Engendering Habituation to Stimulus of Smoking through Mental Simulation of Smoking

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0.1 Acknowledgments

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1. Abstract

This study investigates whether mental simulation of the act of smoking a cigarette can engender habituation to the stimulus of smoking in a number of participants and, as such, result in a reduction in the amount the individual participants smoke or score on the Fagerstrom Test for Nicotine Dependence (FTND). It also investigates the effect, if any, an individual's personality might play in a quit attempt. Participants Stage of Change was taken into consideration in an effort to further gauge the affect mental simulation and tailor any future interventions using mental simulation to a given stage. The study found that participants (n=26) showed no reduction in either the amount smoked or the FTND score when the act of smoking is stimulated mentally. Participants scoring high in extraversion on the EPQ-R recorded an increase in amount smoked, while those high in neuroticism failed to significantly reduce either amount smoked or FTND score. The study concludes that considerably more detailed research is needed to test whether the mental simulation of smoking a cigarette can engender habituation to the stimulus of smoking. It is more than likely that the technique of mental simulation will only have supplementary considerations in the field of smoking cessation.

2. Introduction

can the simple act of thinking about the mechanical actions involved in the process of smoking (i.e. thoughts that are analogous to repeated exposure) affect an individual's smoking behaviour? If the act of thinking *can* influence an individual's behaviour in this regard, what are the precise effects ? Will such an act reduce the amount smoked by an individual, or impact on their self-reported dependency on tobacco or attitude towards attempting to quit?

It is the aim of this study to modify the research of Morewedge Huh and Vosgerau (2010) to determine whether such a novel, simple and cost effective approach to smoking cessation is viable. The effects of this approach will be tested through: participants self-reporting on the amount they smoke during the intervention; the Fagerstrom Test for Nicotine Dependence (FTND) (Heatherton, Kozlowski, Frecker, Fagerström 1991) which gauges participant's nicotine dependence throughout the stages involved in the intervention; and by testing participants on their 'stages of change' as detailed by DiClemente, Prochaska, Fairhurst, Velicer, Velasquez & Rossi (1991). It will also test what effects, if any, personality type (specifically, neuroticism) can have on an individual and their attempts at smoking cessation.

Smoking is a prevalent and continuous health concern in Ireland. Health services provided to smokers cost €1 billion per year and smoking related diseases claim the lives of 7,000 people a year(Department of Heath, 2011). The problem is not limited to Ireland, of course, with nearly 15% of deaths in the European Union (EU) at the turn of the millennium attributed to smoking (World Health Organisation, 2000). These deaths are highly preventable.

2.1 Current smoking interventions and rationale for further research

With smoking appearing to still be such a large problem around the world, it could be argued that smoking cessation interventions have, in some way, failed. However, a 2009 meta-analysis (reference) showed that the opposite was true and that treatments to aid smoking cessation are very reliable (Hughes, 2009). The concordance of the odds\ratio scores in this meta-analysis (despite multiple methodological differences and very different sample sizes), added to the high rates of numerical superiority for treatments, suggest the efficacy of smoking cessation treatments is extremely reliable. The report sees this as important evidence and argues that provision of smoking cessation treatment should be an essential part of both tobacco control efforts and clinical practice and for continuation of research in the field.

Another argument for further research on smoking cessation therapies is the wave of current research emerging with regard to nicotine replacement therapy (NRT). NRT is perhaps one of the most popular aids to smoking cessation (Silagy, Lancaster and Stead, 2004) and was once believed to be very effective as a method in aiding smoking cessation (Cummings & Hyland, 2005). However, questions are increasingly being raised as to its true effectiveness, with many researchers calling for further assessment of its effectiveness. In their meta-analysis, Hughes, Peters and Naud (2011) discuss how only about half of the studies involved found statistically greater quitting among NRT users and that the most rigorous studies did not find greater quitting among users at all. Alpert, Connolly and Biener (2012) found that persons who have quit smoking relapsed at equivalent rates, whether or not they used NRT to help them in their quit attempts. A 2010 meta-analysis also points to the various adverse effects that are associated with NRT such as increased risk of heart palpitations and chest pains, nausea and vomiting, gastrointestinal complaints, skin irritations and insomnia (Mills, Wu, Lockhart, Wilson & Ebbert, 2010).

Another factor influencing a move away from NRT as the 'go-to' therapy for smoking cessation is its inability to treat certain cohorts, such as teenagers (Yeol et al, 2011) or pregnant women (Coleman, Chamerlain, Cooper & Leonardi-Bee, 2010). The meta-analysis of the latter demonstrates that there is insufficient evidence to determine whether nicotine replacement therapy is effective, or even safe, when used in pregnancy.

If successful smoking cessation strategies can generally be divided into two groups, nicotine replacement therapy and behavioural modification (Huber & Mahajan, 2008), the above literature critical of NRT speaks of a need for new or supplementary approaches to smoking cessation therapy that focus on behaviour modification. There is already a rich body of research in the area of smoking that tries to tackle the issue on a behavioural modification front as well as investigating factors that influence quit attempts, from novel behaviour modification of 'inducing' an myocardial infarction (May et al, 2010), using pharmacists to help act as a counseling aid in smoking cessation (Bock, Hudmon, Christian, Grham & Bock 2010), investigating the lapse\relapse process for smokers (Shiffman, 1982, 2008; O'Connell & Shiffman, 1988, Shiffman & Waters, 2008; Shiffman et al 2012) and investigating the differences between intermittent smokers and everyday smokers (Tindle & Shiffman, 2011).

The current research study aims to differentiate itself from previous research by focusing on the idea of mental simulation alone to aid smoking cessation. While the idea of mental simulation as a method for smoking reduction or cessation is novel, Baylen (2007) has tested a form of mental simulation (vividness of simulation vs craving) and its effects on smokers' behaviour.

The Baylen study examined whether manipulating smokers' vividness of cigarette imagery impacted on craving. It was based on the Elaborated Intrusion theory of desire (Kavanagh, Andrade, & May, 2005) according to which mental imagery associated with a target substance is a key factor

contributing to the experience of craving. However, research by May, Andrade, Panabokke, and Kavanagh (2004) showed a specific type of mental imagery that will elicit craving in an individual. Olfactory and taste imagery, imagining the taste and smell of the target substance, was the most effective at producing craving in individuals.

The Baylen (2007) study found that manipulating the vividness of substance-related imagery did have a significant impact upon craving, making participants crave the target substance much more than that of the control group.

The current research study aims to differentiate itself from the Baylen (2007) experiment by focusing on the idea of eliciting habituation, not craving, through mental simulation of the act and not mental imagery of the target substance.

