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"Smoking kills" vs. "Smoking makes restless": Effectiveness of different warning labels on smoking behaviour

Sabine Glock[1, *], Simone Maria Ritter[2], Rutger Engels[2], Ap Dijksterhuis[2], Rick Bart van Baaren[2], Barbara Caterina Nadine Müller[2, 3]

[1]LCMI Research Unit, University of Luxembourg, Luxembourg, Luxembourg
[2]Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, The Netherlands
[3]Department of Psychology, Ludwig Maximilian University, Munich, Germany

Email address:

sabine.glock@uni.lu (S. Glock), s.ritter@psych.ru.nl (S. M. Ritter), r.engels@pwo.ru.nl (R. Engels), a.dijksterhuis@psych.ru.nl (A. Dijksterhuis), r.vanbaaren@psych.ru.nl (R. B. van Baaren), b.muller@psych.ru.nl (B. C. N. Müller)

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Abstract: Warning labels on cigarette packages rely on the negative health aspects of smoking. For smokers, however, smoking is related to positive as well as to negative outcomes. Positive smoking outcomes are shown to be crucial in activating smoking behaviour. Thus, this study compared current health warnings with warning labels contradicting positive outcomes. In a field study, 38 adult smokers were followed over a 5-day period to investigate the effect of the different types of warning labels on actual smoking behaviour. Our results provide evidence that no type of warning label had an influence on smoking behaviour. Reasons for this null-findings and future directions in research are discussed.

Keywords: Smoking, Cigarette Health Warnings, Outcome Expectancies, Cessation

1. Introduction

What happens when a smoker experiences a very stressful event? Most likely, the stressful situation activates the urge to smoke, as smoking is believed to reduce stress [1]. This example illustrates the importance to research outcome expectancies, that is, people's beliefs about the consequences of a particular behaviour and the influence of consequences on behaviour. Outcome expectancies play a crucial role in social cognitive theories, thus suggesting that they determine behaviour [2]. People engage in a certain behaviour when they expect it to result in positive outcomes or to avoid negative outcomes. Therefore people associate a particular behaviour with particular positive consequences and in turn, perform the behaviour to reach those positive consequences [3]. Outcome expectancies develop once the link between positive consequences and the behaviour has been established. The stronger this association, the more likely it is that outcome expectancies automatically activate the behaviour [4]. This is especially true for addictive behaviours [5,6,7,8]. For example, research on alcohol use has shown that outcome expectancies affect drinking behaviour [9,10,11,12], and weakened positive outcome expectations seem to decrease alcohol consumption [13,14]. Similar findings were found for smoking, as outcome expectancies predict both intentions to smoke and actual behaviour [15]. In the present study, we explored whether these smoking-related outcome expectancies can be used on warning labels in order to influence long-term smoking behaviour.

Smoking is expected to have positive and negative consequences. Particularly when it comes to health consequences, expectancies are predominantly negative [16]. Health risk outcome expectancies are positively related to quitting motivations and smoking behaviour change [6]. Positive outcome expectancies mainly involve social reasons and mood management [16]. Smokers often use smoking to cope with stress and to improve their image by feeling cool or sexy through smoking [16]. These positive outcome expectancies are more strongly associated with smoking than negative ones and are easily available due to automatic activation [8].

While positive outcome expectancies are not implemented in cigarette warning labels, health risk outcomes and their

