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"Fuelling" Cognitive Judgments: Worry as a Mediator Between Risk Perceptions and Intentions to Quit Smoking

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Abstract

The aim of the present study was to assess the importance of cognitive and affective risk perceptions along with measures of self-prediction of future smoking status and confidence in one's ability to quit on intentions to quit smoking. Additionally, the purpose was to explore the mediating effect of worry on the relation between risk perception and quitting smoking intentions. The data consist of 415 participants defined as daily and "sometimes" smokers who were interviewed by telephone. The results showed significant direct effects of risk perception, worry, confidence, and self-prediction of future smoking status on intentions to quit smoking. Furthermore, the results showed a significant mediating effect of worry on the relation between risk perception and quitting intentions. The results are discussed in relation to the general role of cognitive and affective processes in influencing behavioural decisions. The implications and limitations of the present analysis are also discussed.

Keywords: smoking, intentions, risk perception, worry, mediation

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The role of risk perceptions in decisions about preventive health behaviours has been a major research concern for a number of years as these perceptions are hypothesized to be important in the initiation and development of self-protective health behaviors (Weinstein, 2000). Risk perceptions refer to individuals' beliefs about the likelihood of possible health problems in future and are usually conceptualised in terms of probabilities (perceived vulnerability) of occurrence of negative outcomes and severity of negative outcomes (van der Pligt, 1998). This concept has accordingly been incorporated in various health behaviour theories, notably the Health Belief Model (see Abraham & Sheeran, 2005), and the Protection Motivation Theory (see Norman, Boer, & Seydel, 2005). Nevertheless, a number of studies have indicated that the relation between risk perception and health behaviours, although most often found to be positive, is weak and inconsistent (see van der Pligt, 1998 and Norman et al., 2005). In a meta-analysis (Harrison, Mullen, & Green, 1992) the average correlations between measures of risk perception and health behaviours never exceeded r=.21 (see also Hall, French, & Marteau, 2009). Similar findings are reported in the area of smoking behaviour (Sutton, 1999; Weinstein, 2003). Accumulating evidence thus suggests that the predictive value of risk perceptions in relation to measures of preventive health behaviour in general, as well in specific areas like smoking, is low. This raises a question of the practical utility of the concept, especially if one is interested in changing a particular health behaviour, like quitting smoking.

One possible reason for the weak association between risk perceptions and health behaviours might be attributed to absence of exploring motivational/emotional mechanisms in previous research. Thus, measures of risk perceptions have mainly been taken as a cognitive activity in the sense that people are making some kind of evaluation and integration of cognitive information before they deliberate whether or not to engage in a preventive health behaviour. The cognitive flavour of the prevailing models of health behaviour has presumably contributed to a neglect of the motivational role played by affect in decisions about preventive health behaviours as compared to that of cognitive evaluation. This tendency may reflect a more common neglect of the role played by affect in decision making theories (Loewenstein, Weber, Hsee, & Welch, 2001). Loewenstein et al. (2001) have proposed that affect should be incorporated along with cognitions in decision-making accounts, denoting their model the risk-as-feeling model. This model is dealing with anticipatory emotions (emotions experienced while the decision is being pondered) as opposed to anticipated affect (affect which comes into the picture when considering the emotional implications of having made a certain decision). The basic idea is that risky decisions are guided by fear and anxiety which work independently of cognitive considerations of risks and outcomes. For example, decision-relevant feelings may derive from vividly imagined consequences of a decision as well as from personal experiences and familiarity of the consequences of making a decision. In effect these authors propose that the impact of cognitive risk considerations on decisions is partly mediated by affective responses (Loewenstein et al., 2001).

