving memory and attention which are disrupted during withdrawal. THC disrupts spatial working memory and impairs attentional processes and behavioral flexibility which is perhaps one of the reasons why a large number of MJ users report to use TB to counterbalance the sedative effects of THC. Furthermore 69 percent of the respondents from a study conducted by Agrawal and Lynskey (2008) stated to smoke TB in order to prolong and sustain the effects of THC. In sum, using TB along with MJ might lead to a more pleasant overall feeling than when MJ is used alone. One of the most important findings,however, might be that THC has the potential to antagonize the aversive reactions of nicotine withdrawal. In fact, a decrease in use of one substance may lead to an increase in use of the other (Agrawal&Lynskey, 2008). This may perhaps be explained by the fact that nicotine withdrawal involves the endogenous cannabinoid system which interacts with the brain's rewarding systems (Viveros et al.,2005). Nicotine withdrawal often leads to anhedonia, a symptom of depression which can be counterbalanced by THC. From their qualitative findings Akre, Michaud, Berchthold and Suris (2009) conclude that a substitution phenomenon takes places between the two substances and that nicotine dependence may be induced by cannabis consumption.

Two of the most famous theories in explaining how the use or abuse of one substance can lead to an increased risk of using or abusing other substances subsequently are the gateway- and the reverse gateway theory (Ramo, Liu & Prochaska, 2012). The gateway theory is often used to describe a progression in addictive substance abuse from TB and alcohol to MJ and other illegal drugs like cocaine (Lynskey et al., 2003). The reverse gateway theory presumes that MJ is a gateway drug to TB. Recent study findings can be used to support the gateway – as well as the reverse gateway theory. Smoking TB can become a gateway drug to MJ, perhaps because individuals used to the inhalation of smoke might be more willing to experiment with other substances administered in the

same way. Agrawal and Lyskey (2008) found that TB users were 3.3-4.5 times more likely to become MJ users than non-smokers or those who consumed TB via chewing or sniffing.

From recent literature evidence for a reverse gateway effect emerged. Patton et al., (2005) found that participants who were using MJ on a daily basis who were not yet addicted to nicotine at the age of 20, were 3,6 times more likely to become nicotine dependent at the age of 24.

Panlilio, Zanettini, Barnes, Solinas & Steven (2013) did research on rats. One week after rats had been preexoposued to THC they were given the opportunity to self administer nicotine. THC exposure increased the likelihood of acquiring the nicotine self-administration response from 65% in vehicle-exposed rats to 94%. The researchers concluded that although it is more common for drug abuse to progress from tobacco to cannabis, in many cases cannabis use develops before tobacco use and leads to subsequent nicotine dependence. In sum, because of the ways in which nicotine and THC interact with each other one can suspect that dual use may promote dependence on both of the drugs and therefore support both gateway theories.

One approach of lowering the risk to become dependent on either MJ or TB could be the use of nicotine reduced or nicotine free TB. Such products could be especially interesting for MJ users who are not yet regular TB smokers or for those who want to stop smoking TB, but not MJ. A meta-analysis of the existing literature about cigarettes containing reduced nicotine, reveals that a reduction in nicotine level in cigarette tobacco has the potential to decrease the level of dependence in smokers without significant compensatory smoking, proven by stable levels of cigarette smoking and stable levels of intoxication (Becker, Rose and Albino, 2008). These findings suggest that using nicotine free TB in joints could significantly decrease symptoms of nicotine dependence.

Since september 2013 a new product, called 'Gold Magic' (GM) which is containing very little nicotine (VLN) is on the market in the Netherlands and in Luxemburg. The tobacco has been established by the company Goodrich Tobacco which is related to 22nd century, a plant biotechnology company who uses genetic engineering and selective plant breeding to raise TB plants containing very low nicotine. The marketing of the product was supported by Wilshire Marketing (taken from:.

We conducted two studies. The aim of the first study was to examine MJ users intention to use nicotine free TB for smoking a joint and the determinants that constitute this intention .

2.1 Theoretical Model

In the first study we examined potential determinants that are believed to constitute a person's intention to change his or her behavior. For that purpose, we applied the 'theory of planned behavior' (TPB) (Aizen, 2006) (see figure 1). This theory is a general approach which has been reevaluated a lot over the past decades and can be applied to all kinds of behaviors. The theory assumes that people make more or less conscious decisions to behave in certain ways based on internal cues, like former experiences and direct cues from the environment. Internal cues are believed to influence the development of various cognitive determinants, such as a person's attitude towards a behavior or someone's perception about the opinion of their social environment toward that behavior. According to the TPB the most important and direct determinant of any behavior is the intention to perform it. Though intention does not necessarily lead to the actual behavior it is found to be the strongest predictor (Moan, 2005) and is believed to be influenced by direct and indirect determinants. Indirect determinants are referred to as the distal determinants and direct determinants are referred to as the proximal determinants. Distal determinants, include demographic factors and other factors that are assumed to have an indirect influence on behavior such as personality and a direct influence on the proximal determinants. Proximal variables directly influence people's intentions and are defined: Attitude, social norm and behavioral control within the TPB.