2.2 Habituation and Smoking

Habituation is the decreased physiological and behavioural response induced by extended or repeated exposure to a stimulus (Rolls, Rolls & Rowe, 1982). In other words the tenth bite of a pizza is not as satisfying, or as desired, as the first. If the effect of habituation can be produced without direct exposure to a stimulus, or less exposure to the stimulus than normal, it could have major implications for the modification of a great number of problem behaviours, smoking for instance.

In a 2004 paper discussing the accumulative literature on habituation and satiation, McSweeney argues that habituation provides a more accurate and useful description than satiation for the loss of effectiveness of a behaviour and that habituation has surprisingly different practical and theoretical implications than satiation for behaviour analysis. McSweeney postulates that

habituation is the result of repeatedly presented reinforces and this, for him, has a great number of implications. For McSweeney habituation may be a single process contributor to the termination of behaviours that are usually attributed to satiation (e.g., ingestive behaviours such as eating and drinking), the waning of attention (e.g., cognitive behaviours such as studying), and pharmacodynamic factors (e.g., drug taking\smoking). Many behavioural problems occur because a reinforcer is too strong and maintains too much behaviour (i.e. obesity and smoking). To reduce the effectiveness of a troublesome reinforcer simply increase habituation and decrease sensitization.

But how can one increase habituation without actually presenting the reinforcer? To deal with this problem McSweeney recommends finding novel ways to increase habituation. For McSweeney this is made possible as habituation is a top-down process. It is habituation, not the correction of a deficit (i.e. low blood sugar in the example of eating), that explains why performing a behaviour contributes to its termination. No homeostatic mechanism is needed.

If it is habituation that stops a behaviour, not some physiological mechanism, and if it is a top-down cognitive processes that is affected by such things as beliefs, memories, or expectations (McSweeney, 2004), perhaps some form of mental simulation could be used to induce it and lead to a reduction of a targeted behaviour.

It was this idea of habituation as a top down process, one that could be theoretically induced by mental simulation, that lead Morewedge et al (2010) to test its effectiveness with regard to food. In this study they took great care in terms of the imagery used to induce habituation, avoiding imagery that was more analogous to the initial exposure to a stimulus that whets the appetite. Instead, they used mental simulation that was more analogous to repeated exposure. In the first part of their experiment, Morewedge et al tested whether repeatedly imagining the consumption of a food would increase or decrease the amount of that food people would subsequently consume, all

participants imagined performing 33 repetitive actions, one at a time, to hold effort constant across conditions. While the control group imagined inserting 33 quarters into a laundry machine. This serving as a control task as it involves motor actions analogous to eating M&Ms. Morewedge et al split the non-control participants into two groups, a three-repetition condition and a 30-repetition condition. The three repetition condition would imagine eating three M&Ms and inserting 30 quarters into a laundry machine. While the 30-repetition condition would imagine eating 30 M&Ms and inserting 3 quarters into a laundry machine. After performing their respective mental simulation participants were invited to eat ad libitum from a bowl containing 40 g of M&Ms. Once a participant indicated they had eaten enough the bowl was taken away and weighted on a digital scale. A between-subjects analysis of variance showed that the type of simulation used would impact on how much a participant would eat, with the 30-repetition condition eating significantly fewer M&M's than did participants in the three-repetition condition and participants in the control condition.

The Morewedge et al (2010) results showed that, at least when it comes to food, it is possible to engender habituation to a stimulus through mental imagery alone. In the conclusion of their study they remark that their results allow for the development of more effective interventions to reduce cravings for unhealthy foods and drugs. Furthermore, in a 'Scientific American: Mind' (2011) article Morewedge commented that the next logical step was to apply the ideas of mental simulation and habituation to smoking.

The theories of McSweeney (2004) on habituation and the experimental results of the Morewedge et al (2010) study have lead the author of this paper to believe there is real benefit in applying such theories and methods in the development of a new approach to smoking cessation. One that could be used by all sorts of cohorts, irrespective of age or gender and that was low cost.

Below are the variables this study aims to use to measure the effectiveness of the intervention.

2.3 Stages of Change and smoking cessation

The Transtheoretical Model of Change (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1997), a theoretical model of behaviour change, has been the basis for developing effective interventions to promote health behaviour change. The Transtheoretical Model is an integrative model of behaviour change. Key constructs from other theories are integrated. The model describes how people modify a problem behaviour or acquire a positive behaviour. The central organizing construct of the model is the Stages of Change.

The model involves emotions, cognitions, and behaviour. This involves a reliance on self-report. For example, in smoking cessation, self-reporting has been demonstrated to be very accurate if dependent on certain factors such as type of population, type of intervention, and demand characteristics (Velicer, Prochaska, Rossi, & Snow 1992). Accurate measurement requires a series of unambiguous items that the individual can respond to accurately with little opportunity for distortion. Measurement issues are very important and one of the critical steps for the application of the model involves the development of short, reliable, and valid measures of the key constructs. (Prochaska & DiClemente, 1983; Prochaska, DiClemente, Velicer, Ginpi & Norcross, 1985; Prochaska, DiClemente Velicer & Rossi, 1993)

The stage construct is the key organizing construct of the model. It is important in part because it represents a temporal dimension. Change implies phenomena occurring over time. The Transtheoretical Model construes change as a process involving progress through a series of five stages (Prochaska et al, 1994).

Pre-contemplation is the stage in which people are not intending to take any action whatsoever to change a targeted behaviour and are quite happy to continue no matter how harmful it may be. However, it is possible people may be in this stage because they are uninformed or under-informed about the consequences of their behaviour. Most traditional health promotion programs would not be designed for these people nor would per-contempltors be suitable for such programmes as it would be seen as futile to try and change the behaviours of someone who does not want to change. (DiClemente et al, 1991; Prochaska et al, 1994; Taylor, 2009 p70)

Contemplation is the stage where people are simply intending to change within the next six months. A six month time frame is used as it was assumed that this is as far into the future as most people can plan a behaviour change. They may be more aware of the advantages of changing but can still rationalise these away, fully aware of what they consider to be the disadvantages of change. These people are also not ready for traditional action oriented programs. (DiClemente et al, 1991; Prochaska et al, 1994; Taylor, 2009 p70)

Preparation is the stage in which people are intending to take action in the immediate future, usually measured as the next month. Those in this stage typically will have embarked on some significant action in the past year. These individuals will have formed some sort of plan of action plotting how they shall tackle the problem behaviour or ways that might help them put a stop to such behaviours, such as joining a health education class, consulting a counselor, talking to their physician, buying a self-help book or relying on a self-change approach. These are the people that should be targeted for action- oriented smoking cessation programs. (DiClemente et al, 1991; Prochaska et al, 1994; Taylor, 2009 p71)

