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Reactance, autonomy and paths to persuasion: Examining perceptions of threats to freedom and informational value

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Abstract Autonomy, often associated with an open and reflective evaluation of experience, is sometimes confused with reactance, which indicates resistance to persuasion attempts. Two studies examined a path model in which autonomy and reactance predicted motivation following the provision of *anonymous* or *source-identified* health-risk information, via the mediation of perceived threat to decision-making freedom and of perceived informational value. Study 1 ($N = 122$) investigated alcohol consumption. The results showed that autonomy was positively related to autonomous motivation and intentions to drink responsibly. Reactance negatively predicted autonomous motivation in the *source-identified* information condition but positively predicted autonomous motivation and intentions in the *anonymous* information condition. Reactance negatively predicted attitudes through the mediation of perceived threat to decision-making freedom. Study 2 ($N = 145$) tested our hypothesized model for smoking behavior and replicated several of the Study 1 findings. Implications for our understanding of autonomy, reactance, and responses to risk-information are discussed.

Keywords Reactance · Autonomy · Persuasion · Health · Motivation

Introduction

Addressing the concept of autonomy has been problematic for researchers, partly due to inconsistencies in its definition. As defined within Self-Determination Theory (SDT, Ryan

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and Deci 1985, 2000), autonomy equates to experiencing self-governance: a person is considered autonomous when their decisions are freely chosen and are instigated and fully endorsed by their conscious self. In addition, autonomy within SDT is considered to be characterised by a person evaluating their options and carefully reflecting upon experience in order to make informed choices (cf. Hodgins and Knee 2002). However, autonomy has also been described by theorists from other research traditions as being associated with striving for independence and freedom, and as characterised by resistance to coercion or external influence (cf. Hmel and Pincus 2002; Murray 1938). This latter interpretation of autonomy is akin to reactance, as described in Reactance Theory (Brehm 1966; Brehm and Brehm 1981), and has been termed by some researchers as *reactive autonomy* (Koestner and Losier 1996). The current research assesses the relationship between autonomy and trait reactance, and suggests that they may lead to opposite responses when health-risk information is provided. Previous research has indicated that some people have a tendency to process health-risk information defensively (e.g., Liberman and Chaiken 1992; Sherman et al. 2000). The current research suggests that people may differ in their level of defensiveness depending on their autonomy and reactance levels, and that this defensiveness may lead to differing attitude and intention formation after reading the risk information. The research is the first to simultaneously model the effects of both autonomy and reactance on responses to risk information, and takes a novel approach to investigating the process by which this may occur.

Information aimed at increasing knowledge and understanding about consequences of action may be perceived by highly autonomous individuals (in comparison to less autonomous individuals) as having greater informational value and as more useful to their decision-making: therefore autonomy might increase the likelihood of acceptance of the

information. This may also be expected because, within SDT (Deci and Ryan 2000), autonomy is suggested as complementing relatedness (the extent to which a person feels connected to those around them). Because the extent to which autonomy leads to greater psychological well-being is dependent on feelings of being related or connected to others (see Sheldon and Niemiec 2006), autonomous individuals may be more likely to have greater respect and regard for other people's opinions. In addition, autonomy has been associated with *mindfulness* (Brown and Ryan 2003; Ryan and Brown 2003), which denotes attention to one's own current state of mind and a heightened sense of awareness. Mindfulness is also related to the use of fewer defensive tendencies such as avoidance (Niemiec et al. 2008), and therefore may lead higher autonomy individuals to be more open to potentially threatening information. Highly reactant individuals, on the other hand, may perceive such information as threatening to decision-making freedom and therefore deny the information, respond with less acceptance of the information, or with attitude change in the opposite direction to that intended by the information. The persuasive impact of information may therefore depend on individual differences in people's levels of autonomy and reactance.

Reactance theory (Brehm 1966; Brehm and Brehm 1981) suggests that a threat to freedom, such as that potentially perceived in persuasive communication, causes reactance, a motivational state that leads to a reassertion of the free behavior and/or belief change designed to restore the threatened freedom. Brehm and Brehm (1981) further suggest that the perceived intent to persuade affects the magnitude of reactance experienced, with experimental research supporting this proposal (Frankel and Morris 1976; Pennebaker and Sanders 1976). The perceived power of the source's social influence and intention to persuade are considered two important factors in reactance theory. Reactance theory also recognises that individuals might differ in the extent to which they are prone to experience reactance, and the extent to which they view a person's intent to persuade as threatening (Brehm and Brehm 1981). A number of measures of trait reactance have subsequently been established (e.g., Hong 1992; Hong and Faedda 1996). Measures of trait reactance address the extent to which a person tends to be angry or frustrated when their freedom is restricted, the extent of their tendency towards non-compliance and the extent of their resistance to the influence attempts and advice of others.

Reactance theory has been investigated in the domain of health-risk communication. For example, Dillard and Shen (2005) gave participants health-risk information that either respected their freedom to choose or was less respectful of their freedom to choose. Communication perceived as less respectful of the person's decision-making freedom aroused more reactance, measured as a combination of both negative affect (anger) and negative cognition (assessed using a thought-listing task). Structural equation modelling showed that this reactance was subsequently associated with changes in attitude and intention, with reactance leading to less positive attitudes and to weaker intentions to engage in the recommended health behavior (see also Rains and Turner 2007).

Further research suggesting that a negative impact of health communication is a result of perceived threat to decision-making freedom has been conducted by Invernizzi et al. (2003). In their study, participants received health-risk information about smoking that was described as from either a health institute or from a neighbourhood association. The health-risk information attributed to the health institute was perceived by participants to be from a more freedom-threatening source and as being less respectful of individual's freedom of choice than the information attributed to the neighbourhood association. Participants who read the information from the health institute also had lower intentions to quit smoking than did participants who read information from the neighbourhood association.