The same reasoning may be derived from social psychology in which a number of studies have provided evidence that it is possible to make a distinction between affect and cognition and accordingly to demonstrate the primacy of affect versus cognition in determining behaviour (see Trafimow et al., 2004 for a review). Combining between- and within-participants analyses across a number of different behaviours, Trafimow et al. (2004) demonstrated that most of the behaviours were driven by affect, although admittedly this tendency was not so clear-cut in the within-person analyses. As noted and elaborated upon by Trafimow & Sheeran (2004), this finding is consistent with the evolutionary ideas presented by Johnston (1999) and Damasio's (1994) somatic marker hypothesis, and the finding that affect is more readily accessible in memory than cognition (Verplanken, Hofstee, & Janssen, 1998). In effect, the above findings suggest that affect provides the motivational impetus for behavioural intentions and that the influence of cognitions on intentions primarily work through affect, i.e. affect exerts its effect in the here and now (see Trafimow & Sheeran, 2004). In other words, although Trafimow-Sheeran model and the risk as feelings model, pertains to current or anticipatory affect, i.e. affect experienced in the here and now, these ideas are nevertheless consistent with the proposition that affect might mediate between cognitive evaluations and decision making processes.

One plausible representative of affective processes which is expected to play an important role in decision making is the concept of worry. Although it is acknowledged that worry might have a cognitive "flavour", this concept has predominantly been operationalized in current literature in terms of affect-laden images which are commonly negative and uncontrollable (Finney Rutten, Blake, Hesse, Augustson, & Evans, 2011). Studies have shown that risk perception (or perceived vulnerability) and worry independently predicted various indicators of screening behaviours (e.g McCaul & Mullens, 2003; see also overview by Hall et al., 2009).

The effects of worry have frequently been associated with self-protective health behaviours in general (McCaul, Schroeder, & Reid, 1996) as well as with quitting smoking intentions (Finney Rutten et al., 2011; Magnan, Köblitz, Zielke, & McCaul, 2009), and quitting smoking activities (Dijkstra & Brosschot, 2003), although these findings are not straightforward (see Hall et al, 2009). For example, Hall and colleagues (2009) have found that worry about

cervical cancer was not related to intention to stop smoking. Hence, the conclusions were made that worry was less important in motivating behavioral change when it comes to disease preventive behaviors.

However, only two studies seem to have tested the mediation hypothesis that the effect of risk perception (likelihood estimates) on preventive health behaviours is mediated by worry, and none of them in the context of smoking behaviour. Cameron & Diefenbach (2001) found that worry about breast cancer mediated the predictive power of risk perception of getting breast cancer on interest in genetic testing. Furthermore, Chapman & Coups (2006) found that worry mediated the effect of risk perceptions on influenza vaccination and that worry was a stronger predictor than risk perception. In a third study outside the domain of traditional preventive health behaviours, on willingness to fly after 9/11, the inclusion of worry into the final regression equation after risk perception, increased the amount of explained variance significantly, but it remains unclear whether worry mediated the effect of risk perception (Bergstrom & McCaul, 2004). Thus there is a need for more studies on the mediational capacity of anticipated worry in relation to risk perception in general as well as in the area of quitting smoking in which the role of anticipated emotions have not been explored.

Additional Predictors

In order to provide a more complete account of the process of forming an intention to quit smoking we included two predictors in addition to measures of affective (worry) and cognitive risk (risk perception). First, when it comes to behaviours which are difficult to perform, like quitting smoking, behavioural performance as well as intention to perform the behaviour are in part dependent on the amount of control one has over it. Consistent with this, perceived behavioural control (Ajzen, 1991) and self-efficacy (Bandura, 1977) are integral parts of the theory of planned behaviour (TPB) and social cognitive theory, respectively. A similar concept has been suggested by Eiser & Sutton (1977) arguing that intentions to stop smoking depend strongly on the expectancy of success (or confidence) in their ability to stop. We included this latter concept into our prediction model. Traditionally, past behaviour has been also included into analyses using the TPB to account for quitting smoking, and has been found to account for additional variance in quitting intentions (see Moan & Rise, 2005) indicating that important predictors are left out (Ajzen, 1991). A related idea which has not been explored in this context is whether a measure of self-prediction of future smoking status adds to the prediction of quitting intentions above the other predictors. Just as smokers make use of what they have been doing in the past when they decide whether or not to stop or continue to smoke, they may also base this decision on reflections about their future smoking status in the long run. Thus the higher the probability of being a daily smoker in the future, the lower the inclination to quit smoking.

