To be or not to be at risk: Spontaneous reactions to risk information

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Abstract

How do people spontaneously respond to health-related risk feedback? In previous studies, reactions toward risk feedback were assessed almost exclusively by predefined closed questions. In contrast, the present study examined spontaneous responses after cholesterol and blood pressure risk feedback in a real-life setting ($N=951$). Most spontaneous responses were related to four types of reactions: Emotions, risk feedback valence, expectedness, and future lifestyle change. This pattern of results emerged consistently across different threat levels (low, borderline high, high risk) and across different types of risk feedback (cholesterol, blood pressure). Importantly, three out of the four most often generated types of reactions (emotions, expectedness, and future lifestyle change) are comparably underrepresented in previous research on psychological effects of risk feedback. Moreover, the results suggest that predominantly adaptive response patterns were generated in the face of personally consequential feedback.

Keywords: *risk perception, risk information processing, health communication, reactions to risk information*

Introduction

Imagine your general practitioner routinely runs a cardiovascular check and tells you that your cholesterol level is too high. What would be your first thoughts and reactions?

Understanding how people react to health risk information is of increasing importance because the range and number of health screening tests is

rapidly increasing. The medical community is progressively focusing more on risk rather than on disease. As a consequence, national health organizations as well as commercial companies are steadily extending their health risk screening programs. Although health risk screenings gain prominence within as well as outside the traditional medical setting, the question how people react toward receiving threatening risk information has been rather neglected. Most national health organizations focus on effectiveness, monitoring, and management of screenings. Even more important, access to risk screening tests outside the traditional medical setting is ever made easier by the growing number of over-the-counter screening tests in pharmacies and shops, or via Internet purchases. Google yields, for example, more than one million hits for cholesterol test kits. Thus, an increasing number of people may have to deal with health risk information without professional support and counseling. Given these developments, there is a need to ensure a better understanding of the psychological effects of health risk information.

One important source for understanding the psychological effects of health risk information is to determine the spontaneous thoughts and reactions upon receiving health risk feedback. Surprisingly, despite numerous experimental and field studies on psychological effects of risk feedback information (e.g., Ditto, Munro, Apanovitch, & Lockhart, 2003; Marteau et al., 2004; for a review see Croyle, Sun, & Hart, 1997; Lerman, Croyle, Tercyak, & Hamann, 2002) this aspect has not yet been systematically addressed. Most often, participants in health risk feedback studies were asked a set of predetermined questions designed to shed light on theoretically compelling issues. This research considers risk feedback valence (e.g., good or bad cholesterol test result) as primary determinant in the reception of risk information (e.g., Croyle et al., 2006; Ditto et al., 2003; Taylor, 1991). Reactions revolving around perceived accuracy and acceptance of the feedback information are the best-studied response type to risk information (e.g., De Hoog, Stroebe, & de Wit, 2005; Ditto et al., 2003). A further well-studied aspect of risk feedback reception concerns reactions related to health threat and perceived implications (Ditto, Scepansky, Munro, Apanovitch, & Lockhart, 1998; Radcliffe & Klein, 2002). Supporting the notion of self-defensive biases, various studies showed that people receiving bad news (e.g., high cholesterol reading) rated the test result as less accurate and less serious than people receiving good news (cf. Croyle et al., 1997; Liberman & Chaiken, 1992). Comparably few studies assessed more behavior-proximal variables such as intentions and behavior change. This type of responses, however, is of particular relevance for understanding the translation of risk feedback into action (Renner & Schwarzer, 2003). Interestingly, these studies suggest a more adaptive response pattern: People who received bad news were more inclined to change behaviors than people who received good news (e.g., Bowen, Fries, & Hopp, 1994, 1994; Kreuter & Strecher, 1996; Renner, 2004).

While these studies greatly facilitated the understanding of risk feedback reception, there are also limitations when asking a predefined set of questions (Sudman, Bradburn, & Schwarz, 1996; Weiner, 1985). Most important,

the method is reactive and participants may answer questions regarding aspects of risk feedback which are not part of their spontaneous reactions repertoire. Furthermore, the reverse case is also possible in that important aspects of feedback reception are not assessed. The assessment of spontaneous responses to risk feedback offers the possibility to explore the whole array of spontaneous reactions in real life settings which is informative with regard to current theories of risk feedback reception.

The present study examined what kinds of reactions are reported spontaneously when participants receive personally relevant health risk feedback in a real-life setting. Building upon previous research, we examined whether responses vary as a function of the threat level of the given risk feedback. Furthermore, reactions toward two different types of risk feedback were assessed, i.e. blood pressure and total cholesterol level feedback. Thus, reliability of reaction patterns across different types of risk feedback was additionally examined.