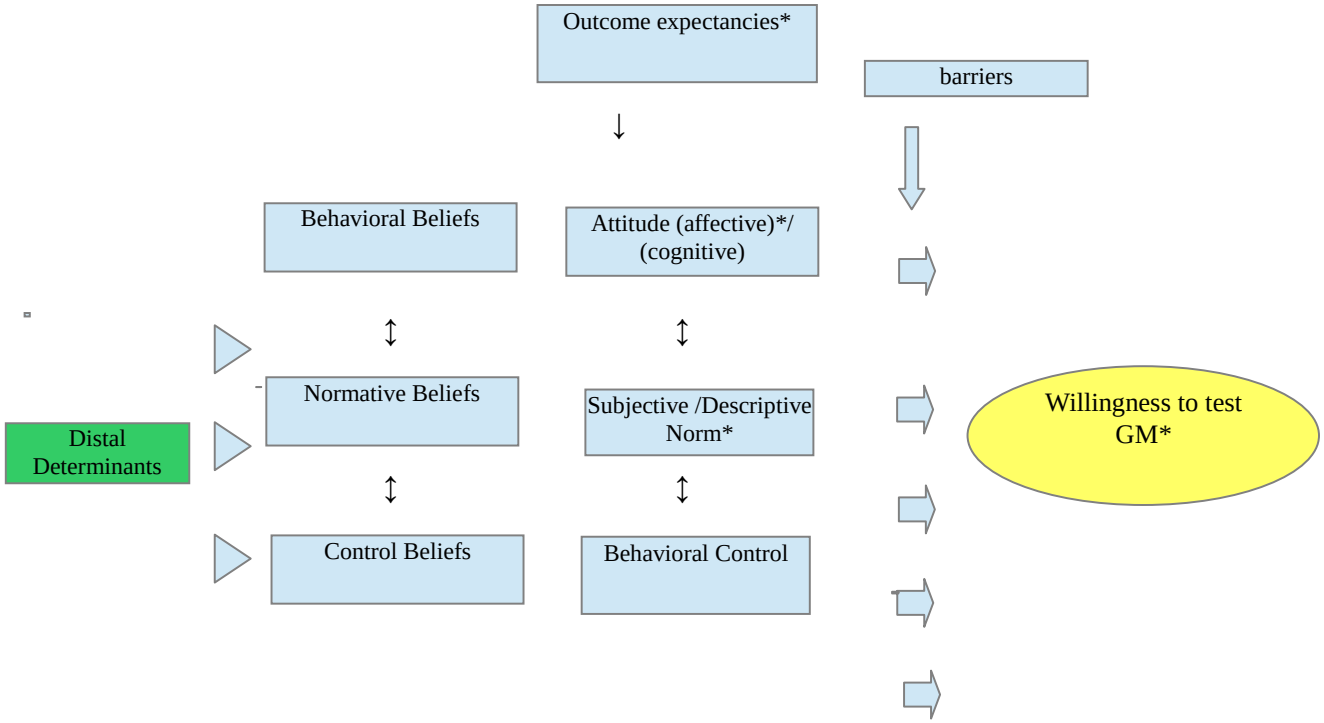
An attitude is a state of mind a person has toward certain objects, behaviors or other people and can be evaluated globally on a continuum from good to bad. Attitudes can vary on two dimensions. First an attitude can vary in strengths ranging from weak to strong. Secondly an attitude can vary in valence from extremely positive to extremely negative. The TPB specifies the relation between behavioral beliefs and attitude. Behavioral beliefs are are subjective evaluations about the probabilities that a behavior will lead to a certain outcome. The term outcome expectancies has its roots in the expectancy-value model. Several concepts included in this model are similar to concepts of the TPB. For instance, perceived benefits which refer to beliefs about the effectiveness of a particular (preventative) behavior are equal to positive evaluation of self-performance and negative self-evaluation is similar to perceived barriers in the TPB.

Subjective norm refers to the perceived social pressure from the environment, especially from important others (Ajzen, 1988). Subjective norm is related to normative beliefs such as what people in the environment think about certain types of behavior and the motivation to comply with these normative beliefs (Ajzen, Fishbein, 1980).

The last determinant in the TPB was not included in the former version from which the TPB originated. The 'theory of reasoned action' (TRA) (Ajzen, Fishbein,) was criticized by many, including

Ajzen himself, because it seemed to be suited only for those behaviors that are under volitional control, but not for those that were under poor volitional control. Ajzen (1985) stated that most behaviors are located on a continuum ranging from total control to completely no control. Therefore he developed the TPB and included perceived behavioral control (PBC) as a main cognitive determinant that influences a person's intention to perform a specific behavior. As Ajzen (1995) mentioned the knowledge about PBC came from Bandura's concept of self-efficacy. Bandura (1988) states that expectations such as motivation and performances determine behavioral reactions. He distinguishes between two kinds of expectations: self-efficacy and outcome expectancy. Self-efficacy is defined as the belief in one's own ability and that one can successfully execute the behavior required to produce the outcomes. In our case, outcome expectancies refer to people's beliefs about the effect of nicotine free TB which can be positive or negative.

Figure 1: Theory of Planned Behavior Model (Ajzen, 2001)



*=additionally included

The TPB has been used widely in research on smoking. Godin, Valoise, Lepagne and Desharnais (1999) found that the frequency of smoking was mainly related to low perceived behavioral control. Several other studies revealed that determinants, included in the TPB significantly contributed to the

prediction of the intention to stop smoking and that PBC was often the strongest predictor (e.g. Norman, Conner and Bell, 1999).