The aim of the present study was twofold. First, to explore whether personal awareness of worry (i.e. affective processes) mediated the effect of cognitive risk perception on quitting intentions. Secondly, to explore whether two additional predictors: (i) self-prediction of future smoking status and (ii) confidence in one's ability to stop smoking, accounted for variance above those of the cognitive and affective risk measures.

Materials and Methods

The data come from a nationwide interview survey (by telephone) conducted in 2000 as part of the national monitoring system of smoking. The interviews were conducted by specially trained professionals and organized by Statistics Norway (see Vågane, 2001). The original sample comprised 2486 persons, and interviews were

obtained with 1446 persons yielding a response-rate of 58.3%. Of the non-responders (N=1037), 396 persons declined to be interviewed, while 271 persons were unavailable, and the rest could not be reached for various reasons. The present study includes smokers defined as "daily" and "sometimes" smokers (N=415), and the results are considered to be representative of Norwegian smokers. The majority of instruments applied here have been used in several previous studies on risk perception (see Rise, Strype, & Sutton, 2002). The mean age of the participants was 42 (range 16-72), 50% were women, they reported to smoke 13 cigarettes per day, and had made on an average 1.7 attempts at quitting smoking during last year.

Measures

Intention to quit smoking was measured by adding the following two items into a sum-score: "I intend to quit smoking during the next 6 months" and "I desire to quit smoking during the next 6 months" using a seven point scale ranging from (1) very unlikely to (7) very likely ($r=.69$, $p<.001$).

Risk perception (cognitive risk measure) was measured by two items in terms of a percentage scale ranging from 0-100%. Risk probability estimates were estimated conditional on quitting smoking ("How likely do you believe it is that you will become sick and die due to your smoking if you stop smoking within a couple years?") and conditional on continuing to smoke ("How likely do you think it is that you will become sick and die due to your smoking if you continue to smoke for the rest of your life?"). The two responses were added to provide a sum-score of risk probabilities ($r=.54$, $p<.001$).

Worry (affective risk measure) was measured by two items asking how worried the smokers were about becoming sick and dying due to their own smoking conditional on carrying on smoking ("Are you worried that you will become sick and die due to your own smoking if you carry on (if you stop) a smoking for the rest of your life. A seven point response scale ranging from (1) "not worried at all" to (7) "strongly worried". The two responses were added to provide a sum-score of worry ($r=.56$, $p<.001$).

Self-prediction of future smoking status was assessed by one item asking participants to estimate their smoking status in 5 years from now using a 4 point scale (1= quite sure that I would smoke daily, 2 = I would probably smoke daily, 3 = I would probably not smoke daily, and 4 = quite sure that I would not smoke daily).

Confidence in one's ability to quit smoking (expectancy of success) was assessed by one item asking participants the following question: "If you now make an attempt to quit smoking, what is in your opinion the probability that you would succeed?" (percentage scale ranging from 0-100%).

Results

Descriptive statistics and correlations are presented in table 1. All measures correlated significantly with intention to quit smoking. The strongest correlation with intention was observed for worry ($r=.41$, $p<.001$), followed by future smoking ($r=.31$, $p<.001$) and confidence ($r=.17$, $p<.01$). It is notable that risk perception, although significantly correlated with intention ($r=.15$, $p<.01$), was weakly related to intention in terms of effect size (Cohen, 1988). Worry was also significantly related to risk perception ($r=.37$, $p<.001$), but was unrelated to future smoking and confidence.

Table 1

Correlations and Descriptive Statistics Among Study Variables

Variables	1	2	3	4	5	M	SD
1. Intention to quit	1.00					3.48	2.15
2. Future smoking	.31***	1.00				3.37	.95
3. Confidence	.17**	.30***	1.00			60.05	33.63
4. Risk perception	.15**	-.20***	-.07	1.00		27.69	19.49
5. Worry	.41***	.06	-.04	.37***	1.00	2.72	1.58

*p<.05. **p<.01. ***p <.001.