relation to the motivation to quit smoking are widely used. However, research on the effectiveness of health-related warning labels provided inconsistent results. There is empirical evidence that cigarette health warning labels are effective [17,18], particularly graphic warning labels have shown their effectiveness [19,20,21,22,23,24]. Smokers reported to smoke less [22], and reported a higher intention to quit [25] because of cigarette health warnings. However, the non-experimental design of these studies makes it impossible to draw firm conclusions about causes and effects of any observed change in smoking behaviour following new labeling laws, since these laws may be accompanied by higher tobacco taxes, advertising restrictions, general economic changes, or any other confounding factors [26,27]. Using experimental designs, a few studies did not provide evidence for the effectiveness of current cigarette health warnings [28,29,30,31]. Particularly, current textual and graphic warning labels were found to lead to defensive responses, thereby maybe resulting in unintended behavior. Moreover, graphic warning labels received more attention by smokers [32]; however, those smokers reported more positive cognitive thoughts after confrontation with graphic warnings [32]. This is in line with previous research which has shown, that smokers are unrealistic optimistic concerning the consequences of smoking for their own health [33]. Smokers perceived their own health risk as average even though they smoked at higher rates than the average smoker [34]. Thus, although smokers know about the health consequences of their behaviour and perceive a higher health-risk, they simultaneously deny that their risk is higher than this of an average smoker [35]. This phenomenon is part of a defensive optimism [36] that comes into play when smokers are confronted with threatening fear arousing messages. Fear appeals often lead to defensive responses and reduce the intention to change the behaviour [37]. Particularly, if smokers do not perceive high self-efficacy to change their behaviour [38], they might respond in a defensive way and might even smoke more than before confrontation with fear-arousing messages [38]. Current cigarette health warning labels can be considered fear appeals [31], thus trying to motivate people to engage in protective actions [39]. However, a recent meta-analysis on fear appeals only found one study which investigated the influence of fear appeals on smoking behaviour [38]. Thus, there is only sparse research investigating the influence of current warning labels on smoking behaviour.

Outcome expectancies also play a crucial role in comprehensive models of drug use [40]. Particularly, positive outcome expectancies are suggested to be more strongly linked to the behaviour [8,41]. It has been shown that people experience extremely positive consequences of drug-use behaviour [42]. Negative outcome expectancies, in turn, are only weakly associated with the behaviour and it has been shown, for alcohol consumption, that people expect to drink more frequently and at higher rates to experience negative consequences [43] compared to their own drinking behaviour.

While negative outcome expectancies such as the health risks of smoking might contribute to the behaviour, positive outcome expectancies seem to activate the behaviour. For instance, smokers may smoke a cigarette because they believe smoking would relax them. Although positive outcome expectancies are crucial when starting, establishing, and maintaining smoking [44], and play a pivotal role after relapse [45], many of them are illusory. Smokers may feel that smoking is relaxing and improves their concentration, but instead, smoking increases blood pressure [46], and thus decreases relaxation and concentration. Even though these positive outcome expectancies are used to justify the behaviour, they are not yet considered when it comes to cigarette warnings.

Thus, the two kinds of outcome expectancies might be useful as warning labels. Negative outcome expectancies are already implemented in current health warnings, as negative outcomes mainly refer to the health-damaging aspects of smoking. The positive outcome expectancies might also be applied, as they entail the reasons why people smoke [16]. Because positive outcome expectancies refer to positive consequences of smoking, warning labels implementing positive outcomes should contradict those outcomes and turn them into negative. They should illustrate that those positive smoking outcomes do not exist.

A recent study has shown that warning labels contracting positive alcohol-related outcomes expectancies have changed implicit attitudes toward alcohol into more negative ones [47], while warning labels focusing on health-damaging aspect of alcohol consumption resulted in more positive implicit attitudes [47]. Moreover, warning labels contradicting positive outcome expectancies lowered drinking intentions and the perception of positive alcohol-related outcome expectancies [47]. In line with this research, there is also a first support for the effectiveness of contradicting positive smoking outcome expectancies [48]. However, a control condition using current health-related cigarette warnings was missing in this research. Therefore, the aim of the present study was to investigate which kind of warning labels are more effective in affecting real smoking behaviour. The present study extends this line of research by testing the contradicting positive outcomes warning labels and their influence on smoking behaviour over a 5-day period in a naturalistic setting. We predicted that [1] smokers smoke less when confronted with cigarette warnings contradicting positive outcomes than smokers who were confronted with cigarette health warnings, and that [2] smokers smoke less than before when confronted with warnings contradicting positive outcomes.

