

Trust in Risk Regulation: Cause or Consequence of the Acceptability of GM Food?

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Although there is ample empirical evidence that trust in risk regulation is strongly related to the perception and acceptability of risk, it is less clear what the direction of this relationship is. This article explores the nature of the relationship, using three separate data sets on perceptions of genetically modified (GM) food among the British public. The article has two discrete but closely interrelated objectives. First, it compares two models of trust. More specifically, it investigates whether trust is the cause (causal chain account) or the consequence (associationist view) of the acceptability of GM food. Second, this study explores whether the affect heuristic can be applied to a wider number of risk-relevant concepts than just perceived risk and benefit. The results suggest that, rather than a determinant, trust is an expression or indicator of the acceptability of GM food. In addition, and as predicted, "affect" accounts for a large portion of the variance between perceived risk, perceived benefit, trust in risk regulation, and acceptability. Overall, the results support the associationist view that specific risk judgments are driven by more general evaluative judgments. The implications of these results for risk communication and policy are discussed.

KEY WORDS: Acceptance; affect; genetically modified food; risk perception; trust

1. INTRODUCTION

In the last decade trust has become one of the most intensively studied themes within risk research (e.g., Renn & Levine, 1991; Kasperson *et al.*, 1992; Freudenburg, 1993; Slovic, 1993; Earle & Cvetkovich, 1995; Frewer *et al.*, 1996; Cvetkovich & Löfstedt, 1999; Greenberg & Williams, 1999; Johnson, 1999; Kasperson *et al.*, 1999; Siegrist *et al.*, 2000; Poortinga & Pidgeon, 2003b). Trust is considered important when tasks are too big or complex for individuals to manage themselves (Earle & Cvetkovich, 1995).

Freudenburg (1993) uses Durkheim's work on the societal division of labor (1984, first published 1893) to stress the importance of trust in a complex modern society. With more differentiation and specialization in society, members have become more dependent on each other. The division of labor comes with the expectation that people who have a specific task or responsibility will perform their duty in a way that others can count on. Although the division of labor has helped to substantially reduce various risks, Freudenburg (1993) argues that society has become more vulnerable in cases where duties are not properly being carried out. Trust is particularly important in the public sector, as these institutions often have the specific duty to protect the public from various risks. Trust in public institutions to effectively regulate or control (technological) risks is generally seen as an important factor in the acceptability of these risks.

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2. TRUST: CAUSE OR CONSEQUENCE?

There is ample empirical evidence that trust in institutions is closely related to the perception and acceptability of various risks (see, e.g., Pijawka & Mushkatel, 1991/1992; Bord & O'Connor, 1992; Flynn *et al.*, 1992; Freudenburg, 1993; Jungermann *et al.*, 1996; Siegrist, 1999; Siegrist *et al.*, 2000). The high correlates show that trust is an important concept in the study of technological risk issues and, in particular, ones that are surrounded by social controversy. It is often implicitly or explicitly assumed that trust is the determining factor in the perception and acceptability of risks. That is, the extent to which people trust risk management institutions determines the level of perceived risk, and consequently the acceptability of these activities or technologies. Eiser *et al.* (2002) termed this the *causal chain* account of trust (see Fig. 1). The causal model of trust is currently the most common interpretation of the generally strong relationships between trust, risk perception, and acceptability. For example, Pijawka and Mushkatel (1991/1992) found a strong negative relationship between trust in (government) institutions and the perceived risks of a high-level nuclear waste repository. As this was accompanied by high levels of opposition, they concluded that people's risk perceptions and their opposition to the siting of the repository was caused by a lack of trust in the U.S. Department of Energy. However, high correlates do not necessarily mean that trust is the cause of risk perceptions and acceptability. Eiser *et al.* (2002) proposed the alternative interpretation that, instead of the *result*, the acceptability of a risk could be the *determinant* of trust. They argue that both trust and risk perception could well be indicators or expressions of a more general attitude toward a certain

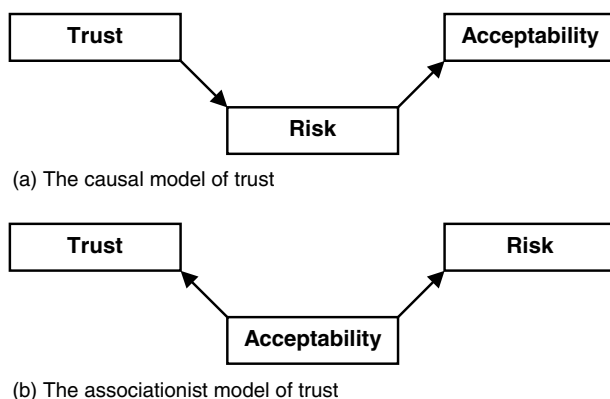


Fig. 1. Two models of trust: (a) the causal model of trust and (b) the associationist model of trust.

