

„Alexandru Ioan Cuza” University of Iași
Faculty of Psychology and Education Sciences
Școala Doctorală a Facultății de Psihologie și Științe ale
Educației

CHANGING SMOKING RELATED IMPLICIT COGNITIONS

Summary

Principal Advisor,
Prof. Ticu Constantin, Ph.D.

Ph.D. candidate,
Silvia Măgurean

IAȘI
March 2014

Contents

Introduction	3
I. Study 1 – Changing implicit cognitions in addiction: a meta-analytical study.....	4
II. Study 2 The evaluative conditioning of attitudes towards smoking – the color-word association paradigm.....	5
III. Study 3 The evaluative conditioning of attitudes towards smoking – the "Go/No-Go" paradigm.....	7
IV. Study 4 The evaluative conditioning of attitudes towards smoking – the mixed paradigm	9
V. Study 5 The evaluative conditioning of attitudes toward smoking in the context of smoking cessation.....	11
VIII. General conclusions.....	15

Introduction

A well-known paradox of tobacco consumption is that even though smokers understand that this habit has many negative consequences, they continue to smoke. The chemical dependence is only partially responsible for this effect. Dual-Process Models of information processing may explain this paradox frequently encountered in substance consumption. The Reflexive-Impulsive Model (Strack & Deutsch, 2004) proposes the existence of two different information processing systems that can operate simultaneously: an automated, fast, impulsive system (the implicit system) and a conscious, slow, reflexive system (the explicit system). Recent studies on addiction show that both the implicit and the explicit processes play an important part in substance use (Chassin, Presson, Sherman, Seo, & Macy, 2011).

Most interventions aimed at reducing tobacco consumption, focus either on pharmacotherapy or on changes made to the explicit, reflexive processes (beliefs, behaviors, routines) in an individual or group setting. None of these interventions contain a component that can lead to changes in the implicit processes involved in smoking.

Recently developed programs have used evaluative conditioning procedures in order to produce changes at implicit level, but their effect on tobacco cessation has yet to be tested.

Therefore, the present research seeks to develop and validate an evaluative conditioning procedure that is aimed at modifying attitudes toward smoking, and to implement the procedure in an intervention program for reducing cigarette consumption.

In order to achieve this result, several steps were followed:

- Analyzing the existing literature on changing implicit cognitions, using a meta-analytic approach

- Developing and calibrating an evaluative conditioning procedure that is effective in modifying implicit attitudes toward smoking
- Implementing the evaluative conditioning procedure in an intervention program that is aimed at reducing tobacco consumption, in order to test if such procedures can bring additional benefits to smokers who want to quit.

I. Study 1 – Changing implicit cognitions in addiction: a meta-analytical study

Objective: Analyzing the effects that different types of interventions have on the implicit cognitions involved in substance use, by employing the specific techniques of a meta-analysis.

Methods: Study selection: a) experimental or quasi-experimental studies; b) the studies must measure the DVs using indirect techniques; c) the studies must target addiction. Eleven papers were included in the analysis which generated 19 effect sizes. The total number of participants was 604. Mean effect size was obtained using the Comprehensive Meta-analysis software, using the specifications given by Borenstein, Hedges, Higgins, & Rothstein (2009).

Results: For the entire sample of studies, a relatively low mean effect size (.24) was found, but the high level of heterogeneity suggests the existence of moderating variables which influence the effectiveness of the interventions. Subgroup analyses did not show any significant differences between the types of interventions (explicit vs. implicit), or between the facets of implicit cognition involved (implicit attitudes vs. attentional biases). Interventions on alcohol use had greater effectiveness than those on tobacco use, but the studies on the latter also had a high level of heterogeneity.

Discussion and conclusion: Regarding tobacco consumption, studies suggest mixed results, due to some moderating variables that could not be analyzed (because of the small number of studies). The two facets of implicit cognition are similarly modified by the interventions developed so far. However, the attentional bias presents a number of methodological disadvantages that led to the decision of focusing our attention on modifying implicit attitudes through evaluative conditioning techniques.

