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Pre-Feedback Risk Expectancies and Reception of Low-Risk Health Feedback: Absolute and Comparative Lack of Reassurance

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Background: Personalised health-risk assessment is one of the most common components of health promotion programs. Previous research on responses to health risk feedback has commonly focused on the reception of bad news (high-risk feedback). The reception of low-risk feedback has been comparably neglected since it is assumed that good news is reassuring and readily received. However, field studies suggest mixed responses to low-risk health feedback. Accordingly, we examine whether pre-feedback risk expectancies can mitigate the reassuring effects of good news. **Methods:** In two studies (N = 187, N = 565), after assessing pre-feedback risk expectancies, participants received low-risk personalised feedback about their own risk of developing (the fictitious) Tucson Chronic Fatigue Syndrome (TCFS). Study 2 also included peer TCFS risk status feedback. Afterwards, self- and peer-related risk perception for TCFS was assessed. **Results:** In both studies, participants who expected to be at high risk but received good news (unexpected low-risk feedback) showed absolute lack of reassurance. Specifically, they felt at significantly greater TCFS risk than participants who received expected good news. Moreover, the unexpected low-risk group even believed that their risk was as high as (Study 1) or higher (Study 2) than that of their peers (comparative lack of reassurance). **Conclusion:** Results support the notion that high pre-feedback risk expectancies can mitigate absolute and comparative reassuring effects of good news.

Keywords: communication, health risk feedback, lack of reassurance, low-risk feedback, risk perception

INTRODUCTION

An increasing number of people face dealing with health risk information without professional support and counseling. Yet, most national health

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organisations focus primarily on the effectiveness, monitoring, and management of screenings and neglect the question of how people receive risk information. Moreover, risk screening tests are becoming increasingly available outside the traditional medical setting through the growing number of self-tracking tools and over-the-counter screening tests available in pharmacies, stores, or online (e.g. Breast Cancer Risk Assessment Tool, National Institutes of Health, 2010). Given these developments, better understanding of the psychological effects of health risk information is required.

From a psychological perspective, personalised feedback indicating an elevated risk status represents self-relevant, negative, and threatening information for the self (Ditto & Croyle, 1995; McQueen, Vernon, & Swank, 2013; Renner, Gamp, Schmälzle, & Schupp, 2015; Renner & Schupp, 2011). When confronted with personalised risk feedback, an often-replicated finding is that people accept high-risk health information to a lesser degree than low-risk information. This asymmetrical acceptance in relation to risk feedback valence is a very robust phenomenon, is evident across a wide range of diseases and samples, and is commonly seen as clear-cut evidence for "self-defensive denial" or "self-defensive motivated reasoning" (e.g. Armor & Taylor, 1998; Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Croyle, Sun, & Hart, 1997; Dawson, Gilovich, & Regan, 2002; Jacobson et al., 2012; Kunda, 1990; Mata, Ferreira, & Sherman, 2013; Schüz, Schüz, & Eid, 2013; Taylor & Brown, 1988; see for an overview Ditto, 2009; Helzer & Dunning, 2012; McQueen et al., 2013). Focusing primarily on the reception of high-risk health information, Croyle et al. (1997) argued that people informed of an elevated risk of disease derogate the risk information in order to maintain a favorable sense of their health. In contrast to such investigations into the reception of high-risk information, the reception of low-risk information has received little attention. However, in order to understand the psychological effects of health risk feedback and to gain a comprehensive understanding of how people receive health risk-related information, the reception of low-risk health feedback also needs to be investigated.

Based on the results of studies focusing on the reception of high-risk health feedback, it has widely been assumed that information indicating a low-risk result is readily received. However, despite broad evidence in favor of the asymmetrical acceptance of low-risk over high-risk health information from experimental studies, low-risk feedback does not always lead to reassurance. For example, Weinstein and colleagues (2004) provided primary care patients with computerised and personalised feedback about their actual risk of developing colon cancer within the next 20 years. Despite receiving personalised low-risk feedback, post feedback ratings of a substantial number of patients showed a lack of reassurance. Specifically, 44 per cent believed their actual risk to be higher than indicated by the personalised feedback. A "lack of reassurance" or resistance towards low-risk feedback has also been observed in other field studies which provided personalised feedback about actual health risk status (Dillard,

McCaul, Kelso, & Klein, 2006; Harle, Downs, & Padman, 2012; Hilgart et al., 2010; Linnenbringer, Roberts, Hiraki, Cupples, & Green, 2010; Michie et al., 2002; Renner, 2004; Scherer et al., 2013; Scott, Prior, Wood, & Gray, 2005). This raises the question, why do some people resist good news and show a "lack of reassurance"?

Weinstein et al. (2004) observed a significant effect of pretest perceptions on the reception of colon cancer risk information. Likewise, in a community health screening providing participants with feedback about their actual cholesterol level, low-risk cholesterol feedback (non-elevated cholesterol level) was not met with clear acceptance and reassurance in all cases (Renner, 2004). Recipients receiving unexpected low-risk cholesterol feedback showed significantly less reassurance (e.g. higher perceived personal threat for cardiovascular disease) than those receiving expected low-risk cholesterol feedback. Accordingly, in line with Weinstein et al. (2004) and Renner (2004), differential responses to low-risk health feedback might be related to pretest perceptions and expectancies (also see Sweeny & Dillard, 2014). However, the interpretation of these previous results is limited since the actual health risk feedback was not randomly assigned to the recipients but was based on actual risk status (e.g. cholesterol readings). Thus, the present two studies randomly assigned participants to a high- or low-risk status condition with regard to the fictitious Tucson Chronic Fatigue Syndrome (TCFS; for further discussion of providing fictitious, randomised health risk feedback see Ditto & Croyle, 1995). In order to systematically investigate the phenomenon "lack of reassurance" both studies focused specifically on the reception of low-risk health feedback.