activity or technology. This is what Eiser *et al.* (2002) call the *associationist view* of trust (cf. Eiser, 1994; see Fig. 1). Eiser *et al.* (2002) compared the two trust models through secondary analyses of three studies of public perceptions of various food technologies. Although they concluded that the findings broadly support the associationist view of trust, the results were somewhat mixed. While in two studies more support was found for the associationist view, in one study the causal model fitted the data best. An explanation for the mixed results might be that the studies were not directly designed to compare the two models of trust. Eiser *et al.* (2002) used slightly different measures for trust, risk, and acceptability in the different studies. Moreover, they used measures of *trust in information*, while measures of *trust in risk regulation* would have been more appropriate.

Risk research provides some additional support for the associationist view, i.e., that *specific* risk judgments are driven by more *general* evaluative judgments. In particular, “affect” is increasingly seen as an important part of the way in which lay perceptions of risk issues are constructed (Alhakami & Slovic, 1994; Finucane *et al.*, 2000; Loewenstein *et al.*, 2001; Langford, 2002; Rundmo, 2002; Slovic *et al.*, 2002, 2004). Although the measurement of affect is plagued by a number of conceptual and methodological problems (Crites *et al.*, 1994; Peters *et al.*, under review), affect could be conceptualized as a “fuzzy” overall valenced (positive or negative) evaluation of a particular object. For example, Slovic *et al.* (2002) define affect as a specific quality of “goodness” or “badness” experienced as a feeling or state and demarcating a positive or negative quality of a stimulus. Affective responses can be distinguished from more cognitive attitudes in the sense that they are more spontaneous and easier accessible. Moreover, because affective responses tend to be instantaneous, affect is seen to guide other judgments and influences subsequent information processing (Zajonc, 1980).

Alhakami and Slovic (1994) were among the first to explore the generally robust inverse relationship between the perceived risks and perceived benefits of various technologies. They demonstrated that the relationship can largely be explained by a person's overall evaluation of a hazard. On the basis of this observation, Finucane *et al.* (2000) proposed a model of affect coming prior to, and hence directing judgments of risks and benefits, which they labeled the *affect heuristic*. That is, people's general affective evaluation of an activity or technology operates as some

kind of mental shortcut for more specific evaluations. Although the affect heuristic has mainly been used to explain the relationship between perceived risk and perceived benefit, it resonates well with the associationist view of risk perceptions and trust. Like the associationist view of trust, the affect heuristic holds that general preferences shape more specific beliefs. From this perspective the affect heuristic should not only be able to explain the relationship between perceived risk and benefits, but could also include other risk-relevant judgments, such as trust in risk regulation.

3. AIMS AND HYPOTHESES

This article explores the role of trust in the context of genetically modified (GM) food in Britain, using three separate data sets on public perceptions of GM food. GM food has become one of the most contentious risk cases in Britain in recent years (see, e.g., Gaskell & Bauer, 2001). Having more clarity about the role of trust is of great importance to risk managers and policymakers working in the field of biotechnology. Different policy responses are likely to be dependent on whether trust is the cause or consequence of people's attitudes toward GM food. The most common interpretation is that the reluctance of the (British) public to embrace GM food is caused by their distrust of the government's ability to regulate GM food. It is often said that the BSE ("mad cow") crisis is one of the root causes of the current unease about GM food. BSE is often considered as a warning of the fallibility of expertise, unrecognized risks of modern farming techniques, and of the failing of risk regulation (Grove-White *et al.*, 1997; Gaskell & Bauer, 2001; House of Lords, 2000). In the light of their previous experiences with (among others) the BSE crisis, people may well have become suspicious about the ability of the government to regulate new technologies, such as GM food. However, it could also be that trust in government regulation is an expression of a more general attitude toward GM food. The debate about GM food has become increasingly polarized in Britain in recent years. It may be that many people have already taken a particular position on the issue of GM food. It is possible that someone's general view of GM food drives his or her further responses to this issue. If the latter is the case, efforts directly aimed at increasing trust could well be unproductive, as they are based on incorrect assumptions about the roots of public opposition to GM food.

