The Effects of Tears on Approach–Avoidance Tendencies in Observers

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Abstract

Emotional tears have been proposed to represent a robust affiliative signal whose main function is to promote the willingness to help the crying individual. However, little is known about the psychological mechanisms at the basis of such responses. To investigate whether tears facilitate approach relative to avoidance tendencies, we exposed participants ($N = 77$) to pictures of faces with and without visible tears, in two different approach–avoidance tasks. In the first task, participants were instructed to either move toward tearful faces and away from nontearful faces, or the other way around, by using a joystick. In the second task, participants made approaching or avoiding responses to tearful and nontearful faces by pressing buttons. The results suggest that tears facilitate behavior that reduces the distance between the observer and the crying person. However, while tears appear to promote approach relative to avoidance behavior, the current findings do not allow firm conclusions about whether tears specifically facilitate approach or rather block avoidance tendencies in observers, or whether they possibly have both effects. Findings are discussed in the context of tears' ability to act as a prosocial stimulus that signals non-aggressive intentions, as well as in the context of the functional goals that predispose humans to approach or avoid crying individuals.

Emotional crying has been proposed to have a communicative function, in particular, that of signaling distress and helplessness and to facilitate bonding (Gračanin, Bylsma, & Vingerhoets, 2018; Vingerhoets & Bylsma, 2015). Tears have been theorized to have evolved from the so-called *distress calls* that are present in all bird and mammal species, and whose function is to regulate (to decrease) physical distance between parents and offspring and to facilitate parents' nurturing behavior. Such acoustic signals are only in humans accompanied and even partly replaced by emotional tears, which are shed not just by infants and children but also by adults. Tears are theorized to have evolved as an attachment signal that conveys the need for help and support and promotes corresponding responses in observers (Gračanin, Bylsma, & Vingerhoets, 2017; Gračanin et al., 2018; Nelson, 2005; Vingerhoets & Bylsma, 2015). Tears are further proposed to represent a signal of non-aggressive intentions and submission (see Hasson, 2009). These claims are partly supported by recent empirical evidence showing that crying (i.e.,tearful) individuals are perceived as more sad and helpless compared to non-crying (nontearful) ones

(Balsters, Krahmer, Swerts, & Vingerhoets, 2013; Hendriks & Vingerhoets, 2006; Provine, Krosnowski, & Brocato, 2009; Vingerhoets, van de Ven, & van der Velden, 2016). Observers also react to tearful faces with a greater inclination to provide help and support and a decreased tendency to express negative feelings toward crying individuals and to avoid them although at the same time they report more negative emotion in the

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presence of criers (Hendriks, Croon, & Vingerhoets, 2008; Hendriks & Vingerhoets, 2006).

What kind of psychological mechanisms are responsible for the fulfillment of the proposed signaling function of tears? More precisely, which psychological processes mediate between the perception of tears and the general inclination of observers to react prosocially? First, "asking" for help may be more effective if the crier is regarded as friendly and nonhostile. Therefore, tears may represent a signal that reliably conveys the absence of hostility or, possibly, even the presence of prosocial intentions of the crier (Gračanin et al., 2018). Indeed, tearful individuals are perceived as more warm and friendly (Van de Ven, Meijs, & Vingerhoets, 2016; Vingerhoets et al., 2016) and less aggressive (Hendriks & Vingerhoets, 2006) than nontearful individuals. Especially when combined with facial expressions of negative emotion, tears can thus make the expressing individual look less threatening, which, in its turn, could result in a reduced inclination to avoid crying individuals. Another option is that tears act as a stimulus that promotes intentions to approach and help a crying person because they directly influence the observer's motivation to approach, which implies that tears might also represent a kind of appetitive stimulus (but see, e.g., Hendriks & Vingerhoets, 2006).

Automatic evaluation of any stimulus at early stages of cognitive processing is adaptive because it allows the organism to prepare quickly for adequate behavioral responses to that stimulus (see Elliot & Covington, 2001). Correspondingly, numerous studies provided evidence that positively valenced stimuli facilitate approach tendencies and block avoidance behavior, while negatively valenced stimuli have the opposite effects. In his seminal work, Solarz (1960) observed quicker reactions when participants were pulling toward themselves (implying approach) cards that contained pleasant words as compared to cards with unpleasant words, whereas reactions were faster when pushing away (i.e., avoiding) cards with unpleasant as compared to pleasant words. Similar effects were observed in other studies in which participants had to approach or avoid positive and negative words (e.g., Chen & Bargh, 1999), pictures of appealing or disgusting foods and drinks (Piqueras-Fiszman, Kraus, & Spence, 2014; Wiers, Rinck, Dictus, & van den Wildenberg, 2009), spiders (Rinck & Becker, 2007), and happy or angry faces (e.g., Enter, Spinhoven, & Roelofs, 2014; Heuer, Rinck, & Becker, 2007, but see, e.g., Wilkowski & Meier, 2010).