In addition, examining feedback reception for different targets (self, average peer) could foster a better understanding of the "lack of reassurance" phenomenon. Investigating feedback reception for the self and others, such as the average peer, two different forms of the phenomenon can be examined: absolute and comparative lack of reassurance (cf. also unrealistic absolute versus unrealistic comparative optimism, Shepperd, Klein, Waters, & Weinstein, 2013). Specifically, after receiving good news unexpectedly, people might still believe that they are at high risk and thus demonstrate *absolute lack of reassurance* (cf. field studies showing a lack of reassurance after low-risk feedback, Linnenbringer et al., 2010; Michie et al., 2002; Renner, 2004; Weinstein et al., 2004). Regarding comparative risk perception, they might either believe that they are more at risk than others, demonstrating *comparative lack of reassurance*, or ascribe a higher risk to their peers than to the self, demonstrating *comparative reassurance*.

Aims of the Present Studies

Consequently, in order to systematically examine the reception of low-risk health feedback and the lack of reassurance phenomenon, the aim of the present two studies was threefold: first, to investigate whether people receiving randomised,

personalised health risk feedback show absolute (lack of) reassurance if low-risk feedback was received unexpectedly (Studies 1 and 2), second, to assess the reception of risk feedback information for two different targets (self, average peer) in order to examine comparative (lack of) reassurance (Studies 1 and 2), and, third, to investigate whether the lack of reassurance phenomenon represents a specific, self-related effect or a general resistance towards risk feedback operating independently of the respective risk target (self, average peer). Therefore, participants in Study 2 received health risk feedback for both themselves and an average peer, and their responses for each target (self, average peer) were examined.

STUDY 1

Method

Participants. Participants were invited via e-mail or links on psychology-related websites to take part in a "Survey on the Tucson Chronic Fatigue Syndrome" (Unipark survey software, Globalpark AG, Hürth, Germany). Participation was entirely voluntary and no payment or incentives were offered. The study was conducted in accordance with the ethical guidelines of the German Psychological Society (Deutsche Gesellschaft für Psychologie, DGPs; http://www.dgps.de/index.php?id=96422&L=0#c435; see paragraph C.III), which are translated from the American Psychological Association (American Psychological Association, 2002; see paragraphs 3.10, 8.01–8.15; see also Huebner & Gegenfurtner, 2012). Specifically, before starting the questionnaire, participants read a description of the study procedures, were informed about the expected duration of participation (a maximum of 15 minutes), and that they could withdraw at any time without negative consequences. Afterwards they were informed that they could either begin the study by clicking "continue" or terminate their participation by clicking "cancel".

A total of 187 participants filled in the questionnaire completely and were included in the analyses, M (SD) = 31.4 (12.1) years. Of these, 143 were women (76.5%) and 86.7 per cent reported at least a university-entrance diploma. Of the 187 participants, 87 (47%) received personalised low-risk TCFS risk feedback. The low- and high-risk feedback conditions did not differ significantly regarding age, gender, or education (all ps > .123).

Procedure. The setting of the online study paralleled self-tests, which are available on the Internet. Mirroring a real-life scenario, a (fictitious) questionnaire named the "Tucson-Fatigue-Vulnerability-Inventory" was used to calculate the self-related risk of developing Tucson Chronic Fatigue Syndrome (TCFS) within the next 10 years. This syndrome was described as having mild but irritating symptoms. The "Tucson-Fatigue-Vulnerability-Inventory" was introduced as an

internationally applied questionnaire examining risk factors of TCFS. In fact, the "Tucson-Fatigue-Vulnerability-Inventory" (in the following called "TCFS-Inventory") consisted of 25 stress-related items, whereby 12 items were newly generated for this study (e.g. "*In times of stress I barely allow myself a rest or stress-compensation*"; "*I usually wake up in the morning feeling refreshed and rested*" (inversely coded)), and 13 items were taken from common psychological tests (e.g. Penn State Worry Questionnaire, Meyer, Miller, Metzger, & Borkovec, 1990; Anxiety Sensitiviy Index, Reiss, Peterson, Gursky, & McNally, 1986). To ensure high plausibility for the fictitious "TCFS -Inventory" and risk feedback manipulation, the item selection was based on two criteria: the item statement has a relation to stress and the item represents a non-clinical, everyday aspect of stress.

After filling in the "TCFS-Inventory", participants reported their pre-feedback risk expectancy for developing TCFS within the next 10 years. Subsequently, all participants received randomly assigned, personalised, absolute low- or high-risk feedback. Since absolute risk estimates are often prone to overestimations (e.g. Lipkus, Klein, Skinner, & Rimer, 2005; van der Velde, van der Pligt, & Hooykaas, 1994; Weinstein et al., 2004), the magnitude of the absolute risk indicated by the feedback was derived from a preceding pilot study. The pilot study sample (N = 662) was asked to estimate their absolute risk for TCFS. The average perceived risk for the self was 28.9 per cent (SD = 23.2). Accordingly, the assigned personalised, absolute risk feedback was given as follows in the low-risk feedback condition "*Your risk of developing Tucson Chronic Fatigue Syndrome within the next 10 years is 28 per cent*", and in the high-risk feedback condition as "*Your risk of developing Tucson Chronic Fatigue Syndrome within the next 10 years is 38 per cent*". In order to systematically investigate the lack of reassurance phenomenon, the present study focused on participants in the low-risk feedback condition.

After reading their absolute personal risk feedback, participants rated their own and their peers' absolute risk for TCFS. These two items were embedded into a series of filler items.

Finally, participants were carefully debriefed on the study's objectives including the reasons for the fictitious feedback. To further prevent persistent false beliefs following debriefing, the "perseverance effect" was explicitly described, which has been shown to be effective in eliminating the perseverance of false beliefs (McFarland, Cheam, & Buehler, 2007).

Measures. *Pre-feedback risk expectancy*: Paralleling the format of the risk feedback, participants were asked to indicate their pre-feedback risk expectancy with regard to developing TCFS within the next 10 years *("How likely do you think it would be that you develop Tucson Chronic Fatigue Syndrome within the next 10 years?")* using a 0 to 100 percentage scale (cf. Rothman, Klein, & Weinstein, 1996). Pre-feedback risk expectancies below the given absolute personal risk feedback were categorised as "low", and pre-feedback risk

expectancies above the given personal risk feedback were categorised as "high". Of the 187 participants, 102 (54.5%) expected to receive low TCFS risk status feedback and 85 (45.5%) expected to receive a high TCFS risk status feedback.

