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Behavior as information: "If I avoid, then there must be a danger"

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ABSTRACT

Background and objectives: Cognitive models of anxiety disorders view safety-seeking behaviors (i.e., avoidance, washing, etc.) as playing a crucial role in the maintenance of irrational fear. An explanation of how these behaviors may contribute to the maintenance of unrealistic beliefs is that patients use their safety behaviors as a source of information about the situation (behavior as information): the behavior is clear evidence of the danger. This study investigates whether, relative to non-clinical control participants, anxious participants actually infer danger on the basis of their safety behaviors, rather than on the basis of objective information.
Methods: Three groups of individuals affected by anxiety disorders (31 obsessive-compulsive participants, 22 panic participants, and 17 participants with social phobia) and a group (31) of non-clinical controls rated the danger perceived in scripts in which information about objective safety vs. objective danger, and safety behavior vs. no-safety behavior were systematically varied.
Results: As expected, anxious participants were influenced by both objective danger information and safety behavior information, while the non-clinical controls were mainly influenced by objective danger but not by safety behavior information. The effect was disturbance specific, but only for individuals with social phobia and obsessive-compulsive disorder.
Conclusions: The tendency to infer danger on the basis of the use of safety behavior may play a role in the development and maintenance of anxiety disorders.

1. Introduction

The term "safety behavior" is generally used to refer to a range of actions intended to detect, avoid, escape or neutralize a feared outcome (cf. Cuming et al., 2009; Deacon & Maack, 2008). They are ubiquitous, often adaptive, and inherently non-pathological and logical responses to the perception of threat. Safety behaviors (SBs) in the presence of actual threat are essential for survival, but anxious individuals often employ SBs in the absence of objective danger (Clark, 1999; Salkovskis, 1991). Common clinical examples include frequent hand washing in obsessive-compulsive disorder (OCD), avoidance of eye contact in social phobia, and the use of safety aids such as a cell phone and prescription anti-anxiety medication in panic disorder. Despite their distinct topography, these behaviors are considered functionally equivalent: they are intended to prevent negative outcomes, and also serve to prevent the disconfirmation of inaccurate threat beliefs that would otherwise take place (Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999). Cognitive models of anxiety disorders view SBs as playing a crucial role in the maintenance of the disorder (e.g. Clark & Wells, 1995; Hofmann, 2007). SBs exert a negative effect on fear reduction by interfering with the process of threat disconfirmation, enabling the avoidance of feared outcomes in anxiety-provoking situations (Salkovskis, 1991; Telch, 1991). The use of SBs might lead to a misattribution of safety to the safety-seeking behavior itself, thus leaving core threat beliefs unaffected. Moreover, as the utilization of SBs requires the anxious individuals to allocate attention to the availability and execution of safety strategies, less attentional resources are available for processing information about the feared situation (Powers, Smits, & Telch, 2004; Sloan & Telch, 2002). Finally, SBs may exacerbate anxiety symptoms by alerting individuals to sources of potential threat (Deacon & Maack, 2008). Several studies have examined the effects of SBs, and of guided threat focus and reappraisal on fear reduction during exposure (e.g. Salkovskis et al., 1999; Sloan & Telch, 2002). In general, it was found that anxious individuals who engage in SBs during exposure therapy show less belief change, less fear reduction, lower between-trial habituation, and an increase in threat

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overestimation. For example, Sloan and Telch (2002) found that anxious individuals encouraged to use SB during exposure showed significantly more fear in post-treatment and follow up relative to those encouraged to focus and reevaluate their core threat(s) during exposure. Moreover, Deacon and Maack (2008) demonstrated that non-clinical participants with both low and high levels of contamination fear, who were instructed to engage in OCD behaviors like cleaning and washing for two weeks, showed an increase in threat estimation and contamination fear.

Hence, by relying on SBs, anxious individuals might be unable to obtain disconfirmatory evidence related to their unrealistic beliefs. Indeed, they might conclude that their own actions (i.e., the SB itself) prevent feared outcomes, leading them to reinterpret harmless, possibly fear-disconfirming experiences as threatening. In the context of exposure treatments, such strategies might thus inhibit the process of adaptive cognitive change. Accordingly, SBs are thus harmful and anti-therapeutic.

Meanwhile it may be noted that sometimes SBs may enhance approach behavior that may not have occurred without SBs. In such cases, SBs may not have negative consequences (e.g. Hood, Antony, Koerner, & Monson, 2010; Milosevic & Radomsky, 2008), especially if they enhance access to disconfirmatory evidence. For example, Milosevic and Radomsky (2008) demonstrated that both participants with a subclinical fear of snake who used safety equipment (e.g., gloves, apron), and those who abstained from using them, showed significant and comparable improvements in subjective fear, proximity to the spider, and negative cognitions. In line with this, in an experimental task, Hood et al. (2010) found that participants who used SBs (wearing protective clothing, such as long-sleeved shirt or rubber gloves), as well as those who refrained from using them, reported significant reductions in fear of spiders. Moreover, both groups reported a decrease in subjective distress during the exposure. More recently, first Rachman, Shafran, Radomsky, and Zysk (2011), and then van den Hout, Engelhard, Toffolo, and van Uijen (2011) in a replication study, found that in non-clinical participants who did not engage in SBs and in those who did, scores of contamination, fear, danger, and disgust significantly decreased. Such observations led these scholars to argue for a "judicious" use of SBs particularly at the beginning of treatment, to improve the tolerability of exposure therapy.