This study has two discrete but closely interrelated objectives. The first objective of this study is to empirically explore the nature of the relationship between trust, perceived risk, and acceptability. We examine whether the relationship between trust and acceptability is mediated by perceived risk (i.e., the causal model of trust) or whether trust and perceived risk are expressions of a more general attitude toward GM food (i.e., the associationist view of trust). This is effectively a replication of the study of Eiser *et al.* (2002) applied to the issue of GM food. The current series of studies are specifically designed to compare the two models of trust, and use measures of "trust in risk regulation" instead of measures of "trust in information." It is expected that, in line with the findings of Eiser *et al.* (2002), more support will be found for the associationist view that both trust and perceived risk are reflections of a more general attitude toward GM food.

The second objective of this study is to explore whether the affect heuristic can be applied to multiple risk-relevant concepts. As argued, the affect heuristic is closely related to the associationist view of trust. Both models hold that specific risk judgments are driven by more general evaluative judgments. Although the affect heuristic has mainly been used to explain the relationship between perceived risk and perceived benefit (see, e.g., Alhakami & Slovic, 1994), this study investigates whether it can be applied to a wider set of important risk judgments (i.e., perceived risk, perceived benefit, trust in risk regulation, and acceptability). It is expected that people's general affective evaluation of GM food will account for most of the shared variance between the different risk judgments, among which trust in risk regulation. This would also be in line with the associationist view of trust.

4. ANALYSIS

Although it is difficult to assess the causality of a correlational relationship with standard statistical techniques, there are some ways to get an indication of the direction. Based on the framework developed by the illustrious Herbert A. Simon (1954), De Vaus (2002) describes how to ascertain the nature of the relationship between variables by identifying a third variable that might account for (part of) the relationship between two variables. De Vaus (2002) describes three typical relationships between a set of variables. The first is a *direct causal relationship*, in which two variables are directly related without being mediated by a third variable. Second, an *indirect causal*

relationship exists when the relationship between two variables is mediated by a third variable. The third model is one of a *spurious relationship*. In this case the relationship between two variables is an erroneous one, because it is caused by a third variable. The latter two models are important here as they represent the causal account and the associationist view of trust, respectively (see Fig. 1). The causal model of trust can be described as an indirect causal relationship, as the link between trust and acceptability is mediated by risk perception. The associationist view represents a spurious relationship between trust and risk perception, i.e., the two are correlated because variation in both variables is caused by differences in acceptability—representing a more general attitude toward genetically modified food.

As Eiser *et al.* (2002) suggest, the nature of the relationships between perceived risk, trust in risk regulation, and risk acceptability can be explored by comparing the zero-order relationships (i.e., the original bivariate correlations) and the correlations after controlling for the third variable (i.e., the first-order partial correlations) (see also Postscript to this article). If the associationist approach is correct, controlling for acceptability should substantially decrease the relationship between trust and perceived risk, while the relationship between perceived risk and acceptability should remain high after controlling for trust, as should the relationship between trust and acceptability after controlling for perceived risk. The causal chain view is supported if the initial relationship between trust and acceptability substantially decreases when controlling for perceived risk. At the same time, the partial correlation between acceptance and perceived risk (controlling for trust) and the partial correlation between trust and perceived risk (controlling for acceptability) should remain significant. We compare the two competing trust models in all three studies.

Zero-order and partial correlations are also used to investigate whether differences in “affect” can explain the relationships between various risk-relevant variables (i.e., perceived risk, perceived benefit, trust,

and acceptability). If the relationships between the different variables are due to differences in people’s general affective evaluation of GM food, controlling for affect should substantially reduce the correlations between these variables (analogous to the associationist model of trust). We investigate this hypothesis in Study 2 and Study 3.

5. STUDY 1

5.1. Method

Data for this first study come from a large-scale British survey. A national quota sample of 1,547 respondents aged 15 years and older were interviewed face-to-face in their own homes between July 6 and July 31, 2002 by the market research company MORI (see Poortinga & Pidgeon, 2003a). The total sample comprised five separate quota samples of about 300 respondents, each covering one of five core risk cases, i.e., Climate Change, Radiation from Mobile Phones, Radioactive Waste, GM Food, and Genetic Testing. The demographic profile of the overall sample as well as the five subsamples reflected that of the British population. This article uses only the subsample of 296 respondents that were interviewed about GM food.