There has been no research to date which has specifically considered the role of autonomy (as characterised in SDT) in relation to reactance (as characterised in Reactance Theory). However, Koestner and Losier (1996) investigated *reflective autonomy* (i.e., autonomy as defined within SDT) and *reactive autonomy* (similar to reactance as defined in Reactance theory) and found that the two measures were not empirically related to each other. Interestingly, they found that while reactive autonomy was associated with participants perceiving a greater number of negative daily events and reporting greater negative affect, reflective autonomy was associated with perceiving a greater number of positive daily events, reporting less negative affect and reporting the use of effective rather than ineffective mood regulation strategies. In a later study, Koestner et al. (1999) found that reactive and reflective autonomy were negatively correlated, and led to opposite patterns of behavioral response. In a racetrack betting task, those high in reactive autonomy were less likely to follow the recommendations of a credible expert than those of a non-credible expert when making their decision, whereas those high in reflective autonomy were, conversely, more likely to follow the recommendations of a credible expert than those of a non-credible expert. The authors suggested that this pattern of findings could be due to participants high in reactive autonomy perceiving the credible expert source to pose a threat to their feelings of self-reliance, and therefore these participants ignored the expert advice and acted contrary to this in order to boost their feelings of self-reliance. Those high in reflective autonomy, however, were suggested to have an integrative and active approach to the

task and to display an adaptive behavioral pattern of using expert information in order to increase their own feelings of competence.

Autonomy supportive interventions have been successful in eliciting greater health behavior change such as smoking cessation (Williams et al. 2006) and diabetes self-management (Williams et al. 2004). Substance misuse clients with autonomous reasons for engaging in treatment have also been shown to exhibit greater engagement in treatment and perceive greater benefits from substance dependence treatment than those with controlled reasons for seeking treatment (Wild et al. 2006). In addition, research drawing on SDT has shown autonomy to be related to people's responses to health-risk information. Pavey and Sparks (2008), for example, found that higher autonomy people reported greater autonomous motivation after reading health-risk information than after reading neutral information, and in a separate study, that lower autonomy people reported the opposite pattern of effects. The authors suggested that this finding could be partly due to those with greater autonomy perceiving the health-risk information as informative rather than coercive, and consequently having fewer tendencies to engage in defensive coping strategies (cf. Knee and Zuckerman 1998). Autonomy may therefore be likely to lead to greater acceptance of potentially threatening and persuasive risk information due to greater perceptions of the content as having informational value. As those with greater autonomy are suggested to be more flexible and reflective of their options when engaging in behavior (Hodgins and Knee 2002; Pavey and Sparks 2008), they are expected to have a more adaptive response to the health-risk messages with this adaptive response manifested in greater reported autonomous motivation.

Autonomous motivation, relative to controlled motivation, is considered to be a stable form of motivation (Deci and Ryan 1991; Vansteenkiste et al. 2004), and previous research has shown it to have a positive impact on attitudes, intentions and behavior (Hagger and Chatzisarantis 2006; Hagger et al. 2002; Hagger et al. 2006), with the impact of autonomous motivation on intentions in some samples mediated by attitudes. Previous research has also identified attitudes as a predictor of behavior through the mediation of intentions (Ajzen 1991; Cooke and Sheeran 2004). Greater autonomous motivation, more positive attitudes and stronger intentions towards engaging in recommended health behavior are therefore all considered to indicate acceptance of health-risk information.

In the two current studies, we aimed to build on the above research findings by investigating the hypothesized process by which autonomy may lead to greater acceptance of health-risk information, namely via a perception of the text as having more informational value. We also

investigated the possible process by which trait reactance leads to less acceptance of health-risk information, that is via greater perception of threat to decision-making freedom. Participants' autonomous motivation, attitudes and intentions towards engaging in the implicitly recommended health-beneficial behavior were measured to assess the extent to which they accepted the information; the hypothesized relationships between these constructs, based on the previous research findings discussed, were incorporated in our model. Incorporating both autonomy and reactance tendencies within a single model allowed the effect of each on our dependent variables to be controlled for simultaneously, allowing co-variation between the two individual difference measures to occur. This method therefore accurately models the impact of these variables on responses to risk information.

In addition, we aimed to assess whether the impact of autonomy and trait reactance on our adaptive response measures differed when the information was anonymous or when it derived from an authoritative source. Information sourced from a respectable organisation may be considered by individuals to be more credible than information that has no source identified. In addition however, the source may be seen as having greater authority to impose restrictions on behavior. The effect of source credibility on responses to persuasion attempts (Petty and Cacioppo 1986) has been shown to be moderated by a wide variety of variables, including dispositional attributes of the receiver (see Pornpitakpan 2004, for a review). Given the previous research developed from reactance theory (e.g., Dillard and Shen 2005; Pennebaker and Sanders 1976), and the research of Koestner and Losier (1996), we expected that a credible, identified source might increase highly reactant individuals' perceptions of threat to decision-making freedom (because they may perceive the source to have greater credibility and greater authority to restrict freedom of choice) and therefore lead to less acceptance of the risk information. For autonomous individuals however, a credible, identified source might increase the perceived informational value of the information and therefore increase acceptance of the risk information. Uncovering the underlying processes of defensive and adaptive responses will not only be of theoretical importance to reactance theory and SDT but could also be of applied importance in the design of health-risk information.

Study hypotheses

The hypothesized path model by which individual differences in autonomy and trait reactance influence reactions to health-risk information is shown in Fig. 1. This model was tested as a multi-sample model to determine whether the
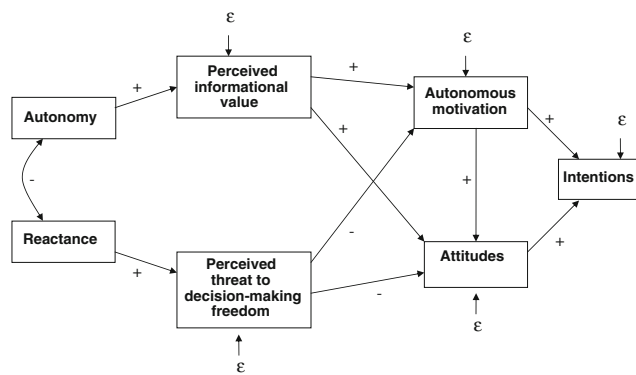
Fig. 1 Hypothesized path model, with indication of the expected direction of the paths

source-identified and *anonymous* conditions differed in the strength of the paths. Path analysis was chosen to incorporate all the hypothesized relationships within a single analysis. The model was assessed for two health-related behaviors: excessive alcohol consumption (Study 1) and cigarette smoking (Study 2). Overall, we expected autonomy to have a positive influence on intentions to engage in the behavior and reactance to have a negative relationship with intentions to engage in the behavior, with these relationships mediated by perceived informational value, perceived threat, autonomous motivation and attitudes. Autonomy was expected to be more strongly positively related to acceptance of the message when it was *source-identified*, compared to when it was *anonymous*, due to autonomous individuals being more likely to reflect upon and evaluate the information carefully. Reactance was expected to be more strongly negatively related to the acceptance of the message when it was *source-identified*, rather than *anonymous*, as reactant individuals might perceive the *source-identified*, compared to the *anonymous* information, as having greater power to deny freedom of choice and as more threatening to decision-making freedom. Each variable in the model serving as both a predictor variable and dependent variable (i.e., variables with paths both to and from them) was expected to act as a mediator of the indirect effects.