Regarding the power of tears to evoke approach or avoidance action tendencies in observers, it makes sense first to consider the findings mentioned above of the effects of perceived tears on the (negative) emotions of the observers, which could imply that tears facilitate avoidance relative to approach behavior. On the other hand, if the presence of tears, on average, decreases the perceived threat and, therefore, also the negativity of particular (negative) facial expressions as suggested above, it might also be expected that exposure to tearful faces should inhibit avoidance relative to approach behaviors. While both lines of reasoning might be logically valid, the perceived valence of tears may not be the core element that could account for their possible influence on approach–

avoidance tendencies. In fact, recent studies have yielded different patterns of approach–avoidance reactions to facial expressions of the same valence so that negatively valenced expressions such as sadness and anger facilitated approach and avoidance, respectively (e.g., Seidel, Habel, Kirschner, Gur, & Derntl, 2010). Furthermore, highly inconsistent results were obtained even in the context of approach–avoidance responses to the same facial expressions such as anger (Enter et al., 2014; Wilkowski & Meier, 2010). In an attempt to better understand these inconsistencies, Krieglmeyer and Deutsch (2013) postulated that angry faces evoke both approach and avoidance, depending on the goals associated with these behaviors. More precisely, reactions to angry faces always imply responding to threatening stimuli, which assumes the existence of (at least) two potentially functional responses. A first obvious response to such stimuli is aggression or attack, which demands approach behavior, whereas, if aggression seems not a viable option, it makes more sense to flee to escape from the threat. Therefore, both approach and avoidance responses may be functional, depending on other contextual information. This is exactly what Krieglmeyer and Deutsch (2013) observed in their study: Angry faces facilitated approach only when it served aggression and not when it served affiliation. Similarly, in other studies, the expressions of fear and sadness facilitated approach behavior irrespective of their negative connotation but also in accordance with the functionality of approach responses to such stimuli (e.g., Marsh, Ambady, & Kleck, 2005; Seidel et al., 2010). For example, sad expressions are theorized to signal a request for help and comfort (Horstmann, 2003) and, therefore, should facilitate approach because it would serve the functional goal better than avoidance behavior. Correspondingly, irrespective of the finding that sad expressions evoke withdrawal behavior on a more conscious level (Seidel et al., 2010), they may facilitate automatic approach behaviors. It is further notable that the expressions of fear and sadness were recently found to facilitate approach especially in participants with more prosocial preferences, which supports the idea that expressions of distress, and especially those that evoke emphatic concern rather than a perception of threat, promote approach behavior (Kaltwasser, Moore, Weinreich, & Sommer, 2017; Nichols, 2001). Therefore, since the suggested function of tears implies the elicitation of helping and/or comforting behavior in observers, the functional (initial) response to tears should also imply facilitation of approach relative to avoidance tendencies.

We postulate that irrespective of the potential elicitation of negative emotions in the observers, tears represent a signal that promotes helping behavior and social bonding, which also implies the absence of threat for the observers (see also Gračanin et al., 2018). This affiliative signal promotes nonaggressive and helping/nurturing responses toward the crier. For such a signal to be functional, its perception should create a motivation to decrease the distance between the crier and the observer, which implies facilitation of approach relative to avoidance tendencies rather than the opposite (which would imply that the approach–avoidance response to tears is primarily determined by their negative connotation). Furthermore, since tears were shown to

be able to elicit supportive responses even when added to not just neutral, but also to sad faces (Balsters et al., 2013, see also Vingerhoets et al., 2016), we expect that their effects on approach–avoidance tendencies should appear in addition to the potential effects of sad faces on approach–avoidance reactions. Recently, Riem, Van IJzendoorn, De Carli, Vingerhoets, and Bakermans-Kranenburg (2017) provided some first support for the idea that tears might facilitate approach relative to avoidance responses. In an experiment in which functional magnetic resonance imaging responses to pictures of crying adults and crying infants were compared, the investigators additionally observed participants' faster reactions to infant tears than to adult tears, independent of the condition (approach vs. avoidance). Importantly, in the adult tears condition only, faster responses were found in the approach than in the avoidance condition.

In conclusion, we anticipate the facilitation of approach relative to avoidance tendencies when people are exposed to tearful faces as opposed to nontearful faces. We evaluated this hypothesis in an experimental study with two different tasks in which participants either had to approach depicted crying faces while avoiding non-crying faces or to do the opposite. The first task was based on a classical joystick version of the approach–avoidance task (AAT; e.g., Heuer et al., 2007) in which participants pulled or pushed a joystick to approach or avoid (non)crying faces, respectively (joystick task [JT]). In the second task, we tested the same hypothesis by using a slightly different methodology. More specifically, in this condition, the participants performed a button (press) task (BT), in which they used up and down arrows to approach or avoid (non)tearful faces, respectively. In both tasks, approach–avoidance tendencies were conceptualized in terms of the effects of behavior (distance change) provided by visual feedback (Van Dantzig, Pecher, & Zwaan, 2008). Pulling the joystick or pressing the up arrow was coupled with visual reinforcement in the form of approaching the stimulus (an increase in size), while the opposite movements were coupled with visual reinforcement simulating moving away from the stimulus (a decrease in size). At the time we were designing the study, there were no previous reports on the approach–avoidance effects of tears, which made our research mostly explorative. Therefore, we aimed to increase the chances to observe any potential effects of tears on approach–avoidance tendencies by using two different (but still overlapping) experimental tasks. For both tasks, we expected interactive effects of the presence of tears (tears absent or present) and movements (approach and avoidance) to be significant, with a pattern implying that tears either facilitate approach or block avoidance tendencies. Note that either of the two outcomes has the same functional meaning, that is, a reduction in distance between the observer (the participant) and the crying person.