Regression Analyses

Table 2 shows the results of the four steps hierarchical linear regression analyses in which quitting intention was regressed upon risk perception (step 1), worry (step 2), confidence (step 3), and future smoking (step 4). Risk perception was a significant predictor of quitting intentions explaining 2% of the variance (β=.14, p<.01). The addition of worry at step 2 contributed significantly to an increase of explained variance (14%; F-change 65.09, p<.001, β=.41 p<.001). The addition of confidence at step 3 explained a significant proportion of additional variance in quitting intentions (3%; F-change 13.92, p<.001, β=.18, p<.001). Finally in the fourth step the inclusion of future smoking added 6% of additional variance (F-change 30.78, p<.001; β=27, p<.001). The final model explained a total of 25% variance in quitting intentions with worry as the strongest predictor, followed by future smoking and confidence. In the second step, the effect of risk perception was reduced to a non-significant effect, indicating a possible mediation effect of worry on the relation between risk perception and quitting intentions. According to Baron and Kenny (1986) mediation effects are confirmed when a mediating variable accounts for a relationship between two other variables in the sense that the effects of predictor variables are significantly reduced when a hypothesized mediating variable is included in the regression analysis.

Table 2

Regressing Intention to Quit Smoking on Self-Prediction of Smoking Status, Confidence, Risk Perception, and Worry.

Steps	Predictors entered	Adj. R^2	F_{change}	Beta
1	Risk perception	.02	6.85**	.14**
2	Risk perception			-.01ns
	Worry	.16	65.09***	.41***
3	Risk perception			.00ns
	Worry			.42***
	Confidence	.19	13.92***	.18***
4	Risk perception			.06ns
	Worry			.38***
	Confidence			.11***
	Future smoking	.25	30.78***	.27***

*p<.05. **p<.01. ***p<.001. ns = non-significant.

In order to test whether this reduction was statistically significant a Sobel test was conducted. The results showed a significant mediational effect of worry on the relation between risk perception and quitting intention (Sobel z =

5.44, $p < .001$). In sum, these results indicate that worry, in addition to being significant predictor of quitting smoking intentions, also serves as a mediator providing a more comprehensive account of the cognitive aspects of risky decision making.

Discussion

There has been a growing interest in the motivational role of affect in the area of decision making (Loewenstein et al, 2001), social psychological research on attitude-behaviour models (Trafimow & Sheeran, 2004), research on perceived risk and preventive health behaviours (McCaul & Mullens, 2003; Chapman & Coups, 2006), and research in the context of smoking behaviours (Kovač & Rise, 2011). A common finding of empirical studies based on ideas deriving from these perspectives is that affect tends to play a more important role than cognition in determining behaviour. Consistent with this, the results of the present study found that affect, conceptualised as worry, was a stronger determinant of intentions to quit smoking than cognition, conceptualized as risk perception. A second important finding of the present study was that the effect of risk perception on quitting intentions was fully mediated by worry. This is consistent with the theoretical prediction of the Trafimow/Sheeran model (Trafimow & Sheeran, 2004). Trafimow & Sheeran (2004) draw upon various theoretical ideas and empirical findings supporting their argument that cognition has to be translated into affect in order to influence behaviour, and that affect provides the motivational impetus for action.