The questionnaire contained a wide range of items on the issue of GM food. *Trust in Risk Regulation* was measured with two items. People were asked whether they agreed with the statements “I feel that current rules and regulations are sufficient to control GM food” and “I feel confident that the British government adequately regulates GM food.” People could answer on a scale ranging from 1: “totally disagree” to 5: “totally agree.” The two items were used to construct a reliable trust measure (Cronbach’s $\alpha = 0.81$). *Perceived Risk of GM Food* was measured by asking people to assess the risks of GM food to themselves, to the environment, and to British society as a whole. The scores of all items could vary from 1: “no risks” to 7: “very high risks,” with 4: “some” in the middle. The internal consistency of the three risk

Relationship	Zero-Order Correlation	<i>n</i>	Controlling for:	Partial Correlation	<i>n</i>
Trust × Risk	−0.54**	193	Acceptability	−0.25**	196
Risk × Acceptability	−0.68**	216	Trust	−0.53**	196
Trust × Acceptability	0.56**	221	Risk	0.32**	192

Table 1. Zero-Order and Partial Correlation Between Trust, Perceived Risk, and Acceptability of GM Food (Study 1)

Note: * $p < .01$; ** $p < .001$.

items was high (Cronbach's $\alpha = 0.88$). *Acceptability of GM Food* was measured with two items. First, respondents were asked to indicate the extent to which they thought that GM food is acceptable on a scale ranging from 1: "very unacceptable" to 5: "very acceptable." Second, they were asked to weigh the risks and benefits of GM food on a scale with the following response options: 1: "the risks far outweigh the benefits," 2: "the risks slightly outweigh the benefits," 3: "the risks and the benefits are about the same," 4: "the benefits slightly outweigh the risks," and 5: "the benefits far outweigh the risks." As the reliability was again high (Cronbach's $\alpha = 0.85$), an acceptability scale was constructed combining the items.

5.2. Results

The zero-order and the partial correlations between trust, perceived risk, and acceptability of GM food are presented in Table I. Consistent with the associationist view, controlling for acceptability substantially reduced the negative correlation between perceived risk and trust. At the same time, the positive correlation between trust and acceptability was reduced when controlling for perceived risk, the latter effect being somewhat smaller than the former one. The negative correlation between perceived risk and acceptability only slightly diminished after controlling for trust.

6. STUDY 2

6.1. Method

Data for the second study were collected between April 31 and May 13, 2003 (see Poortinga, 2004). During this period 600 questionnaires were distributed to households in Norwich, the county town of Norfolk (United Kingdom). In order to ensure a wide range of people with different backgrounds, the survey was conducted in three parts of Norwich with different socioeconomic profiles. In these three areas people of every third house were asked to participate in a study on GM food. The questionnaires were left for self-completion and collected by the researchers on a subsequent day. Where someone was not at home at the time of collection a freepost envelope was left so that the questionnaire could be returned. In total, 396 respondents completed and returned the questionnaire, representing a response rate of 66%.

The questionnaire contained items on trust, perception of risks and benefits, acceptability, and affect.

Trust in Risk Regulation was measured using three items. People were asked whether they agreed with the statements "I feel confident that the government adequately regulates GM food," "The regulation of GM food is in safe hands with the government," and "I feel that the current rules and regulation are sufficient to control GM food." Respondents answered on a scale ranging from 1: "totally disagree" to 5: "totally agree." The reliability of the three items was sufficient (Cronbach's $\alpha = 0.71$). *Perceived Risk of GM Food* was measured by asking people to indicate the risks to themselves, to the environment, and to society as a whole on a 5-point scale, ranging from 1: "very low" to 5: "very high." The three perceived risk items were combined into one perceived risk measure with a high internal consistency (Cronbach's $\alpha = 0.90$). *Perceived Benefit of GM Food* was measured by asking people to assess the personal and environmental benefits of GM food, as well as the benefits for society as a whole, with scores varying from 1: "very low" to 5: "very high," with 3: "moderate" as the scale midpoint. The reliability of the three benefit items was again high (Cronbach's $\alpha = 0.89$). *Acceptability of GM Food* was measured with the same two items used in Study 1. An internally consistent acceptability scale was constructed using the average response to the two items (Cronbach's $\alpha = 0.84$). People's *General Affective Evaluation of GM Food* was measured by asking them "How do you feel about GM food" on a scale from 1: "very negatively" to 5 "very positively," with 3: "neither positively nor negatively" as the midpoint value. People were also asked "To what extent do you think GM food is a good or a bad thing" on a 5-point scale, ranging from 1: "very bad thing" to 5 "very good thing," with 3: "neither good nor bad thing" as the midpoint value." The internal consistency was again sufficiently high to create one general affective evaluation scale (Cronbach $\alpha = 0.82$).