Self- and peer-related perceived TCFS risk: After participants received randomly assigned personal TCFS risk feedback, they estimated their own absolute risk of developing TCFS within the next 10 years ("*How likely is it that you will develop Tucson Chronic Fatigue Syndrome within the next 10 years?*") as well as the absolute TCFS risk for their peers ("*How likely is it that an average person of your age and gender will develop Tucson Chronic Fatigue Syndrome within the next 10 years?*") on a 10-point Likert scale ranging from 1 "*very unlikely*" to 10 "*very likely*" (cf. Perloff & Fetzer, 1986).

In addition, risk feedback information comprehensibility was rated on a 10-point Likert scale ranging from "*not at all comprehensible*" to "*absolutely comprehensible*".

Results

Manipulation Check. In a first step, as a manipulation check, the impact of the TCFS risk status feedback (low- vs. high-risk feedback) was tested with a 2 × 2 × 2 repeated measures analysis of variance (ANOVA) with "pre-feedback risk expectancy" (low vs. high) and "personal TCFS risk feedback" (low- vs. high-risk feedback) as between-subjects factors and self and other-related post-feedback risk perceptions as within-subject factor "target". The ANOVA yielded a significant main effect for "personal TCFS risk status feedback", indicating that risk perceptions were higher after receiving higher risk status feedback ($M = 3.73$; $SD = 1.64$) than after receiving lower risk status feedback ($M = 3.61$; $SD = 1.68$), $F(1, 183) = 4.49$, $p = .035$, $\eta_p^2 = .024$. Hence, the randomly assigned TCFS risk feedback was effective. Furthermore, the two experimental, personal TCFS risk feedback conditions (low- vs. high-risk feedback) did not systematically vary in their average "TCFS-Inventory" score, $t(185) = 1.34$, $p = .182$. Thus, no pre-existing differences in the "TCFS-Disposition" were observed which might have impacted the plausibility of the given TCFS risk feedback.

Reception of Low-Risk Health Feedback. In order to test for absolute and comparative (lack of) reassurance after receiving good news (low TCFS risk status feedback), a 2 × 2 repeated measures analysis of variance (ANOVA) within participants who received low TCFS risk status feedback was conducted with pre-feedback risk expectancy (low vs. high) as between-subjects factor and self- and other-related post-feedback risk perceptions as within-subject factor "target".

Importantly, the significant "pre-feedback risk expectancy" effect, with $F(1, 85) = 8.80$, $p = .004$, $\eta_p^2 = .094$, was qualified by a significant "pre-feedback risk expectancy" × "target" interaction, $F(1, 85) = 13.18$, $p < .001$, $\eta_p^2 = .134$, which was followed up by simple effects analyses (see Figure 1).

Participants receiving unexpected low-risk feedback information (high pre-feedback risk expectancy) felt at higher risk than participants receiving expected low-risk feedback information (low pre-feedback risk expectancy) (M = 4.20, SD = 1.90 vs. M = 2.62, SD = 1.36), $F(1, 85) = 18.55$, $p < .001$, $\eta_p^2 = .179$, indicating absolute lack of reassurance in the unexpected good news group.

In addition, participants who received unexpected low-risk feedback information rated their TCFS risk as slightly, albeit not significantly, higher than that of an average peer (M = 4.20, SD = 1.90 vs. M = 3.72, SD = 1.44), $F(1, 85) = 3.14$, $p = .080$. Conversely, participants who received expected low-risk feedback information demonstrated comparative reassurance. They rated themselves as being at lower risk of developing TCFS than an average peer (M = 2.62; SD = 1.36 vs. M = 3.65, SD = 1.58), $F(1, 85) = 10.65$, $p = .002$, $\eta_p^2 = .111$. Thus, comparing risk perceptions for the self and for an average peer after receiving TCFS feedback showed comparative lack of reassurance for the unexpected low-risk feedback group, while evidence for comparative reassurance (i.e. an Optimistic Bias, see Weinstein, 1980; Shepperd, Waters, Weinstein, & Klein, 2015) was found within the expected low-risk feedback group.