Method

Participants and Stimuli

The study was approved by the Ethics Review Board of the School of Social and Behavioral Sciences, Tilburg University
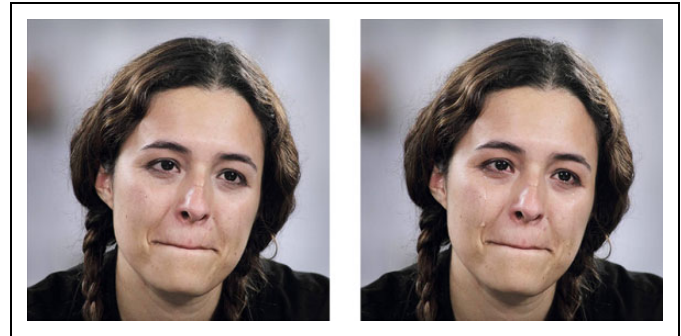

Figure 1. Participants responded to pictures of crying individuals (right) and to pictures of the same individuals with tears digitally removed (left). Photograph by Marco Anelli© 2010.

(EC-2016.3). Sixty-four female and 13 male students (age range 17–28 years; $M = 19.99$, $SD = 2.27$) provided a written informed consent and received course credit for participation. In the JT, 16 pictures of faces (seven male and nine female ones), randomly selected from a photoset created by photographer Marco Anelli (see http://www.flickr.com/photos/themuseumofmodernart/sets/72157623741486824), were digitally edited so that the first group consisted of 16 original pictures showing tearful faces while the second group depicted the same faces with the tears digitally removed (see Figure 1). The latter ones were validated in a pilot study in which we asked participants ($N = 65$) to rate the presence of the expression of six basic emotions and neutral expression in each of the 24 pictures (the complete initial set) on a visual analog scale (1–100). The findings revealed that the depicted faces expressed a blend of mainly negative emotions of a mild to moderate intensity (average ratings and SDs: disgust, 15.4 [9.83]; surprise, 18.1 [10.42]; fear, 19.5 [9.61]; anger, 19.6 [8.94]; happiness, 26.4 [7.93]; sadness, 35.7 [10.55]; neutral, 44.4 [11.81]). There was a moderate variability between the pictures, so that, for example, mean ratings for anger varied from 6.77 (10.95) to 53.98 (25.26), while, at the level of participants, the range of ratings of anger across the pictures varied from 0 to 98.

The same 77 participants from the JT also took part in the BT. The data of 11 participants in the BT task were missing because of noncompliance with the instructions (see below), or because of extreme outlier scores (two participants had average responses that were more than three SDs slower than the mean value of the sample). The stimuli involved 20 randomly selected pictures of (non)crying individuals (9 men and 11 women), from the same original set that was used in the JT.