A somewhat different explanation of how SBs may contribute to the maintenance of irrational worries is suggested by studies demonstrating that response information may influence stimulus evaluations. For example, a number of empirical studies have demonstrated that risk expectancies can be emotion-based (cf. Clore, 1992; Schwarz & Clore, 1988). The apparent informational value of affective cues may be influenced by *dispositional* affective differences. The more people experience a particular kind of affect, the more they may rely on it as a source of valid information. Indeed, in a number of studies it was found that adult anxious patients tend to use anxious emotion to evaluate danger (cf. Arntz, Rauner, & van den Hout, 1995; Engelhard, Macklin, McNally, van den Hout, & Arntz, 2003), while patients affected by obsessive-compulsive disorder would tend to use guilt affect as information that increases the sense of threat and decreases the sense that preventive action is effective (Gangemi, Mancini, & van den Hout, 2007). In general, thus, anxious patients tend to engage in *emotional reasoning*: they draw invalid conclusions about a situation on the basis of their subjective emotional response. This tendency to infer danger on the basis of subjective negative emotion may play a role in the development and maintenance of anxiety disorders by starting a vicious circle: anxiety induces a sense of threat, further stimulating anxiety and so on.

Also physiological response information influences stimulus evaluation. For example, Davey (1987) demonstrated that, in non-clinical individuals, false physiological response feedback affects the expectation of *t* danger. Moreover, Valins and Ray (1967) reported that in clinical subjects, false feedback suggesting no hart rate response to snake slides positively influenced subsequent approach to a live snake.

These processes fit with clinical observations when applying cognitive therapy: when asked why a specific situation looks dangerous, patients sometimes say that their safety behavior is a clear proof of the danger. For example, the second author treated a patient suffering from Panic Disorder who justified his worries by arguing: "it was clear that I was losing control: I ran away from the room so fast". A patient suffering from social phobia, argued "the situation was clearly bad, indeed I was standing by myself". Analogously to what Arntz et al. (1995) found out for emotions, patients thus may use their SBs as a source of information about the situation (behavior as information). This mechanism may lead them to draw invalid conclusions about the situation, for example inferring that a feared event is going to occur. If danger is inferred on the basis of an SB, even in the absence of information about objective danger, it is clear that false alarms are not recognized as such and irrational fear will tend to persist, leading patients to further use SBs.

Very few empirical studies have investigated whether behavior information influences appraisals of threat stimuli (for a notable exception see Deacon & Maack, 2008). The present study aimed to investigate whether individuals affected by anxiety disorders tend to infer danger on the basis of safety-seeking behaviors. Earlier it was found that anxious participants tend to draw conclusions about the safety/danger of a situation on the basis of their subjective emotional response, whereas non-clinical controls infer danger only on the basis of objective information (e.g., Arntz et al., 1995). Analogously, we hypothesized that danger ratings in our non-clinical individuals would be affected mainly by objective information and not by behavior information, while we expected the anxious participants would also infer danger from the presence of safety behaviors.

The study largely followed an experiment reported earlier (Arntz et al., 1995): Anxious participants, in our case obsessive-compulsive participants, panic participants, and participants with social phobia, were compared to non-clinical controls. Each subject rated the perceived danger of a series of scripts in which information about objective danger (danger vs. safety) and information about the use of SB (SB vs. no-SB) were systematically varied in a 2×2 within-subjects design. To test whether areas and behaviors that are directly related to the specific anxiety disorder activate the hypothesized mechanism, specific scripts for obsessive participants, panic participants, and participants with social phobia were used.

2. Method

2.1. Participants

Four groups of participants took part in the study. There were 31 participants with obsessive-compulsive disorder (OCD) (12 men and 19 women, 19 with contamination fears, 9 checking, 4 order and symmetry obsessions,[1] mean age: 30.3, range 16–50), 22 panic participants (8 men and 14 women; mean age: 34, range 21–52), and 17 participants with social phobia (6 men and 11 women; mean age: 35, range 20–50), who applied for treatment at Studio di

[1] Each patient was administered the Yale-Brown Obsessive-Compulsive Scale, self-report version (Y-BOCSSR; Steketee, Frost, & Bogart, 1996) and the accompanying symptom checklist to determine primary presenting symptom.

Psicoterapia Cognitiva, SPC–APC in Rome. All anxious participants were at the starting phase of treatment and consented to take part in the study. Originally, there were 35 non-clinical controls recruited by advertisements placed at the Department of Psychology of Cagliari University. There were missing data of four of them, leaving 31 non-clinical controls (13 men and 18 women; mean age: 33, range 20–49). Mean age in the total sample was 32.7, SD = 9.7.

Prior to treatment, clinical psychologists or trained graduate students in clinical psychology assessed anxious individuals using the Structured Clinical Interview for DSM-IV (SCID; First, Gibbon, Spitzer, & Williams, 1996). Non-clinical controls were screened by an abbreviated SCID interview for Axis I disorders, to exclude those with past or current Axis I mental disorders.