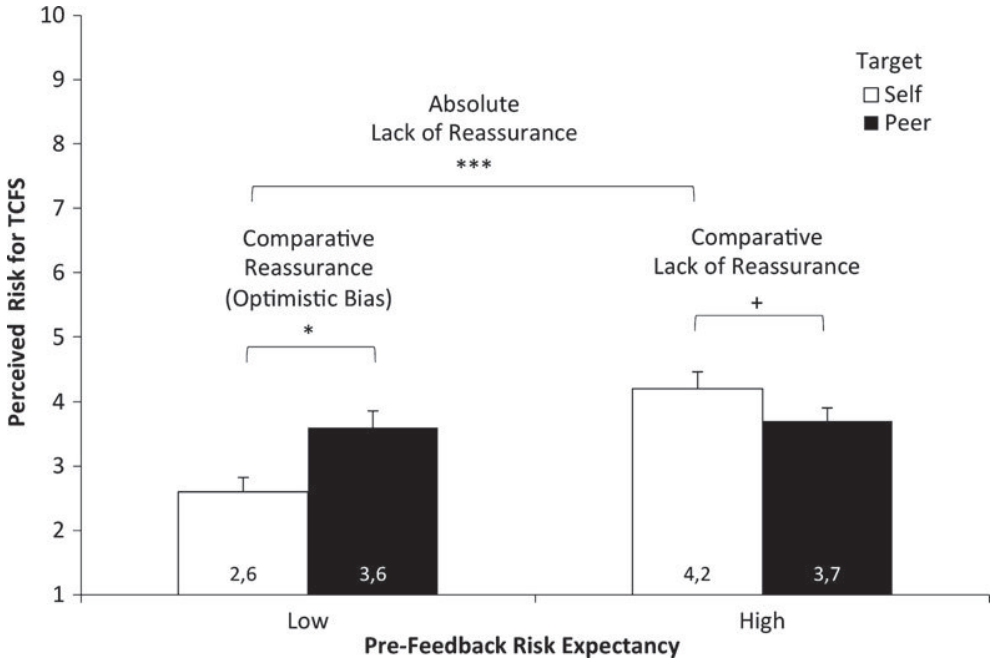

FIGURE 1. Mean self- and peer-related risk perception for Tucson Chronic Fatigue Syndrome after low-risk feedback reception for participants with low compared to high pre-feedback risk expectancies in Study 1 (±*SE*).
Note: *** $p < .001$; * $p < .01$; + $p < .1$.
Participants with pre-feedback risk expectancies below the given absolute personal risk feedback were allocated to the "low pre-feedback risk expectancy" group, and participants with pre-feedback risk expectancies above the given personal risk feedback were allocated to the "high pre-feedback risk expectancy" group.

Control Analyses. To further secure the found pattern of results, several control analyses were conducted.

First, to test the stability of the results, a 2 × 2 ANOVA was conducted with participants who received low TCFS risk status feedback and who gave a pre-feedback risk expectancy rating of at least 10 points higher or lower than the given feedback ($N = 65$). Again, a significant "pre-feedback risk expectancy" by "target" interaction emerged, $F(1, 63) = 16.45$, $p < .001$, $\eta_p^2 = .207$.

In addition, both experimental groups rated the given TCFS risk feedback as comprehensible, with $M = 6.46$, $SD = 2.64$ for the low TCFS risk feedback group and $M = 6.53$, $SD = 2.75$ for the high TCFS risk feedback group, $t(185) = -.177$, $p = .859$.

Summary. The results show evidence for absolute and comparative lack of reassurance for participants who unexpectedly received good news about their TCFS risk status. They rated themselves as being at higher risk than participants who received expected low-risk feedback and felt similarly at risk to an average peer. Conversely, the expected low-risk feedback group believed their own risk to be substantially lower than that of an average peer.

One might argue that the effects are due to a selective sample and that absolute and comparative lack of reassurance might indicate a general feedback resistance effect (i.e. participants were not able or willing to integrate the provided risk feedback information) rather than a specific, self-related lack of reassurance. Hence, it is very important to replicate the observed effects and to examine whether the lack of reassurance is due to a general feedback resistance effect. Thus, in Study 2, participants received randomised peer-related health risk feedback in addition to the self-related health risk feedback. Hence, it can be investigated whether lack of reassurance generalises to the reception of peer-related feedback (general feedback resistance) or whether the phenomenon is confined to the reception of self-related feedback information (specific feedback resistance).

STUDY 2

Method

The procedure and material of Study 2 were identical to Study 1, with three additional feedback conditions stating the absolute TCFS risk for an average peer.

Participants. Participants were invited via e-mail or links on psychology-related websites to take part in a "Survey on the Tucson Chronic Fatigue Syndrome" (Unipark survey software, Globalpark AG, Hürth, Germany). A total of 565 participants filled in the questionnaire completely and were included in the analyses. Participants were on average 30.7 ($SD = 10.5$) years old, 438

participants were female (77.5%), and 89.1 per cent reported at least a university-entrance diploma. Of the 565 participants, 309 (55%) received low-risk feedback about their personal TCFS risk status. The six risk feedback conditions (personal TCFS risk feedback "low-risk" vs. "high-risk" × peer TCFS risk feedback "lower" vs. "equal" vs. "higher") did not differ significantly regarding age, gender, or education (all *p*s > .182).

Procedure. For the online study the (fictitious) "Tucson-Fatigue-Vulnerability-Inventory" was again applied to assess the self-related risk of developing Tucson Chronic Fatigue Syndrome (TCFS) within the next 10 years (cf. Study 1).

After filling in the "TCFS-Inventory", participants reported their pre-feedback risk expectancy for developing TCFS within the next 10 years. As in Study 1, pre-feedback risk expectancies below the given absolute personal TCFS risk feedback were categorised as "low" and pre-feedback risk expectancies above the given personal TCFS risk feedback were categorised as "high".[1] Of the 565 participants, 276 (48.8%) expected to receive low TCFS risk status feedback and 289 (51.2%) expected to receive a high TCFS risk status feedback.

Subsequently, all participants received the randomly assigned low-risk or high-risk absolute personal risk feedback used in Study 1 ("*Your risk of developing Tucson Chronic Fatigue Syndrome within the next 10 years is 28 per cent [38 per cent]*"). As in Study 1, the focus of the results is on the reception of low-risk personal feedback to enable investigation of absolute and comparative lack of reassurance. Extending Study 1, participants in Study 2 received an addition to their personal TCFS risk feedback, that is feedback about the absolute TCFS risk for an average person of their age and gender ("*On average, people of your age and gender have a risk of [x] per cent for developing Tucson Chronic Fatigue Syndrome within the next 10 years*"). The absolute peer risk feedback given was either higher, equal to, or lower than the given personal TCFS risk feedback. Specifically, either 39 per cent, 28 per cent, or 17 per cent was given for the low personal risk feedback group and 49 per cent, 38 per cent, or 27 per cent for the high personal risk feedback group.

After receiving the absolute personal and absolute peer TCFS risk feedback, participants rated their own and their peers' absolute risk of developing TCFS. As in Study 1, these two items were embedded in a series of filler items.

Finally, participants were carefully debriefed regarding the study's objectives, including an explanation of the reasons for the fictitious feedback. To avoid a "perseverance effect", where participants persist in false beliefs despite

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[1] Two participants estimated their risk of developing TCFS as exactly 28 per cent and 38 per cent, respectively. Results were unaffected by exclusion of these participants; thus, they were assigned to the "low" pre-feedback risk expectancy group.

debriefing, we explicitly described this phenomenon as this has been shown to be an effective procedure for eliminating the perseverance of false beliefs (McFarland et al., 2007).