6.2. Results

Table II shows the zero-order and partial correlation between trust, perceived risk, and the acceptability of GM food. The results of the second study clearly support the associationist view of trust. The relationship between perceived risk and trust was considerably lower after controlling for acceptability. In contrast, the correlations between perceived risk and acceptability, and between trust in risk regulation and acceptability, remained high after controlling for trust and perceived risk, respectively.

Relationship	Zero-Order Correlation	<i>n</i>	Controlling for:	Partial Correlation	<i>n</i>
Risk × Trust	-0.55**	296	Acceptability	-0.16*	291
Risk × Acceptability	-0.68**	298	Trust	-0.49**	291
Trust × Acceptability	0.62**	375	Risk	0.51**	291

Table II. Zero-Order and Partial Correlations Between Trust, Perceived Risk, and Acceptability of GM Food (Study 2)

Note: **p* < .01; ***p* < .001.

Study 2 was also designed to test whether the correlations between various risk-relevant variables could be explained by differences in people’s general affective evaluation of GM food. Table III shows the zero-order correlations between perceived risk, perceived benefit, trust in risk regulation, and acceptability of GM food, as well as the partial correlations between these variable after controlling for respondents’ general affective evaluation of GM food. All correlations were clearly reduced when taking differences in people’s general affective evaluation of GM food into account. Especially the correlations between perceived risk, perceived benefit, and trust in risk regulation were reduced when controlling for people’s general affective evaluation of GM food. The relationships between acceptability and the other variables also decreased after controlling for affect, albeit to a lesser extent. While the partial correlations remained significant, the size of the relationships (percentage of overlapping variance) was generally small.

7. STUDY 3

7.1. Method

Data for the third study were collected between July 19 and September 12, 2003 (see Poortinga & Pidgeon, 2004a). This was a large-scale British survey designed to measure attitudes to GM food in gen-

eral as well as to evaluate a national public debate on the commercialization of agricultural biotechnology occurring during the summer of 2003. A nationally representative quota sample of 1,363 respondents aged 15 years and older was interviewed face-to-face in their own homes by the market research company MORI.

Trust in Risk Regulation was measured with the items “I feel confident that the British government adequately regulates GM food” and “I am confident that the development of GM crops is being carefully regulated.” Both statements were answered on a 5-point scale from 1: “totally disagree” to 5: “totally agree.” The internal consistency of the two items was moderate, but high enough to construct a common scale (Cronbach’s $\alpha = 0.69$). *Perceived Risk of GM Food* was measured with the same three items as in Study 1. The reliability of these three risk items was high (Cronbach’s $\alpha = 0.91$), and could therefore be combined into one variable. To measure the *Perceived Benefit of GM Food*, respondents were asked to assess the benefits of GM food for themselves, the environment, and for British society as a whole. The scores of all items could vary from 1: “no benefits” to 7: “very high benefits,” with 4: “some” in the middle. An reliable benefit variable was constructed using these three items (Cronbach’s $\alpha = 0.88$). *Acceptability of GM Food* was measured with the same two items used in Study 1 and Study 2. The internal consistency

Zero-Order <i>r</i>	Perceived Risks	Perceived Benefits	Trust in Risk Regulation	Acceptability
Partial <i>r</i>				
Perceived Risks		-0.58** (287)	-0.55* (296)	-0.68** (298)
Perceived Benefits	-0.12 ⁺ (274)		0.59** (304)	0.81** (304)
Trust in Risk Regulation	-0.16* (274)	0.19* (274)		0.62** (375)
Acceptability	-0.24** (274)	0.42** (274)	0.27** (274)	

Table III. Zero-Order and Partial Correlations Controlling for General Affective Evaluation (Study 2)

Note: Zero-order correlations are presented above the table diagonal and the partial correlations controlling for general affect are presented below the table diagonal; sample sizes are given in parenthesis; ⁺*p* < .05; **p* < .01; ***p* < .001.