JT

In each trial, participants had to decide whether the picture contained a tearful face or not and then to pull or push the joystick (Logitech Attack 3) in the direction that was required depending on the instructions. The *tears–approach* instructions asked the participants to pull the joystick toward themselves
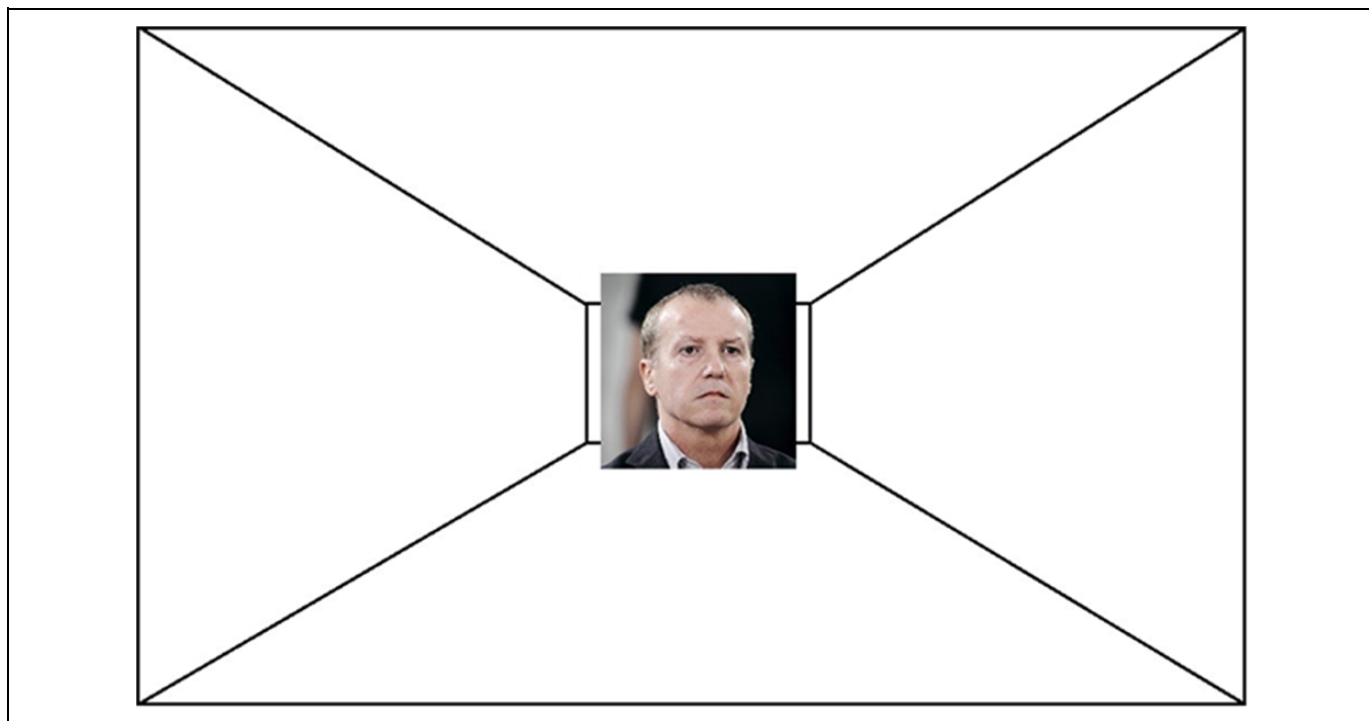
Figure 2. A three-dimensional corridor was used to facilitate the impression of picture movement in the button task. Photograph by Marco Anelli© 2010.

when seeing a tearful face and to push it away when seeing a nontearful face by using their dominant hand. The *tears–avoidance* instructions required the opposite reaction. In each trial, the blank screen was replaced by a picture when participants pressed the joystick's "fire" button. Pulling the lever up to 30° angle increased the picture size (initially 499 × 499 pixels) and, in the case of a correct response, its disappearance. This created an impression of the picture moving toward the participant. Similarly, pushing the lever created an impression of the picture moving away. Only full movements in the correct direction ended a trial. The next trial could start as soon as the joystick was brought back to the central position. The program for running the study was adapted from the program designed for standard approach–avoidance JTs used in previous research (e.g., Rinck & Becker, 2007).

BT

In this task, the visual approach effects were created by pressing the *up* arrow while the visual avoidance effects were produced by pressing the *down* arrow. This button version of the AAT was applied according to the same principles as the joystick version described above, except for the following modifications. This time, the participants were instructed to keep pressed a (*middle*) release button between the up and down arrow buttons[1] on a specially designed keypad, by using the index finger of their dominant hand. Following each picture presentation, they had to release the middle button and then, depending on the instruction, to press the up button (moving finger forward, i.e., away from themselves) in order to *make the picture getting closer* (approach) or to press the down button (moving finger backward; i.e., toward themselves) in order to *make the picture move away* (avoidance). An illusion of a simple three-dimensional corridor was created by placing a rectangle in the middle of the screen, from which four lines stretched toward the screen corners (Figure 2). Correct responses were followed by an animated increase or decrease in the size of the 400 × 200 pixels picture until it got twice as large or small as the original one, which in both cases lasted 1,000 ms. This created the illusion of the picture moving through the corridor. Correct responses were followed by prompting the participants to press and hold the middle button and then by the presentation of the empty corridor for 3,000 to 4,000 ms, followed by a subsequent picture. Incorrect responses were followed by the presentation of the message "Wrong answer!" together with prompting to press the middle button and the same corridor presentation and intertrial interval as for the correct responses. The program for running the study was created in Delphi XE5 platform.

Procedure

Participants were seated approximately 60 cm in front of a 29-in. monitor. In the JT, the instructions presented on the screen were followed by a block of eight practice trials. This was followed by the repeated instructions and the corresponding main task (first block) that included 96 experimental trials (half of them with tearful faces) and then by a brief instruction

that required the reactions opposite from those before (i.e., if the first block required approaching tears, then the second block required avoiding them), practice trials, and a second block consisting of 96 experimental trials. Consequently, each of the four experimental conditions (tears-pull, tears-push, no-tears-pull, and no-tears-push) included 48 trials presented in a pseudorandom order. The order of the tears–approach and tears–avoidance instructions was rotated across participants so that half the participants started with approaching tearful faces and half with avoiding them in the first block.

The time between the JT and the BT (always in that order) was 15 min, during which the participants were involved in a task outside the scope of this study. Each of the two experimental blocks of the BT contained 40 trials and was preceded by a practice block (10 trials). The instruction in one block was to approach tearful faces and to avoid nontearful faces, while the other block implied the opposite instructions. The order of the blocks was rotated.