Study 1

In Study 1, we investigated excessive alcohol consumption, a health-detrimental behavior known to be a specific problem for the student population in both the UK (Gill 2002) and the US (Wechsler et al. 2000). Informing students of the health-detrimental effects of excessive alcohol consumption is one strategy used to encourage responsible drinking among this population. However, information

provision for risky health behaviors is often ineffective (e.g., Larimer and Cronce 2007; Liberman and Chaiken 1992; Sherman et al. 2000). If health-risk information produces a reactance effect, it is possible that the information provision will backfire and produce changes in motivation to drink responsibly which are opposite to those intended.

Method

Participants and procedure

First and second year psychology undergraduate students ($N = 122$: 103 females and 19 males) participated in the study to fulfil course requirements. Ages ranged from 18 to 55 ($M = 19.94$, SD $= 3.56$). Participants were randomly allocated to one of two conditions: the *source-identified* condition ($n = 62$), and the *anonymous* condition ($n = 60$).[1] Participants took part in one of two sessions in a large lecture theatre, and the materials were presented as a questionnaire in the order they are described below. Ethical guidelines were adhered to in the conduct of the study.

Materials

Questionnaires were distributed to all participants. Seven-point response scales were used unless otherwise indicated (response scale end-points are indicated in parentheses). Participants were asked to indicate their age, sex and their university email address (to identify them for course credit purposes). Email addresses were subsequently removed from the data file to ensure participants' anonymity.

Autonomy. The three-item measure of general autonomy (Sheldon et al. 2001) was modified to measure participants' autonomy (as in Pavey and Sparks 2008). The three questions: *"I feel that my choices are based on my true interests and values"*, *"I feel free to do things my own way"*, and *"I feel that my choices express my true self"* (*'not at all true'* to *'very true'*) were supplemented by four additional items devised by the authors. These items drew on key definitions of autonomy from within the self-determination literature: *"I tend to do things that are important to me as a person"*, *"I tend to do things because I want to rather than because I am told to"*, *"I generally feel that I am in control of what I do"*, and *"I feel that I make my own decisions"*. The scale showed good inter-item reliability, $\alpha = .83$, and the mean of the items was taken as our measure of autonomy.

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[1] There was also a neutral condition used in Study 1, in which participants ($N = 60$) read information unrelated to alcohol consumption. However, given that this data would not have fitted our hypothesised model, data from participants in the neutral information condition were removed. No neutral condition was used in Study 2.

Reactance. The 11-item Hong Reactance Scale (Hong and Faedda 1996), refined from a previous 14-item version (Hong 1992), and previously tested for its convergent and discriminate validity (Hong and Faedda 1996), was used to measure trait reactance. The scale consisted of 3 items relating to participant's emotional response to restricted choice (e.g., *"I become angry when my freedom of choice is restricted"*), 3 items regarding reactance to compliance (e.g., *"Regulations trigger a sense of resistance in me"*), 3 items about resisting influence from others (e.g., *"I resist the attempts of others to influence me"*) and 2 items on reactance towards advice and recommendations (e.g., *"I consider advice from others to be an intrusion"*). Participants were asked to rate the extent to which each of the items was true for them (*'not at all true'* to *'very true'*). The scale showed good inter-item reliability, $\alpha = .80$, and the mean of the items was therefore taken as our measure of reactance.

Alcohol consumption. Participants were asked to list all the alcoholic drinks they had consumed during the previous seven days. This information was subsequently converted to units of alcohol ($M = 15.45$, $SD = 11.94$). A list of how many units standard drinks contain was then provided, and participants were asked to indicate the number of units of alcohol they usually consumed on a night out ($M = 7.58$, $SD = 4.14$). Participants ($n = 7$) who reported having not consumed any alcohol in the past week and who reported usually consuming no alcohol on a night out were removed from our analysis due to the lack of relevance of our measured variables to these participants.

Health-risk information. In the *source-identified* condition, information about the dangers of excessive alcohol consumption was given to participants to read. This consisted of seven short paragraphs, each followed by a question about the information to ensure the participants had read it thoroughly. All information was accurate and collated from the UK Alcohol Concern website. At the start of the information one sentence read *"All of the information you will now read is taken from Alcohol Concern, an official national organization funded by the UK government Department of Health"*. The facts were chosen for their shocking and unpleasant nature (e.g., *"Cirrhosis is found in about 20% of heavy drinkers and is the result of continuous liver damage. Where symptoms are visible, they usually include: general ill health, flatulence, lack of appetite, sallow skin, jaundice, itching, anaemia, loss of weight, vomiting of blood and lower back pain. There may also be subtle mental changes leading to profound confusion and coma"*. Question: *"What percentage of heavy drinkers show symptoms of Cirrhosis?"* At the end of the information a sentence read *"All of the information above is backed by scientific research and has been taken from an official organization funded by the UK government Department of Health"*.

In the *anonymous* condition the information given to participants was identical to that in the *source-identified* condition, but with the two sentences referring to the source of the information omitted.

Autonomous motivation. Participants were told that drinking responsibly referred to limiting their alcohol intake to the recommended daily amount of no more than 3–4 units for men and 2–3 units for women. Participants were then asked why they might drink responsibly at some time in the future, and rated 12 possible reasons (*'not at all true for me'* to *'very true for me'*) (Mullan et al. 1997). Seven items measured autonomous motivation (e.g., *"It is an important choice I really want to make"*), $\alpha = .84$, and five items measured controlled motivation (e.g., *"I want others to approve of me"*), $\alpha = .77$. Each participant's controlled motivation score was subtracted from their autonomous motivation score to give a measure of their relative autonomous motivation (positive scores indicating greater autonomous motivation scores than controlled motivation scores).

Attitudes. Five items measured attitudes towards drinking responsibly: *I feel that me drinking responsibly would be…"* (*'bad'* to *'good'*, *'harmful'* to *'beneficial'*, *'unpleasant'* to *'pleasant'*, *'unenjoyable'* to *'enjoyable'* and *'foolish'* to *'wise'*), $\alpha = .80$.