2.2 Research Questions and Hypothesis

For the first part of our study we can formulate the following main question:

' What is the relation between the determinants (affective attitude, cognitive attitude, subjective norm, descriptive norm, behavioral control, outcome expectancies) included in our theoretical model and 'willingness to test GM'?'

Hypothesis 1: We presume that respondents with more positive affective attitudes will be more willing to test GM for smoking a joint
Hypothesis 2: Respondents with more positive cognitive attitudes will be more willing to test GM for smoking a joint
Hypothesis 3: Increasing levels of approval from the social environment will be related with a stronger willingness to test GM for smoking a joint
Hypothesis 4: The more respondents think that people in their environment would use GM for smoking a joint the more willing they will be to test it themselves
Hypothesis 5: Respondents who perceive greater control over their behavior will be more willing to test GM' for smoking a joint

Next to the main question above we can formulate two questions with their corresponding hypotheses:

2) *In how far are distal determinants of behavior related to willingness?*

Hypothesis 6) Respondents with higher intentions to reduce or stop smoking TB will be more willing to use GM for smoking a joint
Hypothesis 7) The younger respondents were at the age when they started to smoke TB the less willing they will be to use GM for smoking a joint
Hypothesis 8) The stronger the intention to reduce or stop MJ use the more willing respondents will be to test GM for smoking a joint

Hypothesis 9) The more joints respondents smoke, during a normal week the less willing they will be to test GM for smoking a joint

3) What is the relation between attitude and outcome expectancies?

Hypothesis 10) The less negative and the more positive effects respondents expect the more positive will the affective attitude toward using nicotine free TB for smoking a joint be
Hypothesis 11) Respondents with more positive cognitive attitudes will expect more positive and less negative effects

Study 2
Research question:

'What are MJ users experiences with GM and how is the overall opinion in terms of positive and negative?'

3. Methods

3.1 Sample and Procedures

We conducted an online survey and found 37 people who responded and filled in our questionnaire. Our plan was to conduct the study mainly in coffeeshops in Enschede. But approaching respondents in coffee shops turned out to be difficult, because many owners did not allow us in. Eventually, we found only one owner of a small coffee shop who allowed us to ask his guests to fill out a paper version of questionnaire. Six of the guests took the time. To find more respondents we used a non-probability sampling technique called 'snow ball'. This technique is believed to be highly appropriate in research when members of the population are difficult to approach. We collected data on a few people from whom we knew that they were smoking MJ and asked them to spread an online link that gave access to our survey via social network sites. That way we were able to gather 31 more respondents. Our inclusion criteria was that all respondents had to be MJ users, since we wanted to analyze the intention to test nicotine free TB of this particular group.

3.2 Measures

Most of the items were taken from Solinski (2012) who did research on the progression in cannabis dependence based on a stage approach. The first page of the questionnaire contained a short

introduction that informed participants about the aim of the study and that it would approximately take 10 minutes to fill in the questionnaire. The first questions were related to demographic variables such as age, gender and current level of education which we can define as the distal determinants of behavior. Other variables defined as distal variables in our model were 'smoking status TB', 'age of onset for smoking TB', 'joints smoked during a week', 'intention to stop smoking TB', 'intention to stop smoking MJ'. Solinski (2012) adopted the former from Boer, Goosensen & Pieterse, n.d.. and added a fourth item asking respondents about their intention to reduce MJ and/or TB use. 'Smoking status TB' was measured by one item categorizing respondents into (a)incidental smokers, (b) daily smokers (<10 cigarettes per day), (c) heavy smokers (> 10 cigarettes per day) and (d) non smokers. We made no further distinction between ex-smokers and people who never smoked. Moreover we asked respondents in which form they typically consume their cannabis. We applied four items asking respondents to rate how often they use either a joint, a water pipe, a bong or cookies/brownies on a 5-point likert scale (Solinski, 2012). In that way we were afterwards able to confirm the results of previous study findings that suggest that joints are the major form in which MJ is consumed.

Next to distal variables, we included the proximal determinants of the TPB. Items were again taken from Solinski (2012) and reformulated for our purpose. Furthermore we extended the original model and added scales for outcome expectancies, descriptive norm and affective attitude. Outcome expectancies, as mentioned in the introduction constitute attitude and have also an influence on perceived behavioral control. We conceptualized an 'outcome expectancy' scale which contained 7 items. We included potentially positive outcomes (e.g. ' when I smoke nicotine free TB, instead of common TB in a joint, I will not get addicted to nicotine') as well as potentially negative ones (e.g.' When I use nicotine free TB, instead of common TB for smoking a joint, I will become less high'). We recoded the negative items.

Affective attitude, as opposed to cognitive attitude is believed to yield a more spontaneous reaction instead of demanding careful thinking. French et al., (2006) conducted a study using the TPB to predict someone's intention to increase physical activity. Next to general attitude items, an affective attitude scale was added. So respondents were not only asked about the disadvantages and advantages of that behavior, but also about whether they would like or hate it, or enjoy or not enjoy it. Adding the attitude affective scale could explain additional 11 percent of the variance, suggesting that applications of the TPB should consider affective and not only cognitive aspects of someone's attitude . Thus, we decided to include not only general attitude, which can be defined as a cognitive attitude, but also affective attitude. We used one item and asked respondents to rate the use of nicotine free TB on a 7-point scale ranging from unenjoyable to enjoyable.