Table IV. Zero-Order and Partial Correlations Between Trust, Perceived Risk, and Acceptability of GM Food (Study 3)

Relationship	Zero-Order Correlation	<i>n</i>	Controlling for:	Partial Correlation	<i>n</i>
Trust × Risk	−0.47**	1033	Acceptability	−0.18**	951
Risk × Acceptability	−0.64**	1006	Trust	−0.50**	951
Trust × Acceptability	0.58**	1071	Risk	0.42**	951

Note: ***p* < .001.

of the two items was sufficiently high to create a acceptability scale (Cronbach $\alpha = 0.84$). Finally, people's *General Affective Evaluation of GM Food* was measured with measured using the same items as in Study 2. A reliability analysis showed that one scale could be constructed from the two items (Cronbach's $\alpha = 0.75$).

7.2. Results

The third study found more support for the associationist view than for the causal chain account of trust (see Table IV). Controlling for acceptability clearly reduced the correlation between perceived risk and trust. In contrast, the relationship between perceived risk and acceptability decreased marginally after controlling for trust. Similarly, controlling for perceived risk only slightly decreased the correlation between trust and acceptability.

The results presented in Table V confirm the results of Study 2 that people's general affective evaluation of GM food accounts for a large proportion of the shared variance between the different risk-relevant variables. As would be predicted by the affect heuristic, the correlations between perceived risk, perceived benefit, trust in risk regulation, and acceptability decreased after controlling for people's general affective evaluation of GM food. Especially the correlations

between perceived risk, perceived benefit, and trust in risk regulation were substantially reduced after controlling for people's general affective evaluation of GM food, even rendering the relationship between perceived risk and perceived benefit nonsignificant. The relationships with acceptability were reduced to a lesser extent.

8. DISCUSSION

This article explored the role of trust in the context of GM food in Britain. By comparing the zero-order and partial correlations between perceived risk, trust in risk regulation, and the acceptability GM food we have been able to examine whether trust in the government's ability to regulate GM food is likely to be the cause (causal chain account) or the consequence (associationist view) of the acceptability GM food. The results presented in this study are more supportive of the associationist view than of the causal chain account of trust. The results from three separate studies of public attitudes to GM food demonstrated that controlling for acceptability reduced the correlations between perceived risk and trust in risk regulation to very low levels. Conversely, controlling for perceived risk only somewhat diminished the relationship between trust in risk regulation and acceptability. Similarly, controlling for trust only

Table V. Zero-Order and Partial Correlations Controlling for General Affective Evaluation (Study 3)

	Zero-Order <i>r</i>	Perceived Risks	Perceived Benefits	Trust in Risk Regulation	Acceptability
Perceived Risks			−0.35** (973)	−0.47** (1033)	−0.64** (1006)
Perceived Benefits		0.00 (n.s.) (854)		0.48** (993)	0.67** (964)
Trust in Risk Regulation		−0.23** (854)	0.15** (854)		0.58** (1071)
Acceptability		−0.36** (854)	0.32** (854)	0.28** (854)	

Note: Zero-order correlations are presented above the table diagonal and the partial correlations controlling for general affect are presented below the table diagonal; sample sizes are given in parenthesis; n.s. = nonsignificant; ***p* < .001.

slightly reduced the correlation between perceived risk and acceptability. Although these results more closely support the associationist view of trust, the causal chain account of trust cannot be completely ruled out, because the relationship between trust and risk perception remained significant in all three studies when variation in acceptability was partialled out. Accordingly, the current findings suggest that this relationship can best be characterised as a *partly spurious* one (De Vaus, 2002). This means that even if both trust and perceived risk are largely expressions of a more general attitude toward GM food, there is still a direct, if small, relationship between trust and perceived risk.

This article also examined whether the affect heuristic could be applied to a wider set of risk-relevant concepts than just perceived risk and benefits, again by comparing the zero-order with the partial correlations after controlling for people's general affective evaluation of GM food. As expected, and in line with the associationist perspective, people's general affective evaluation of GM food accounted for a large portion of the variance between perceived risk, perceived benefit, trust in risk regulation, and acceptability. In particular, the associations between the former three were substantially reduced after controlling for people's general affective evaluation of GM food. In the third study controlling for affect even rendered the relationship between perceived risk and perceived benefit nonsignificant. These findings clearly demonstrate that the affect heuristic can be broadened to other risk-relevant concepts such as trust in risk regulation and acceptability. The results also strengthen the idea of the associationist view that many concepts used in risk research are in fact expressions of a more general attitude toward the risk issue at hand. Then again, the partial correlations also reveal that perceived risk, perceived benefit, and trust in risk regulation each have a modest but significant independent contribution to the explanation of the acceptability of GM food. In other words, while most of the overlapping variance can be attributed to differences in people's general affective evaluation of GM food, a part of the variation in acceptability can be explained by individual differences in perceived risk, perceived benefit, and trust in risk regulation.