2. Method

2.1. Participants and Design

Thirty-nine smokers (16 male) participated in this study; their age range was 21-73 (M = 36.85, SD = 14.12). All participants were daily smokers: 10.3% smoked 5-10

cigarettes/day, 17.9% 11-15 cigarettes/day, 35.9% 16-20 cigarettes/day, and 35.9% 20-50 cigarettes per day. Participants gave verbal consent to participate in this study, and were informed that they could stop participation at any time. The two groups were checked for differing personal characteristics; no significant differences were found (Table 1).

Participants were recruited on the street by using flyers, and they had the possibility to win a 50 € coupon.

A 2 (warning labels: positive warnings vs. health warnings) x 6 (time: pre-measure vs. day 1 to 5) mixed design was used, with warning label as between-subjects factor, and time as within-subjects factor. The number of cigarettes smoked per day was the dependent variable.

Table 1. *Mean Scores, standard deviations, and percentages on personal characteristics*

	Positive Outcomes (*N* = 20)		**Negative Outcomes (*N* = 19)**		
	Mean	Standard Deviation	Mean	Standard Deviation	Effects
Age	38.10	14.80	35.52	13.65	$F(1,37)<1$, *n.s.*
Attempts to give up smoking	1.55	1.19	1.68	1.29	$F(1,37)<1$, *n.s.*
Intention to quit (yes answers)	15% (*N* = 3)		26% (*N* = 5)		χ^2 (1) = .77, n.s.

2.2. Procedure and Materials

As a cover story, participants were told that this was a marketing study about the taste of cigarettes. One day before the experiment started, participants were asked to answer some questions concerning personal characteristics (sex, age, educational background), and information about their smoking behaviour (how long they smoked, how many cigarettes they smoked on average per day, attempts to give up smoking). Moreover, they were asked to indicate what brand of cigarettes they usually smoked. 17 people normally smoked a different cigarette brand than the brand they received in the current study (Marlboro red cigarettes). Participants received five cigarette packs, and a diary containing five short questionnaires for the following five days (Monday until Friday). These questions concerned whether participants read the message on the pack (yes/no-answer), and how many cigarettes they smoked during the day. Participants were asked to answer the questions every evening after their last cigarette of the day. Participants got the instruction to continue smoking as they were used to, and to use their own cigarettes, in case they smoked more than a pack a day.

In the health warnings condition, participants received cigarette packs with textual warning labels commonly used in Germany. Fifteen different warning labels were used. Each participant randomly received five different warnings on five different packs. In the positive warnings condition, these warning labels were replaced by warning labels contradicting social consequences and coping-related outcomes of smoking (as used in Glock, Unz, et al., 2012). For instance, we used arguments like "Smoking makes unpopular", or "Smoking makes nervous". We copied the format of the health warning labels to create 15 packs with positive outcomes warning labels. The five packs each participant received contained five different warnings. Participants were randomly assigned to one of the two conditions.

On the last day of the study, participants were asked to answer some final questions. These addressed whether participants noticed something particular during the study, whether they had any ideas what the study was about, and whether they thought the manipulation had an influence on their smoking behaviour. After participants handed in the diary and the last questionnaire, they were thanked for their participation and debriefed.

2.3. Results

None of the participants indicated that they knew what the study was about, or that they thought that the messages on the packs affected their smoking behaviour. One participant in the health-warning group was excluded from further analyses because of very high smoking rates (> 50 cigarettes per day).

Table 2. *Smoking Behaviour as a function of warning labels*

	Positive Outcomes (*N* = 20)		**Negative Outcomes (*N* = 18)**		
	Mean	Standard Deviation	Mean	Standard Deviation	Effects (Bonferroni corrected)
Premeasure	18.50	6.22	19.83	5.47	$F(36)=0.49, p=.49$
Day 1	18.55	6.25	19.11	6.23	$F(36)=0.77, p=.78$
Day 2	17.65	6.94	20.11	7.71	$F(36)=1.07, p=.31$
Day 3	18.55	6.02	20.89	7.74	$F(36)=1.09, p=.30$
Day 4	17.20	6.55	21.22	7.95	$F(36)=2.92, p=.10$
Day 5	17.80	6.78	20.83	6.31	$F(36)=2.06, p=.16$

First, we checked if participants had the impression that their smoking behaviour during the experiment differed from their normal smoking behaviour. A chi^2-test was done to compare this score (yes/no-answers) between the two conditions (positive warnings vs. health warnings); no significant differences were found, $\chi^2_1 = 1.90$, $p = .168$.