For attitude (cognitive) we used one item. We asked what they would think of nicotine free TB for smoking a joint from very good to very bad. We used a 5-point scale and recoded the items.

To assess injunctive norm, which represents the determinant 'subjective norm' from the TPB we used four items asking respondents to rate whether their brothers/sisters or other important others would find it okay if they used GM , instead of common TB in their joints on a 7-point likert scale from 'very unlikely' to 'very likely'.

Furthermore we added a scale for descriptive norm. Rivis and Sheeran (2003) used a meta-analysis to quantify the relationship between descriptive norms and intentions and to determine whether descriptive norm had unique explanatory value. The results indicate that there was a significant correlation between intention and descriptive norm and that descriptive norm could account for additional five percent of the variance. For that reason we added one item for descriptive norm asking respondents to rate how many of their friends would want to use GM ranging from everyone to none on a five point scale. The scale was recoded so the higher respondents scored the more of their friends they estimated would want to use GM.

When we thought about how to measure the most direct direct determinant of behavior, which is intention we came to the conclusion that nicotine free TB is so new that people actually cannot have a direct intention to use it. Therefore we regarded it as non appropriate to use the intention scales we used to assess respondents intention to quit smoking TB and/or MJ. Eventually we decided to adopt the construct 'willingness' from the Prototype Willingness Model (Gibbons and Gerrard, 1997) which was mainly used for risk behaviors in the past. The question was formulated in a more hypothetical way than the intention scales. On a 7-point likert scale we measured how likely or unlikely respondents would react in a particular way in a situation when GM was offered to them ('Imagine: You are at a party with some friends and someone offers you nicotine free TB, instead of common TB for smoking a joint') . Three reactions were proposed: “I would take it”, “I would say no “thank you and refuse it”, and “I would leave the situation”.

The last question ('Imagine: Nicotine free tobacco is available everywhere now and you could buy it for the same price as common tobacco...') was related to perceived behavioral control and contained four items (e.g. 'It's hard for me to use nicotine free for smoking a joint, when I feel bad'). Though we did not know about the prices of nicotine free TB, we added the notion '(…) and you could buy it for the same price as common tobacco (…)', to make sure this factor did not influence respondents answers. The first item of the scale was formulated positively ('I feel in complete control whether or not I use nicotine free tobacco instead of common tobacco within my joints') and had to be excluded, because reliability analysis showed that cronbach's alpha could increased significantly by deleting this item. The other three items were formulated negatively and respondents could rate from 'very unlikely'

to 'very likely' how hard it would be in a given situation to use nicotine free TB, instead of common TB for smoking a joint. Due to the negative formulation items were recoded.

3.3 Reliability

Reliability analysis was carried out for all items that contained more than one item (see table 1). Therefore the scales descriptive norm, attitude (affective) and attitude (cognitive) were excluded from reliability analysis. Cronbach's Alpha was measured to show how well the different sets of items measured their underlying latent constructs. We considered a scale to have an acceptable reliability when Cronbach's Alpha was at least 0,60. Two scales were modified to increase the alpha value. First the perceived behavioral control scale was modified by deleting the first item ('I feel in complete control whether or not I smoke nicotine free tobacco, instead of common tobacco within my joints'). The initial alpha value was α=.56 and could be increased up to α= .90. Finally, we decided to delete the third item of the willingness scale to increase alpha from 0,883 to 0,937. All other scales were sufficiently reliable and were retained for further analysis.

Table 1

Reliability-Analysis

Variable	Number items	Cronbach's α
Willingness	2	.94
Perceived behavioral control	3	.90
Subjective norm	4	.91
Outcome expectancies	6	.74
Intention to stop smoking MJ	4	.93
Intention to stop smoking TB	4	.90

Our plan was to give them an online-link to a short questionnaire and to ask them in an open manner about their experiences with GM. We decided to not include any closed question to minimize the risk of influencing respondents answers. We hoped to gain insight into experiences with regard to taste and effect. As proposed in the introduction nicotine free TB should make the experience of MJ use less pleasant, since aversive effects of THC, such as tiredness will not be counterbalanced by nicotine.

3.4 Data analysis

We used SPSS version 20.0 to analyze our data. As reliability analysis revealed (see table 1) all scales proved to be at least of acceptable reliability (α >.60). First, we conducted a small frequency analysis which included demographic factors such as gender, age, SES, smoking status and age of onset for smoking TB which we defined as distal variables. Afterwards we calculated the means for the scales of our proximal variables as well as for the distal variables 'age', 'age of onset for smoking TB', 'grams of cannabis used in one joint', 'joints smoked per week', 'intention to stop smoking TB' and 'intention to stop smoking MJ'. In order to decide which kind of tests to further apply we implemented a distribution analysis which revealed that some scales were not normally distributed. Because of that we used parametric (pearson's r) as well as non-parametric (spearman's rho) tests for further bivariate analysis. Bivariate analysis was carried out in two steps. First we correlated the proximal variables with the distal ones. We examined the correlations between the proximal variables and 'willingness to test GM'. Furthermore we correlated the distal variables with 'willingness' and outcome expectancies with both attitude scales. Variables which correlated at a level of p<.20 were taken into regression anaylsis. Multiple regression was performed. First we entered the distal variables and to see whether the proximal variables add any significant value we included them in a second regression model.