It is important to consider that when comparing different theoretical models it is necessary that the measures of the various model constructs are valid and reliable. Especially the measurement of "affect" seems to be critical, as this construct is surrounded by a number of conceptual and methodological prob-

lems (see, e.g., Crites *et al.*, 1994; Peters *et al.*, under review). Although a criticism of this study could be that some of the scales consist of only two items and that they therefore may not have measured the different concepts accurately, all scales were internally consistent. Furthermore, it may be difficult to separate the measurement of affect from more cognitive factors with typical attitude items such as used in this study (responses to these items may well be based on cognitive processes). Having said that, the conclusion of this article that general preferences shape more specific beliefs still holds. Overall, the findings clearly indicate that, using two different measures (i.e., "acceptability" and "affect"), someone's overall evaluation of GM food may serve as a powerful "anchor" for other more specific risk judgments. These results were repeated in three separate studies with relatively large sample sizes. An additional positive feature of the current series of studies is that they investigated beliefs about risk and trust in samples of the general population.

A more political argument can also be advanced here, which is by no means in conflict with the affect heuristic or the associationist view of trust. The issue of GM food was a particularly visible, controversial, and to some extent polarized case in Britain during the time that all of the surveys were conducted (see, e.g., Gaskell & Bauer, 2001; Poortinga & Pidgeon, 2004a). Over 25 years ago, Molotch and Lester (1975) noted that "one dimension of power can be construed as the ability to have one's account become the perceived reality of others." Accordingly, Horlick-Jones *et al.* (2003) point out that where risk issues are hotly contested, considerable care has to be exercised over the interpretation of perceptions data. In short, one should be aware of the "politics of accounts." The mere filling out of a questionnaire or attendance at a focus group can in itself represent a political or symbolic act for some respondents. In a polarized situation many people have (by definition) already taken a particular stance that may drive their further responses to that particular issue. It could well be that people use their risk, benefit, and trust judgments in a rhetorical way in order to support their own (political) standpoint. For example, an opponent is unlikely to say that GM food is safe, has major benefits, or that GM food can be properly regulated. This would not only lead to an internal "attitudinal conflict" (cf. Festinger, 1957), but it is also not strategically sensible to support views or to trust regulation in ways that contradict your own position. Similarly, it would be unwise for supporters to undermine their own

position by questioning the safety or regulation of GM food. It is important to recognize here that people's expressed judgments still reflect their opinion on the issue in question. However, viewing people as political actors provides a plausible additional explanation for the findings of the current studies, alongside some pointers for further research. For example, if this interpretation is correct, then for polarized issues the influence of overall affect judgments on various risk-relevant concepts should remain relatively stable across different situations, as they are expressions of underlying and strongly held beliefs about the issue in question. Equally, a legitimate empirical question arises over the generalizability of the current findings to other less contested risk issues and social contexts. In particular, would the influence of affect and associational judgments be so marked with more mundane (e.g., automobiles) or less-well-known risk issues (such as nano-technology)? Moreover, it is not clear whether the same effects can be found for the generally more controllable (but sometimes evenly contentious) lifestyle hazards (e.g., smoking). Clearly, there is further productive research to be done here.

The findings of this study may hold important implications for risk communication and policy. Although for many organizations the "reclamation of trust" has become an explicit objective, this study suggests that risk communication efforts that are aimed at *directly* increasing trust may not be universally effective in solving risk controversies (cf. Fischhoff, 1995). These policies could well be counterproductive where they are based on the incorrect assumption that trust can be simply manipulated in order to increase the acceptance of a controversial technology. As the results suggest, where trust in regulation is strongly dependent on someone's general attitude, it is more likely that trust will be increased only through understanding and addressing the underlying concerns about that particular issue. This would support the view that two-way risk communication holds advantages over conventional one-way provision of information. On the issue of trust and risk communication, Bier (2001) argues that, especially in a situation of distrust, one must start with listening to the concerns of the public before giving them new information. Trying to increase trust by simply providing information may well be interpreted as not taking concerns seriously, and is more likely to destroy than to create trust.