Method

Procedure

A call for a community-based blood pressure and cholesterol screening was made via information leaflets and flyers in multiple public institutions (e.g., universities, parishes) located in Seoul, South Korea. During the screening, trained laboratory assistants measured participants' blood pressure, followed by total cholesterol level measurement. After each measure, participants were provided with their exact actual reading, and they received a standardized feedback on their risk category according to international guidelines (cf. WHO, 2004). Oral feedback was given by trained medical staff, and supplemented by a feedback sheet displaying the individual test results. Thus, participants with a blood pressure of $\leq 140/90$ mmHg or a cholesterol level of ≤ 200 mg dL⁻¹ were told that their reading was normal and did not pose a risk for cardiovascular diseases. Individuals with either a borderline high reading (systole between 140–160 mmHg or diastole between 90–95 mmHg; cholesterol between 201–239 mg dL⁻¹) or a high reading (systole > 160 mmHg or diastole > 95 mmHg; cholesterol > 239 mg dL⁻¹) were informed about the potential risks of borderline high and high readings for cardiovascular diseases. Upon receiving the cholesterol risk feedback, participants were asked to write down any thoughts or ideas they had after receiving cholesterol and blood pressure feedback (Cacioppo & Petty, 1981; Orbell & Hagger, 2006).

Participants

Nine hundred and fifty-one South Koreans aged 16–90 years ($M = 33$, $SD = 18$; 57% women) participated in the health screening. Of these, only participants reporting at least one spontaneous reaction were included in the main analyses, resulting in a final sample of 629 participants with a mean age of 31 ($SD = 16$) and 55% women. The average cholesterol level of the responders was 167 mg dl⁻¹

(SD = 30), which is below the mean South Korean population cholesterol level of 187 mg/dl. The mean blood pressure value with 124/81 mmHg was comparable to the population level with 120/78 mmHg (Kang et al., 2006).

Of the 322 participants who did not report any relevant spontaneous reaction, 61% were female. They were on average 38 years old (SD = 19), with an average cholesterol level of 172 mg dL⁻¹ (SD = 26) and an average blood pressure level of 129/84 mmHg. Analyses showed that non-responders were on average 7 years older than responders, $t(570.09) = -6.31$, $p < 0.001$, $d = 0.40$, and that they exhibited a significantly higher mean cholesterol reading, $t(927) = -2.71$, $p < 0.05$, $d = 0.16$, a significantly higher systolic and diastolic blood pressure reading, $t_s(569.89) > -4.26$, $p_s < 0.001$, $d_s < 0.3$, than responders. Both groups did not differ significantly with regard to sex.

One reason for non-response might be a lower level of articulateness and education. The education pattern for non-responders (16% no completion of high school, 44% high school degree, 37% college or university degree) differed significantly from the pattern for responders (7% no completion of high school, 44% high school degree, 49% college or university degree, $\chi^2(6) = 19.3$, $p = 0.004$). The formal education pattern of non-responders' was less similar to the South Korean education stratification (OECD, 2005) than the pattern for responders. Thus, compared with responders and the general South Korean population, non-responders were less educated and probably less articulate, which might partly explain why they were more likely to abstain from giving a written response.

Coding system

Responses were translated from Korean to English by a bilingual Korean native speaker who was unaware of the purpose of the study. A comprehensive coding system was developed based on previous research and on 10% of all thoughts listed. The system was tested and revised on the basis of two test codings. All responses used for the development or testing of the coding system were excluded from further analyses. The final coding was conducted by two independent coders who were given a 45-min training session in which the coding system was presented. Each relevant response was rated once on each of the following nine dimensions: (1) *Emotions* (e.g., "I feel depressed"; "I am very happy"), (2) *risk feedback valence* (e.g., "I have a bad result"; "I received a normal reading"), (3) *expectedness* (e.g., "The result was unexpectedly high"; "I thought that I might end up with a high cholesterol level, but I am assured that it is not"), (4) *future lifestyle change* (e.g., "I'll exercise more"; "I need to control my diet"), (5) *causal attribution* (e.g., "I lead a healthy life, so this could be expected"; "The results reflect my obsession with dried squids"), (6) *implications for future health* (e.g., "It is an indication of poor health"; "I am in good health"), (7) *need for information* (e.g., "I want more precise results"; "I didn't understand what they were saying"), (8) *acceptance* ("I will have a reexamination"), and (9) *residual*.

160 Interrater agreement was moderate to high (99.7–89.4%). Any disagreements
were resolved by discussion between the coders before further data analysis.