Intentions. Four items measured participants' intentions to drink responsibly, e.g., *"I intend to drink responsibly during the next 6 weeks"* (*'definitely do not'* to *'definitely do'*), $\alpha = .95$.

Perceived informational value. Five items measured the perceived informational value of the information: *"Will the information help inform your decisions"*, *"Do you trust the information to be factually correct?"*, *"Was the information trying to educate you"*, *"To what extent have you learnt something from the information"* and *"How accurate do you feel the information to be?"* (*'not at all'* to *'very much so'*), $\alpha = .86$.

Perceived threat to decision-making freedom. Two items measured the extent to which participants perceived the information to threaten their freedom: *"Did the information threaten your freedom to make your own decisions?"* and *"Did the information put pressure on you?"* (*'not at all'* to *'very much so'*), $r = .62$.

Results

Randomisation check

Three independent samples *t*-tests were conducted to determine if there were any differences between conditions in the amount of alcohol consumed over the previous week, the amount of alcohol usually consumed on a night out, or age. In addition, a chi square analysis was conducted to

Table 1 Study 1 and 2: Means and Standard Deviations of each variable in each condition

| | Study 1 | | | | Study 2 | | | |
| | Sourced | | Anonymous | | Sourced | | Anonymous | |
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Past behavior[a]	16.24	11.70	16.78	14.35	59.53	40.49	55.07	44.12
Autonomy	5.37	0.69	5.38	0.66	5.45	0.76	5.14	0.78
Reactance	3.85	0.73	3.64	0.88	4.16	0.84	4.24	0.85
Perceived informational value	5.38	0.91	4.84	1.13	4.76	1.03	4.70	1.05
Perceived threat to decision-making freedom	3.07	1.44	3.04	1.51	2.51	1.74	2.49	1.60
Autonomous motivation	1.74	1.13	1.48	1.26	2.59	1.47	2.17	1.57
Attitudes	4.98	1.09	5.10	0.97	5.02	1.29	5.14	1.05
Intentions	3.88	1.69	3.91	1.88	4.23	2.00	4.39	1.98

[a] Past Behavior in Study 1 was the number of units of alcohol consumed in the previous seven days. Past Behavior in Study 2 was the number of cigarettes smoked on average per week

assess possible gender differences between conditions. None of these analyses showed significant results, suggesting that any differences between conditions found in the main analysis were not a result of age, gender or alcohol consumption levels.[2]

Main effects of condition

Independent samples *t*-tests of the main effects of condition on perceived informational value, perceived threat to decision-making freedom, relative autonomous motivation, attitudes and intentions were also conducted (variable means in each condition are displayed in Table 1). The only significant difference between conditions was that participants in the *source-identified* condition perceived the information to have greater informational value than did those in the *anonymous* information condition, t (113) = 2.83, $p < 0.01$.

Structural equation model

A path analytic structural equation model was estimated using a maximum likelihood procedure with the EQS program (Version 6.1, Bentler 2004). The descriptive statistics and correlation matrix for all variables included in the model are shown in Table 2.

Before estimating the model, Mardia's coefficient was calculated in both our conditions to determine whether the data met the assumption of normality of data. The results showed that Mardia's coefficient was large (16.23) in the

source-identified condition, and therefore robust fit statistics were used to evaluate the model and estimate parameters. Several criteria of the overall goodness of fit of the model to the covariance matrix were used. The comparative fit index (CFI) and the root mean square error of approximation (RMSEA) are reported. CFI values of approximately 0.95 or higher and RMSEA values of approximately 0.05 or lower indicate a good fit of the model to the data (Hu and Bentler 1999). In addition, the chi-square test statistic with the Satorra-Bentler correction for non-normal data (Satorra and Bentler 1994) is reported (SB χ^2), with a non-significant chi square statistic indicating that, collectively, all paths not specified in the model were not of significance.

Our initial *hypothesized model* showed a poor fit to the data, SB $\chi^2(22) = 32.85$, CFI = .72, RMSEA = .09. Inspection of the Lagrange Multiplier (LM) test statistics indicated that four paths could be added to the model to significantly improve model fit: direct paths from autonomy to autonomous motivation, reactance to autonomous motivation, autonomy to intentions and reactance to intentions. After adding these parameters, this unconstrained *final model* showed a good fit of the structural model to the data across conditions, SB $\chi^2(14) = 12.57$, CFI = 1.00, RMSEA = .00.

Constraints were then placed on all of the structural paths to test the hypothesis that these paths would differ depending on whether the information given to participants was *source-identified* or *anonymous*. If the paths did not differ across conditions, the model would not worsen when the paths were constrained to be equal. The fully constrained model proved to be worse than the unconstrained model, SB $\chi^2(28) = 33.56$, CFI = .86, RMSEA = .06. A chi-square difference test ($\Delta\chi^2$) indicated that the *fully constrained final* model was marginally significantly worse

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[2] Adding alcohol consumption over the past seven days as a covariate in the model did not significantly affect the results of the model in Study 1.

Table 2 Study 1: Means (*M*), standard deviations (SD) and the correlation matrix of all variables included in the models (*N* = 115)

	M	SD	1	2	3	4	5	6	7	8
1. Alcohol consumption	16.50	13.00	–	.00	.26*	.00	.48**	−.19	−.34*	−.65**
2. Autonomy	5.38	.67	.05	–	−.06	.17	−.02	.32**	−.14	−.04
3. Reactance	3.75	.81	−.07	.04	–	−.07	.13	.22	−.06	.04
4. Perceived informational value	5.12	1.06	.16	.11	−.01	–	.15	.21	.15	−.06
5. Perceived threat to decision-making freedom	3.05	1.47	.27*	−.02	.24†	.16	–	−.12	−.30*	−.23†
6. Autonomous motivation	1.62	1.20	−.11	.10	−.22†	.26*	−.02	–	.01	.38**
7. Attitudes	5.04	1.03	−.12	.14	−.26*	.07	−.23†	.25†	–	.43**
8. Intentions	3.89	1.77	.50**	−.19	.13	−.05	−.15	.22†	.17	–

Correlation coefficients shown above the diagonal are for those in the *anonymous* condition

* *p* < 0.05, ** *p* < .01, † *p* < 0.10

than the *unconstrained final* model ($\Delta\chi^2(14) = 20.99$, $p < .10$), suggesting that there was some variance in paths across conditions. To identify which paths were significantly unequal, the LM test was performed. This analysis showed that the paths between reactance and autonomous motivation, and reactance and intentions significantly differed across conditions, and these two constraints were subsequently released. There was an excellent fit of the resulting model to the data, SB $\chi^2(26) = 23.93$, CFI = 1.00, RMSEA = .00.