Therefore, in the next step, we tested two different types of evaluative conditioning procedures. Given the absence of an established procedure to change attitudes towards smoking, we selected two procedures based on their potential to cause changes in the general affective reaction to the desired object: the procedure based on the color-word paradigm (Schmidt & Besner, 2008) and a procedure based on the Go/No-Go paradigm (Houben, Nederkoorn, Wiers, & Jansen, 2011).

II. Study 2 The evaluative conditioning of attitudes towards smoking – the color-word association paradigm

The color-word paradigm was adapted by Schmidt & De Houwer (2012) to determine the effect of evaluative conditioning. This procedure was tested by repeatedly presenting neutral non-words (CS) with either positive or negative adjective (US). The participants' task was to press one key for the negative adjectives and a different key for the positive adjectives. At the end of the task, the non-words that were presented more frequently with the negative adjective assimilated a negative valence, while the words presented more frequently with the positive adjectives assimilated a positive valence. The advantages that encourage us to use this procedure are that: it

shows good reliability even with a small sample size, it has a reduced administration time, and the effect produced is generalized to include the valence and not just the adjectives that were presented in association with the non-words. On the other hand, this technique has not been tested on CSs that already have a strong valence, and has not been implemented with the use of images, as in the case of this study.

Objective: Analyzing the effectiveness of the implicit learning technique proposed by Schmidt & De Houwer (2012) in changing implicit and explicit attitudes toward smoking.

Methods: The study employed an experimental design, with two independent groups (the negative conditioning and the “placebo”/neutral conditioning of smoking). Eighty-nine students who were smokers participated in the study. The intervention was similar to that proposed by Schmidt & De Houwer (2012).

Materials: Implicit attitudes were evaluated with the use of the Affect Misattribution Procedure (AMP) Payne et al., (2007) and the Implicit Association Test (IAT) (Greenwald et al., 1998). Explicit attitudes were measured by evaluating images representative for smoking. Craving was evaluated with a Visual Analogue Scale ranging from 1 to 100. Tobacco dependence was measured with the Fagerstrom Nicotine Dependence Questionnaire developed by Heatherton, Kozlowski, Frecker, & Fagerström (1991). Contingency awareness was analyzed at general level (not at stimulus level).

Results: The results show no direct effect of the conditioning on the implicit or explicit attitudes towards smoking, or on craving, even though the experimental manipulation was successful (participants learned the associations between the stimuli). Additional analyses revealed that contingency awareness could have an important role in the effect of the conditioning procedure. Thus, smokers who observed the association between negative stimuli and the stimuli

representative for smoking, showed a more negative general attitude toward smoking and a lower level of craving.

Discussion and conclusion: Results showed that there is no direct effect of the intervention on either implicit attitudes, explicit attitudes or craving. In line with previous research (Hofmann et al., 2010; Schmidt & De Houwer, 2012b), our results also suggests that EC effect are different, depending on the level of contingency awareness. Thus, as participants observe the association between the negative stimuli and smoking-related stimuli, they are more likely to have a more negative attitudes and a lower craving sensation after the evaluative conditioning.

III. Study 3 The evaluative conditioning of attitudes towards smoking – the "Go/No-Go" paradigm

In the context of addiction, a successfully used paradigm for modifying attitudes toward alcohol was adapted by Houben, Nederkoorn, Wiers, & Jansen (2011) based on the Go/No-Go Association Test. In this procedure, participants are presented with a series of alcohol related images (in our case, smoking representative images) and images representative for a contrast category (i.e. water in the original study and chewing gum in this study). Participants have to categorize the images based on irrelevant characteristics of the pictures (the letters "p" or "f" written in the corner of the image): they must press the space bar (the "go" instruction) if the image contains the letter *p* and they must not press any keys (the "no-go" instruction) if the picture contains the letter *f*. In fact, all images representative for alcohol were presented with the "no-go" instruction, while all the images representative for the contrast category were accompanied by the "go" instruction. This evaluative conditioning paradigm has two

major advantages: it led to the development of negative general affective reactions towards alcohol, and it was effective in reducing alcohol consumption.