Results

Manipulation Check. For the manipulation check, the impact of personal and peer TCFS risk feedback was tested with a 2 × 2 × 3 × 2 repeated measures analysis of variance (ANOVA) with "pre-feedback risk expectancy" (low vs. high), "personal TCFS risk feedback" (low- vs. high-risk feedback), and "peer TCFS risk feedback" (higher vs. equal vs. lower) as between-subjects factors and self- and other-related post-feedback risk perceptions as within-subject factor "target". As in Study 1, the ANOVA yielded a significant "personal TCFS risk feedback" main effect, indicating that risk perceptions were higher after receiving higher risk status feedback (M = 3.98; SD = 1.79) than after receiving lower risk status feedback (M = 3.88; SD = 1.96), $F(1, 553) = 4.34$, $p = .038$, $\eta_p^2 = .008$. In addition, a significant main effect for "peer TCFS risk feedback" emerged, $F(2, 553) = 4.03$, $p = .018$, $\eta_p^2 = .014$. Risk perceptions increased with increasing peer TCFS risk feedback information (M_{lower} = 3.69, SD_{lower} = 1.72; M_{equal} = 3.90, SD_{equal} = 1.89, M_{higher} = 4.17, SD_{higher} = 1.94). Thus, personal and peer risk feedback manipulations were effective. Furthermore, the six experimental TCFS risk feedback conditions did not vary significantly in their average "TCFS-Inventory" score before receiving the randomly assigned feedback ("personal TCFS risk feedback": $F(1, 559) = 1.52$, $p = .219$; "peer TCFS risk feedback": $F(2, 559) = 1.84$, $p = .159$). Hence, no pre-existing differences in the "TCFS-Disposition" between the experimental conditions were observed.

Reception of Low-Risk Health Feedback. Focusing on the reception of low-risk health feedback, a 2 × 3 × 2 repeated measures analysis of variance (ANOVA) within participants who received low TCFS risk feedback was conducted with "pre-feedback risk expectancy" (low vs. high) and "peer TCFS risk feedback" (lower vs. equal vs. higher) as between-subjects factor and self- and other-related post-feedback risk perceptions as within-subject factor "target".

Replicating the pattern of results observed in Study 1, a significant "pre-feedback risk expectancy" effect, with $F(1, 303) = 88.06$, $p < .001$, $\eta_p^2 = .225$, was qualified by a significant interaction between "pre-feedback risk expectancy" and "target", $F(1, 303) = 42.15$, $p < .001$, $\eta_p^2 = .122$. In addition, a significant "peer TCFS risk feedback" effect, with $F(2, 303) = 3.52$, $p = .031$, $\eta_p^2 = .023$, and a significant "peer TCFS risk feedback" by "target" interaction emerged, $F(2, 303) = 6.19$, $p = .002$, $\eta_p^2 = .039$. No other statistically significant effects were observed. In subsequent simple effects analyses, interaction effects were followed up (see also Figure 2).

Testing absolute and comparative (lack of) reassurance: To test for absolute and comparative (lack of) reassurance, simple main effects following up the significant "pre-feedback risk expectancy" by "target" interaction were analyzed. Replicating the pattern of results observed in Study 1, participants receiving unexpected low-risk feedback (high pre-feedback risk expectancy) showed a significantly higher risk perception for the self than participants receiving expected low-risk feedback (low pre-feedback risk expectancy; $M = 4.88$, $SD = 2.23$ vs. $M = 2.58$, $SD = 1.42$, $F(1, 303) = 109.48$, $p < .001$, $\eta_p^2 = .265$), indicating absolute lack of reassurance within the unexpected good news group.[2]

In addition, participants receiving unexpected good news rated the TCFS risk for the self as significantly higher than that of an average peer ($M = 4.88$, $SD = 2.23$ vs. $M = 4.22$, $SD = 1.76$), $F(1, 303) = 17.27$, $p < .001$, $\eta_p^2 = .054$. Conversely, participants receiving expected low-risk feedback demonstrated comparative reassurance. They rated themselves as being at lower risk of developing TCFS than an average peer ($M = 2.58$, $SD = 1.42$ vs. $M = 3.51$, $SD = 1.50$), $F(1, 303) = 24.94$, $p < .001$, $\eta_p^2 = .076$. Hence, as in Study 1, the unexpected low-risk feedback group showed comparative lack of reassurance, while evidence for comparative reassurance (i.e. an Optimistic Bias, see Weinstein, 1980; Shepperd et al., 2015) was found within the expected low-risk feedback group.

Testing general feedback resistance: To probe whether the lack of reassurance phenomenon is due to a general feedback resistance effect, the impact of receiving peer-related risk feedback on self- and other-related risk perceptions was examined. As the significant "peer TCFS risk feedback" by "target" interaction, $F(2, 303) = 6.19$, $p = .002$, $\eta_p^2 = .039$ indicates, feedback about the TCFS risk status of an average peer impacted peer and self risk ratings differently. Increases in the average peer risk status given in the feedback information were reflected in increased risk ratings for an average peer ($M = 3.31$, $SD = 1.46$; $M = 3.99$, $SD = 1.64$; $M = 4.39$, $SD = 1.77$), $F(2, 303) = 10.64$, $p < .001$, $\eta_p^2 = .066$. Conversely, the provided peer risk feedback did not significantly modulate self-related risk ratings ($M = 3.78$, $SD = 1.89$; $M = 3.97$, $SD = 2.30$; $M = 3.85$, $SD = 2.46$), $F(2, 303) < 1$, $p = .704$ (see also Figure 3).[3]

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[2] The simple main effect for pre-feedback risk expectancy within the absolute peer-related TCFS risk perceptions was also significant, $F(1, 303) = 13.58$, $p < .001$, $\eta_p^2 = .043$. Thus, risk perception for the peer was higher for participants with high compared to low pre-feedback risk expectancy ($M = 4.22$, $SD = 1.76$ vs. $M = 3.51$, $SD = 1.50$).