Action is the stage in which people have made specific, overt, change to a behaviour in their life-styles within the past six months. Originally this 6 month period was split into an early action (0 – 3 months) and late action (3 – 6) periods. However, it was found that there was no real difference between these early and late periods and so a single 0 – 6 month period was settle upon. People must attain a criterion that scientists and professionals agree is sufficient to reduce risks for disease. In smoking, for example, the field used to count reduction in the number of cigarettes as action, or switching to low tar and nicotine cigarettes. However, here that is not action, only total abstinence counts. The Action stage is also the stage where vigilance against relapse is critical and is considered the busiest stage. (Prochaska & DiClemente, 1983; Prochaska et al, 1994 Taylor, 2009 p71)

Maintenance is the period 6 months after action has taken place and maintained. It is continued until smoking is no longer considered a problem. (Prochaska et al, 1994; Taylor, 2009 p71)

Velicer, Fava, Prochaska, Abrams, Emmons, & Pierce (1995) demonstrated that the distribution of smokers across the first three Stages of Change was approximately identical across three large representative samples. Approximately 40% of the smokers were in the pre-contemplation stage, 40% were in the Contemplation stage, and 20% were in the Preparation stage. However, the distributions may be different in different countries. Etter, Perneger, & Ronchi (1997) summarized the stage distributions from four recent samples from different countries in Europe (one each from Spain and the Netherlands, and two from Switzerland). The distributions were very similar across the European samples but very different from the American samples. In the European samples, approximately 70% of the smokers were in the pre-contemplation stage, 20% were in the Contemplation stage, and 10% were in the Preparation stage.

The stages of change dictate that certain interventions should be considered only for certain stages and that some interventions could be devised as a means to helping smokers move from one stage to the next. It is still popular and effective measure that has been used to examine the process of smoking cessation in certain instances such as in adolescence (Guo, Aveyard, Fielding & Sutton 2009) and pregnant women (Buja, Guarnieri, Forza, Tognazzo, Sandona & Zampieron, 2011; Huang, Guo, Wu & Chien 2011).

With this in mind, this study aims to use the trans-theoretical model of stages of change to gauge the effectiveness of mental simulation as a smoking cessation therapy. It focuses on the first four stages: pre-contemplation, contemplation, preparation and action. If an intervention can be tailored to a certain stage it can be more effective and be applied across groups (Velicer et al, 1995). "Cessation interventions may be able to increase success rates by being sensitive to stage and by shifting strategies depending on stage of change" (DiClemente et al, 1991).

2.4 Personality and Smoking cessation

Certain personality dimensions drawn from personality trait theories (such as Eysenck, 1947) have been associated with aspects of addictive behaviours in general and with cigarette smoking behaviours specifically, such as in one meta-analysis which indicated a significant difference between smokers and nonsmokers on both extraversion and neuroticism (Munafo`, Johnstone, Murphy, & Walton, 2001). In their 2005 meta-analysis Munafo, Zetteler and Clark posit that some of the more widely and consistently reported associations between smoking behaviour and personality relate to approach-related traits (such as extraversion, novelty seeking, and impulsivity) and avoidance-related traits (neuroticism, harm avoidance, etc.). Neuroticism (an avoidance-related trait) comprises facets of anxiety, negative affect (i.e., depression), and anger.

One possibility why this personality trait correlates with smoking is that individuals who score highly on measures of avoidance-related traits smoke to self-medicate high basal levels of anxiety, negative affect, or anger with nicotine (Eysenck, Grossarth-Maticek, & Everitt, 1991). Munafo et al (2006) also cite data from twin studies of Heath and Madden (1995) as a further possibility that relevant personality traits and smoking behaviours share a common genetic basis. Their meta-analysis found that those who scored higher on the neuroticism scale on the revised Eysenck personality questionnaire (EPQR) were more likely to be smokers. Further research in the area found that high scores on sub-items of the neuroticism scale of the NEO-PI-R predicted an inability to quit (Berlin & Covey, 2006; Boudrez, 2009). Cosci, Pistelli, Lazzarini and Carrozzi (2010) found that high scores in neuroticism and psychoticism on the EPQ-R have a negative effect on the success of smoking cessation. Finally, Acton, Kunz, Wilson and Hall (2010) said internalisation presents problems for individuals who are attempting to quit. Acton notes that high scores for neuroticism on psychometric tests is a strong indicator of internalisation.

All of the above literature points towards problems for individuals who score high on neuroticism in their attempts to stop smoking and this current research study aims to examine how neuroticism affects smoking cessation when coupled with mental simulation.

While the majority of the literature which focuses on personality and smoking cessation is preoccupied with negative affect personalities traits, one study by Lipkus, Barefoot and Williams (1994) found that those who are impulsive and sensation seeking are more likely than others to start smoking and still be found smoking in later years. Impulsiveness and sensation seeking would be considered factors of the extraversion scale on the EPQ (Eysenck, 1947; Eysenck et al, 1985).

With this is mind, the current research study aims to examine what role extraversion might play in smoking cessation during the intervention.

2.5 Summary and Hypotheses

During this intervention the initial and follow-up contact with participants will be web-based (tailored and generic emails & online surveys) as this process affords flexibility, is less time consuming, has been shown to be effective and those who have participated in such interventions have been satisfied with them (Zbikowski, Hapgood, Barnwell, & McAfee, 2008). Also, the reliability and validity of self-reported smoking in anonymous online surveys has been successfully demonstrated by Ramo, Hall, and Prochaska (2011).

The mental simulation will be tailored so as not to elicit cravings by avoiding olfactory and taste related imagery which was shown by Baylen (2007) to increase an individuals want, or craving, of a target substance. A 2009 study by Gilbert, Nazareth & Sutton stressed the importance of producing health promotion literature at an appropriate level of reading, using language that can be understood by smokers of all reading levels without being patronizing. With this in mind, great care will also be taken in the construction, prose and readability of the instructions for mental simulation.

There will also be a qualitative element to the final follow up questionnaire to try and gauge how participants, at an individual level, found the intervention.

The three main hypothesis of this study are:

(A) Participants will record a significant reduction in amount smoked after intervention when compared to pre-intervention and score lower on FTND post intervention compared to pre-intervention.

(B) (i) Participants who score high on the neuroticism measure of the EPQ-R will be unlikely to significantly reduce their amount smoked and for there to be little difference between their before and after intervention scores on the FTND measure. And that those who score low on neuroticism would show a significant reduction in both amount smoked and FTND scores.

(ii) Participants who score high on the extraversion measure of the EPQ-R will be unlikely to significantly reduce their amount smoked and for there to be little difference between their before and after intervention scores on the FTND measure.

(C) A significant number of participants in the preparation stage will show a significantly greater reduction (in scores on FTND and self-reports on amount smoked) than those in the pre-contemplation and contemplation stage.