Although this study shows that trust in regulation is largely an expression of a more general attitude, it does not mean that specific events have no impact on perceived risk, trust, or acceptability. As noted ear-

lier, perceived risk and trust in risk regulation still have a moderate but significant contribution to the explanation of acceptability. In addition, Kasperon *et al.* (1999) showed that trust in institutions is quite sensitive to specific events. An interesting direction for future research would be to examine how the impacts of events interact with people's (prior) attitudes. There is plenty of evidence suggesting that people select and interpret social information in order to support their existing worldviews (see, e.g., Sherif & Hovland, 1961; Lord *et al.*, 1979; Eiser *et al.*, 1989; Plous, 1991; Koehler, 1993; Frewer *et al.*, 1998; Poortinga & Pidgeon, 2004b; White *et al.*, 2003). Already in the 1960s it was demonstrated that people interpret new information by taking their own attitudinal position as a frame of reference (Sherif & Hovland, 1961). In the context of the controversial issue of capital punishment, Lord *et al.* (1979) found that people considered evidence that supported their own views as more trustworthy than evidence that was at variance with their own beliefs. Similarly, Plous (1991) found that people with differing attitudes draw different conclusions from noncatastrophic industrial breakdowns. That is, supporters of a technology interpret near misses as evidence that safeguards had worked, whereas the same events negatively influenced opponents' trust in safeguards to prevent future accidents. In a study about communicating possible benefits of GM food to the general public, Frewer *et al.* (1998) found that trust in information sources as well as the evaluation and the impact of persuasive information are dependent on people's initial attitudes. Recently, White *et al.* (2003) found that prior attitudes significantly moderated the effects of differently valenced messages on trust. More specifically, whereas participants with a positive attitude generally had greater confidence in positive messages than in negative messages, the reverse pattern was found for participants with less favorable attitudes. More research is needed in order to get a better understanding of the logic and dynamics of trust, especially in relation to complex technological risk cases such as GM food. The underlying issue of whether trust is stable (e.g., Earle & Cvetkovich, 1995) or volatile (e.g., Slovic, 1993) has yet to be resolved. While many studies have shown that trust is easier to lose than to gain (see, e.g., Barber, 1983; Shapiro, 1987; Kasperon *et al.*, 1992; Slovic, 1993), recent research suggests that the asymmetric pattern may reflect the influence of people's prior attitudes toward the issue (White *et al.*, 2003) and may especially apply to situations of distrust (Cvetkovich *et al.*, 2002). The latter studies

seem to be in line with the value similarity hypothesis of Earle and Cvetkovich (1995) that trust links people together who share social identities and/or have a similar understanding of a specific situation, suggesting that trust may be relatively stable where there is a correspondence in attitudes. The results of the present study that trust is largely an expression of a more general attitude also indicate a considerable degree of stability. Differences in the interpretation of evidence and the onus of proof in interaction with the networks of cognitive and affective associations people hold regarding risk issues could explain the relative stability or otherwise of trust and attitudes toward various risk issues.

9. POSTSCRIPT

There is an ongoing discussion whether zero-order and partial correlations can be used to test mediation. According to some, the regression-based approach of Baron and Kenny (1986) is a better methodology to investigate mediation processes (see, e.g., <http://users.rcn.com/dakenny/mediate.htm>). An advantage of this approach is that the reduction in correlation can be assessed with the Sobel test (see, e.g., Sobel, 1982; Baron & Kenny, 1986). However, the correlational and multiple regression procedures are in essence the same. We reanalyzed the three studies according to the Baron and Kenny (1986) methodology, and found that the standardized regression coefficients were largely comparable to the zero-order/partial correlations presented in this article. Sobel tests showed that *all* the correlations were significantly reduced after the third variable was included as a covariate. This would seem to support the causal as well as the associationist model of trust. However, as argued in this article, there is little support for the causal model of trust, as the indirect effects between trust and acceptability (via risk perception) are much smaller than the direct effects.

ACKNOWLEDGMENTS

Work reported in this article was partly supported by the Programme on Understanding Risk, funded by a grant of the Leverhulme Trust (RSK990021), and partly supported by two grants from the Economic and Social Research Council, including a grant from the ESRC Science in Society programme (L144250037).

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