Results

Frequency of generated reactions toward risk feedback

165 Participants who generated at least one reaction ($N=629$) generated a
comparable amount of reactions after cholesterol feedback ($M=1.67$,
 $SD=0.85$, range 1–5) and blood pressure feedback ($M=1.62$, $SD=0.81$,
range 1–5, $t(1)=3.58$, ns). A single reaction was generated by 55% of the
participants; multiple reactions were generated by 45%. For both risks,
170 cholesterol and blood pressure, post hoc tests revealed that the number of
reactions generated did not differ significantly between the three risk categories
optimal, borderline high, and high ($ps > 0.06$).

Type of generated reactions

Analyses showed that emotional reactions toward blood pressure feedback clearly
constituted the predominant type of spontaneous reactions generated by 47% of
175 the participants (cf. Figure 1). A description of the risk feedback valence was the
second most frequently generated category of reactions (37%). A substantial
amount of responses (24%) encompassed the expectedness of the feedback, and

Figure 1. Percentages of reactions by type of risk feedback.
Note. Multiple responses were possible.

the fourth most often generated response was related to future lifestyle change, with 20%. As Figure 1 shows, the remaining types of reactions were comparatively seldom generated. The categories causal attribution, implications for future health, need for information, and acceptance were generated by less than 10% of the participants.

Reactions toward cholesterol feedback yielded a highly comparable pattern (cf. Figure 1). The rank-order of response types mirrors the pattern found for blood pressure feedback perfectly, with emotional reactions, risk feedback valence, expectedness, and lifestyle change as the most frequent response types. Comparing the absolute frequencies of responses of cholesterol with blood pressure feedback showed small, albeit significant differences for risk feedback valence, expectedness, future lifestyle change and causal attribution, ($F_s(1) < 17.41$, $ps < 0.01$, $\eta_s^2 < 0.03$).

Additional control analyses showed that this pattern of results was highly consistent across sex and age groups. Sex differences were tested by 2 (women *versus* men) $\times$ 2 (reaction present *versus* non-present) chi-square tests for cholesterol and blood pressure, respectively. For the total 18 different reactions tested, only one analysis yielded a significant effect: Men were less likely to generate emotions than women as reaction toward cholesterol feedback, $X^2(1) = 13.44$, $p < 0.001$. In addition, younger adults (below 35 years) and older adults (35+ years) generated highly comparable reaction patterns. Out of 18 comparisons, only two were significant: Adults older than 35 years were less likely to generate risk feedback valence or implications for health than younger adults after receiving feedback about their cholesterol reading ($X^2_s(1) > 13$, $ps < 0.001$). In general, the rank order of frequently generated reactions (emotions, risk feedback valence, expectedness, and future lifestyle change) and rarely generated reactions (implications, need for information, and acceptance) was very similar across sex and age groups. Moreover, the rank order was also highly consistent across participants who gave a single-reaction response *versus* those who gave a multiple-reaction response.

Level of health threat and type of generated reactions

Blood pressure risk feedback. Comparing reactions generated by participants who received a blood pressure reading within the desirable range with those receiving a borderline-high or high reading yielded for most response categories a highly similar pattern (cf. Table I). Within all three risk groups, emotions, risk feedback valence, expectedness, and future lifestyle change represented the four most frequently generated types of reaction. Emotional responses were the most frequently generated response type, with 46, 48, and 42% for the desirable, the borderline-high, and the high blood pressure feedback group, respectively, $\chi^2(2, n = 614) = 0.31$, *ns*. Table I shows that the only statistically significant difference between the three risk groups emerged for the category future lifestyle change, $\chi^2(2, n = 614) = 23.96$, $p < 0.001$. The high-risk group and borderline-high risk group generated thoughts related

to future lifestyle change more often (38 and 31%, respectively) than the desirable blood pressure group (13%).

The number of responses falling into the remaining five categories was comparably low, cf. Table I.

225 *Cholesterol Risk Feedback.* A similar pattern of responses was observed across the risk levels for cholesterol feedback. Most reactions generated by the three different risk groups were related to the categories emotions, risk feedback valence, expectedness, and future lifestyle change, cf. Table I. Again, the borderline-high and high cholesterol level groups generated more responses
230 related to future lifestyle change (49 and 39%, respectively) than those with desirable cholesterol levels (21%), $\chi^2(2, n = 612) = 22.02, p < 0.001$. In addition, the number of emotional responses differed significantly between the three risk groups, $\chi^2(2, n = 612) = 10.33, p < 0.01$. Participants with a desirable cholesterol level generated emotional responses more often (50%) than participants with a
235 borderline-high (28%) or high (33%) cholesterol test result. In a similar vein, participants receiving good news generated thoughts about risk feedback valence significantly more often than the two other groups, $\chi^2(2, n = 612) = 8.6, p < 0.05$. For the category expectedness, no significant differences with regard to risk group were found, $\chi^2(2, N = 612) = 2.7, ns$.