Estimated path coefficients

The standardized beta coefficients for the paths of the constrained multi-sample final model, with the one path constraint released that showed significant variation across conditions, are shown in Fig. 2. Autonomy and reactance were unrelated. The hypothesized path from autonomy to perceived informational value, although in the predicted direction, did not reach significance. As predicted, greater reactance was related to greater perceived threat to decision-making freedom. Contrary to hypothesis, neither of these paths differed across conditions.

Also as predicted, greater perceived informational value led to greater autonomous motivation towards reducing alcohol consumption. Perceived informational value had no significant effect on attitudes. There was also no significant effect of perceived threat to decision-making freedom on autonomous motivation, although the beta weights were in the hypothesized direction. However, as predicted, greater perceived threat to decision-making freedom was related to less positive attitudes towards reducing alcohol consumption.

Contrary to prediction, there was no relationship between autonomous motivation and attitudes. However, as predicted, greater autonomous motivation was associated

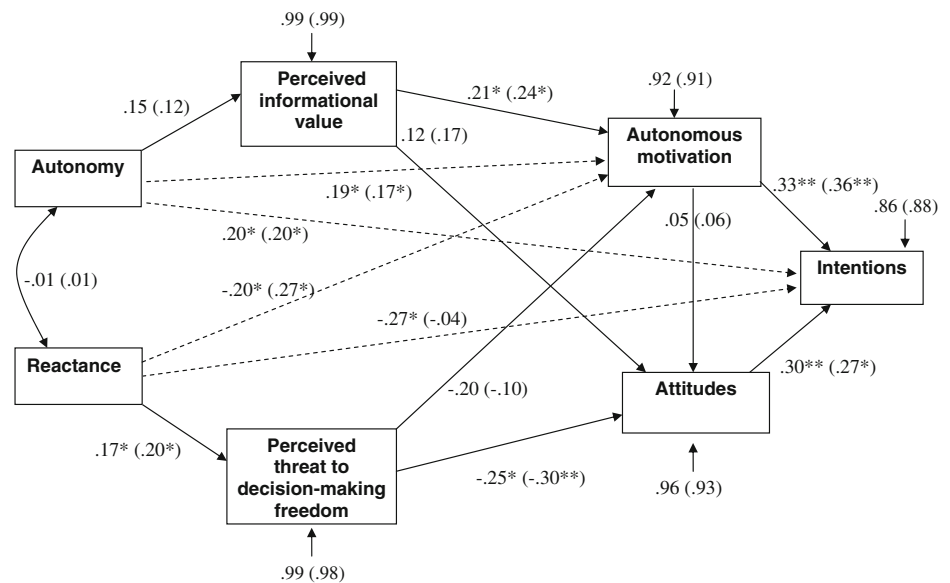with stronger intentions. Attitudes were also positively related to intentions.

The additional direct paths indicate that there was a significant positive relationship between autonomy and autonomous motivation in the predicted direction, and a significant positive relationship between autonomy and intentions. There were also significant effects of reactance on autonomous motivation and intentions which differed across conditions. In the *source-identified* condition, greater reactance was associated with less autonomous motivation and lower intentions. In the *anonymous* condition, however, greater reactance was associated with greater autonomous motivation and was not associated with intentions.

Indirect effects

The indirect effects of autonomy and reactance on attitudes, autonomous motivation and intentions to drink alcohol responsibly, were addressed using a series of Sobel tests (Sobel 1982). Variables with significant paths both to and from them in the final model were tested as potential mediators. The results show that there were no significant indirect effects of autonomy on autonomous motivation ($z = 1.26$) or on attitudes ($z = 1.06$) via perceived informational value. However, there was a marginally significant indirect effect of autonomy on intentions via autonomous motivation ($z = 1.85$, $p < .10$) suggesting that autonomous motivation partially mediated the relationship between autonomy and intentions.

There was no significant indirect effect of reactance on autonomous motivation via perceived threat to decision-making freedom ($z = 0.97$). However, there was a marginally significant indirect effect of reactance on attitudes via perceived threat to decision-making freedom ($z = 1.68$, $p < .10$). Reactance had no significant indirect negative effect on intentions through autonomous motivation in the

source-identified condition ($z = 1.51$), and a marginally significant indirect positive effect on intentions through autonomous motivation in the *anonymous* condition ($z = 1.89$, $p < .10$).

Discussion

The results of Study 1 show that the direct paths from trait reactance to autonomous motivation and intentions significantly differed between conditions, with reactance and autonomous motivation negatively related in the *source-identified* condition but positively related in the *anonymous* condition. Reactance and intentions were negatively related in the *source-identified* condition but not in the *anonymous* condition. These findings lend support for the notion that for high reactance individuals, information from an identified source may backfire to produce less desirable motivational effects than if the information was anonymous. However, this variability between conditions was only present for the direct effect of reactance on autonomous motivation and intentions and not present for the effect of reactance on perceived threat to decision-making freedom. This suggests that any detrimental impact of the source information on autonomous motivation and subsequent intentions was not due to this information being perceived as more freedom-threatening.

Although the initial hypothesized model displayed some paths consistent with our predicted model, overall it displayed a poor fit to the data. Adding four direct paths significantly improved the model, suggesting that the mediating variables of perceived informational value and perceived threat to decision-making freedom did not account for all variance in the relationships between autonomy, reactance, attitudes, autonomous motivation and

intentions. This suggests that there may be other variables not measured in the current model which may account for both the positive effect of autonomy on responses to risk information, and the negative impact of reactance on responses to source-identified risk information. The final model indicated indirect positive effects of autonomy on intentions to drink responsibly through greater autonomous motivation. Reactance had an indirect negative influence on intentions to drink responsibly through an association with autonomous motivation which differed between conditions. Perceived informational value did not mediate any of the relationships between autonomy, reactance, and people's attitudes, autonomous motivation and intentions to reduce their alcohol consumption. However perceived threat to decision-making freedom significantly mediated the relationships between reactance and attitudes towards drinking alcohol responsibly.