3. Methods

3.1 Measures

The materials used in this study were the Fagerstrom Test for Nicotine Dependence (FTND) (Heatherton et al, 1991) questionnaire, a short form Stages of Change questionnaire based on research from DiClemente et al (1991). The Revised Short-scale Eysenck personality questionnaire (EPQ-R) (Eysenck, Eysenck & Barret, 1985) will be used to measure the personality traits of extraversion and neuroticism.

3.1a The EPQ-R (short form)

The Eysenck scales for measuring personality have gone through a number of revisions over the past 60 years, which has resulted in an increase in its length (Francis, Lewis, & Ziebertz, 2006) resulting in the development of the revised version of the EPQ called the Revised Eysenck Personality Questionnaire (EPQ-R) which had 100 items (Eysenck et al, 1985). At the same time Eysenck et al (1985) devised a short form of the Revised Eysenck Personality Questionnaire (EPQ-R s) for use among adults. In this form the four areas of extraversion, neuroticism, psychoticism and the lie scale each contain 12 items (Francis et al, 2006). The EPQ-R s has now been used quite widely, including studies by Aleixo and Norris in examining the moral reasoning in young offenders (2000), Blagrove and Akehurst in sleep studies (2001), Chan and Joseph in domains of aspiration, and subjective well-being (2000), Chivers and Blagrove in Nightmare frequency (1999), Creed, Muuer, and Machin in predicting mental health in the unemployed (2001), and by Glicksohn and Golan in developing a personality profile of a bomb-disposal expert (2001). Showing the EPQR-S to be a versatile psychometric tool. This versatility along with the fact it measures both neuroticism

and extraversion make it ideal for this study.

3.1b The Fagerstrom Test for Nicotine Dependence (FTND)

The Fagerstrom Test for Nicotine Dependence (FTND) has been shown to be a valid and reliable measure of nicotine dependence across gender, cohorts and culture (Payne, Smith, McCracken & McSherry, 1994; Pomerlean, Carton, Lutzke & Flesland, 1994; Richardson & Ratner, 2005; Ling, Hui & Hung, 2006). In a study of smokers diagnosed with PTSD, Buckley, Mozley, Holohan, Walsh and Beckham (2005) found that the FTND had excellent test-retest reliability and correlated significantly with both biological and psychological measures of nicotine dependence. Vink, Willemsen, Beem, and Boomsma (2005) reported acceptable levels of internal consistency in a sample of non-psychiatric Dutch smokers. It is also a relatively short measure, its length making it ideal for this study due to its time constraints. When it is compared to other short form nicotine measures, such as the Heavy Smoking Index (HSI), the FTND has been shown to be more effective amongst populations or sub-populations that are low in nicotine dependence (Pérez-Río et al, 2009). It will be used to see if there any changes between nicotine dependence before and after the intervention.

3.1c Other measures

A short form questionnaire consisting of two questions, derived from the work of DiClemente et al (1991), will be used to assign participants to one of the first three stages of change. A demographic questionnaire designed for this study was used to assess participant characteristics including age, gender, smoking history and occupation. A qualitative questionnaire designed for this study was used to gauge participants opinions of the techniques used during the

study. The instructions for mental simulation were devised by the author from the theories of McSweeny (2004) and the experimental work of Morewedge et al (2010). Participants were also told to keep a pen and paper record of how much they smoked in a given week. All instructions for participants were sent via email. Questionnaire data collection was also conducted online.

3.2 Participants

Participants (n=35) all of which received the intervention, were selected through convenience and then snowball sampling. Twenty one of the participants were male with the reaming fourteen being female. The mean age of participants was 28.49 years.

Participant who had been smoking for fewer than two years or were currently using any form of NRT were rejected. Participants were not offered any form of compensation for their participation.

All participants were from the County Dublin area apart from a single participant from County Wicklow. Participants were a mix of students (n=10) and those of several different occupations (Therapist n=3, photography n=3, Tv Editor n=3, Montessori teacher n=2, Sales n=2, Banker n=2, Waiter n=2, Barman n=1 Intern n=1, Naval Architect n=1, Journalist n=1, Media Account Manager n=1, IT n=1, Set Designer n=1 and Lawyer n=1). Socioeconomic background was not considered in this study.

3.3 Procedure

Participants were recruited through social proximity to author, email and social networking sites (such as 'Facebook'). Once a participant had volunteered they were asked, via email, if they knew any other smokers that might be interested.

Once all eligible participants had been gathered they were sent, via email, a link to an online

survey (containing Fagerstrom Test for Nicotine Dependence (FTND), EPQ-R s and Stages of Change measure) which they were asked to fill out. As the online survey was completed by participants at a time of their choosing, replies were received in a staggered fashion. There was a spread of three days from the arrival of the replies of the first participants to those of the last. Within approximately twelve hours of completing the survey, participants were then instructed by email to record, as accurately as possible, the number of cigarettes smoked over the next seven days. Participants were advised to do so by using a pen and paper. All participants were sent identical emails in content.

Once seven days had passed from their initial response to the survey, the participants were sent a follow-up email asking them to report their total number of cigarettes smoked in the intervening time. At this stage all thirty-five participants who filled out the initial online survey replied (over a course of four days) and submitted a first week total of cigarettes smoked. However, almost none had kept an accurate total and in many cases offered only a estimate of how much they smoked. Accompanying the email, by way of an attached file, were detailed instructions for the technique of mental simulation. These instructions were accompanied with information of how often and when the technique was to be used. Once more the participants were asked to record the number of cigarettes they smoked over the next seven days, but on this occasion while employing the technique of mental simulation. It was emphasised to participants at this stage, in a separate email, that obtaining as accurate a number of cigarettes smoked as possible was crucial to the study.

After seven days had passed from when the participant had received email instructions for the technique of mental simulation they were sent an email containing a link to the follow-up questionnaire. This consisted of FTND and Stages of Change measures. Also part of the follow up questionnaire were four questions of a qualitative nature designed to gauge how each participant found the technique of mental simulation as an aid to smoking cessation. The participants were also asked to report their total number of cigarettes smoked over the seven days while using the

technique of mental simulation.

Out of the 35 participants who replied to the first questionnaire only 26 completed the second follow up questionnaire and submitted a report of total cigarettes smoked for the second week. Of those 26 who reported how much they smoked in the second week all were approximations by the participants own admission. 18 of the participants completed the qualitative aspect of the follow up questionnaire.

4. Results

4.1 Demographic information and miscellaneous

35 participants started the intervention of whom only 9 failed to finished. Of the remaining participants 11 were female and 15 male. The average age of these participants was 26.77 (SD= 3.648).