[3] The simple main effects for target within the peer TCFS risk feedback conditions "lower" and "higher" than personal TCFS feedback were marginally significant, $F(1, 303) = 3.33$, $p = .069$, $\eta_p^2 = .011$, and significant, $F(1, 303) = 9.99$, $p = .002$, $\eta_p^2 = .032$. In contrast, there was no significant simple main effect within the peer TCFS risk feedback condition "equal to" personal TCFS feedback, $F(1, 303) < 1$, $p = .696$. Thus, participants indicated relative accuracy in comparative risk perceptions.

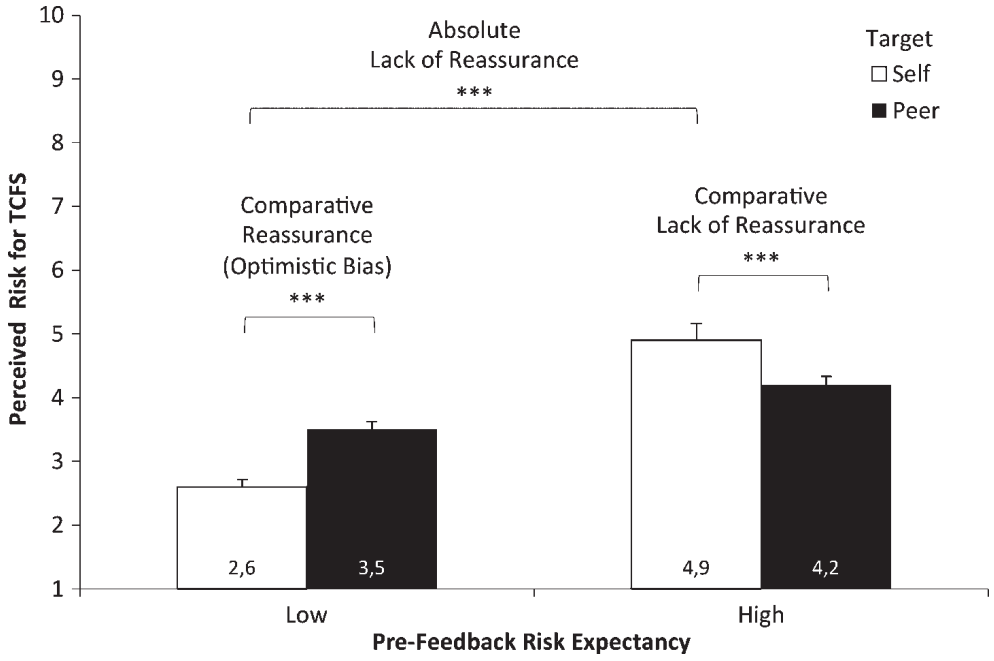

FIGURE 2. Mean self- and peer-related risk perception for Tucson Chronic Fatigue Syndrome after low-risk feedback reception for participants with low compared to high pre-feedback risk expectancies in Study 2 (±*SE*).
Note: *** $p < .001$; * $p < .01$; + $p < .1$
Participants with pre-feedback risk expectancies below the given absolute personal risk feedback were allocated to the "low pre-feedback risk expectancy" group, and participants with pre-feedback risk expectancies above the given personal risk feedback were allocated to the "high pre-feedback risk expectancy" group.

Control Analyses. First, a 2 × 3 × 2 ANOVA was conducted with participants who received low-risk TCFS feedback and who showed a pre-feedback risk expectancy rating of at least 10 percentage points higher or lower than the given TCFS risk status feedback ($N = 232$). The ANOVA again yielded a significant interaction between "pre-feedback risk expectancy" and "target", $F(1, 226) = 40.71$, $p < .001$, $\eta_p^2 = .153$, as well as a marginally significant interaction between "peer TCFS risk feedback" and "target", $F(2, 226) = 3.00$, $p = .052$, $\eta_p^2 = .026$.

In addition, all feedback groups rated the feedback information as comprehensible ($M_{min} = 6.46$; $M_{max} = 6.80$; $SD_{min} = 2.59$; $SD_{max} = 2.83$), with no differences between the experimental groups ("personal TCFS risk feedback": $F(1, 559) < 1$, $p = .854$; "peer TCFS risk feedback": $F(2, 559) < 1$, $p = .669$).

Summary. The present pattern of results replicated the findings of Study 1. Participants who received unexpected good news about their TCFS risk status rated themselves as being at higher risk than participants who expected the good news. In addition, they felt at higher risk than an average peer, while the expected low-risk feedback group believed their own risk to be substantially lower than the risk of an average peer. Thus, the unexpected low-risk feedback