Study 2

Study 2 tested our hypothesized model (see Fig. 1) using a different health-related behavior, in order to evaluate whether the model could be generalised to a health behavior other than alcohol consumption. Study 2 investigated cigarette smoking, a behavior that also has extremely serious detrimental consequences for public health (Hublet et al. 2006). The same method and procedure as Study 1 was followed, but using a sample of smokers and giving health-risk information concerning smoking. After reading risk information that was either *source-identified* or *anonymous*, measures of perceived informational value, perceived threat to decision-making freedom, autonomous motivation, attitudes and intentions towards quitting

smoking were completed. The hypothesized fully mediated model (see Fig. 1) was initially tested. Following this, the direct paths from the final model in Study 1 were added to determine any improvement in model fit and consistency between the samples.

Method

Participants and procedure

Participants were 145 students ($n = 136$) and non-students ($n = 9$): 103 females and 41 males (1 missing value for gender), recruited from a university participant pool. Ages ranged from 18 to 49 ($M = 22.96$, SD = 5.24). A recruitment email was sent to a university participant pool (a list of email addresses of university students and staff who are willing to take part in psychological research), requesting participation in an online study about health behaviors. Smokers (who regularly smoked more than 2 cigarettes per week) were asked to click on a link, which sequentially took them to one of two online questionnaires: the *source-identified* condition ($n = 71$) or the *anonymous* condition ($n = 74$). Non-smokers were asked to click on a different link, which took them to an unrelated online survey. Both smokers and non-smokers were entered in a prize draw with the chance of winning £100 (about $160). The materials were presented in the order they are described below. A paragraph at the start of the questionnaire informed participants that they had the right to withdraw from the study at any time and that their data would remain anonymous and confidential. After completing the questionnaire, participants were asked to enter their email address so they could be contacted if they won the prize draw, and were fully debriefed.

Materials

Data were collected in online questionnaire format. Seven-point response scales were used, unless otherwise indicated (response scale end-points are indicated in parentheses). Participants were asked to indicate their age, sex and their student or non-student status.

Smoking habits. Participants were asked how many cigarettes they smoked on average per day or per week. 'Per day' responses were multiplied to give the average smoked per week. Number of cigarettes smoked per week ranged from 2 to 210 ($M = 56.91$, SD = 42.75).

Autonomy and reactance. The autonomy, $\alpha = .81$, and reactance items, $\alpha = .78$, were identical to those used in Study 1.

Health-risk information. In the *source-identified* condition, information about the dangers of smoking was given to participants to read. This consisted of six short paragraphs, each followed by a question about the information

to ensure the participants had read it thoroughly. All the information was accurate and collated from the NHS 'quit smoking' website. At the start of the information one sentence read *"All the information below has been taken from '*www.quitsmoking.co.uk*'–an official organisation funded by the UK government department of health"*. The facts were chosen for their shocking and unpleasant nature (e.g., *"The average 15–20 a day smoker takes about 1 pint of brown sticky tar into the lungs every year. It is a mixture of many different chemicals, including formaldehyde, arsenic and cyanide. Tobacco smoke contains over 4,000 chemical compounds, over 50 of which are known carcinogens"*. Question: *"How much brown sticky tar does the average 15–20 a day smoker take into the lungs each year?"* At the end of the information a sentence read *"All of the information above is backed by scientific research funded by the UK government Department of Health"*.

In the *anonymous* condition the information given to participants was identical to that in the *source-identified* condition apart from the two sentences referring to the source of the information were omitted.

Autonomous motivation. The autonomous motivation measure was identical to that used in Study 1, but adapted for the behavior of quitting smoking (autonomous motivation items: $\alpha = .84$; controlled motivation items: $\alpha = .78$).

Attitudes. Five items measured attitudes towards quitting smoking: *"I feel that me quitting smoking would be…"* ('*bad*' to '*good*', '*harmful*' to '*beneficial*', '*unpleasant*' to '*pleasant*', '*unenjoyable*' to '*enjoyable*' and '*foolish*' to '*wise*'), $\alpha = .71$.

Intentions. Three items measured participants' intentions to quit smoking, e.g., *"I intend to quit smoking during the next 12 months"*, ('*definitely do not*' to '*definitely do*'), $\alpha = .97$.

Perceived informational value and perceived threat to decision-making freedom. The items measuring perceived informational value, $\alpha = .73$, and perceived threat to decision-making freedom were identical to those used in Study 1. However, the correlation between the two items included in the perceived threat to decision-making freedom scale was low ($r = .25$). The one item deemed by the authors to most accurately represent the perceived threat to decision-making freedom construct item was therefore used in our analyses: *"Do you think the information threatened your freedom to make your own decisions?"* ('*not at all*' to '*very much so*').

Results

Randomisation check

Two independent sample *t*-tests were conducted to determine if there were any differences between conditions in

Table 3 Study 2: Means (*M*), standard deviations (SD) and the correlation matrix of all variables included in the models (*N* = 141)

	M	SD	1	2	3	4	5	6	7	8
1. Cigarettes per week	57.22	42.31	–	−0.02	−0.02	−0.12	0.00	−0.08	−0.25*	−0.13
2. Autonomy	5.29	.78	−0.18	–	.08	−.05	.07	.18	.09	.03
3. Reactance	4.20	.84	−.05	−.28*	–	−.20	.40**	−.26*	.09	.03
4. Perceived informational value	4.73	1.04	−.25*	.07	.12	–	−.16	−.08	.10	.15
5. Perceived threat to decision-making freedom	2.50	1.66	−.12	−.06	.35**	.22†	–	−.33**	−.11	−.09
6. Autonomous motivation	2.37	1.53	.02	.19	−.18	.00	−.11	–	.24*	.08
7. Attitudes	5.09	1.17	−.15	.31*	−.06	.18	−.20†	.33**	–	.43**
8. Intentions	4.31	1.99	−.02	.08	.01	.05	−.02	.09	.52**	–

Correlation coefficients shown above the diagonal are for those in the *anonymous* condition

* $p < 0.05$, ** $p < 0.01$, † $p < 0.1$

the number of cigarettes smoked per week or in age. In addition, chi-square analysis was conducted to determine whether there were gender differences between conditions. None of these analyses showed significant results.[3]

Main effects of condition

Independent sample *t*-tests of the main effects of condition on perceived informational value, perceived threat to decision-making freedom, relative autonomous motivation, attitudes and intentions were conducted (variable means and standard deviations in each condition are displayed in Table 1). There were no significant differences between conditions.