Nine had made no attempt to quit smoking in the past year, five had made one attempt, three had mad two while the remaining ten had made three or more 24 hour quit attempts in the past year. Five participants had been smokers for 2 – 4 years, three for 4 – 6 years, seven for 6 – 8 years and the remaining elven reported they had been smokers for 8 or more years. The majority of the remaining participants (16) reported that they smoked 10 or less cigarettes a day, with nine on 11 – 20 a day and only a single participant reporting they smoked 21 – 30 cigarettes a day.

The spread of stages of change among participants was 26.9% in the pre-contemplation stage, 23.1% in the contemplation stage and 42.3% in the preparation stage.

The first week (pre-intervention) FTND indicated that the average participant's level of dependence on nicotine was very low (M= 1.69, SD= 1.350).

4.2 Hypotheses Results

Hypothesis (A) predicted that participants would record a significant reduction in amount smoked post-intervention when compared to pre-intervention and score lower on FTND post-intervention compared to pre-intervention.

Table 1.

Hypothesis A paired samples t-test paired differences

	Mean	Std. Deviation	t	Sig. (2-tailed)
Total smoked week 1 Total smoked week 2	-.077	9.247	-0.42	0.967
FTND score week 1 FTND score week 2	.115	.217	.531	.600

A paired samples T-Test to compare means between pre-intervention amount smoked (M= 43.42, SD= 17.797) and post intervention amount smoked (M= 43.50, SD= 22.075) showed there was no significant difference in total smoked between pre- and post-intervention testing (t (25)=- .042, p= .967, 2-tailed).

A second paired samples T-Test showed there was no significant difference in FTND scores between pre-intervention (M= 1.69, SD= 1.350) and post-intervention (M= 1.58, SD= 1.815) testing (t (25)= -.531, p= .600, 2-tailed).

In this case the null hypothesis was accepted as no significant difference was found in either instance. Mental simulation of the act of smoking did not result in participants reducing either their amount smoked or nicotine dependence.

Hypothesis (B) (i) predicted that participants who score high on the neuroticism measure of the EPQ-R s will be unlikely to significantly reduce their amount smoked and for there to be little difference between their before and after intervention scores on the FTND measure. And that those who score low on neuroticism would show significant reduction in both amount smoked and FTND scores.

To test this hypothesis, participants who scored below the mean score of the neuroticism scale were assigned to the Low neuroticism group and those participants who scored above the mean were assigned to the High neuroticism group. Then paired samples t-testes were run.

Table 2.1

Hypothesis B (i) paired samples t-test paired differences

		Mean	Std. Deviation	t	Sig. (2-tailed)
High Neuroticism	Total smoked week 1 Total smoked week 2	3.625	5.528	1.855	.106
	FTND score week 1 FTND score week 2	.375	.916	1.158	.285

A paired samples T-Test showed there was no significant difference in total smoked between pre-intervention (M= 34.25, SD= 12.186) and post-intervention (M= 30.63, SD= 11.160) testing for those with High levels of neuroticism: (t (7)=1.855, p= .106, 2-tailed).

A paired samples T-Test showed there was no significant difference in FTND scores between pre-intervention (M= 1.25, SD= 0.707) and post-intervention (M= 0.88, SD= 1.126) testing for those with High levels of neuroticism: (t (7)=1.855, p= .106, 2-tailed).

As predicted, participants scoring high on the neuroticism scale failed to significantly reduce either their total smoked or FTND score. However, they did record a slight reduction in

both.

Table 2.2

Hypothesis B (i) paired samples t-test paired differences

		Mean	Std. Deveation	t	Sig. (2-tailed)
Low Neuroticism	Total smoked week 1 Total smoked week 2	-1.722	10.191	-.717	.483
	FTND score week 1 FTND score week 2	.000	1.188	.000	1.000

A paired samples T-Test showed there was no significant difference in total smoked between pre-intervention (M= 47.50, SD= 18.640) and post-intervention (M= 49.22, SD= 23.509) testing for those with Low levels of neuroticism: (t (17)= -.717, p= .483, 2-tailed).

A paired samples T-Test showed there was no significant difference in FTND scores between pre-intervention (M= 1.89, SD= 1.530) and post-intervention testing (M= 1.89, SD= 1.997) for those with Low levels of neuroticism, in fact, there was no change at all: (t (17)= -.000, p=1.000, 2-tailed).

Contrary to the second part of the predicted hypothesis, there was no significant reduction in either total smoked or their FTND score for participants of the Low neurotic category. In fact, there was no change at all in FTND scores and an actual increase in amount smoked.

Hypothesis (B) (ii) predicted that participants who score high on the extraversion measure of the EPQ-R will be unlikely to significantly reduce their amount smoked and for there to be little difference between their before and after intervention scores on the FTND measure.

Table 2.3

Hypothesis B (ii) paired samples t-test paired differences

		Mean	Std. Deviation	t	Sig. (2-tailed)
High Extraversion	Total smoked week 1 Total smoked week 2	-5.600	7.306	-2.424	.038*
	FTND score week 1 FTND score week 2	-.400	.843	-1.500	.285

Note * $p < 0.05$

When the extraversion group was split into High and Low categories (those scoring below the mean were put into the Low category and those scoring above the mean put into the High category) and tested for reduction in smoking and FTND scores pre- and post-intervention a paired samples T-Test showed there was a significant increase in mean total smoked between pre-intervention (M= 42.50, SD= 22.001) and post-intervention (M= 48.10, SD= 26.552) testing for those with High levels of Extraversion: (t (9)= -2.424, p= .038, 2-tailed).

There was no significant difference in scores on the FTND (t (9)= 1.500, p= .168, 2-tailed) for those High in extraversion nor was there a any significant difference between amount smoke (t (15)= 1.534, p= .146, 2-tailed) or FTND scores (t (15)= 1.518, p= .150, 2-tailed) for those scoring Low on extraversion.

This increase in amount smoked, along with no significant change in FTND score, for those participants in the High extraversion group was in keeping with the prediction made in part (ii) of hypothesis B.

Hypothesis (C) predicted that a significant number of participants in the preparation stage will show a significantly greater reduction (in scores on FTND and self-reports on amount smoked) than those in the pre-contemplation and contemplation stage. A paired samples t-test between the three stages was run to test this hypothesis.

Table 3.1

Hypothesis C paired samples t-test paired differences

		Mean	Std. Deviation	t	Sig. (2-tailed)
Pre-contemplation	Total smoked week 1 Total smoked week 2	-4.667	6.055	1.888	.118
	FTND score week 1 FTND score week 2	.000	.632	0.000	1.000

It showed there was no significant difference in total smoked between pre-intervention (M= 41.33, SD= 15.253) and post-intervention (M= 46.00, SD= 15.253) testing for those in the pre-contemplation stage (t (5)= -1.888, p= .118, 2-tailed). There was also no change at all between means in FTND score between pre-intervention (M= 1.17, SD= 1.169) and post-intervention (M= 1.17, SD= 1.169) testing in the same group (t (5)= 0.00, p= 1.00, 2-tailed).