Next, the results provide support for the additional contribution of confidence in one's quitting ability or expectancy of quitting success as noticed in earlier formulations of the concept in the formation of intention to quit smoking (Eiser & Sutton, 1977; Sutton, Marsh, & Matheson, 1987). This suggests that control perceptions are important in the prediction of quitting intentions irrespective of whether they are conceptualised as perceptions of control as in the TPB, self-efficacy in the SCT (see Moan & Rise, 2005; 2006, and Armitage & Conner, 2001) or as confidence. Finally, it should be noted that self-prediction of future smoking status was the second strongest predictor of intentions (close to that of worry). At least two explanations may be advanced to account for this finding. First, as suggested in the introduction, representations of the self in the distant future, e.g. prediction of future smoking status, may enter into the calculations underlying the decision whether or not to stop smoking. However, the finding may also indicate that smokers' statement of their intention to quit in the near future partly reflects a heuristic judgement based on a simple extrapolation from a representation of the future self as a smoker or non-smoker. Empirical studies have shown that representations of the self in the distant future are more important than representations of the self in the near future for a number of relevant self-processes (Wakslak, Nussbaum, Liberman, & Trope, 2008).

Although it was expected that worry would appear to be an important direct predictor of intentions as well as a mediator of the relation between risk perception and quitting intention, it is nevertheless important to note that worry may not capture the full essence of risk perception. In their conceptual review, McCaul & Mullens (2003) were reluctant to parallel worry with an emotional episode like fear. They construed worry as being closer to a core affect in the sense that it is constantly present, carrying with it negative feelings. These authors suggest that worry constitutes unwanted and uncontrollable thoughts about a threatening event, which nevertheless may motivate adaptive problem solving. In a number of studies they have provided evidence that worry is a better predictor than risk perception when it comes to specific health protective behaviours such as cancer screening (see McCaul & Mullens, 2003). Extending this idea, the present results indicate that general sensation of worry may not be limited to the workings of immediately threatening events, but also be useful in "fuelling" general

cognitive evaluations and judgments which contribute in the decisions to pursue healthy behavioural alternatives. Worry has some similarities with affect in the risk-as-feelings model in the sense that it diverges from the cognitive assessment of risk in terms of being an anticipatory concept exerting its effects in the here and now. Thus, worry is frequently experienced immediately prior to or at the very time of a decision, exerting a dominant influence in the decision making process. However, this differs from the risk-as-feelings model in which affective reactions are similar to an emotional episode deriving information from the current situation in terms of vividness and immediacy of a hazard.

As noted, the relation between risk perception, as representative of cognitive processing of risk, and worry, as representative of affective processing of risk, is similar to some of the popular dual process models in contemporary psychology, notably Epstein (Epstein & Pacini, 1999), and Mischel (1996). With reference to Epstein, the cognitive-experiential self-theory posits that people react to and comprehend reality through two fundamentally different co-acting systems, the rational and the experiential systems (Epstein & Pacini, 1999). While the latter is characterised by being intuitive, automatic, affect-based, oriented towards rapid processing, and experiential, the rational system is analytical, deliberative, verbal, and oriented towards slower processing. The basic idea is that when a person responds to an emotionally significant event, he or she will automatically search memory for related events which contains some emotional associations. Similarly, the Cognitive Affective Personality System model (CAPS) (Mischel & Ayduk, 2002) aims to integrate various attention processes and different modes of information processing along with a possible link to neuroscience and brain structures. The central feature of the CAPS model is the existence of two distinct and interactive systems: the “hot” system which is based on emotional processing and the “cool” system which is cognitively oriented (Metcalfe & Mischel, 1999). The interaction of these two systems produces mental representations and behavioural patterns which are both cognitive and emotional. Thus, thinking about the object or behaviour of desire (e.g. cigarette or smoking) may activate emotion and consequently action. The theory suggests that self-regulatory failures are primarily caused by activation of strong emotionally based processes which sabotage already planned actions, e.g. quitting smoking. However, the basic premises of the CAPS also suggest that cognitive processes would be stronger if they are supported by correspondent emotional mechanisms. For example, a person might plan to quit smoking and perceive this course of action as a rational choice in a given situation, but nevertheless fail to enact it being based on deficiency of emotional processes which are supposed to support the cognitive orientation. In terms of our study it would imply that risk perception can only be instrumental in the quitting process if they are supported by activation of worry in relation to quitting smoking. This is indicated by the present findings which show that worry (a) contributes to a significant increase of explained variance in quitting intentions after the effects of risk perceptions are being controlled, and (b) fully mediates the effect of risk perception on quitting intentions. This suggests that abstract cognitive perceptions are dependent on affective states (e.g. worry) in order to guide behaviour towards achievement of long term aims and self-regulatory consistency.