Method: An experimental design with 3 independent groups was used: one group that responded to the irrelevant characteristic of the image, similarly to Houben's (2011) study, one group that responded to the relevant characteristic of the image (image content), and a neutral-“placebo” control group. Seventy students (smokers) participated in the study. The materials used were similar to those in the previous study. The conditioning procedures were implemented as described above.

Results: Results showed that the type of intervention had no direct effect on implicit and explicit attitudes, nor on craving. The effect of contingency awareness could not be measured because of the specifics of the task. Additional analyses were conducted in order to discover the role that tobacco addiction in the effectiveness of the interventions. Effects were observed only for implicit attitudes assessed by the AMP task: participants with high levels of addiction who were negatively conditioned showed negative implicit attitudes towards tobacco.

Discussion and conclusion: The absence of a direct effect of evaluative conditioning on attitudes and on the craving could be due to different aspects: the specific task characteristics, different from Houben et al.'s (2011) study; the initial attitudinal valence towards tobacco consumption; the lack of effect of the intervention. However, it appears that this type of procedure influences the automatic affective reactions toward smoking, in smokers who are highly addicted.

Even though smokers' attitudes were not directly modified by the evaluative conditioning procedure performed, the results suggest a

series of measures that can be used to improve the conditioning effect. These measures were implemented in the following study.

IV. Study 4 The evaluative conditioning of attitudes towards smoking – the mixed paradigm

In order to increase the chances of changing implicit and explicit attitudes toward smoking, a series of procedures designed to optimize the intervention and the study design were extracted, after testing the two different evaluative conditioning paradigms. These procedures were integrated in a new study that seeks to assess the effectiveness of a mixed paradigm (that combines the two previous procedures) in reducing tobacco consumption by modifying implicit and explicit attitudes (emphasizing their negative valence).

Method: A two-independent group experimental design was used. Fifty five students who smoked and were at least moderately nicotine addicted participated in the study. The materials used were identical to the ones in the previous studies. Additionally, the number of cigarettes smoked in the 24 hours following the participation to the experiment and the stage of change (using the procedure proposed by Wewers, Stillman, Hartman, & Shopland (2003)) were measured.

Results: In order to analyze the indirect effect of the implemented intervention on the smokers' behavior, a serial multiple mediation model was tested. We hypothesized that the conditioning procedure has an effect on the implicit attitudes, which in turn has an effect on explicit attitudes, which modifies the smokers' behavior (the number of cigarettes smoked following the experiment).

Three indirect effects were computed, however only one was significant: *conditioning* → *implicit attitudes* → *explicit attitudes* → *number of cigarettes smoked following the experiment* . The indirect effect was -.07 and had the 95% confidence interval between -.293 and -.001.

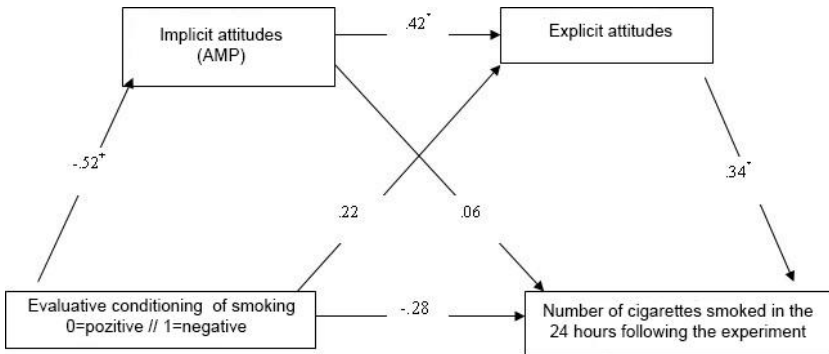


Figure 1 Implicit and explicit attitudes serially mediate the effect of evaluative conditioning on the number of cigarettes smoked. The relationships between the variables are expressed by unstandardized regression coefficients. * $p < .05$; + $p = .06$

Discussion: The results obtained are similar to those reported by Houben et al. (2012) on negative conditioning of alcohol.