Structural equation model

As in Study 1, the hypothesized model (Fig. 1) was tested using a maximum likelihood structural equation modelling procedure. The descriptive statistics for all the variables included in the model are shown in Table 3. Mardia's coefficient was small in both our conditions, and therefore normal maximum likelihood statistics were used to assess model fit.

The hypothesized model showed a poor fit to the data, SB $\chi^2(22) = 28.57$, CFI = .92, RMSEA = .07. Adding the direct paths as found in Study 1 improved the model fit, SB $\chi^2(14) = 18.13$, CFI = .99, RMSEA = .07, but the RMSEA value was still unsatisfactory. LM test statistics indicated that a direct path from autonomy to attitudes would significantly improve model fit. The final model, which consisted of the paths from the final model in Study 1 and the addition of a path from autonomy to attitudes,

showed a good fit to the data, SB $\chi^2(12) = 13.14$, CFI = .99, RMSEA = .04.

Constraints were then added on all the paths and the covariance to determine whether the beta coefficients for any of these parameters differed across conditions. The fully constrained model, SB $\chi^2 (27) = 27.36$, CFI = 1.00, RMSEA = .01 did not significantly decrease the fit of the model, $\Delta\chi^2(15) = 14.22$, $p = .51$, and inspection of the LM test revealed that none of the directional parameters significantly differed across conditions.

Estimated path coefficients

The beta weights for paths in the final model are shown in Fig. 3. There was no significant relationship between autonomy and perceived informational value. However, reactance significantly predicted perceived threat to decision-making freedom: higher reactance was associated with greater perceptions of the information as threatening to decision making freedom. Contrary to hypothesis, but in accordance with the results of Study 1, there were no differences in the magnitude of these paths across information conditions.

There was no significant relationship between perceived informational value and autonomous motivation. However, perceived informational value had a marginally significant effect on attitudes in the direction predicted: greater perceived informational value was associated with more positive attitudes. There was a significant negative association between perceived threat to decision-making freedom and autonomous motivation, as predicted. Perceived threat to decision-making freedom marginally significantly predicted attitudes in the *anonymous condition* but in the *source-identified* condition this path did not reach significance.

Autonomous motivation was positively associated with attitudes across conditions but was not associated with

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[3] Adding the number of cigarettes smoked per week as a covariate in the model did not significantly effect the results of the model in Study 2.

Fig. 3 Study 2: Path diagram
showing the standardized beta
coefficients for all paths in the
multi-sample *final model* with
all paths constrained. *Dotted
lines* indicate direct paths added
to the model. Parameter
estimates for those in the
anonymous condition are shown
in brackets. ** $p < 0.01$,
* $p < 0.05$, † $p < 0.10$
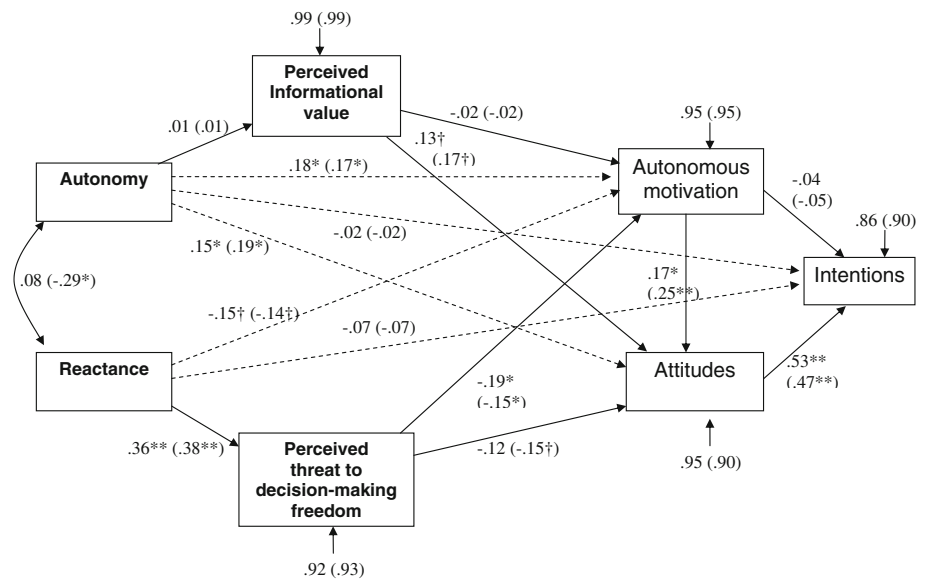
intentions. Attitudes and intentions were highly positively
related.

As in Study 1, the addition of direct paths was necessary
to increase model fit. These paths indicated that autonomy
was associated with greater autonomous motivation in both
conditions. Autonomy was also associated with more
positive attitudes towards quitting smoking. Reactance was
marginally negatively associated with autonomous moti-
vation. In contrast to Study 1, there was no significant
direct effect of either autonomy or reactance on intentions.

Indirect effects

The indirect effects were again tested using a series of
Sobel tests. The results indicate a marginally significant
indirect effects of autonomy on attitudes through autono-
mous motivation ($z = 1.68$, $p < .10$) and a significant
indirect effect of autonomy on intentions through attitudes
($z = 2.05$, $p < .05$).

There was a marginally significant indirect effect of
reactance on autonomous motivation ($z = 1.80$, $p < .10$)
but no significant indirect effect of reactance on attitudes via
perceived threat to decision-making freedom ($z = 1.57$).
Reactance had no significant indirect negative effect on
attitudes through autonomous motivation ($z = 1.41$).

Discussion

Autonomy had a positive direct effect on attitudes to quit
smoking, and a positive indirect influence through its effect
on autonomous motivation. Trait reactance had a negative
indirect influence on autonomous motivation, partially
mediated by perceived threat to decision-making freedom.

Although not all the hypothesized paths proved significant,
the final model showed a good fit of the data and the pat-
tern of results supported the proposal that autonomy and
reactance lead to different responses towards engaging in a
health-beneficial behavior following exposure to risk
information. As in Study 1, perceived informational value
failed to mediate the effect of autonomy on acceptance of
the risk information.