There was no significant difference between the clinical and non-clinical groups, on sex (χ^2 (1, 101) = 1.3, p = .25), age (clinical participants: M = 33.4 years, SD = 8.75; non-clinical participants: M = 32.55 years, SD = 11.44, t(99, 101) = .43, p = .67), and educational level (clinical participants: M = 13.6 years, SD = 3.35; non-clinical participants: M = 14.03 years, SD = 3.42, t(99, 101) = .61, p = .54) distributions. All participants gave written informed consent.

2.2. Materials and procedure

A paper and pencil task was given which consisted of booklet with a series of scenarios, each followed by several 100 mm Visual Analogue Scales (VASs). On the first page the following instructions were presented (translated from Italian):

> "This is an investigation into the appraisal of events. Several stories will be presented to you. After each story is read, you will be asked to judge it by rating various aspects. Please evaluate these events as if they are happening to you. There are no right or wrong answers. We are only interested in your personal judgment. It is very important that you try to identify yourself with the description as much as possible."

Following this instruction, an explanation of how to use the VAS was given and an example of a VAS with a rating was provided.

For the three areas (OCD, panic disorder, and social phobia) four scripts were then presented: infected wound and gas tap (OCD relevant), crowded elevator (panic disorder relevant), social interaction (social-phobia relevant). The panic disorder relevant and social-phobia relevant scripts were adapted from the Arntz et al. (1995) experiment. However, all the SBs were derived from the examples given in the DSM-IV-TR (the *Diagnostic and Statistical Manual of Mental Disorders,* 4th ed., text rev; American Psychiatric Association, 2000). The choice to use two OCD-related scripts and only one panic-disorders related and one social-phobia related scenarios, was due to the fact that relative to other anxiety disorders, OCD is rather heterogeneous in terms of eliciting cues, catastrophes feared, and safety behaviors, although they are mainly ascribable to two classes: washers and checkers.

For each script, there were four versions. Each version started with the same stem but ended differently: 1) with objective safety information and no-SB; 2) with objective safety information and SB; 3) with objective danger information and no-SB; and 4) with objective danger information and SB.

To prevent carry-over effects and stereotypical ratings on the basis of identical descriptions of behavior information, the SB and no-SB information varied systematically between the three areas and also between the scripts of the same area. The sixteen scripts were printed on different pages and randomly ordered with the restriction that the first four scripts consist of scripts of the four different stories, as done in the second, third, and last group of four scripts, and that scripts with the same story are separated by at least one script of another story. The same random order was applied to all participants. As a first example, the four washing scripts start as follows:

> "You are cooking for yourself and your loved ones when a sharp pain reminds you of the small wound on your hand that has become infected and is protected only by a band-aid."
>
> The objective safety/no-SB script continues as follows:
>
> "You remember a documentary you recently saw on TV which gave a very detailed explanation of the main ways diseases are transmitted and caught. It explicitly mentioned that cooking with an infected wound on the hand is absolutely harmless. You go on cooking."
>
> The objective safety/SB script continues as follows:
>
> "You remember a documentary you recently saw on TV which gave a very detailed explanation of the main ways diseases are transmitted and caught. It explicitly mentioned that cooking with an infected wound on the hand is absolutely harmless. You start washing your hands repeatedly and insistently."
>
> The objective danger/no-SB script continues as follows:
>
> "The thought comes to you that when one of your family members fell ill with hepatitis B, the doctor not only informed you about the severity of the disease, which can lead to death, but also about the possibility of catching it yourself and becoming a healthy carrier without realizing it, capable of passing the disease on. You go on cooking".
>
> The objective danger/SB script continues as follows:
>
> "The thought comes to you that when one of your family members fell ill with hepatitis B, the doctor not only informed you about the severity of the disease, which can lead to death, but also about the possibility of catching it yourself and becoming a healthy carrier without realizing it, capable of passing the disease on. You start washing your hands repeatedly and insistently."

The four social interaction scripts were constructed as follows. Start of the scripts:

> "At a large birthday party, you are about to give a speech in front of all the guests. You have prepared your speech very well and full of self-confidence you begin to speak. You have difficulty getting the audience's attention, and so you crack a joke to draw attention."
>
> The objective safety/no-SB script continues as follows:
>
> "And indeed, you succeed in attracting attention, people laugh and everyone is looking friendly and interested and you keep on talking…"
>
> The objective safety/SB script continues as follows:
>
> "And indeed, you succeed in attracting attention, people laugh and everyone is looking friendly and interested in you. You quickly stop talking and go away, avoiding to look at the others…"
>
> The objective danger/no-SB script continues as follows:
>
> "Suddenly, they get quiet, and you get looks of disapproval. You start to stammer, are not sure how to continue, and everyone is looking at you. You keep on talking…".

The objective danger/SB script continues as follows:

"Suddenly, they get quiet, and you get looks of disapproval. You start to stammer, are not sure how to continue, and everyone is looking at you. You quickly stop talking and go away, avoiding to look at the others…"

(The other two scripts can be obtained from the authors upon request).

Each script was followed by four VASs on which the participant could judge various aspects of the event. The first VAS was the dependent variable. "Absolutely not dangerous" was printed on its left side and "extremely dangerous" was printed on its right side. The other three VASs were added as filler items to reduce the possibility that participants would remember their ratings. The three additional VASs asked for ratings of safety, responsibility, and good vs. bad expected outcome. VAS ratings were measured in mm.