3.5 Study 2

Since it turned out to be difficult to find coffee shop owners who agreed to let us asking their guests to participate in our study we chose for a convenient sampling procedure. During parties from which we knew that people were smoking MJ there we asked a few to take a small sample of GM and use it during the following week for smoking joints.

4. Results

In total 37 cannabis users participated in our study (for an overview of the sample characteristics see table 2). The sample consisted of 23 men and 14 women aged between 18 and 44 years. Most respondents currently followed post secondary education programs. On average our respondents

Table 2

Sample Characteristics (N=37)

Variable	Minimum	Maximum	Mean	*N*	*%*
Gender					
Male				23	62,2
Female				14	37,8
Age	18	44	25,86	37	
18-25				19	51,4
26-35				18	48,6
Age of Onset (TB)					
Early (< 13)	12	20	16,19	6	16,2
Late (> 13)				29	83,8
Education status					
Lower secondary education				2	5,4
Upper Secondary education				9	24,3
Post secondary education				26	70,3
Smoking behavior					
Incidental				2	5,4
Daily (<10)				18	48,6
Heavy (>10)				6	16,2
Non smoker				10	27,0
Joints/week	0	35	7,92	37	
Gram/joint	0	1,0	0,31	37	

Variable	Minimum	Maximum	Mean	*N*	*%*
Substance used first					
Tobacco				26	70,3
Marijuana				11	29,7

started smoking tobacco with 15,31 years in a range from 12 to 20 years and could the majority of the respondents be identified as daily smokers (<10 cigarettes per day). On the average participants smoked 7,92 joints during a normal week in a range from 0 to 35 and used 0,31 in a range from 0,1 to 1,0 gram of cannabis in one joint. We had three outliers. One person smoked 20 joints per week and one 35 joints and two people reported to use a whole gram of MJ for one joint. Moreover most respondents used TB before they used MJ.

4.1 Distribution Analysis

With SPSS 20.0 and the Kolmogorov Smirnov test we tested if the data were normally distributed in order to decide whether non-parametric tests had to be applied for further data analysis.

Table 3

Minimum,maximum, mean, standard deviation of the theoretical constructs.

Variable	Minimum	Maximum	Mean	*SD*
Willingness to test GM	3	21	7,03	± 5,10
Attitude (affective)	1	7	4,59	± 2,02
Attitude (cognitive)	1	5	3,25	± 0,88
Subjective Norm	7	28	16,57	± 6,71
Descriptive Norm	1	5	3,54	± 0,84

Variable	Minimum	Maximum	Mean	*SD*
Perceived behavioral control	7	28	17,31	± 5,16
Outcome expectancies	7	44	20,68	± 7,87
Intention to stop smoking TB	4	28	16,58	± 8,63
Intention to stop smoking MJ	4	28	11,18	± 7,69

Analysis revealed that the following scales were not normally distributed: Age of onset for smoking TB (p=.42), attitude (affective) (p=.15), form of consumption (p=.50), intention to stop smoking tobacco (p=.63), behavioral control (p= .34) and outcome expectancies (p= .86). For further analysis of these variables we will use non-parametric tests.

4.2 Means & Frequencies

Willingness to test GM was rather low (M=7,03, SD ± 5,10) (for complete overview and the minimum/maximum values see table 3). Means for attitude (cognitive) (M=3,25,SD ± 0,88), subjective norm (M=16,57, SD ±6,71), descriptive norm (M=3,54,SD ± 0,84), behavioral control (M=17,31; SD ± 5,16) and outcome expectancies (M=20,68, SD 7,87) were average. Many respondents were located in the category 'undecided'. According to the mean value of the affective attitude scale respondents presumed the use of nicotine free TB to be rather enjoyable for smoking a joint (M=4,59, SD ± 2,02). Intentions to stop smoking MJ was low (M=11,18,SD ± 7,69) and intentions to stop smoking TB were average (M=16,58, SD ± 8,63).

4.3 Correlations between willingness & proximal variables

'Affective attitude' (rho=.358,p=.02) correlated significantly positive with willingness (see table 4). Thus the more enjoyable respondents rated the use of nicotine free TB the more likely they were willing to test GM. That confirms our first hypothesis. In our second hypothesis we presumed that the more

positive the cognitive attitude the more willing respondents will be to use GM. This hypothesis could not be confirmed (r=.08,p=.63).

Moreover we found no evidence that could support our third and fourth hypotheses. Increasing levels of approval from the social environment were not significantly associated with stronger willingness to use GM for smoking a joint (r=.28,p=.10). We thought the more of their friends respondents thought would like to use nicotine free TB for smoking joints the more willing they would be themselves to use it. This could not be mirrored by our results (r=.08,p=.64). Eventually, PBC correlated significantly with willingness (rho=.50, p<.01). Thus, the more control respondents felt over whether to use nicotine free TB instead of common TB for smoking a joint, the more willing they were to test it.

Table 4. Correlations between our dependent variable 'willingness to test GM' and the proximal determinants included in the theoretical model (see figure 1).