Statistical Analysis

Average error rates (ERs) and reaction times (RTs) were calculated for each experimental condition within each task. Errors in the JT implied completed responses with an initially wrongly chosen movement, while in the BT they implied an improperly chosen up or down button. Reaction time in the BT was calculated as the time between picture presentation and the release of the middle button. In this way, the RT as a variable of interest always implied the same type of physical movement for both approach and avoidance responses. For the JT, we calculated initiation time, as the time between the stimulus presentation and the very first movement, which allowed us to make a more adequate comparison with the results from the BT. In both tasks, individual median reaction times were calculated as RTs. Median RTs were preferred over mean RTs since they are less sensitive to outliers than arithmetic means (see, e.g., Rinck & Becker, 2007). The RTs of trials involving a movement in the erroneous direction were discarded.

A 2 (presence of tears: tears vs. no-tears) × 2 (movement/direction: pull/approach vs. push/avoid) × 2 (task: JT vs. BT) factorial design was used to analyze ERs and RTs. To control for the influence of the block order (tears-pull/approach-first, tears-push/avoid-first), two between-subject factors (the block order within each task) were added. We performed 2 four-way analyses of variance with tears, movement/direction, and task (JT or BT), as within- and block order combinations as between-subjects independent variables, and ERs and RTs as dependent variables. Irrespective of the absence of a three-way interaction between tears, movement/direction, and task, we also repeated the analyses for each task separately in order to get a deeper insight into the results. Specifically, these additional analyses were necessary for testing whether the interaction between tears and movement direction was statistically significant in each task.

Results

ERs

ERs across the two tasks were moderate (10%), which is consistent with previous AAT and facial expressions findings (Marsh et al., 2005). Significantly more errors were made in the JT than in the BT, .12 vs. .08 per trial; $F(1, 62) = 11.93$; $p = .001$; $\dot{\eta}_p^2 = .16$. Moreover, the average number of errors per trial was significantly higher, $F(1, 62) = 30.14$; $p < .001$; $\dot{\eta}_p^2 = .33$, for tears than for no-tears pictures (.12 vs. .08), while there was no difference, $F(1, 62) < 1$; $p = .98$; $\dot{\eta}_p^2 = .00$, between approach and avoidance (.10 vs. .10) conditions. Finally, neither the two-way interaction between tears and movement direction, $F(1, 62) < 1$; $p = .86$; $\dot{\eta}_p^2 = .00$, nor their interaction with the task was significant, $F(1, 62) = 2.57$; $p = .11$; $\dot{\eta}_p^2 = .04$. Despite the absence of the interaction between tears and movement direction across the tasks, due to its importance to our hypothesis, we performed a similar analysis for each task separately. Such interaction was completely absent in the JT, $F(1, 75) < 1$; $p = .94$; $\dot{\eta}_p^2 = .00$, but it was significant in the BT, $F(1, 64) = 5.80$; $p = .019$; $\dot{\eta}_p^2 = .08$. While there was no difference in ERs between approach and avoidance (.14 vs. .13) of faces with tears, $F(1, 64) < 1$; $p = .39$; $\dot{\eta}_p^2 = .01$, participants made significantly more errors when presented with nontearful faces and instructions to approach them than in case of instructions to avoid them, .06 vs. .02; $F(1, 64) = 17.56$; $p < .001$; $\dot{\eta}_p^2 = .22$.

RT

Participants' RTs were significantly shorter in the BT (546 ms) than in the JT, 625 ms; $F(1, 62) = 9.90$; $p = .003$; $\dot{\eta}_p^2 = .14$, which, together with the differences in ERs points to a substantially better performance in the BT than in the JT, This might be attributed to practice effects since the two tasks followed each other. Further, RTs were shorter when pushing/avoiding than when pulling/approaching stimuli, 574 vs. 596 ms; $F(1, 62) = 7.27$; $p = .009$; $\dot{\eta}_p^2 = .10$. Finally, participants also responded significantly faster to tearful than to nontearful faces (570 vs. 601 ms; $F(1, 62) = 21.46$; $p < .001$; $\dot{\eta}_p^2 = .26$. In the current study design, the latter effect is not particularly interesting, since it certainly takes less time to find what is present (tears) than what is not present (no-tears). What does count is the interactive effect of tears and movement, which was significant, $F(1, 62) = 4.58$; $p = .036$; $\dot{\eta}_p^2 = .07$. While there was no significant difference between approaching and avoiding pictures with tears, 572 vs. 568 ms; $F(1, 62) < 1$; $p = .81$; $\dot{\eta}_p^2 = .00$, participants responded significantly faster when avoiding pictures without tears than approaching them, 581 vs. 621 ms;
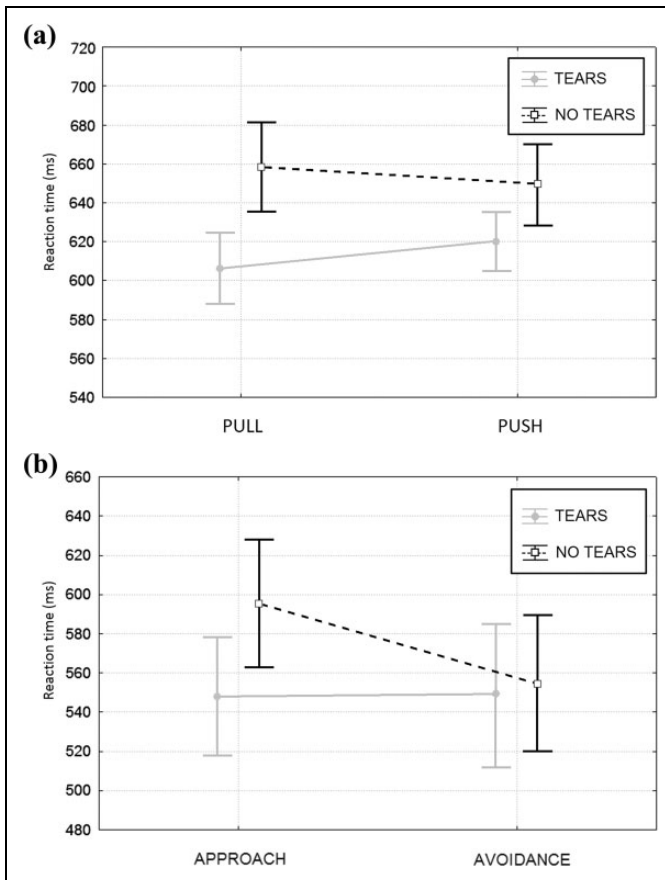
Figure 3. (a) The interaction between tears (tears/no-tears) and movement (pull/push) on reaction times in the joystick task. (b) The interaction between tears (tears/no-tears) and direction (approach/avoidance) on reaction times in the button task.