All clinical participants completed the task as part of a pretest before beginning treatment at Studio di Psicoterapia Cognitiva, SPC–APC in Rome. Normal controls completed the task individually in a quiet room at Cagliari University. In all cases an experimenter was present and introduced the task, also preventing participants from returning to previous pages.

3. Results

3.1. Validity (manipulation check)

The scripts were given to 23 psychotherapists of the Studio di Psicoterapia Cognitiva, SPC–APC in Rome, who were unaware of the hypothesis under investigation. The experts were instructed to rate the presence of objective danger and the presence of safety-seeking behavior in the scripts on two VASs. They were instructed to give an objective judgment and not their personal feelings or reaction. Of the 23 therapists, 18 returned the scripts. Ratings were analyzed by means of ANOVA with two within-group factors: Danger information and SB information.

There appeared to be a strong effect of Danger information on danger ratings in each of the four scripts ($F(1, 17)$s > 103, $ps < .001$; panic scripts: objective danger-SB: $M = 6.5$, $SD = 1.5$; objective danger-no-SB: $M = 6.8$, $SD = 1.6$; objective safety-SB: $M = 2.5$, $SD = 1.7$; objective safety-no-SB: $M = 3.8$, $SD = 2.1$; social scripts: objective danger-SB: $M = 6.3$, $SD = 1.5$; objective danger-no-SB: $M = 6.1$, $SD = 1.5$; objective safety-SB: $M = 2.6$, $SD = 1.7$; objective safety-no-SB: $M = 1.9$, $SD = 1.3$; washing scripts: objective danger-SB: $M = 6.1$, $SD = 1.4$; objective danger-no-SB: $M = 6.6$, $SD = 1.3$; objective safety-SB: $M = 2.1$, $SD = 1.4$; objective safety-no-SB: $M = 2$, $SD = 1.3$; checking scripts: objective danger-SB: $M = 6.2$, $SD = 1.1$; objective danger-no-SB: $M = 6.7$, $SD = 1.4$; objective safety-SB: $M = 2.1$, $SD = 1.6$; objective safety-no-SB: $M = 2.2$, $SD = 1.3$).

SB information did not significantly influence danger ratings ($ps > .2$), nor did the Danger × SB interaction ($ps > .2$). As hypothesized, SB information strongly influenced SB ratings in each of the four scripts ($F(1, 17)$s > 51, $ps < .001$; panic scripts: objective danger-SB: $M = 7$, $SD = 1$; objective danger-no-SB: $M = 3.8$, $SD = 2.1$; objective safety-SB: $M = 7.3$, $SD = .7$; objective safety-no-SB: $M = 2.8$, $SD = 1.9$; social scripts: objective danger-SB: $M = 6.7$, $SD = .8$; objective danger-no-SB: $M = 3.1$, $SD = 1.7$; objective safety-SB: $M = 7.3$, $SD = 1.1$; objective safety-no-SB: $M = 2.7$, $SD = 2$; washing scripts: objective danger-SB: $M = 7.7$, $SD = 1.2$; objective danger-no-SB: $M = 3$, $SD = 1.4$; objective safety-SB: $M = 7.5$, $SD = 1.5$; objective safety-no-SB: $M = 2.9$, $SD = 1.8$; checking scripts: objective danger-SB: $M = 6.6$, $SD = 1.3$; objective danger-no-SB: $M = 2.8$, $SD = 1.8$; objective safety-SB: $M = 7$, $SD = 1.1$; objective safety-no-SB: $M = 3.2$, $SD = 1.9$). By contrast, Danger information did not significantly influence SB ratings ($ps > .07$), nor did the Danger × SB interaction ($ps > .11$).

3.2. Reliability

A subgroup of the normal control group ($n = 15$) completed the task twice, in an interval ranging from 3 to 5 weeks. Pearson correlations of the danger ratings of the 16 scripts of two tests were all larger than .7 ($ps < .001$). Thus there is clear evidence that the task yields reliable and stable danger ratings.

3.3. Danger ratings in anxiety participants vs. non-clinical controls

The danger ratings were analyzed by means of a $4 \times 2 \times 2$ ANOVA with Group (obsessive-compulsive participants vs. panic participants vs. participants with social phobia vs. non-clinical controls) as the between-group factor and Danger (objective danger vs. objective safety) and SB (SB vs. no-SB) as within-group factors.

A main effect of Danger information was obtained ($F(1, 97) = 88.8$, $p < .001$). As shown in Fig. 1, with objective danger scripts, participants rated the danger significantly higher ($M = 4.46$, $SD = 1.83$) than with objective safety scripts ($M = 3.1$, $SD = 1.72$). A main effect of SB information on danger judgments was also found ($F(1, 97) = 51.61$, $p < .001$). When faced with SB information, participants tended to rate the danger higher ($M = 4.2$, $SD = 1.81$), than when faced with no-SB information ($M = 3.36$, $SD = 1.67$) (see Fig. 1). Finally a main effect of Group was obtained ($F(3, 97) = 12.5$, $p < .001$). Three clinical groups tended to rate the danger higher (OCD: $M = 15.41$, $SD = 6.9$; panic group: $M = 18.12$, $SD = 5.5$; social-phobia group: $M = 19.43$, $SD = 4.87$) than the non-clinical control group ($M = 10.37$, $SD = 4.43$; OCD vs. non-clinical controls: $t(60) = 3.42$, $p < .001$, panic group vs. non-clinical controls: $t(51) = 5.66$, $p < .01$; social-phobia group vs. non-clinical controls: $t(46) = 6.53$, $p < .01$).