For the pre-contemplation group there was an increase in amount smoked and no change at all in FTND scores. This is unsurprising as pre-contemplators have no desire whatsoever to change behaviour.

Table 3.2

Hypothesis C paired samples t-test paired differences

		Mean	Std. Deviation	t	Sig. (2-tailed)
Contemplation	Total smoked week 1 Total smoked week 2	2.000	8.731	-.724	.487
	FTND score week 1 FTND score week 2	-.300	.949	-1.000	.343

A paired samples T-Test showed there was no significant difference in total smoked between pre-intervention (M= 56.00, SD=16.786) and post-intervention (M= 58.00, SD= 21.108) testing for those in the contemplation group (t (9)= -.724, p= .487, 2-tailed). There was also no significant difference between pre-intervention (M= 1.80, SD= 1.476) and post intervention (M= 2.10, SD= 2.025) FTND scores in the same group.

Contemplators showed a small increase in amount smoked and a small increase in FTND scores. Once more, this is not surprising despite their taking part in an intervention to reduce smoking. While contemplators might have future plans to quit, they are only tentative plans which are easily subject to change.

Table 3.3

Hypothesis C paired samples t-test paired differences

		Mean	Std. Deviation	t	Sig. (2-tailed)
Preparation	Total smoked week 1 Total smoked week 2	4.600	9.924	1.466	.177
	FTND score week 1 FTND score week 2	.600	1.350	1.406	.193

A paired samples T-Test showed there was no significant difference in total smoked between pre-intervention (M= 32.10, SD= 12.151) and post-intervention (M= 27.50, SD= 16.029) testing for those in the preparation group (t (9)= 1.466, p= .177, 2-tailed). There was also no significant difference between pre-intervention (M= 1.90, SD= 1.370) and post intervention (M= 1.30, SD= 1.947) FTND scores in the same group (t (9)=1.406, p= .193, 2-tailed).

Once more, contrary to the predicted hypothesis, there was no significant reduction in either participants total smoked or their FTND score regardless of which stage of change they occupied. However, those participants in the preparation group did show a small, statistically insignificant, reduction in both amount smoked and FTND scores. This reduction might have become more significant if the intervention had continued beyond one week.

Of the 26 participants who finished the intervention, 7 were now reporting a difference in stage change from the first week. 2 had now started a quit attempt and were occupying the Action stage, one from the Preparation stage and the other from the Contemplation stage. 2 had progressed from Contemplation to Preparation and 1 from Pre-contemplation to Contemplation. While the remaining 2 had actually regressed from Contemplation to Pre-contemplation. It is unlikely, however, that much can be read into this.

Of the 9 participants who failed to follow up in the second week (with a total smoked and FTND score) the majority (5) were in the pre-contemplation stage, with 2 in contemplation and 2 in preparation. The fact that the majority of participants who dropped out were those in the pre-contemplation stage is unsurprising. As mentioned, those in this group have no want to change behaviour.

The final part of the follow up questionnaire included a subjective and qualitative section of certain questions which tried to gauge participants opinions of the techniques used during the study. As the spread of answers varied greatly it would be redundant to simply list all responses here. However, all the questions and answers can be found in appendix C.

5. Discussion

The aim of the current research was to find a cost effective, low effort alliterative to NRT that was suitable for multiple cohorts through modification of the ideas of Morewedge et al (2010) and McSweeney (2004). Specifically, McSweeny's (2004) assertion that habituation is a single process contributor to the termination of behaviours and a top down process and the Morewedge et al (2010) experimental findings that habituation can be induced through mentally simulating the act one wishes reduce.

To this end the current research aimed to make use of the Transtheoretical Model of Change (Prochaska et al, 1983, 1992, 1997) and its stages of change (Prochaska et al, 1991, 1994) to gauge the effectiveness of such intervention, such as how effective it was relative to a given stage and whether it would be more suitable for a specific stage.

It also investigated what role, if any, personality might play in a person's attempt to quit smoking. Specifically, how traits such as neuroticism and extraversion might hinder an individual as they attempt to quit.

In the case of hypothesis (A), that participants would see a reduction in both their FTND scores and amount smoked between pre- and post-intervention testing simply through use of mental simulation alone, the data showed this to not to be the case at all. A simple look at the means shows there was no real change at all (in fact, there was a .08 increase) which runs contrary to the results of Morewedge et al (2010) who found a reduction in amount a participant would eat using the same technique of mental simulation.

It must be noted, however, that there was a significant difference between these two experiments. In the Morewedge et al study (2010), participants had only to use to technique of mental simulation once, under instruction, and were presented with the target substance only once.

As well as this, the study took place exclusively in laboratory conditions. In the current research study it was up to the participants to remember themselves when to use the technique and then they had to use it repeatedly in an attempt to avoid an already highly addictive behaviour. This all under the stress of everyday life.

Some of the answers the participants gave to the question, 'How often did you use the technique of mentally simulating smoking?', show that simply remembering to use the technique was a struggle unto itself. Some only remembered to use it during the first day, others used it as few as only two times, while one participant reported that they “never remembered to use it”. One participant who sent an email one week after the intervention had finished went so far as to suggest “maybe if you could pair it with some kind of reminder like an alarm or even some sort of bracelet?”. A very interesting suggestion which could be a consideration for any future research.

The research of Bock et al (2010) found that pharmacists can play an important role in the effective delivery of smoking cessation counseling. Future research could incorporate mental simulation into the smoking cessation counseling provided by the pharmacist (or any health care professional) and this would serve as a reminder to continue use it.

Then asked 'Did you feel that the technique was in anyway effective in helping you reduce the amount you smoked?' the majority of participants reported that it was not effective. This is hardly surprising as the technique was too hard to remember to do in the first place. However,it should be mentioned that there were some participants who remembered to use it and in turn did find the technique useful in stopping them from smoking. However, they were in the minority.

There was a concern that perhaps sending instructions for the technique of mental simulation via email might be inadequate and participants may fail to understand them. Gilbert et al (2009) make it clear in their paper that if experimenters are using written instructions those instructions must be clear. With this in mind, participants were asked at the end of the intervention 'Do you feel it would have been better to have the instructions explained to you in person or was email

sufficient?' The majority of which answered that the email was indeed sufficient with none communicating to the author any trouble with the written instructions. As such, poorly written instructions can be ruled out as a confounding variable.

However, the time between pre- and post- intervention was only two weeks, a very short and insignificant amount of time relative to a smoking habit the majority of participants (11) had fostered for at least 8 years or longer. In one instance, the research of Prochaska et al, (1991) took place over a 2 year period. Future research might consider greatly lengthening the time of the intervention and even the number of follow ups. This can be considered one of the study's greatest limitations, the technique was not afforded enough time to take effect.