Although the time sequence is clear with regards to administrating the conditioning procedure, followed by attitude changes, and then by cigarette consumption (24 hours after the procedure), the dynamic of the changes in implicit attitudes relative to the changes in explicit attitudes requires further research. Recent studies (Perugini, Richetin, & Zogmaister, 2014) showed that implicit learning procedures have a different impact on explicit attitudes, depending on whether or not implicit measures were assessed prior to the evaluation of the explicit attitudes. The authors suggest that this effect has two possible explanations: (a) going through implicit tasks acts like a signal, helping participants observe the newly developed automatic reactions or (b) going through implicit tasks helps to strengthen the newly developed automatic reactions, by having an additive effect on the conditioning procedure. Both explanations are plausible in the case of the present study.

Therefore, after the negative conditioning of smoking, participants start to automatically assign a negative valence to tobacco consumption, and once the smoker is aware of this, he/ she consumes fewer cigarettes.

Thus, in the next study we propose the implementation of the evaluative conditioning procedure in a randomized control trial, alongside other established methods used for smoking cessation.

V. Study 5 The evaluative conditioning of attitudes toward smoking in the context of smoking cessation

With regard to tobacco use, we have already succeeded, as shown by the studies described earlier, in developing a conditioning procedure that modifies the smokers' attitudes and even their behavior. Therefore, we believe that the next step is to implement this procedure within the context of developing an intervention for smokers who want to give up smoking.

Objective: Analyzing the degree to which a procedure that seeks the evaluative conditioning of attitudes toward smoking can be effective in reducing tobacco consumption. In order to test this objective, a randomized control trial was conducted in which three types of interventions for reducing tobacco consumption were examined: (a) pharmacotherapy - using a vareniclin-based product (Champix); (b) a behavioral group intervention, according to Stritzke et al. (2009); (c) a mixed intervention that contained both the psychological group intervention and the evaluative conditioning paradigm used in the previous study.

Method: A randomized control trial was implemented. Variables were measured before the start of the intervention, during the intervention (at regular intervals) and at the completion of the

study. Additionally, the number of cigarettes smoked per day was also measured two months after the end of the intervention.

Seventy-five eligible participants showed up for the first evaluation. The final standard analysis was performed only on participants who went through at least 50% of the intervention they were assigned to, namely 27 participants (pharmacotherapy n=13, group intervention n=7, mixed intervention n=7)

In the intent-to-treat analysis, the participants who received at least one session (at the beginning of the intervention) were included: pharmacotherapy n=23, group intervention n=21, mixed intervention n=18.

Intervention: Pharmacotherapy was performed using Champix, a vareniclin-based drug sold without a prescription. The drug was administered for five weeks, while participants were monitored regarding their progress and the occurrence of any side-effects. The group intervention was developed by Stritzke et al. (2009) and contains elements based on the recommended international guidelines for best practices and on the general principles that form the foundation of evidence-based treatments for addictive behaviors (Stritzke et al., 2009). The group intervention included eight sessions that were delivered over the course of 4 weeks. The mixed intervention included the group intervention described above and the evaluative conditioning procedure used in the previous study. The evaluative conditioning procedure was once a week, during the entire length of the group intervention (4 weeks).

Materials: Implicit attitudes were evaluated using the AMP and the IAT, while the explicit attitudes were measured using a semantic differential for three dimensions: pleasant-unpleasant, useful-damaging, delightful-disgusting. The number of cigarettes smoked per day was recorded and analyzed as a DV. Other variables that were analyzed include: smoking cessation self-efficacy, t

ambivalence, beliefs regarding tobacco consumption, confidence in the intervention and craving. Addiction level (measured with the FNDQ, like in the previous studies), self-identity as a smoker (according to Shadel & Mermelstein, 1996) and the background of tobacco consumption were also measured.

The study was carried out following several steps: (a) participants recruitment; (b) an initial meeting conducted in order to sign the participation agreement and to have a baseline assessment; (c) the implementation of the interventions and weekly assessments; (d) the final assessment; (e) a follow-up evaluation, two months after the intervention.