There was a significant interaction between SB and Danger ($F(1, 97) = 19.37$, $p < .01$). The impact of adding information about SBs was, overall, larger in the objective safety scripts relative to the objective danger scripts (objective danger condition: SB: $M = 4.68$, $SD = 2.04$; no-SB: $M = 4.24$, $SD = 1.88$, $t(100) = 3.12$, $p < .05$; objective safety condition: SB : $M = 3.73$, $SD = 1.99$; no-SB: $M = 2.48$, $SD = 1.8$, $t(100) = 7.97$, $p < .001$) (see Fig. 1). To test whether the impact of SB information was larger in the objective safety scripts that in the objective danger scripts, we computed the difference between SB/no-SB information in both the Danger conditions. As expected, we found that the difference in the objective safety condition ($M = 1.25$, $SD = 1.6$) was significantly higher than that in the objective danger condition ($M = .44$, $SD = 1.42$, $t(100) = 4.68$, $p < .001$).

As hypothesized, there was also a significant interaction between Group and SB information ($F(3, 97) = 2.73$, $p < .05$). The three clinical groups showed the predicted perceived danger-inflating effect of SB (OCD: SB $M = 4.38$, $SD = 1.93$; no-SB $M = 3.33$, $SD = 1.68$, $t(30) = 5.47$, $p < .001$; panic group: SB $M = 5.1$, DS $= 1.31$; no-SB $M = 4$, $SD = 1.65$, $t(21) = 4.5$, $p < .05$; social-phobia group: SB $M = 5.4$, $SD = 1.23$; no-SB $M = 4.33$, $SD = 1.63$, $t(16) = 2.8$, $p < .02$), whereas the SB information effect was not significant in the non-clinical control group (SB: $M = 2.76$, $SD = 1.3$; no-SB: $M = 2.43$, $SD = 1.19$, $t(30) = 1.6$, $p = .12$). As expected, there was no interaction between Group and Danger, $F(3, 97) = .78$, $p = .51$.

Finally, there was a significant three-way interaction between Group, Danger information, and SB information, $F(3, 97) = 3.95$, $p < .02$. Fig. 1 suggests that the clinical groups were more influenced by SB information than were the non-clinical controls, especially in the context of objective safety (SB vs. no-SB: obsessive group: $t(30) = 9.4$, $p < .001$, panic group: $t(21) = 3.92$, $p < .002$, social-phobia

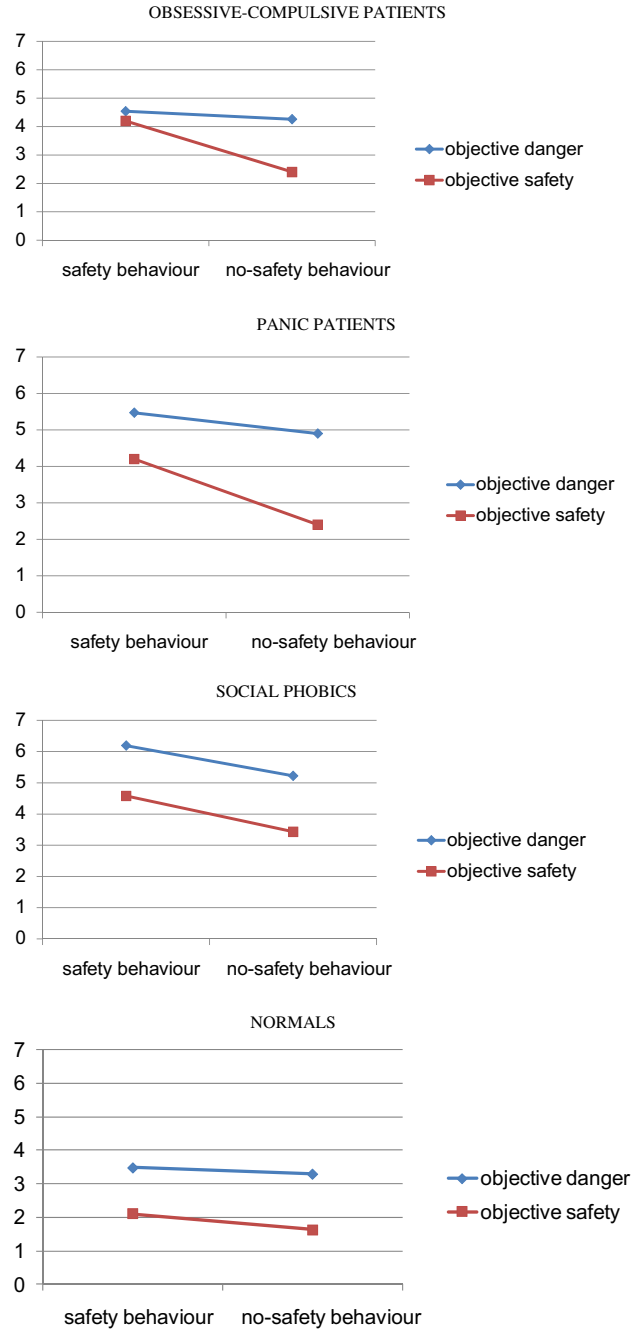

Fig. 1. Mean ratings of perceived danger as a function of objective danger vs. safety information and safety behavior vs. no-safety behavior information in the two groups of anxiety patients and the normal control group.

group: $t(16) = 2.78$, $p < .02$, non-clinical control group: $t(30) = 1.85$, $p = .07$). With the objective danger information, all groups tended to rate the danger relatively high, regardless of the SB information (SB vs. no-SB: obsessive participants: $t(30) = 1.19$, $p = .24$, participants with social phobia: $t(16) = 1.89$, $p = .08$, non-clinical controls: $t(30) = .83$, $p = .41$, with the exception of the panic group that, also in the context of objective danger, rated the danger significantly higher in the presence of the SB ($t(21) = 2.87$, $p < .05$).