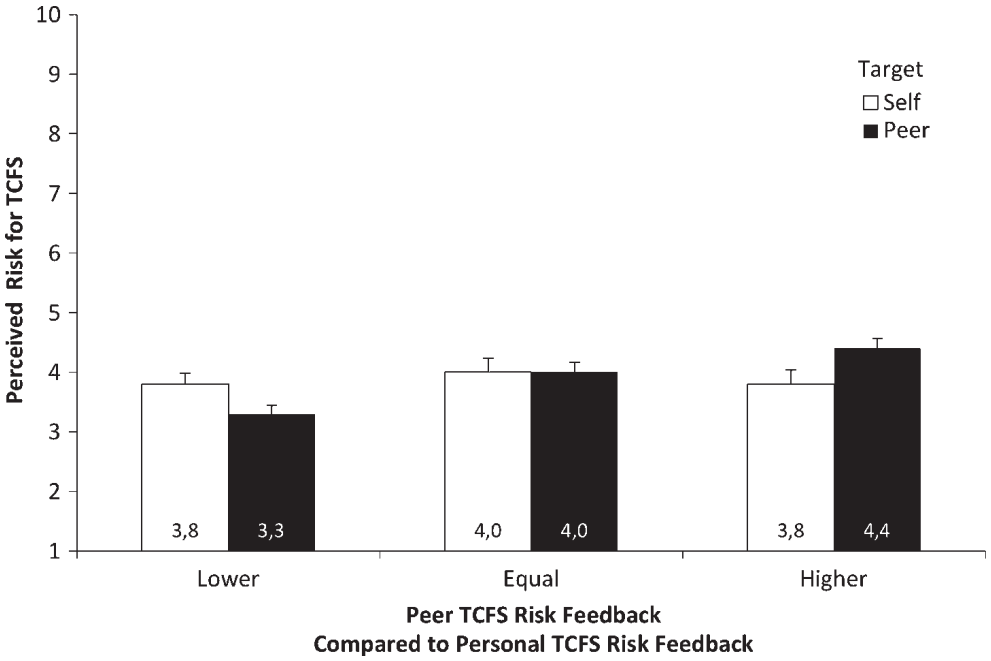

FIGURE 3. Mean self- and peer-related risk perception for Tucson Chronic Fatigue Syndrome after low-risk feedback reception for participants having received peer TCFS risk feedback lower than, equal to, or higher than personal TCFS risk feedback in Study 2 ($\pm SE$).
Note: *** $p < .001$; * $p < .01$; + $p < .1$
Participants in the randomly assigned low personal risk condition were informed that their risk for developing TCFS within the next 10 years was 28 per cent. The randomised absolute peer risk feedback given was either higher (39%), equal to (28%), or lower (17%) than the given personal TCFS risk feedback.

group showed evidence for both absolute and comparative lack of reassurance. In addition, participants do not appear resistant towards health risk status feedback in general. Post-feedback risk perceptions for an average peer were accurately adapted to the given peer risk feedback. That is, participants were capable of understanding risk information and adapting risk estimations accordingly.

DISCUSSION

The present studies examined reactions to personal and peer health risk information to contribute to our understanding of how people react to health feedback, particularly when receiving low-risk feedback about their personal health risk status without professional assistance.

Two Forms of Lack of Reassurance

Replicating previous findings from field studies, participants in the present studies were not "unconditionally" reassured after receiving good news about their

current health risk status; instead, risk perceptions were moderated by pre-feedback risk expectancy. Extending previous research, two different forms of the phenomenon "lack of reassurance" were observed.

Participants who received unexpected good news rated their self-related risk as substantially higher than those who expected good news (absolute lack of reassurance). That is, although the two groups received identical risk feedback, they differed significantly in their perception of risk to the self as a function of pre-feedback risk expectancy (Studies 1 and 2). In addition, participants showed comparative lack of reassurance after receiving unexpected good news. They estimated their own TCFS risk to be as high as (Study 1) or even higher (Study 2) than that of an average peer. Conversely, participants who received expected good news displayed comparative reassurance by rating their own risk as being lower than that of an average peer. Thus, high pre-feedback risk expectancy mitigated reassurance effects of low-risk health information in two different ways.

This raises the question how the observed absolute and comparative lack of reassurance are related to previous empirical findings on health-related risk feedback reception. Although most previous studies did not explicitly focus on lack of reassurance, a variety of supporting evidence for the phenomenon can be drawn from the reported findings. For example, participants given feedback about their actual health risk overestimated their own absolute risk after the feedback was given (Absetz, Aro, & Sutton, 2003; Dillard et al., 2006; Linnenbringer et al., 2010; Michie et al., 2002; Weinstein et al., 2004), which might indicate absolute lack of reassurance. Similarly, participants who initially overestimated their relative risk showed higher relative (i.e. less optimistic) risk perceptions after receiving risk feedback information than participants who underestimated their relative risk status (Harle et al., 2012), suggesting comparative lack of reassurance. However, these studies commonly examined one form of risk perception and, thus, captured either absolute or comparative lack of reassurance. Extending this research, the present studies showed the co-occurrence of absolute and comparative lack of reassurance.

The co-occurrence of absolute and comparative lack of reassurance in both studies raises the question of whether the two forms might represent two equivalent rather than two distinctive aspects of the phenomenon. Research on the Unrealistic Optimism or Optimistic Bias, however, suggests that absolute and relative biases are two distinct responses (Shepperd et al., 2013, 2015; see also Renner et al., 2015). For example, a study by Lipkus and colleagues (2001) showed that women who dramatically overestimated their personal absolute breast cancer risk, indicating absolute pessimism, were also strongly convinced that their comparative risk was below average, demonstrating comparative optimism. Thus, although people may overestimate their personal absolute risk, they can also be convinced that their risk is lower than that of others (see also Rothman et al., 1996). In a similar vein, people are often quite accurate in estimating the relative risk levels of different hazards although they often lack accuracy in

estimating absolute risks (e.g. Raude, Fischler, Setbon, & Flahault, 2005; Renner et al., 2015; Renner & Schupp, 2011; Wright, Bolger, & Rowe, 2002). Extending this line of reasoning, information about one's own absolute and comparative risk status differentially impacts affective, cognitive, and behavioral outcomes (e.g. French, Sutton, Marteau, & Kinmonth, 2004; Harris & Smith, 2005; Harris, Sparks, & Raats, 2002; Klein, 1997, 2002, 2003; Moore & Klein, 2008). Thus, these results imply that absolute and comparative lack of reassurance represent two related, albeit distinct, responses.

Adaptivity in Risk Perception

One could argue that the two observed forms of lack of reassurance indicate a general insensitivity to health risk information. This reasoning requires that participants would not adapt their post-feedback risk perceptions regardless of the target (self, peer). However, although participants in both studies showed a lack of reassurance in post-feedback perceived self-risk, and thereby a lack of sensitivity to the feedback, the post-feedback perceived risk for an average peer was accurately adapted to the given peer risk feedback score (see also French et al., 2004). Hence, it can be shown that the participants understood the risk information and adapted risk estimations accordingly. This implies that lack of reassurance represents a specific, self-related effect and raises the question, why do people resist self-related low-risk health feedback?