A 2 (warning labels type: positive vs. health warnings) x 6 (time: pre-measure vs. day 1 to 5) mixed ANOVA with repeated measures on the last factor was conducted to test whether participants confronted with the positive outcomes warning labels smoked less than participants confronted with the health warnings. Looking at the within-subjects effects, a linear effect was found between time and warning labels type, $F(1,36) = 5.63$, $p = .023$, $\eta^2_\rho = .14$ (see Table 2 for all means and one-sided simple effect tests). However, subsequent analyses implied that this reflected a type-1 error. Looking at the simple effects, the positive warnings group did not differ from the health group. Furthermore, there were no main effects for time, $F(1,36) = 0.48$, p = .494, or warning labels, $F(1,36) = 1.26$, $p = .269$, $\eta^2_\rho = .03$.

We examined whether participants in the positive warnings condition read the warning labels more often than participants in the health warnings condition, which was indicated every day by answering a yes/no-question. A sum score was calculated of how often participants in each group read the messages on the pack (yes-answer=1, no-answer=0). A (positive vs. health warnings) ANOVA was conducted with the sum score as dependent variable. Participants in the positive warnings condition read the messages more often during the five days ($M = 3.10$, $SD = 2.00$) than participants in the health warnings condition ($M = 1.39$, $SD = 1.58$), $F(1,36) = 8.46$, $p = .006$, $\eta^2_\rho = .19$. To control for this fact, we conducted a 2 (warning labels) x 6 (time) repeated measures ANCOVA, with the reading sum score as covariate. Looking at the within-subjects effects, the effect for time changed, $F(1,34) = 3434$, $p = .07$, $\eta^2_\rho = .09$. Furthermore, an effect was found for the interaction between time and the reading score, $F(1,34) = 4.40$, $p = .043$, $\eta^2_\rho = .12$. The interaction between warning labels and time was not significant, $F(1,34) = 2.95$, $p = .09$, $\eta^2_\rho = .08$.

3. Discussion

This experimental study was conducted in a naturalistic setting to investigate the effectiveness of health warnings versus warning labels contradicting positive outcome expectancies in affecting daily smoking. The results show that none of the warning labels was able to influence smoking behaviour over five days.

The warning labels contradicting positive outcome expectancies did not change smoking behaviour. Perhaps, they were not able to change smoking-related expectancies in our sample. If expectancies did not change, no behavioral change can be observed. However, there is another explanation for the ineffectiveness of the contradicting warning labels. Maybe they changed smoking-related outcome expectancies, but those were not as strongly related to the behavior as previous research assumed [5,6]. In order to explore which explanation might hold, future research should additionally include measures to assess changes in smoking-related expectancies and relate those measures to behavior. This could also answer the question of the importance of expectancies beliefs for smoking behavior, as outcome expectancies are suggested to play a pivotal role [5,6]. However, our results show that neither positive nor negative outcome expectancies are strong determinants of smoking behaviour. Thus, future research should explore other cognitive determinants of behaviour, such as attitudes. Although a recent meta-analysis found subjective norm and perceived behavioural control to be a stronger predictor of smoking behaviour than attitudes [49], research should not neglect the role of implicit attitudes for the automatic components of smoking. Implicit attitudes as automatic evaluations [50] of smoking are suggested to be a causal factor [51] or at least a moderating factor [52] that drives smoking.