Limitations and Implications

Some limitations of the present study should be acknowledged. First, it may be argued that predicting quitting intentions requires a more complete model of potential predictors. For example, predictors taking social influence into account are not included, whereas control perceptions and self-prediction of future smoking are included. Second, although information about the process of actual quitting is certainly valuable, due to restrictions in the data collection procedure, it was not possible to obtain a measure of actual quitting. Nevertheless, as behavioural intention is presumed to be the most proximal predictor of behaviour (Ajzen, 1991), analyses of this kind may still

be of help in disentangling the primacy of affect versus cognition in this particular area. Third, the study was conducted using telephone interviews where participants commonly tend to answer in a fairly rapid manner, as compared to traditional paper and pencil responses. Thus there was a restricted possibility for participants to go back and modify some of the previously given answers. Additionally, although we are not aware of any studies which address this question, one could speculate that this approach might accentuate the use of heuristic/automatic responses at the expense of intentional/conscious processes. Fourth, it is possible that alternative measures of risk perception would be stronger predictors of quitting intentions. Following Sloman (1996), Windschitl & Wells (1996) argued that being confronted with estimations of numerical probabilities, which is common practice regarding assessments of risk perception (Sutton, 1999; Weinstein, 2003), tends to sway people towards deliberative and rule-based reasoning. In contrast, the use of verbal measures such as scales which for example range from "very unlikely" to "very likely" tend to elicit more associative and intuitive thinking. Hence it is possible that verbal measures of risk perception may be stronger predictors of intention than numerical probability estimates. Future studies should use matching instruments in order to more accurately estimate the relative importance of these constructs (for a detailed discussion of measurement issues concerning risk perception and worry see Sjöberg, 1998). Finally, the use of only one item to assess self-prediction of future smoking and confidence, and only two items to assess behavioural intentions, risk perception, and worry may to some extent have weakened the reliability of these measures.

Notwithstanding these limitations, the present study may have some theoretical and practical implications. In theoretical terms, the findings provide further support for the idea that affect is of primary importance for risky decision making. Current literature on this topic has predominantly focused on "who wins the battle", cognition or emotion (Epstein & Pacini, 1999; Mischel, 1996). The present work offers an alternative approach which emphasizes the importance of exploring a more nuanced relation between emotion and cognition (Evans, 2007). The results indicate that emotion and cognition might even be supportive of each other, and conjointly work in the same direction. Furthermore, the results emphasize the need for more detailed research on the mediational role of other possible emotional measures which could be useful in obtaining self-regulatory success when it comes to demanding personal projects such as quitting smoking. From an applied perspective, the results indicate that smoking threat communications may benefit from inducing more chronic negative emotions like worry, and not only rely on more episodic negative emotions like fear. Although it is reasonable to assume that worry and fear are conceptually related, future research should focus on investigations of the causal relation between these concepts. Thus, an important issue in the decision making process might revolve around analysis of the conditions under where fear evoking stimuli or images also aim at establishing a more lasting sensations of worrying for own health or life situation. Finally, the results point to the importance of representations of the self in the distant future in the intention formation process.

Conclusions

This study specifically aims to make contribution to the research field which investigates the role of affective and cognitive processes in decisions related to quitting smoking. The results clearly show that cognitive judgments, which frequently represent detached evaluations of future actions, need affective processes (i.e. worry) in order to "fuel" behavioural decisions. Although the role of affective processes in prediction of future actions has predominantly been neglected in current literature on health behaviours, the conclusions of this research point out the necessity of including the relevant affective processes (e.g. worries and desires) in theoretical models which aim to provide a comprehensive account of human actions. Future research should investigate whether or

not these results are applicable to health behavioural decision making in general as well as contexts which require self-regulatory efforts/competencies.

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