$F(1, 62) = 10.41$; $p = .002$; $\dot{\eta}_p^2 = .14$. No interaction between tears, movement/direction, and task was observed, $F(1, 62) < 1$; $p = .40$; $\dot{\eta}_p^2 = .01$. The observed pattern of the two-way interaction is in line with our hypothesis, although the size of the effect is relatively small. In order to more directly compare our results with those of Riem et al. (2017), we repeated this analysis without taking into the account the block order. This analysis also yielded a significant two-way interaction, $F(1, 65) = 6.31$; $p = .014$; $\dot{\eta}_p^2 = .09$, making our results highly comparable, and providing additional support for our hypothesis about the approach–avoidance effects of tears.

When each task was analyzed separately, the results revealed a rather complex picture (Figure 3a). Expectedly, the interaction between tears and direction in the JT was significant, $F(1, 75) = 5.07$; $p = .027$; $\dot{\eta}_p^2 = .06$. However, tears were pulled significantly faster than pushed, 607 vs. 620 ms; $F(1, 75) = 5.34$; $p = .024$; $\dot{\eta}_p^2 = .07$, while there was no difference between pulling and pushing for the no-tears pictures, 659 vs. 650 ms; $F(1, 75) = 1.46$; $p = .23$; $\dot{\eta}_p^2 = .02$. In the BT, the expected interaction between tears and direction (Figure 3b)

was also significant, $F(1, 64) = 4.45$; $p = .039$; $\dot{\eta}_p^2 = .06$, but with a more similar interaction pattern to the one observed across the tasks. While there was no significant difference between approaching and avoiding pictures with tears, 548 vs. 549 ms; $F(1, 64) < 1$; $p = .92$; $\dot{\eta}_p^2 = .00$, participants responded significantly faster when avoiding pictures without tears than when approaching them, 555 vs. 596 ms; $F(1, 64) = 8.35$; $p = .005$; $\dot{\eta}_p^2 = .12$. Therefore, while the findings of both tasks thus support our hypothesis about the effects of tears on the increase of approach *relative* to avoidance behavior, the interactive patterns in each specific task are somehow different from each other.

Finally, a comparison of the effects observed for ERs with those found for RTs in the BT reveals that the latter ones did not result from a speed accuracy trade-off: approach responses in the no-tears conditions were both slower and more error-prone than avoidance responses, and there were no differences in either speed or accuracy when faces with tears were presented. Therefore, the observed pattern of the ERs additionally supports our hypothesis. The data and results of the analyses of this experiment are available at https://osf.io/943vt/

Discussion

Based on the general notion that emotional crying implies the elicitation of helping and/or comforting behavior in observers (Hendriks et al., 2008; Vingerhoets & Bylsma, 2015), we hypothesized that the exposure to emotional tears would lead to a relative facilitation of approach compared to avoidance responses. This contrasts the alternative expectation that tears facilitate avoidance relative to approach behaviors because they may elicit negative emotions in observers (see Hendriks et al., 2008). Rather than linking the expected response to tears with a positive or negative valence of the stimulus (e.g., liking or not liking the crying individual), our hypothesis was based on the idea that approach–avoidance reactions to tearful faces are facilitated by a decrease in perceived threat by crying faces compared to non-crying faces. The hypothesis was supported by the interactive effects of the presence of tears, and approach–avoidance reactions on RTs observed across the two different experimental tasks, and by the pattern of ERs in the second task. Despite the methodological differences between the tasks, when their results were subsumed under a joint analysis of RTs, there was a clear overall effect of tears on approach–avoidance reactions. Furthermore, applying the same analytic approach as the one done by Riem et al. (2017), who recently reported on the power of tears to facilitate approach relative to avoidance behavior, the overall interaction effect was even more substantial, and of a comparable size to the one in the latter study. However, all the effect sizes were still relatively small (but see below). It is important to note that in the JT, the difference in RTs of approach and avoidance reactions was present in the tears condition only, while in the BT, the difference was present in the no-tears condition only. The