Study 2 is consistent with Study 1 in finding significant
positive paths between: (1) autonomy and autonomous
motivation after reading risk information; (2) reactance and
perceived threat to decision-making freedom after reading
risk information; (3) attitudes and intentions towards
engaging in more healthy behavior following reading risk
information. Studies 1 and 2 also both find an overall
positive indirect relationship between autonomy and
intentions to engage in healthy behavior, and an overall
negative relationship between reactance and intentions to
engage in a healthy behavior. The key differences between
the two studies are that in Study 1, reactance was nega-
tively associated with autonomous motivation after reading
source-identified risk information and positively associated
with autonomous motivation after reading anonymous
information. In Study 2, there were no differences in the
responses of those who read the source-identified infor-
mation and those who read the neutral information. This
difference could be due, for example, to the nature of the
health behavior in question (i.e., differences between
motivations for alcohol consumption vs. cigarette smoking),
the differing levels of stigma attached to the two behaviors,
or the extent to which people are previously aware of the
risk information presented. Testing the model using
information about a range of different health behaviors

would determine the extent to which our findings might be generalised.

General discussion

The two studies reported provide evidence that autonomy and reactance are discrete individual differences that should be considered to be conceptually and empirically independent of one another. Autonomy and trait reactance were associated with different cognitive responses to health-risk information: greater autonomy was associated with greater acceptance of the information and greater reactance was associated with less acceptance. The research indicates that an acknowledgment of the distinction between autonomy and reactance (cf. Koestner et al. 1999; Koestner and Losier 1996) may be necessary to understand diverse responses to information about the consequences of certain health-detrimental behaviors.

Although the current research supports previous research in consistently finding a positive influence of autonomy on responses to potentially threatening stimuli (e.g., Knee and Zuckerman 1998; Pavey and Sparks 2008), and a negative impact of trait reactance on the acceptance of threatening information and advice (e.g., Dillard and Shen 2005; Koestner and Losier 1996; Rains and Turner 2007), further research is needed to clarify the processes by which autonomy and reactance exert their influence. In both Studies 1 and 2, the effect of reactance on adaptive responses was partially mediated, as expected, by perceived threat to decision-making freedom. However, across both studies, autonomy only exerted direct influences on autonomous motivation and attitudes, with no evidence for this effect being mediated by perceived informational value. It is possible that this lack of any clear mediation effects for perceived informational value was due to problems with the measurement of this construct. Future research should investigate this construct in more detail and/or attempt to provide a more reliable measure of perceived informational value in order to establish a more reliable model and to test possible mediation effects in more detail. Alternatively, a broader ranger of potential mediator variables could be included to develop our understanding of the processes by which reactance and autonomy might affect acceptance of information.

With regard to the impact of source information on the persuasive impact of health-risk information, we predicted that for highly autonomous individuals, *source-identified* information would lead to more acceptance of the risk information than would *anonymous* information, and for highly reactant individuals, *source-identified* information would lead to less acceptance of the risk information than would *anonymous* information. Some evidence to support the latter prediction was found: in Study 1, reactance was associated with

more autonomous motivation in the *anonymous* than in the *source-identified* information condition. This effect could have been due to the sourced information being perceived as more credible in Study 1. Indeed, Study 1 participants perceived the sourced information to have greater informational value (including being seen as more accurate) than the neutral information. As in Koestner and Losier's (1996) study examining the use of credible and non-credible expert advice, higher reactance individuals could have perceived the sourced and credible information as exerting a controlling influence and thus reported less relative autonomous motivation to act in accordance with that information. Note that we would only expect the hypothesized differences between the two conditions in terms of the responses of participants based on their levels of autonomy and reactance if the information was perceived to be from a credible (rather than a non-credible) source. Although the two sources used (Alcohol Concern and the NHS) are likely to be both well-known and perceived as credible by study participants, it would be beneficial for further research to directly measure source credibility when examining the impact of source-identified vs. anonymous information.

It is possible that the impact of the source of the information on responses to the text could have been underestimated, as the source manipulation was fairly subtle in these studies. In addition, there is the possibility that participants assumed that the anonymous information was taken from an authority source, or that participants considered the researchers themselves to be an authority source. Further research could build on these findings and design research which further investigates the effects of source information on highly autonomous or highly reactant individuals, using alternative source manipulation techniques. With regard to the methods of analysis, ideally a full structural model using latent variables would have been estimated, using parcelled item measures to indicate each scale as a latent variable (Landis et al. 2000). This would have incorporated estimates of measurement error in the model. However, the sample size of this study was considered inadequate for the number of estimated parameters that such a model would produce (Bentler and Chou 1987). Further research could therefore increase the sample size so that a full structural model could be estimated and measurement error minimised.

The studies are somewhat limited by the use of self-report measures of the included variables. It is possible that people who are strongly reactant would be averse to self-reporting their level of defensiveness. Reactance theory acknowledges the difficulty in accurately assessing defensiveness through self-report (Brehm and Brehm 1981), and it may be useful for more implicit measures of reactance to be developed. In addition, all variables were completed at the same time point. A stronger test of our hypotheses

would be to manipulate the variables of, for example, autonomy and reactance, or of perceived threat to decision-making freedom. Further to this, it would of interest to evaluate the impact of autonomy, reactance and health risk information on objective measures of health behavior.

Despite these considerations, the current research represents an important area of investigation that takes a novel approach in combining variables which relate to different definitions of autonomy and in examining their effect on responses to risk information. In addition, two behavioral domains were examined: alcohol consumption and cigarette smoking, suggesting that it is possible to generalise the findings, to some extent, beyond a single health behavior. The research makes an important contribution to the literature investigating health behavior change, and applies the two prominent social psychological theories of SDT and Reactance to behaviors which are highly detrimental to health and increasingly relevant to the student population studied. In addition, the research has the potential to be used to develop more successful health behavior interventions, for example by highlighting autonomy and minimising reactance effects.

Misconceptions about the nature of autonomy are addressed extensively by SDT and in research that follows the principles of SDT. Nonetheless, it is possible to confuse the type of autonomy that leads to reactant, defensive behavior and that which leads to reflective behavior and openness to potentially threatening information. Although autonomy and reactance are both associated with greater freedom from external constraints, reactance is a tendency to strive for independence at the expense of well-being, and to refuse to acknowledge the advice of others, whereas autonomy is a tendency to actively reflect on all available information before making a fully informed, autonomous decision. The research presented here points further to the necessity of distinguishing the two constructs, and extends our understanding of the effects of the two measures by confirming their contrasting impact on people's responses to health-risk information. It is the first to simultaneously model the effects of both autonomy and reactance within a single model, and suggests that the two individual differences can lead to opposite responses when health-risk information is presented.

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