Results: The standard analysis shows that all interventions led to a significant reduction in the number of cigarettes smoked. Analysis of the intent-to-treat shows that, immediately after completion of treatment, smokers receiving pharmacotherapy smoked fewer cigarettes than the other smokers, but this advantage is lost 2 months after completing the intervention. For the group that received the mixed intervention, the number of cigarettes smoked per day decreased from pretest to posttest, however, it remained constant over the next two months.

The attitudes measured with the AMP were more negative at posttest evaluation for participants who were negatively conditioned towards smoking, as compared to participants who only received the explicit group intervention. However, only the participants in the pharmacotherapy group rated explicit attitudes more negatively. For the mixed intervention group, the implicit attitudes modified by the conditioning procedure were not transferred to the explicit level, as shown in the previous study.

The effect of the interventions on mediating variables showed that most of these variables were influenced in the predicted direction, by all three interventions.

Adherence to treatment in the present study was rather low. Analyses of the participants' attrition rate showed that the differences between the three groups are not significant. There is, however, a higher tendency of adherence to treatment for participants who received pharmacotherapy compared with the other two groups. The literature shows a similar or even lower attrition rates in intervention studies on addictions (DiClemente, 1993). Further analysis showed that individual differences are not responsible for the high rate of withdrawal from the experiment.

Discussion and conclusion: The present study brings forward, for the first time in the practical field of smoking cessation intervention, an evaluative conditioning procedure designed to modify implicit attitudes toward smoking.

Even though immediately after the completion of the intervention, pharmacotherapy appeared to be the most effective in reducing the cigarettes consumption, after ending the treatment, smokers in this condition tended to return to a higher level of daily consumption of cigarettes. Participants who received the group intervention program showed an opposite trend, as they consumed significantly less cigarettes two months after completing the treatment, compared to the end of the intervention. At intent-to-treat level of analysis, the group that benefited from the mixed intervention had a constant level of cigarette consumption after the completion of the program. Upon completing the treatment, participants who consumed varenicline found themselves in the situation where the cravings continued to exist and they had no assistance in dealing with cravings or other vulnerable situations without smoking. Conversely, the smokers who benefited from the group intervention, even though they no longer had the psychological support of their group, had the opportunity to learn and, more importantly, to practice different

strategies for managing cravings and vulnerable situations without smoking.

It is important to notice that changes induced by the conditioning procedure at the implicit level of attitudes were not transferred to the explicit level. Discrepancies in the implicit and explicit attitudes recorded in the mixed intervention condition may be justified by the framework suggested by Perugini et al. (2014), which states that after completing an evaluative conditioning procedure, the first to be modified are the implicit attitudes, and if these changes are consciously noticed, it will reflect in the changes in explicit attitudes as well. The process through which smokers attempt to quit is a difficult one, filled with ambivalence and sprinkled with negative experiences. The dynamics of the implicit and explicit processes in this specific context has not been studied so far, so it is difficult to explain how changes in implicit attitudes transfer to explicit attitudes, or conversely how the discrepancy between the two is maintained.

The limitations of the present study include the high attrition rate and the low number of smokers included in the final analyses. The absence of any physiological measurements of tobacco consumption is another disadvantage of the present research approach. Future studies may bring in useful information by following the smokers' progress over a longer period of time and by testing all variables at the follow-up evaluation and not just tobacco consumption.

VIII. General conclusions

Evaluative conditioning has been intensely studied in laboratory conditions, with strong evidence supporting its effectiveness (Hofmann et al., 2010). The present study is a first step towards transferring the knowledge regarding evaluative conditioning

and implicit cognitions in the practical field of interventions designed to reduce tobacco consumption. Beyond the results presented, the research program raises a number of questions, such as: what is the dynamic between implicit and explicit processes involved in tobacco cessation?; to what extent does the discrepancy between implicit and explicit attitudes have an effect on the consumption, or on successfully reducing the number of cigarettes smoked?; which factors can enhance the effect of evaluative conditioning in interventions on smoking cessation?; why would the evaluative conditioning procedure rather cause changes in smokers with a higher level of addiction?