240 The remaining five categories were mentioned comparably less often, cf. Table I.

Discussion

To our knowledge, this is the first study examining spontaneous reactions toward blood pressure and cholesterol test result feedback in a standardized screening
245 context using the cardiovascular risk categories recommended by WHO medical guidelines. We found that most spontaneous reactions were related to four types of reactions: Emotions, risk feedback valence, expectedness, and future lifestyle change. Interestingly, similar types of spontaneous reactions were generated by individuals receiving low, borderline high, or high risk feedback and upon
250 receiving blood pressure and cholesterol risk feedback.

How do the findings relate to previous findings in the field of psychological effects of risk feedback? They provide support for the notion that feedback valence is of central importance for the reception of feedback (e.g., Croyle et al., 2006; Ditto et al., 2003; Renner, 2004). Responses related to feedback valence
255 represented the second frequently generated response category. In contrast, the other three most often generated reaction categories (emotions, expectedness, and future lifestyle change) are comparably underrepresented in previous research on psychological effects of risk feedback.

Emotional reactions were the most frequent response to risk feedback.
260 However, most studies assessing the psychological impact of individualized risk feedback focused on cognitive reactions. The few studies assessing emotional reactions focused mainly on emotional distress, i.e. worry and fear

(De Hoog et al., 2005; French, Maissi, & Marteau, 2006). A new and interesting finding is that emotional reactions emerged not only when receiving borderline or high risk information, but with similar frequency when receiving good news. Possibly, not only the intensity of negative, but also of positive emotions indicates how people cope with and adapt to personally relevant health information. Specifically, a lack of positive emotions after receiving good news might be an indicator for difficulties in adjustment and coping, and may be predictive of extensive retesting behavior.

Whether the risk feedback was expected or not by the participants constituted a further salient response category. Thus, expectancies modulated risk feedback reception. This converges with findings suggesting that medical test results which are objectively the same elicit different psychological responses depending on prior expectations (Renner, 2004; Sheppard & McNulty, 2002). Moreover, these results provide support for the conception of the cue adaptive reasoning account, which proposes that not only risk feedback valence, but also feedback expectedness represents a core determinant of the reception of health-related feedback. For example, unexpected positive cholesterol feedback induced a more elaborate processing of the information given. By contrast, expected positive feedback was processed rather superficially (Renner, 2004).

Lifestyle-related reactions, the fourth frequent category of spontaneous risk responses, showed expected differences as a function of the threat level posed by the given risk feedback (low, borderline-high, high). People with an elevated reading were more than twice as likely as those with a desirable reading to generate thoughts about future lifestyle change. This pattern of results concurs with findings showing that negative risk feedback increases perceived pressure to change (Renner, 2004), intentions for behavior change (Croyle, Sun, & Louie, 1993), and actual behavior changes (Bowen et al., 1994; Kreuter & Strecher, 1996).

The response categories acceptance or implications for future health were comparably seldom generated, suggesting that these facets of risk feedback reception may not be spontaneously generated by individuals receiving cardiovascular risk feedback. This observation is interesting given that acceptance or implications for future health represent the most frequently applied response types in experimental risk research to demonstrate self-defensive biases in the reception of consequential health-feedback.

Experimental research has typically analyzed specific reactions to health risk feedback in an isolated manner (e.g., Ditto & Lopez, 1992). By contrast, the pattern of spontaneous reactions found in the present study could build the basis for analyzing multiple reactions jointly. The combined pattern of reactions, i.e., the network of reactions, could be used to explore the adaptivity of reactions toward risk feedback in a more ecological valid and comprehensive way.

The present study represents a first-step into examining spontaneous responses toward health risk feedback. Considering that control analyses yielded a highly consistent pattern across sex and age groups as well as across single *versus* multiple responders, one might speculate that the reaction pattern found

represents a more general pattern. However, limitations of the internal and external validity of the present study must be acknowledged. People who choose to be tested are by definition self-selected and the degree to which the findings generalize to people who refrained from testing is limited. Moreover, future research is needed to determine whether the pattern extends to other health risk information and to different socio-cultural contexts. Also, the degree of spontaneity of reactions might have been limited due to the written response format.

Overall, the present results imply that spontaneous psychological reactions to consequential health feedback are rather adaptive. Recipients consider the match between the feedback and their prior expectations and elaborate on ways of behavioral adaptation when the result signals a potential health threat (cf. Renner, 2004). The study of spontaneous risk reactions extends the array of reactions assessed in current research. Findings suggest considering not only the valence of the given test result, but also prior expectancies, and assessing emotional as well as behavior-related responses (cf. also Marteau & Weinman, 2006).

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