3.4. Specificity of the effect of SB information

To assess the specificity of the effect of SB information on danger ratings, we constructed a "Behavior-as-Information Index". It was the difference in danger ratings for each script with and without SB information. It was computed for the three clinical groups and for the three scripts, resulting thus in nine indices (see Table 1).

Danger ratings were subjected to a 3 × 3 ANOVA, comparing Group (obsessive-compulsive participants vs. panic participants vs. participants with social phobia) as a between-group factor and Area (obsessive scripts vs. panic disorder scripts vs. social-phobia scripts) as a within-group factor.

A main effect of the Area factor was found (F (2, 134) = 14.01, $p < .001$). OCD scripts ($M = 9.68$, SD = 3.12) produced a larger SB information effect on danger ratings than the other two kinds of scripts (panic disorder scripts: $M = 7.13$, SD = 4.33 vs. social-phobia scripts: $M = 7.83$, SD = 4.26, $t(69) = 1.77$, $p = .80$; obsessive scripts vs. social-phobia scripts: $t(69) = 4.02$, $p < .001$; obsessive scripts vs. panic disorder scripts: $t(69) = 5.36$, $p < .001$).

A main effect of Group was also obtained (F (2, 67) = 4.75, $p < .05$). Overall, participants with social phobia ($M = 9.79$, SD = 2.36) were more vulnerable to the SB information effect than OCD participants ($M = 6.99$, SD = 3.58), rating the danger higher, $t(46) = 2.89$, $p < .001$. The panic group also showed a tendency to rate the danger higher ($M = 8.71$, SD = 2.99) than OCD participants, although this difference did not reach statistical significance ($t(51) = 1.83$, $p = .07$; panic group vs. social-phobia group: $t(37) = 1.22$, $p = .23$).

Finally, there was a significant Group × Area interaction, F (4, 134) = 10.22, $p < .001$. OCD participants were more strongly influenced by SB information in the obsessive situations, than in the other two scripts (obsessive scripts: $M = 9.81$, SD = 3.47, panic scripts: $M = 5.24$, SD = 4.34, social-phobia scripts: $M = 5.93$, SD = 4.08; OCD scripts vs. panic scripts: $t(30) = 6.84$, $p < .001$; obsessive scripts vs. social-phobia scripts: $t(30) = 8.46$, $p < .001$; panic scripts vs. social-phobia scripts: $t(30) = 1.45$, $p = .16$). Also participants with social phobia were more sensitive to the SB information mechanism in their diagnosis-related scripts (i.e., social interaction scripts) than in the other two scripts (social-phobia scripts: $M = 11.2$, SD = 2.15; obsessive scripts: $M = 9.46$, SD = 3.1; panic scripts: $M = 8.72$, SD = 3.65; social-phobia scripts vs. obsessive scripts: $t(16) = 2.33$, $p < .05$; social-phobia scripts vs. panic scripts: $t(16) = 3.01$, $p < .05$; OCD scripts vs. panic scripts: $t(16) = .91$, $p = .37$). By contrast, panic participants were not more strongly influenced by a behavior information effect in the panic disorder scripts, as shown by danger ratings as high as in the other two scripts (panic scripts: $M = 8.57$, SD = 3.88; social-phobia scripts: $M = 7.89$, SD = 4.22; obsessive scripts: $M = 9.67$, SD = 2.75; panic scripts vs. social-phobia scripts: $t(21) = .91$, $p = .37$; panic scripts vs. OCD scripts: $t(21) = 1.43$, $p = .16$; social-phobia scripts vs. obsessive scripts: $t(21) = 2.09$, $p < .05$).

4. Discussion

The findings confirm that individuals affected by anxiety disorders tend to infer danger not only on the basis of the presence of objective danger, but also on the basis of safety-seeking behavior. There was no evidence that non-clinical controls show this

Table 1
Mean and standard deviation of "Behavior-as-Information Index" for the three patient groups and for the three scripts.

Scenarios			
Groups	PD	OCD	SP
OCD	.72 (1.82)	1.52 (1.65)	.39 (1.36)
PD	1.04 (1.87)	.99 (1.5)	1.03 (1.68)
SP	.85 (2.31)	.67 (2.2)	2.02 (3.44)

tendency. Moreover, the effect of SB response information on danger perceptions was disorder-specific for both OCD participants and individuals with social phobia: they tended to use SB as information to infer the presence of danger, especially when it was disorder-specific (e.g. washing, stopping talk, and going away). Panic participants did not show such a content-specific effect and were affected by SB information irrespective of the content of the scenarios.