Addressing these issues in future research in a systematic manner can have important practical implications for the optimization of interventions designed to reduce tobacco consumption.

References

- Borenstein, M., Hedges, L. V, Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to Meta-Analysis. Psychotherapy research journal of the Society for Psychotherapy Research* (Vol. 19). Chichester, UK: John Wiley & Sons, Ltd.
doi:10.1002/9780470743386
- Chassin, L., Presson, C. C., Sherman, S. J., Seo, D.-C., & Macy, J. (2011). Implicit and Explicit Attitudes Predict Smoking Cessation: Moderating Effects of Experienced Failure to Control Smoking and Plans to Quit. *Psychology of Addictive Behaviors*, 24(4), 670–679. doi:10.1037/a0021722.Implicit
- DiClemente, C. C. (1993). Changing Addictive Behaviors: A Process Perspective. *Current Directions in Psychological Science*, 2(4), 101–106. doi:10.1111/1467-8721.ep10772571
- Greenwald, a G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: the implicit association test. *Journal of Personality and Social Psychology*,

- 74(6), 1464–80. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9654756>
- Heatherston, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K. O. (1991). The Fagerström Test for Nicotine Dependence: a revision of the Fagerström Tolerance Questionnaire. *British Journal of Addiction*, 86(9), 1119–27. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/1932883>
- Hofmann, W., De Houwer, J., Perugini, M., Baeyens, F., & Crombez, G. (2010). Evaluative conditioning in humans: a meta-analysis. *Psychological Bulletin*, 136(3), 390–421. doi:10.1037/a0018916
- Houben, K., Nederkoorn, C., Wiers, R. W., & Jansen, A. (2011). Resisting temptation: decreasing alcohol-related affect and drinking behavior by training response inhibition. *Drug and Alcohol Dependence*, 116(1-3), 132–6. doi:10.1016/j.drugalcdep.2010.12.011
- Payne, B. K., McClernon, F. J., & Dobbins, I. G. (2007). Automatic affective responses to smoking cues. *Experimental and Clinical Psychopharmacology*, 15(4), 400–9. doi:10.1037/1064-1297.15.4.400
- Perugini, M., Richetin, J., & Zogmaister, C. (2014). Indirect measures as a signal for evaluative change. *Cognition & Emotion*, 28(2), 208–29. doi:10.1080/02699931.2013.810145
- Schmidt, J. R., & Besner, D. (2008). The Stroop effect: why proportion congruent has nothing to do with congruency and everything to do with contingency. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, 34(3), 514–523. doi:10.1037/0278-7393.34.3.514
- Schmidt, J. R., & De Houwer, J. (2012a). Contingency learning with evaluative stimuli: testing the generality of contingency learning in a performance paradigm. *Experimental Psychology*, 59(4), 175–82. doi:10.1027/1618-3169/a000141
- Schmidt, J. R., & De Houwer, J. (2012b). Learning, awareness, and instruction: Subjective contingency awareness does matter in the colour-word contingency learning paradigm. *Consciousness and Cognition*, 21(4), 1754–68. doi:10.1016/j.concog.2012.10.006

- Shadel, W. G., & Mermelstein, R. (1996). Individual differences in self-concept among smokers attempting to quit: Validation and predictive utility of measures of the smoker self-concept and abstainer self-concept. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, 18(3), 151–6. doi:10.1007/BF02883391
- Stritzke, W. G., Chong, J. L., & Ferguson, D. (2009a). *Treatment manual for smoking cessation groups: a guide for therapists*. Cambridge University Press.
- Stritzke, W. G., Chong, J. L., & Ferguson, D. (2009b). *Treatment manual for smoking cessation groups: a guide for therapists*. Cambridge University Press.
- Wewers, M. E., Stillman, F. a, Hartman, A. M., & Shopland, D. R. (2003). Distribution of daily smokers by stage of change: Current population survey results. *Preventive Medicine*, 36(6), 710–720. doi:10.1016/S0091-7435(03)00044-6