Primarily focusing on the impact of feedback valence, the self-defensive motivated reasoning perspective assumes that people readily accept low-risk information in order to establish or maintain a positive view of their person or health (e.g. Croyle et al., 1997; Kunda, 1990; Mata et al., 2013; see for an overview Ditto, 2009; Helzer & Dunning, 2012; McQueen et al., 2013). However, the present studies show that good news is not unconditionally accepted as the low-risk information was not utilised to establish a favorable view of the self-risk status: Despite low-risk feedback, participants acknowledged a higher risk for themselves (absolute lack of reassurance). In addition, they did not show evidence of comparative compensation. That is, despite a higher self-risk perception, participants did not ascribe a higher risk to their average peer (comparative lack of reassurance). Thus, a self-defensive motivated reasoning perspective cannot sufficiently explain these two forms of the phenomenon lack of reassurance.

A lack of reassurance might partly result from a need for self-verification (Kwang & Swann, 2010) and might represent an adaptive response. According to the cue adaptive reasoning account (CARA, Renner, 2004; Renner et al., 2015; Renner & Schupp, 2011), unexpected information receives more attention and elaborate processing than expected information. As a consequence, it is more likely that unexpected information is considered as less accurate than expected information (see also Ditto, 2009; Edwards & Smith, 1996; Hilton,

Klein, & von Hippel, 1991; Lord, Ross, & Lepper, 1979). Specifically, in the context of stress and stress-related diseases, beliefs about one's own vulnerability are probably embedded in a multitude of personal experiences and thus based on an elaborated self-schema. Hence, incoming information (e.g. low-risk TCFS feedback) which contrasts with existing beliefs (e.g. high pre-feedback risk expectancy) is likely to be subject to more elaborate processing. As a consequence, unexpected low-risk feedback information might be gradually incorporated into the self-concept rather than being accepted at face value. The more elaborate processing of unexpected low-risk feedback information can protect the self in the long run despite forfeiting a short-term emotional gain (reassurance) since erroneously accepting false low-risk self-feedback might lead to substantial harm and emotional costs in the future if, for example, less preventative measures are taken. Following this line of reasoning, a reluctant response toward unexpected good news can represent an adaptive response (Hilgart et al., 2010; Panzer & Renner, 2008; Renner & Schupp, 2011; Renner, 2004).

Implications

Examining the reception of low-risk health feedback is of great practical importance. From an applied perspective, the present results indicate that people are generally willing and able to understand health risk information as it may occur during a physical check-up, specifically in a transparent numerical format (see Gigerenzer, Gaissmaier, Kurz-Milcke, Schwartz, & Woloshin, 2007, for a detailed discussion on transparent numerical risk communication). However, pre-existing beliefs that participants hold about their risk status need to be considered and addressed when informing patients about medical test results. One possibility is to assess and discuss pre-feedback risk expectancies by applying a mental model approach (cf. Fischhoff, Bostrom, & Quadrel, 1997; Fischhoff, 1999). Accordingly, when communicating personalised health risk information, physicians may inquire after pre-feedback risk expectancies in order to facilitate the processing of risk status information. Hence, erroneous beliefs can be identified and systematically addressed in counseling in order to support patients in understanding and accepting the health risk information provided. Importantly, the phenomenon lack of reassurance opens up a new perspective on personalised health risk feedback reception as it demonstrates that not only high-risk health information needs to be discussed thoroughly: Even if a low-risk status is implied, physicians may be advised to take account of patients' pre-feedback risk expectancies when delivering test results. If patients reasonably doubt unexpected good news, further tests might be indicated, whereas in cases of inappropriate skepticism revision of erroneous beliefs and strengthening confidence in the medical test may increase feedback acceptance and reassurance.

Limitations

As well as the strengths of the present studies, which result from a real-life scenario simulation and the experimental manipulation of the health risk information provided, several limitations also need to be acknowledged. Generalisability of the present results is restricted since people who choose to be tested are by definition self-selected and may, in part, be psychologically and behaviorally prepared for dealing with bad news. In addition, since personalised health risk feedback was randomly assigned, the present studies examined the phenomenon lack of reassurance in the context of a mild condition in order to take ethical considerations into account. Consequently, the degree to which the findings generalise to people who refrained from testing as well as to more severe conditions is limited. A further limitation of the present studies is that the pre-feedback risk expectancy was not experimentally manipulated (see Sweeny & Dillard, 2014). Thus, a priori differences between the high and low pre-feedback risk expectancy groups might have impaired internal validity. However, it is important to note that, in the present samples, low versus high pre-feedback risk expectancies were approximately evenly distributed (Study 1*:* 54.5% "*low*" vs. 45.5% "*high*"; Study 2: 48.8% "*low*" vs. 51.2% "*high*"). The use of a numerical feedback manipulation might also be considered limiting. Previous research findings show that risk percentages might be perceived as rather abstract and with limited applicability and experiential value for most people (Ditto, Pizarro, Epstein, Jacobson, & MacDonald, 2006; Loewenstein, Weber, Hsee, & Welch, 2001; Renner & Reuter, 2012). Thus, numerical manipulations may lack emotional relevance. We tried to reduce this lack of emotional relevance by matching the provided risk ratings with the average risk estimate for TCFS in a pilot study. Therefore, the magnitude of the communicated risk was substantially amplified compared to similar existing syndromes, as for example Chronic Fatigue Syndrome, ensuring the practical relevance of the communicated risk. The need for increasing the risk figure, however, eventually indicates that other forms of providing risk information might need to be applied.

Conclusion

In two online studies we examined the reception of low-risk health feedback for both absolute self- and peer-related risk perceptions. Pre-feedback risk expectancy considerably modulated risk perceptions. Thus, we found two forms of "lack of reassurance": if low-risk feedback information was received unexpectedly compared to expectedly, self-related risk perception was significantly increased (absolute lack of reassurance) and self-related risk was perceived as high as or respectively higher than peer-related risk (comparative lack of reassurance). This lack of reassurance in self-related risk perception but relative accuracy in peer-related risk perception suggests that low-risk feedback is not always

readily accepted even though participants generally understand risk information and adapt risk estimations accordingly.

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CONFLICT OF INTEREST

We have no conflict of interest to declare.

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