This observed situation specificity in obsessive participants and social phobics may be accounted for by Lang's theory (1984) on anxious individuals' reactions to specific feared situations. This theory states that fear networks can be activated by a) response information, b) stimulus information, and c) meaning information. In this study, we manipulated both the response (SB, e.g., washing) and the stimulus information (situation, e.g., the presence of an infected wound on the hand), while the meaning information (danger) was our dependant variable. Given that anxiety disorders are usually domain-specific, it might follow that the activation of the SB in a context that is threat relevant stimulates danger evaluation by increasing it more than if the SB information is given in a context that is threat irrelevant.

According to Lang's theory, we may also explain the observed absence of situation specificity in panic participants, which seem to be particularly concerned by loss of control (e.g. Taylor, 1999; Weiner, Freedheim, Schinka, & Velicer, 2003). In our study, both the social phobia and OCD scenarios included factors that suggest or cause this lack of control (for example, the repetitiveness of the obsessive's SBs might cause distress and thus the possibility of losing control), leading panic participants to think that threat was also at hand in the OCD- and social-phobia-specific situations.

A second question raised by our findings is why clinical participants and non-clinical controls differed in their use of the SB information to infer danger. One explanation is that the use of SB as information in anxious individuals may logically be a result of having a disorder. Clinical individuals are very familiar with SBs in the context of perceived threat, and this may be far less the case in non-clinical controls. Thus, the associative strength between SBs and threat may be become high in clinical participants where it does not in non-clinical controls. Moreover, our scenario manipulation may have tapped this bidirectional association between SB and threat that may have been strengthened in clinical participants due to actual SBs. Another answer might be that the tendency to infer danger from SB information is a pre-morbid general characteristic of anxious participants. Such a trait-like information processing bias might predispose people to develop anxiety disorders, and in general could be linked to trait anxiety. As for the affect as information (e.g. Arntz et al., 1995; Schwarz & Clore, 1988, 2007) trait anxiety could influence individuals' assumptions about the relevance of not only their experiences of state anxiety but also of safety behavior for judgments of risk. Further experiments could thus test whether high levels of trait anxiety in non-clinical people would influence their use of safety-seeking behavior. Following Davey (1987) and Arntz et al. (1995), another possibility is to investigate whether healthy subjects, without any psychopathology, but with a tendency to infer danger on the basis of SB information, are specifically vulnerable to increased reactivity and delayed extinction in classical conditioning procedures in which response feedback is artificially inflated. Finally, one might argue that the SB information increased state anxiety and that increased danger ratings after SB information may have been due to momentary state anxiety. This however would not change the fact that SB information in patients is sufficient to increase perceived danger and that SB's may serve to maintain anxiety disorders.

Together with the studies of Sloan and Telch (2002) and Salkovskis et al. (1999), our data suggest that SB may influence danger expectations. This tendency to infer danger on the basis of the SB might play a role in the development, maintenance, or aggravation of anxiety disorders by starting a vicious circle: SB induces threat perception, further stimulating SB, and so on.

The hypothesized vicious circle might explain why anxious individuals' use of safety-seeking behaviors during exposure exerts a negative effect on treatment outcome with both panic disorder individuals (Salkovskis et al., 1999) and participants with social phobia (Wells et al., 1995). SB would confirm the presence of the threat, leading anxious individuals to further turn to SB. Meanwhile, the behavior as information might help to explain the efficacy of techniques such as the Exposure with Response Prevention, in which clinical individuals are exposed to the feared situation and encouraged to avoid SB during exposure, thus interrupting the hypothetical vicious circle.

Finally, a behavior-as-information vicious circle might fruitfully be addressed directly with cognitive techniques. In particular, during exposure and related behavioral experiments it may be helpful to challenge the validity of SBs as sources of information about threat and to direct attention to objective information about safety and danger.

The study has limitations. First, our data may have resulted from participants guessing the nature of the hypothesis and responding in a desirable way. In that case, however the same effect should have occurred in the control group. Indeed, there is no a priori reason why the expectancy bias would be less prominent in the control group. Moreover, one may object to the generalizability of our findings to real life situations. Being asked to imagine a situation and imagining how one might behave in the situation may not be consistent with how participants actually behave. It would be unclear, therefore, the extent to which individuals with anxiety disorders might really infer danger on the basis of their own SBs in such situations. However, the fact that our results came from the use of imagined scenarios leads us to conclude that the mechanism we are investigating could be even stronger in real life. Our clinical participants tended to infer danger from the presence of safety-seeking behaviors that are held to be specific to their disturbance (cf. DSM-IV-TR), but that were not tailor-made. Possibly, then, scripts may not have been relevant to the idiosyncratic concerns of some clinical participants. The fact that the behavior-as-information effect did nevertheless materialize may argue for its robustness.

References

Arntz, A., Rauner, M., & van den Hout, M. (1995). If I feel anxious, there must be danger: ex-consequentia reasoning in inferring danger in anxiety disorder. *Behaviour Research and Therapy, 33*, 917–925.

Clark, D. M. (1999). Anxiety disorders: why they persist and how to treat them. *Behaviour Research and Therapy, 37*(Suppl. 1), S5–S27.

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. Heimberg, M. Liebowtiz, D. A. Hope, & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment and treatment*. New York, NY: The Guilford Press.