Variable	Willingness			
	r	p	rho	*p*
Attitude (cognitive)	.08	.63		
Descriptive Norm	.08	.64		
Attitude (affective)			36*	. .02
Perceived Behavioral Control			51**	<.01
Subjective Norm			-.18	.30
Outcome expectancies			-.03	.85

significant at p<.05 level
significant at p <.01 level

4.4 Correlations between willingness and distal variables

Furthermore we presumed that the intention to stop smoking TB the more willing respondents would be to take GM for smoking a joint when it was offered to them (see table 5). Although the relation was positive it was non significant (rho=.183,p=.28) which forces us to reject hypothesis six.

We found no evidence for a negative association between 'age of onset for smoking TB' and willingness (rho=.13,p=.47). Though the relation was not significant it was positive, as opposed to our expectations, meaning the older respondents were at the age when they started smoking TB the more willing they were to use GM for smoking a joint. Therefore our seventh hypothesis can neither be confirmed.

Table 5. Correlations between our dependent variable 'willingness to test GM' and the distal determinants included in the theoretical model (see figure 1).

Variable	Willingness			
	r	p	rho	*p*
Age	.02	.89		
Gender	.11	.53		
Level of education	.07	.67		
Smoking Status	-.15	.36		
Gram/Joint	-.01	.95		
Intention to stop smoking MJ	.42*	.01		
Age of onset for smoking			.13	.47

Variable	Willingness			
	r	p	rho	*p*
TB				

significant at p<.05 level

significant at p <.01 level

Willingness was significantly positive related to the intention to stop smoking MJ (r=.416*,p=.01). Thus the stronger the intention to stop or reduce MJ use the more willing respondents were to test GM which is in line with hypothesis number 8.

'Joints smoked per week' correlated significantly negative with 'willingness to test GM' (rho=-.362., p=.03), meaning that the more joints people smoke during a normal week, the less willing they were to test GM. Therefore we can confirm our last hypothesis with regard to the relationship between the distal determinants and willingness.

4.5 Correlations between Attitude and Outcome Expectancies

No evidence emerged with regard to the predicted positive correlation between outcome expectancies and affective attitude (rho=.04,p=.80). How enjoyable respondents rated the use of nicotine free TB had apparently little to do with specific expectancies about the effects. Cognitive attitude, on the other hand, correlated significantly positive with outcome expectancies (rho .41,p=.01). The better respondents rated the use of nicotine free TB the more positive and the less negative outcomes they associated with it. Therefore our last hypothesis can be confirmed.

4.6 Regression Analysis

We carried out multiple regression analysis with willingness to test GM as dependent variable. As predictors we included distal and proximal determinants that correlated with willingness to test GM at a significance level of p<.20. (see table 6). We tested two competing theoretical models. In the first model we included the distal determinants 'joints smoked per week' and 'intention to stop smoking MJ'.

To examine whether the proximal determinants contributed to the explanation of willingness we included 'affective attitude' and 'behavioral control' in the second model. 'Joints smoked per week' and 'intention to stop smoking MJ' accounted for 13,3 % (R^2=.12) of the variance in willingness, whereas 'affective attitude' and 'perceived behavioral control' added another 20,7 % (R^2=.21) to the explained variance in the model (ΔR^2= .27).

The F-ratio gives us information about whether the predictors significantly contributed to the prediction of willingness. The F-ratio for the first model was F(2,36)=2,68 (p=.09). So 'intention to stop MJ' and 'joints smoked per week' could not significantly account for the variance in willingness. Nevertheless, 'intention to stop smoking MJ' alone had a unique explanatory value (t=2,14,p=.04). When we compare the F-ratio of the first model with the second, we can see that the additionally inserted predictors contribute significant value to the model F(4,36)=4,11, p=.01). Together with 'joints smoked per week' and 'intention to stop smoking MJ', 'perceived behavioral control' and 'affective attitude' could explain 34 % (R^2=.34) of the total variance in willingness.

When considering the t- coefficients we can see that only 'perceived behavioral control' had unique explanatory value (t=-2,90, p=.01) and that significance of 'intention to stop smoking MJ' is decreased and now non significant at a level of p<.05 (t=1,94,p=.06).

A decrease in significance of a predictor from one model to the next and a corresponding decrease in beta is an indication for a mediation effect. One potential path could be that low behavioral control is associated with weak intentions to stop smoking MJ'. However, if 'intention to stop smoking MJ' was partially mediated by 'affective attitude' and/or 'perceived behavioral control' 'intention to stop smoking' would significantly correlate with them.

Table 6. Multiple regression analysis.

	Willingness [1]				
	B	Beta	t	*p*	R^2
Model 1					
Joints/week	-.01	-.03	-0,21	.84 [2]	.133
Intention to stop smoking MJ	.23	.35	2,14	.04 [2]	

	Willingness [1]				
	B	Beta	t	*p*	R^2
Model 2					
Joints/week	-.02	-.04	-0,28	.77 [3]	.340
Intention to stop smoking MJ	.19	.29	1,94	.06 [3]	
Attitude (affective)	.48	.25	1,70	.10 [3]	
Perceived Behavioral Control	.21	.32	2,10	.03 [3]	

Dependent variable[1] : 'willingness to test GM'

Independent variables[2] : 'Intention to stop smoking MJ', 'joints smoked per week'

Independent variables[3] : 'Intention to stop smoking MJ', 'joints smoked per week','perceived behavioral control', 'affective attitude'

To test that we used bivariate analysis, more specifically spearman's rho, because some of the scales were not normally distributed. The results displayed neither significant correlations with behavioral control ' (rho=.154,p=.36) nor with 'affective attitude' (rho=.207,.23). However, this does not mean that 'intention to stop smoking MJ' is not mediated by these two proximal variables, only that the effect is not of statistical significance. In sum, perceived behavioral control was the strongest predictor (ß=.31,p=.03), followed by 'intention to stop smoking MJ' (ß=.30,p=.06) and 'affective attitude' (ß=.26,p=.10).