Hypothesis (B)(i) predicted that those who scored high in neuroticism would not show significant reductions in amount smoked or FTND scores while those who scored low would show significant reductions in both.

In this instance, the participants grouped to high neuroticism did indeed fail to significantly reduce either their amount smoked or their FTND scores. This coincides with the research of Cosci et al (2010), Munafo et al (2001, 2005), and Eysenck et al (1991) that avoidance-related traits such as neuroticism can have a negative effect on the success of smoking cessation. However, participants who were grouped to low neuroticism also failed to show a significant reduction on either measure used to gauge the effectiveness of the intervention.

As a result, no real conclusions can be drawn as to whether it was their avoidance-related traits or the intervention not being effective that led to a failure to reduce FTND scores and amount smoked in those with high neuroticism.

Part (ii) predicted that those who were high in extraversion would fail to significantly reduce their amount smoked and their FTND score. The FTND score of this sub group did, as expected, not change significantly. The amount smoked by those scoring high in extraversion showed a

significant increase over the first week. While the previous literature from Lipkus et al (1994) said it was more likely these participants would simply continue smoking, it is still plausible that they could also record an increase overtime and as such these results could be considered in keeping with the previous literature.

One possible issue to be considered here is the EPQ-R (short form) which was used to measure participants personality traits. While it is a long standing, valid, reliable and versatile psychometric test, a more accurate test might have been of greater use. The NEO-PI-R, as used in the research by Acton et al (2010), Boudrez et al (2009) and Berlin et al (2006), might produce some more interpretable data if used in any future research.

In the case of hypothesis (C), that participants in the preparation stage will show a significantly greater reduction in both amount smoked and FTND scores pre- and post-intervention than those in either the pre-contemplation or contemplation stages, the results showed that there was no significant difference in either set of scores regardless of stage of change.

This is unsurprising for those in the pre-contemplation stage. If any significant change in behaviour was brought about for those in this stage by an intervention it could be classed not only as extremely effective but almost as a form of brain-washing, as it is in this stage one finds those who are not intending to take any action whatsoever to change a targeted behaviour and are quite happy to continue no matter how harmful it may be. Indeed, these participants actually showed an increase in amount smoked. This is in keeping with the previous research of Prochaska et al (1991, 1994) and DiClemente et al, (1991).

It is much the same for those in the contemplation stage who only have vague plans of changing their behaviour within a six month time frame. To expect change, even a small amount, from this stage over such a short space of time, is unrealistic (Prochaska et al 1991, 1994). In fact,

in this instance, they had shown an increase (albeit small) in both amount smoked and FTND scores.

However, those in the preparation stage are classed as those intending to take action in the immediate future, usually the next 30 days. They have also already made at least one 24 hour quit attempt within the past year. (Prochaska et al 1991, 1994). It was expected that if any of the first 3 stages were to show a reduction in either amount smoked or FTND it would be here. This was not the case as participants in the preparation stage failed to significantly reduce either amount smoked or FTND scores. However, they did show a small reduction and perhaps given more time this reduction could have grown.

The main conclusion to be drawn here is that the technique of mental simulation is ineffective one for any of the first three stages of change, at least over the a short time period in this study. Future research could attempt to implement a similar intervention over a longer time period while perhaps focusing on only the preparation stage. Indeed, future research might have more success using the technique during the action stage, during which a quit attempt has already started and vigilance against relapse is critical (Prochaska et al 1983, 1994). The technique might be more suited to tackling relapse, as opposed to helping a person begin a quit attempt, as somewhat evidenced by its failures with those in the first three stages of change (which all are pre-quit stages).

The method for assigning stage of change to a participant could also be considered one of the current research study's limitations. While the method used was derived from the work of Prochaska et al (1991) , that is to say participants were separated in order of those who had no plans to change behaviour, those who planned to do so in 6 months and those who planned to do so in 30 days (with the qualifier that they had at least one quit attempt in the past year), it remained very simplistic. Use of the 'Smoking processes of change' scale (Prochaska et al, 1988), a 40 item questionnaire that measures the 10 processes of change from the trans-theoretical model with four items each, might have been a more effective method for assigning participants to their correct stage

of change. The measure has demonstrated high reliability, internal validity, discriminative validity and predictive validity (Prochaska et al, 1991).

The short time frame of the current research was another limitation and perhaps a large contributor to some of its failings to produce interpretable data, as mentioned above. This applies not only with respect to the duration of the actual intervention, but also with respect to the little opportunity to properly screen participants. Some, it would seem, were more willing than others to commit to the process and this could have resulted in the drop off of some volunteers from an original 42 (before the start of experiment) down to 26. A larger, more diverse, sample would be more likely to produce useful data. It was also the aim of this research study to find a smoking cessation technique that could be used by multiple cohorts. With such a small sample size it was impossible to extrapolate results beyond the extremely limiting cohort involved in the study.

Another limitation resulting from the failure to properly screen participants was the type of smokers involved, the majority of whom seemed to be 'casual' or intermittent smokers. 61% of the participants smoked less than 10 cigarettes a day. Further evidence that the smokers taking part were intermittent was the mean score of their FTND (1.69). This is keeping with findings of Shiffman et al (2012) who found that intermittent smokers scored in the 0 – 2 range of the FTND. They also found that when compared to daily smokers, intermittent smokers were more likely to cite alcohol drinking, socializing, and being with other smokers as common contexts for smoking. Such triggers are impossible to control for and unlikely to be affected by mental simulation. In fact they are more likely to be hinder a participant remembering to use such a technique. As discussed, remembering to use the technique was a major problem for participants. Future research could concentrate solely on daily smokers who smoke at least 15 – 20 cigarettes a day.

A major problem became very apparent when collecting the participants' self-reported amount smoked for a given week, participants were not keeping an exact record but instead simple

approximations of unknown accuracy. At this time, it is impossible to postulate why exactly this happened but future research would need to address this issue in order to get accurate, useable, data. A suggestion, taken from Prochaska et al (1991), would be to ask participants to name a significant other who could be contacted and would validate the participants reported smoking patterns. This procedure could act as a bogus pipeline and the significant other would not need to actually be contacted at all.

It could be argued that the this study's participants were not adequately incentivised beyond their own perceptions of the health and monetary benefits of quitting smoking. Could some sort of additional monetary incentive stopped drop-outs or even simply encouraged participants to keep accurate records of the amount they smoked? Quit-and-win programs are used widely in the United States and internationally and appear to attract many participants and produce modest quit rates according to Donatelle et al (2004). However, they explain, the quality of the evaluations of quit-and-win programs varies considerably, and none has employed rigorous control or comparison groups to sufficiently identify the effect of incentives (Donatelle, et al 2004). Still, future research might want to consider some sort of incentive to maintain the interest of participants, as such failings were one of this current research study's limitations.