Besides, implicit attitudes as a possible cognitive determinant of smoking, research has shown that self-efficacy is an important factor when people process threatening and negative information [38,53]. Self-efficacy can be regarded as perceived behavioral control [54], which is strongly related to smoking [49]. Smoking behaviour is hardly to change, as less than 10 % of the smokers successfully quit on their own [55]. This might be partly due to the fact that they do not know how to quit or that they do not believe to be able to quit [56]. Thus, self-efficacy enhancing information should receive more space in interventions, particularly for smoking interventions [38]. Both types of warning labels did not include self-efficacy enhancing information; thus future research should add such information and additionally compare warning labels contradicting positive outcome expectancies prevalent in the whole population with new health-related warning labels. This design would shed more light on the results found in this study. Moreover, introducing a third warning labels type which only includes self-efficacy enhancing information could explore the importance of self-efficacy in smoking behaviour change. If this warning labels type would prove most effective, this information would be the most important to provide to smokers in order to influence their behaviour.

Two aspects should be pointed out: Firstly, despite the sample being rather small the study was conducted in a naturalistic setting. The participants lived and smoked as they were used to. The only exception was that they smoked cigarettes from the brand that was provided to them by the experimenter rather than their usual brand. Moreover, there were none of the artificial conditions that can often be encountered in experimental labs. Hence, the results approximate real smoking behaviour. Secondly, due to the sample not only including college aged participants but the age of the participants ranging up to 73 years, these findings might be more generally applicable than results from college aged smokers.

Nevertheless, some limitations should be kept in mind. First, smoking behaviour was assessed via self-reports. Future research should try to assess smoking behaviour more objectively via the instruction to bring back the packs

and counting the remaining cigarettes or via observation of smokers' behaviours [50]. Second, our study is limited due to the applied methodology. This study was a field study with an experimental design. However, in order to ensure the naturalistic setting of the study, variables that can be controlled for in experimental settings did not remain under control. For instance, we did not know whether our participants experienced critical life-events during the five days. Those life-events might have contributed to the number of cigarettes they smoked. However, investigating the influence of warning labels over days does not allow experimentally controlling participants' environment. In addition, one could argue that our participants smoked more than usual because we provided them with free cigarette packs. However, these higher smoking rates should have been observable in both warning labels groups which participants have been randomly allocated to. Thus, in case that free packs increased the number of smoked cigarettes this fact could not have influenced our findings, as each experimental condition was prone to higher smoking rates.

Additionally, the contradicting warning labels are novel and smokers are not used to read about negative social and coping-related smoking outcomes. Although our analysis using the reading measure as a covariate did not substantially change our results, novel [51] and negative social information [52] are attention grabbing and more likely to be intensely processed than other information. However, the simple effects tests were not significant, implying that, in our study, negative social information had no effect.

In a college-aged setting, warning labels contradicting positive outcome expectancies as used in this study [48] as well as health-related warning labels formulated as questions turned out to be effective when it comes to short term smoking behaviour, as first results show [60]. However, although college-aged smokers are at risk to become heavy smokers [61,62], they show different smoking patterns than older smokers [63]. Accordingly, outcome expectancies change as a function of the number of smoked cigarettes per day [5], suggesting that heavier smokers endorse different outcomes than light smokers. Compared to college-aged smokers, the sample in his study can be considered heavy smokers, as they nearly smoked 20 cigarettes per day [5]. The behaviour of heavy smokers might be more resistant to change than the behaviour of light, college-aged smokers. Those college-aged smokers seem to be more susceptible for interventions [64], and heavy smokers experience higher nicotine dependence. Future research should ask for outcome expectancies when taking non-college smokers into account to create warning labels that contradict positive outcome expectancies that are representative of the whole smoking population. Thus, future research should not only rely on college-aged smokers but also take into account heavy smokers and investigate which information should be placed on warning labels in order to influence heavy smokers.

As the two kind of warning labels both did not prove effective, the question remains which information should be provided on warning labels in order to influence smoking behaviour. There is much more research needed to answer this question and to find information that works for the whole smoking population. Probably it is worth looking at the factors which are able to predict successful cessation. As pointed out above, self-efficacy enhancing information might be a good starting point in order to ensure that smokers do not react in defensive ways [38,65]. Moreover, research has shown that higher self-efficacy was related to more success in smoking cessation [66]. Thus, future research should work with self-efficacy-enhancing information, as self-efficacy plays a pivotal role in the two stages of behaviour change: Intention and action [54].

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