Clore, G. L. (1992). Cognitive phenomenology: feelings and the construction of judgement. In L. L. Martin, & A. Tesser (Eds.), *The construction of social judgement* (pp. 133–163). Hillsdale, NJ: Erlbaum.

Cuming, S., Rapee, R. M., Kemp, N., Abbott, M. J., Peters, L., & Gaston, J. E. (2009). A self-report measure of subtle avoidance and safety behaviors relevant to social anxiety: development and psychometric properties. *Journal of Anxiety Disorders, 23*, 879–883.

Davey, G. C. L. (1987). An integration of human and animal models of Pavlovian conditioning: associations, cognitions, and attributions. In G. C. L. Davey (Ed.), *Cognitive processes and Pavlovian conditioning in humans*. New York: Wiley.

Deacon, B. J., & Maack, D. J. (2008). The effects of safety behaviors on the fear of contamination: an experimental investigation. *Behaviour Research and Therapy, 46*, 537–547.

Engelhard, I. M., Macklin, M., McNally, R. J., van den Hout, M. A., & Arntz, A. (2003). Emotion- and intrusion-based reasoning in Vietnam veterans with and without chronic post-traumatic stress disorder. *Behaviour Research and Therapy, 39*, 1339–1348.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1996). *Structured clinical interview for DSM-IV axis I disorders: Patient edition (SCID-I/P, version 2.0)*. Washington, DC: American Psychiatric Press.

Gangemi, A., Mancini, F., & van den Hout, M. A. (2007). Feeling guilty as a source of information about threat and performance. *Behaviour Research and Therapy, 45*, 2387–2396.

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: a comprehensive model and its treatment implications. *Cognitive Behavior Therapy, 36*(4), 193–209.

Hood, H. K., Antony, M. M., Koerner, N., & Monson, C. M. (2010). Effects of safety behaviors on fear reduction during exposure. *Behaviour Research and Therapy, 48*, 1161–1169.

Lang, P. (1984). The cognitive psychophysiology of emotion: fear and anxiety. In A. H. Tuma, & J. D. Maser (Eds.), *Anxiety and the anxiety disorders*. Hillsdale, NJ: LEA.

Milosevic, I., & Radomsky, A. S. (2008). Safety behavior does not necessarily interfere with exposure therapy. *Behaviour Research and Therapy, 46*, 1111–1118.

Powers, M. B., Smits, J. A. J., & Telch, M. J. (2004). Disentangling the effects of safety-behavior utilization and safety-behavior availability during exposure-based treatment: a placebo-controlled trial. *Journal of Consulting and Clinical Psychology, 72*, 448–454.

Rachman, S., Shafran, R., Radomsky, A. S., & Zysk, E. (2011). Reducing contamination by exposure minus response prevention. *Journal of Behavior Therapy and Experimental Psychiatry, 42*, 397–404.

Salkovskis, P. M. (1991). The importance of behavior in the maintenance of anxiety and panic: a cognitive account. *Behavioural Psychotherapy, 19*, 6–19.

Salkovskis, P. M., Clark, D. M., Hackman, A., Wells, A., & Gelder, M. G. (1999). An experimental investigation of the role of safety behaviors in the maintenance of panic disorder with agoraphobia. *Behaviour Research and Therapy, 37*, 559–574.

Schwarz, N., & Clore, G. L. (1988). How do I feel about it? Informative functions of affective states. In K. Fiedler, & J. Forgas (Eds.), *Affect, cognition and social behavior* (pp. 44–62). Toronto: Hogrefe.

Schwarz, N., & Clore, G. L. (2007). Feelings and phenomenal experiences. In E. T. Higgins, & A. Kruglanski (Eds.), *Social psychology. A handbook of basic principles* (2nd ed.). (pp. 385–407) New York: Guilford Press.

Sloan, T., & Telch, M. J. (2002). The effects of safety-seeking behavior and guided threat reappraisal on fear reduction during exposure: an experimental investigation. *Behaviour Research and Therapy, 40*, 235–251.

Steketee, G., Frost, R. O., & Bogart, K. (1996). The Yale-Brown obsessive compulsive scale: interview versus self-report. *Behaviour Research and Therapy, 34*, 675–684.

Taylor, S. (1999). *Anxiety sensitivity: Theory, research, and treatment of the fear of anxiety*. Mahwah, NJ: Erlbaum.

Telch, M. J. (1991). Beyond sterile debate. *Journal of Psychopharmacology, 5*, 296–298.

Valins, S., & Ray, A. A. (1967). Effects of cognitive desensitization on avoidance behavior. *Journal of Personality and Social Psychology, 7*, 345–350.

van den Hout, M., Engelhard, I. M., Toffolo, M. B. J., & van Uijen, S. L. (2011). Exposure plus response prevention versus exposure plus safety behaviors in reducing feelings of contamination, fear, danger, and disgust: an extended replication of Rachman, Shafran, Radomsky & Zysk (2011). *Journal of Behavior Therapy and Experimental Psychiatry, 42*, 364–370.

Weiner, I. B., Freedheim, D. K., Schinka, J. A., & Velicer, W. F. (2003). *Handbook of psychology*. New York: Wiley.

Wells, A., Clark, D. M., Salkovskis, P., Ludgate, J., Hackman, A., & Gelder, M. (1995). Social phobia: the role of in-situation safety behaviors in maintaining anxiety and negative beliefs. *Behavior Therapy, 26*, 153–161.