reason for such a difference could be related to the fact that the order of the two tasks was not counterbalanced, and, therefore, performance in the BT could have been influenced by the preceding JT. In part, the absence of a significant difference between the approach and avoidance RTs during exposure to tears in the BT might be attributed to a floor effect that could have appeared in that task only. Indeed, the average RT of the approach to tearful faces was not only significantly faster in the BT than in the JT, but it was also faster than any average RT in the studies in which responses were given by button presses (e.g., Neumann & Strack, 2000; van Dantzig et al., 2008). This decrease in RTs could be attributed to the methodological differences between the tasks (e.g., initiating a finger movement could be faster than initiating a hand movement) or participants' training in visual search for tears that occurred during the JT. The fact that the ERs also significantly decreased from JT to BT corroborates the latter interpretation. However, since the joint analysis of the results across the two tasks yielded an overall interaction pattern that is characterized by the avoidance of nontearful faces and the absence of such an effect when tears are added, it could be too early to ignore potential theoretical implications of such a result and regard it as a consequence of the floor effect only. We will thus elaborate on this specific finding below.

The only existing study on the approach–avoidance effects of tears (Riem, et al., 2017) provided an initial support for the general hypothesis that tears facilitate approach relative to avoidance responses. The methodology used in that study can be compared to the one used in the BT in our study. However, there are some important differences between our study and the one by Riem and colleagues. First, our study evaluated the hypothesis about the impact of tears on approach–avoidance reactions in two different tasks, rather than a single task, which allows for an additional degree of generalization of the observed effects. Second, while facial expressions in our study were perceived as mildly to moderately negative, Riem et al. used neutral facial expressions. This difference might explain the somehow different pattern of interactions observed across both tasks in our study in comparison to the one applied by Riem et al. (2017), in which there was no overall primacy of avoidance responses, as it was the case in our study.

As we argued above, there are some good reasons to expect that tears facilitate fundamental, immediate approach responses relative to avoidance responses because of the proposed help-elicitation function of crying, and because of their ability to signal the absence of hostile intentions (Gračanin et al., 2018). It could be argued that tears promote such responses because of their ability to act as relatively positive rather than negative stimuli at an elementary level, or even to evoke a certain positive emotional response in observers (see Vingerhoets et al., 2016). However, the findings of some previous self-report studies show precisely the opposite (i.e., people tend to experience negative emotions in response to crying faces; Hendriks et al., 2008; Hendriks & Vingerhoets, 2006). This apparent inconsistency could be explained by the

possibility that the goal of the approaching reaction might be to undo the negative emotion initially evoked by tears. Furthermore, it is possible that more conscious subsequent responses to tears observed in those studies do not necessarily follow the initial behavioral tendencies observed in this study. In the same way as for the expression of sadness, which evoked withdrawal behavior at a more conscious level, but facilitated more automatic (and functionally meaningful) approach behaviors (Seidel et al., 2010), the perception of tears could also affect these two types of behaviors in two different ways, depending on the timescale and the depth of cognitive processing performed. For example, Kaltwasser, Moore, Weinreich, and Sommer (2017) found that, relative to other negative expressions, expressions of distress may facilitate approach rather than avoidance, especially in participants with prosocial preferences, which they explained in the context of the (empathic) *concern hypothesis* (Nichols, 2001). Comparably, Marsh, Ambady, and Kleck (2005) observed the facilitation of approach behavior when participants attended to expressions of fear which, although potentially aversive, may, in fact, represent an affiliative stimulus. These authors suggested that fear expression might function as an appeasement cue, intended to stop conflict and to elicit conciliatory or affiliative behavior, comparable to the submission cues that can be observed in other species.