Results Study 2

The study was meant to be qualitative in nature and could only be carried out partly. We found 13 people who tested GM in one joint on two occasions at a friends party. Our plan was to give a small sample to people who were smoking MJ in joints and ask them to smoke GM for a time period of two weeks in their joints and to give their opinion on it afterwards by filling in a short online questionnaire. The problem was that non of the participants was willing to smoke more than this one joint with GM they had smoked at the party and rejected our sample. The reason basically all participants reported

was that the taste was so bad that they did not want to spend their MJ to smoke it with GM for more times than on this one occasion.

5. Discussion

The main purpose of our first study was to gain insight into the relationship between the determinants included in our theoretical model and willingness to test GM. The second study was meant to test MJ users actual experience with GM. Overall, we hoped to find out whether nicotine free TB could be an attractive product for MJ users and if they were willing to use it, instead of common TB for smoking joints. The results of both studies gave no indication that MJ users are interested in using nicotine free TB for smoking joints.

We tested which of the cognitive determinants were related to willingness. Attitude (affective) and perceived behavioral control (PBC) were positively related to willingness, meaning that the more enjoyable respondents rated the use of nicotine free TB and the more control they felt over using it, instead of common TB in a joint the more willing they were to test it. We speculated that cognitive attitude was not related to willingness, because GM is a new product and people might not yet have formed an actual opinion about it. In that way it was a good decision to add an item for attitude (affective) that did not demand respondents to carefully think about whether nicotine free TB is good or bad, but that was meant to get a spontaneous reaction.

Furthermore we postulated the hypothesis that greater levels of approval from the social environment would result in higher willingness. Our results gave no indication that this is the case. However, one could argue that the question with regard to injunctive norm was a bit controversial and easy to misinterpret. We asked respondents to rate whether their friends and family would find it okay if they smoked nicotine free TB, instead of common TB in their joints which presumes that people generally find it okay to smoke MJ. It is conceivable that parents do not find it okay when their children smoke MJ and that this influenced respondents answers.

From the distal determinants 'intention to stop smoking MJ' and 'joints smoked per week' were related to willingness. Respondents with stronger intentions to stop or reduce using MJ were more willing to test GM in a joint and the more joints they smoked, during a normal week the less willing they were to use GM. That is in line with our hypotheses. Perhaps people who want to stop or reduce smoking MJ are paying more attention to the health risks involved in smoking TB and MJ and therefore think that using nicotine free TB might be less unhealthy. On the other hand, the more joints people smoke during a week the less willing they were to use GM. Greater frequency of use might promote stronger smoking habits. As we know from the literature of the introduction frequent (>10

times/week) cannabis use increased the risk of becoming nicotine dependent significantly. Higher levels of nicotine dependence are related to lower levels of PBC (e.g. Norman, Conner and Bell, 1999) and lower levels of PBC were associated with a lower willingness to test GM within our study. When we used these three variables along with attitude (affective) in regression analysis, results showed that PBC decreased the significance of intention to stop smoking MJ which is a sign that the relation between intention to stop MJ and willingness could be mediated by PBC. The fact that we found no significant relation between PBC and intention to stop smoking MJ could be due to our small sample size which is one of the major limitations of our study. So in a greater sample this relationship could turn out to be significant. Thus, the less PBC people have the weaker the intention to stop or reduce smoking MJ and the less willing they will be to use nicotine free TB. However, we also presumed that people who have the intention to stop or reduce smoking TB would be more willing to use nicotine free TB for smoking joints. This hypothesis could not be confirmed. Maybe people who have the intention to quit smoking are not willing to take any TB when it is offered to them not even when it does not contain nicotine, because GM still contains all other (unhealthy) ingredients. It seems plausible that people do not intend to quit smoking to get rid of their addiction, but because smoking itself and not only the addition to it causes health problems.

Our studies were highly exploratory in nature, since this is a new study field. Therefore we can only speculate about the reasons for our findings. First of all, our literature review revealed that MJ users probably benefit from nicotine, because nicotine makes the effect from THC more pleasant. Nicotine interacts with the cannabinoid system in our brain and feelings of tiredness or anxiety that are induced by THC become counterbalanced by nicotine, because it has the opposite effect on this system. In the introduction we cited a study that emphasized that a majority of MJ users uses TB to sustain and prolong the effects of THC (Ramo et al.,2012). However, within our first study analysis of the outcome expectancies toward nicotine free TB showed that respondents were not aware of the interaction effects of THC and nicotine. The majority did not believe that using nicotine free TB would make them less high or that they had to use more MJ to get the same effect. The lack of negative expectancies could be due to a lack of experience with the product. GM entered the market in 2013 and nicotine free TB in general is quite new and probably not that prominent yet. In that regard the second study could have been a useful reality check. Unfortunately, none of the participants were willing to use GM more than one time and no one filled in the questionnaire. Yet, the results of the second study were quite clear. All participants rejected further use of GM, because of its bad taste. For that reason, we assume that people did not pay attention to the effects of GM when smoking it in a joint and were therefore not able to report any differences compared to when they use common TB.