There was also no control group involved in this research (once more, due to time constraints and small sample size) and it would probably be of use in any future research in order to remove the intervention process as the reason for any reductions in smoking.

As mentioned in the opening of this discussion, part of the motivation of the current research study was to investigate an alternative to NRT as current research by Hughes et al (2011) and Alpert et al (2012) posits a move away, in research terms, from NRT as a go to therapy. As such, participants were asked, at the end of the intervention, if using NRT alongside mental simulation

would have been more beneficial. Of all the participants to respond, only one did not believe the additional help of NRT would have been needed. However, the remaining participants did think that if ran alongside NRT mental simulation would be more beneficial.

Perhaps then, as consideration for future research, the technique of mental simulation would be best used, not as a replacement for NRT, but as a partner of it or some other nicotine cessation therapy. Indeed, with the simulation technique shown to be of little use on its own perhaps a combination with one of the more successful therapies is the only place left for it.

One such avenue of research in the combining of mental simulation with NRT could be found in the relatively new idea of nicotine pre-loading. The use of NRT, prior to a quit attempt, is called pre-loading (Bullen et al, 2010). This simple variation on normal NRT treatment has, in some instances, been shown to be somewhat effective (Rose et al, 1994). One possible theory for its effectiveness is an extinction of the conditioned link between nicotine (reward) and smoking (Rose, Behm & Westman, 1998). If repeatedly simulating an action can trigger its behavioral consequences (Morewedge et al, 2010) it could also help break this conditioned link and incorporating the technique of mental simulation could bolster results of such treatments.

In a recent study, Bolt, Piper, Theobald and Baker (2012) showed combination therapies to be superior to both a placebo and monotherapies. They attest that this shows craving reduction is important in effective nicotine cessation therapy. Future research of mental simulation could test whether such a technique has an effect on craving, if it cannot reduce the amount someone smokes on their own.

The anti-depressant nortriptyline has been shown to have higher prolonged abstinence rates after 6 months (vs placebo) and resulted in prolonged abstinence rates that were more than twice as high as a placebo (Wagena, Knipschilo and Zeegers, 2004). Perhaps the technique of mental

simulation used inline with nortriptyline could produce even more successful results.

With all the above taken into consideration, where does that leave the technique of engendering habituation to smoking through mental simulation? With the numerous methodological flaws evident in this current research study one would have to say, at square one. Data gleamed was not really interpretable and makes it impossible to say whether or not it could be an effective therapy for nicotine cessation. However, it could still be used, as suggested, complementary to other more established therapies both in practice and research.

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6.2 Appendices

Appendix A.

Fagerstrom Test for Nicotine Dependence

1. How soon after you wake up do you smoke your first cigarette?

¨ After 60 minutes (0)

¨ 31-60 minutes (1)

¨ 6-30 minutes (2)

¨ Within 5 minutes (3)

2. Do you find it difficult to refrain from smoking in places where it is forbidden?

¨ No (0)

¨ Yes (1)

3. Which cigarette would you hate most to give up?

¨ The first in the morning (1)

¨ Any other (0)

4. How many cigarettes per day do you smoke?

¨ 10 or less (0)

¨ 11-20 (1)

¨ 21-30 (2)

¨ 31 or more (3)

5. Do you smoke more frequently during the first hours after awakening than during the rest of the day?

¨ No (0)

¨ Yes (1)

6. Do you smoke even if you are so ill that you are in bed most of the day?

¨ No (0)

¨ Yes (1)

* Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerstrom Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. British Journal of Addictions 1991;86:1119-27

Fagerstrom Test for Nicotine Dependence (cont.)

Your score was:_____

Your level of dependence on nicotine is:

0-2 Very low dependence 6-7 High dependence

3-4 Low dependence 8-10 Very high dependence

5 Medium dependence

Scores under 5: “Your level of nicotine dependence is still low. You should act now before your level of dependence increases.“

Score of 5: “Your level of nicotine dependence is moderate. If you don’t quit soon, your level of dependence on nicotine will increase until you may be seriously addicted. Act now to end your dependence on nicotine.”

Score over 7: “Your level of dependence is high. You aren’t in control of your smoking

– it is in control of you! When you make the decision to quit, you may want to talk with your doctor about nicotine replacement therapy or other medications to help you break your addiction.”

Apendix C

Below are the anwsers to the qualative section of follow up questionnaire. All anwsers are copied verbaitum. N/a marks a question not answered by participant.

Participant	How often did you use the technique of mentally simulating smoking?	Did you feel that the technique was in anyway effective in helping you reduce the amount you smoked?	Do you feel it would have been better to have the instructions explained to you in person or was email sufficient?	Do you believe the technique would benefit if used along side some other treatment (such as nicotine patches) ?
No. 1	8 - 10 times a day	sometimes	email was fine	yes
No. 2	a couple of times first day. Stopped using it after one day	not at all	N/a	N/a
No. 3	everyday	no	N/a	yes
No. 4	Few times	Don't know	Email	maybe
No. 5	Not often	N/a	N/a	N/a
No. 6	few times throughout the day. Wouldn't remember to do it on the hour like instructed	No	No	yes
No. 7	Didn't use it	Didn't use it	N/a	N/a
No. 8	As per your instructions on the hour and whenever I needed to smoke.	I think so yes. It took my mind off the cravings at times	the email instructions were fine dont think there would have been need for them to be given face to face	It could but I felt it worked well enough on it;s own
No. 9	Didn't	N/a	N/a	N/a
No. 10	never remembered to use it	No	N/a	N/a
No. 11	A few times a day	Nope	N/a	N/a
No. 12	Everyday	At times	N/a	yes
No. 13	couple times a day - more in the mornig then at nit	yes, in the morningg	N/a	N/a

No. 14	1st day, on the hour or when I was about to go for a smoke. After that, stopped using it. Forgot to if I'm honest	No	Email	yes
No. 15	not very often,about 20 times all together	No	Email was fine	yes
No. 16	5 times	Yes - on the 5 occasions I didnt smoke	Email was suffcient	yes
No. 17	2	yes	No	No
No. 18	Often	Yes	Email	yes
No. 19	N/a	N/a	N/a	N/a
No. 20	N/a	N/a	N/a	N/a
No. 21	N/a	N/a	N/a	N/a
No. 22	N/a	N/a	N/a	N/a
No. 23	N/a	N/a	N/a	N/a
No. 24	N/a	N/a	N/a	N/a
No. 25	N/a	N/a	N/a	N/a
No. 26	N/a	N/a	N/a	N/a