The findings of Kaltwasser et al. (2017), Marsh et al. (2005), and Seidel, Habel, Kirschner, Gur, and Derntl (2010) are in line with the explanation of effects of perceived tears on approach and avoidance reactions proposed here. While tears, like sadness or fear expressions, might convey negative emotional states (Balsters et al., 2013) and evoke negative emotions in observers (Hendriks & Vingerhoets, 2006), they also seem to represent a strong affiliative stimulus, which is evident in their ability to influence the attributions of friendliness and nonaggressiveness, as suggested above, and to eventually result in non-aggressive and friendly responses toward the crier. A general interactive pattern observed in our study, which is different from the one reported in the until now only published study (Riem et al., 2017) on the approach–avoidance effects of tears offers an additional insight into the possible mechanism through which tears might affect the behavior of the observers. Specifically, it appears that participants in our study (especially in the BT) showed an initial tendency to avoid stimuli, which was diminished by the presence of tears. While one possible explanation of such a result concerns the floor effect discussed above, it is also plausible that in the presence of potentially threatening stimuli (i.e., facial expressions with a certain amount of negative emotion including anger and disgust), tears might have the effects of undoing the initial tendency to avoid such stimuli. Specifically, the moderate amount and relatively high variability of negative emotions in the faces of non-crying models (observed in the pilot study) could have increased the likelihood that, at least in some participants, the initial response to non-crying faces was avoidance, which was then undone by the presence of tears. This fits the idea that tears, in

order to fulfill their attachment, help- and nurturance elicitation function, have to signal submission and the absence of threat (Gračanin et al., 2018).

While further research on the mechanisms involved in approach–avoidance effects of tears should certainly address the plausibility of such an explanation, it is important to stress that it might be problematic to view approach and avoidance responses to certain stimuli as independent reactions, and consequently, to expect a more specific interactive pattern between tears and movement direction (either the one observed in the JT or in BT). Instead, any result that points to a relative primacy of approach relative to avoidance reactions, or vice versa, should be viewed as a result/value on a single continuum. That is the case because the approach–avoidance tendency which is initially facilitated by a certain stimulus sets a baseline value to depart from when the (additional) stimulus of interest is introduced. For example, if somebody offers you candy, then it might be more likely that you will approach, or less likely that you will run away, but the resulting direction depends primarily on the initial threat by (or attraction toward) that individual. Hence, our formulation *approach relative to avoidance* reaction. As stated earlier, a decrease in avoidance and an increase in approach both have the same functional meaning: a reduction in the distance between the observer and the crying person. Nevertheless, the different patterns of interaction between tears and approach–avoidance movements observed in the JT and the BT call for more attention of researchers. Therefore, future research should try to explore the question whether tears specifically facilitate approach or block avoidance tendencies in observers.

The current study yielded the first systematic evidence that emotional tears may facilitate basic approach relative to avoidance responses. The observed distance-change effects were of a relatively small size but consistent across two different tasks. It has to be noted that such effect sizes are common in approach–avoidance studies (e.g., Jones, Young, & Claypool, 2011; Wilkowski & Meier, 2010). In addition, it is important to note that the signaling value of tears manifests itself primarily in the context of close interpersonal attachment relations (Nelson, 2005). On the other hand, most of the experimental studies on the signal value of tears were based on the assessment of reactions to unfamiliar crying individuals, which is why it is not surprising that the size of the effects of tears is often relatively small (e.g., Balsters et al., 2013; Hendriks & Vingerhoets, 2006). Relatedly, one of the few studies that assessed reactions to tears depending on the degree of closeness between crier and observers revealed that providing comfort and understanding seemed far less likely for a stranger than for an intimate (Vingerhoets, 2013). Thus, the replication of the current study should primarily be attempted in the context of variations in closeness and attachment relationships. The next steps should also imply searching for the exact mechanisms that could be at the basis of these effects. To that aim, it would be crucial to evaluate the effects of tears in conditions in which participants have to decide about the presence of irrelevant features of the stimuli,

such as, e.g. eye color, which would allow us to test hypotheses about the type of processing involved in the occurrence of these effects. Even more importantly, the exposure to tears should be combined with stimuli that vary in valence (e.g., happy, sad, or neutral expression) as well as with goals of the actions that would vary in valence (e.g., "making a friend happy"). Such a strategy would not only advance the research on approach–avoidance reactions to tears, but it may also contribute to an ongoing debate about whether the *motivational mechanism* or *the evaluative coding mechanism* is at the basis of all approach–avoidance effects (e.g., Eder & Hommel, 2013; Eder & Rothermund, 2008; Krieglmeyer, Deutsch, De Houwer, & De Raedt, 2010; but see Eder, Rothermund, & Hommel, 2016 for an integrative solution). Furthermore, recent studies of approach–avoidance reactions in the domain of facial expressions also point to the importance of the moderating role of context variables (e.g., Krieglmeyer & Deutsch, 2013; Paulus & Wentura, 2016). Adding contextual information may not only increase the ecological validity of the results, but it might represent a crucial step in searching for more basic mechanisms responsible for the approach–avoidance effects of tears in particular and emotional expressions in general. The role of contextual variables such as the emotional context, power or status relations, perceived appropriateness of tears, or aggressive and helping behaviors directed toward (non)crying individuals should be evaluated (see, e.g., Elsbach & Bechky, 2018; Van Kleef, 2016). Finally, future research would benefit from taking into account potentially relevant characteristics of observers, such as diverse forms of psychopathology, including autism, social anxiety, or more extreme forms of psychopathy. Similarly, personality features such as agreeableness, or more specifically, aggressiveness or empathy could play a role as well.

Note

1. The participants whose data were missing due to the noncompliance with the instruction were continuously pressing up or down arrow buttons while holding the release button.

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