Moreover did the participants test GM during a party and smoked joints with common TB at the same evening. So it was hard to check whether outcome expectancies matched with actual experiences.

Of course, we asked ourselves why participants found the taste of GM so bad. One explanation could be that our sample of GM was a few months old and was maybe too dry already. Another reason could be that people have general brand preferences. Most smokers have one brand of cigarettes or tobacco which they prefer. Maxwell (2013) found that brand preferences are related to the prominence of a brand which is facilitated by advertising. Especially among young people (18-25) heavily advertized brands such as Marlboro, Newport and Camel are preferred. Changing the brand might have the consequence that the new TB is perceived to taste different or even less good. After a short time this effect might fade away, as people get used to the taste of the new brand. Of course, people must be motivated to switch brands first. Regarding GM, increasing brand awareness and promoting the positive effects, such as lowering the risk of becoming nicotine dependent, might increase people's motivation to use it. We presumed that especially non smokers or people who want to stop smoking TB could be interested in a product containing no nicotine. The results of the first study could not confirm that this groups are more willing to use GM.

Moreover, after we reviewed the effects of nicotine for smoking MJ we suspect that people will recognize a difference in effect after a short while. One could even argue that people do smoke TB alone or with MJ, for the sake of the effects nicotine exerts on the brain's rewarding system. Additionally, GM still contains all other unhealthy ingredients such as tar and monoxides which could lessen people's motivation to use it.

Our study had various limitations. One of the limitations is related to our sampling technique. This technique is primarily used in exploratory research like ours. However, it is hardly representative of the larger study population. The problem with this technique is that we conducted the study within the same circles of people. That is for example reflected in various sample characteristics such as level of education. Most respondents currently followed post secondary education programs and therefore do not represent the whole population of MJ users. However, our main interest was to get a better understanding of this new study field. MJ use has been widely studied for its health risks and an increased risk of becoming nicotine dependent seems to be amongst the newest concernes in the scientific world. Therefore we hoped to find out whether MJ users would be willing to use nicotine free TB which could decrease the risk of developing nicotine addiction as a result of dual use.

The major limitation was the low number of respondents. First, our aim was to find 70 people to complete the questionnaire. That goal could not be reached due to difficulties in finding owners of coffee shops who would allow us to ask their guests to participate in our study. Eventually, we could only find 37 (n=37) respondents which lowered the power of our sample tremendously. Huge samples

can detect small differences, whereas chances are low for finding any significant relations or differences in very small samples like in our one. Most of the determinants of the TPB showed no relation with willingness. Other studies that did research on the TPB revealed that all components are effective in predicting behavioral intention (Moan, 2013). In our study PBC was the only determinant that predicted willingness. Increasing the sample size could make relations between the other components of the TPB and willingness significant.

One of the major methodological concerns was our general methodological approach. Besides the overall low willingness of respondents to use nicotine free TB, it was reflected in our results that people probably do not have an idea yet what to think about nicotine free TB, what importantant others would think about it or whether they would feel in control about using it. The TPB has been used for well – known behehaviors in the past, but it is questionable whether unknown and very hypothetical behavior is best assessed by using this model. Another point related to this is that in order to do justice to the nature of quantative research we formulated eleven hypotheses. For well understood topics there is in most cases a lot of literature to base your hypotheses on. In our case, we only speculated in advance how various determinants could be related to willingness. So on the one hand, we made our data more testable, but through that we neglected the very nature of exploratory research which is characterized by its impartiality.

Another methodological complication was that we did not use the TPB in its original version, but added three scales and used two items from another theory to measure intention. We adopted 'willingness' from the Prototype Willingness Model. This model was mainly designed to measure willingness with regard to risk behaviors (Gibbons& Gerrard,1997). Willingness is not the same as intention. We thought that people cannot already have an intention to use nicotine free TB, since it is a very new product. We hoped to gain insight into how willing MJ users are to use GM. But even if they had been highly willing to use GM for smoking a joint, intention would still depend on experience. In our second study participants were willing to use GM, but found the taste so bad that they surely had no intention of using it in the future. Willingness to test GM can only be viewed as a first step. It gives information about how open people are toward a new product or a certain risk behavior rather than it does predict intention. To form the intention to use GM people must either really like it in terms of taste, effect, price etc. or must see huge advantages. The only advantage GM has is that it contains no nicotine and does not support or lead to dependence. Still, it is unhealthy and people might therefore be not very motivated to use it. Especially MJ users who already engage in a risky health behavior may not mind whether they are additionally exposed to nicotine or not.

In conclusion, our study does not provide any evidence that MJ users are interested in smoking nicotine free tobacco within their joints. Users experiences were rather negative, since all participants

complained about the bad taste of GM. Due to several limitations of our study, including the sampling technique we do not propose that our results are representative. Our goal was to contribute some useful information to this highly new area of research and that goal was achieved.

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