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Crying and Health: Popular and Scientific Conceptions

Ad Vingerhoets

Department of Psychology and Health
Tilburg University
Tilburg, The Netherlands

Lauren Bylsma

Department of Psychology
University of South Florida
Tampa, Florida

Abstract

We summarize popular and pre-scientific conceptions of the relationship between crying, well-being and health, and we review the scientific literature on this topic. First, the focus is on whether crying brings relief and facilitates emotional recovery. Next, we discuss the evidence addressing whether crying or its chronic inhibition is associated with an increased risk of developing health problems. Finally, we address crying as a signal or symptom of disease. It is concluded that the question regarding whether crying brings relief has yielded seemingly contrasting findings, dependent on the design of the study. Concerning the second and third issues, there is a lack of sound studies. Little is known about the nature of the association between depression and crying. The evidence for a relationship between neurological disorders (in particular, stroke and multiple sclerosis) appears more convincing. There is also mainly anecdotal evidence of increased crying in a wide variety of health problems, which may reflect symptoms of disease, co-morbid depression, adjustment problems, or side effects of treatment. Some recent studies further suggest a positive effect of crying on health status in certain patient groups. More systematic and well-designed studies are needed to clarify the relationship between crying and health.

Keywords: crying, health, well-being, coping strategy

Introduction

Crying is a universal and uniquely human way of expressing emotions. It permeates our lives from the very beginning (e.g., “the primal scream”) until the end, when we die. During the course of our lives, nearly without exception, all

✉ Ad Vingerhoets, Department of Psychology and Health, Tilburg University, P.O. Box 90.153, 5000 LE Tilburg, The Netherlands. E-mail: Vingerhoets@uvt.nl

important emotional events are typically associated with the shedding of tears, whether they be positive (e.g., weddings, the birth of a child, winning a gold medal at the Olympic Games) or negative events (e.g., the loss of beloved persons or cherished goods, failing at important events). However, one should be aware that such emotional events are also rather rare and therefore cannot explain the crying frequency of adults (women 2 - 5 times per month, men .5 - 1 time per month, see Vingerhoets & Scheirs, 2000). Indeed, crying seems more often to be elicited by common and everyday, though not necessarily trivial, experiences. This suggests that not only the specific causal event is relevant, but other contextual factors and individual differences also play a role in crying behavior.

The capacity to shed emotional tears has surprisingly received little serious attention from the scientific community. Further complicating the issue, the rather scarce research that has been done has employed very different theoretical viewpoints. Furthermore, there is little connection between the studies, which are conducted by researchers with different backgrounds. This may explain why we know rather little about this intriguing phenomenon and why many obvious questions concerning antecedents, moderators and consequences of crying cannot yet be answered adequately.

In this contribution, the focus will be on the relationship between crying and mental and physical health. As we will demonstrate, the idea that the expression of emotions in particular, and its opposite, the inhibition of emotional expression, may be important for our mental and physical well-being, is widespread and has a long history.

A closer examination of these claims reveals that it is important to distinguish between the immediate effects of crying (versus suppression of a single crying episode) and the long-term effects of regular crying (versus chronic inhibition of tears). First, there is the claim that crying brings relief. For example, Darwin (1872/1965) points out that "Children, when wanting food or suffering in any way, cry out loudly (...) partly as a call for their parents for aid, and partly from any great exertion serving as a relief" (p. 174). He even suggested a dose-response relationship, as evidenced by the following comment: "And by as much as the weeping is more violent and hysterical, by so much will the relief be greater, — on the same principle that the writhing of the whole body, the grinding of the teeth, and the uttering of the piercing shrieks, all give relief under an agony of pain" (p. 175). Breuer and Freud (1968, p. 8) refer to tears in "Studies on Hysteria" as "involuntary reflexes" that discharge affect so that a "large part of the affect disappears." According to Menninger, Mayman and Pruyser (1964), crying may be considered as perhaps the most human and most universal of all relief measures. Actually, already two thousand years ago, the Roman poet Ovid voiced this conviction when stating that "It is a relief to weep; grief is satisfied and carried off by tears."

However, crying is not only expected to bring immediate relief, but long term health benefits as well. In common lore the chronic inhibition of tears has been claimed to endanger our physical health. As shown by Cornelius (1986), in the popular media of a period covering 130 years (between 1850 and 1985), the conviction prevails that crying, and emotional expression more generally, should be regarded as beneficial for one's health, whereas withholding one's tears may have damaging health effects. Headaches, ulcers, hypertension, and insomnia are mentioned as examples of disorders that were considered to result from the failure to cry.

There is an even longer history of the presumed association between crying and health in writings on medicine and the arts. For example, as early as 1694, the Dutch physician and philosopher Franciscus Mercurius Van Helmont wrote about the necessity of crying after bereavement in order to prevent the development of distemper or sickness. A further well-known quotation is from the poem "The Princess", written in 1847 by Alfred Lord Tennyson:

*Home they brought the warrior dead;
She nor swooned nor uttered cry.
All her maids, watching said,
'She must weep or she will die.'*

The famous British psychiatrist Sir Henry Maudsley (1835-1918) has been attributed the statement that "Sorrows which find no vent in tears may soon make other organs weep." Other examples of the conviction that crying is healthy and beneficial can be found in Solter (1995), who considers crying "an inborn healing mechanism" (p. 28) and in Mills and Wooster (1987), who describe crying as a "vital part of a healing or growing process that should not be hindered" (p. 125). Nearly 35 years ago, Rees (1972) speculated that the increased mortality observed after bereavement in men may be partly due to repression of the expression of sadness, including crying. More recently, Frits Zorn, the pseudonym for a Swiss cancer patient, wrote in his 1988 autobiography that all the tears that he had never wept nor had wished to weep during his life had massed in his neck and had created his tumor, because (as he formulated) their true function (i.e., being shed) had not been attained. On the internet, it is also not difficult to find statements expressing the relevance of crying for one's emotional and physical well-being. For example, on the site <http://www.primalworks.com> one can read "Crying is essential to human health. Just as sweating is necessary for heat regulation, crying is necessary for emotional regulation," and "With proper non-judgmental support, crying will lead to an inner emotional movement towards balance and health. Healing is not always immediate, but will occur with time." In addition, the concern is expressed that "Unfortunately, our natural ability to cry, and thus to heal, has been suppressed. Crying is part of our emotional immune system, and we desperately need to get it back." These quotes leave little doubt: Cry or die!

It is clear that the popular belief is that crying is beneficial to one's health; however, what is the scientific evidence related to this question? In what follows, we will focus on the relationship between crying and health from three different perspectives. In particular, the following topics will be discussed: (1) the immediate effects of crying on mental and physical well-being; (2) the long-term health effects of the expression and inhibition of crying; (3) the relationship between health status and specific disease states and crying, as well as crying as a sign or a symptom of disease. This question will be briefly discussed for both infants and adults, with special attention given to depression and neurological disorders (e.g., stroke and multiple sclerosis). Finally, we will briefly address the effects of anti-depressive medication on crying.

Does crying bring relief and promote physical recovery?

Under this heading, the focus will be on studies that have investigated the short-term consequences of crying on subjective well-being and physiological functioning. In addition, we will review the ideas put forth about the possible neurobiological mechanisms that might underlie the supposed beneficial health effects of crying.

Concerning the immediate effects of crying on one's mental well-being (i.e., relief), mixed results have been reported, apparently dependent on the design of the study. Quasi-experimental laboratory studies in which subjects are exposed to sad films have demonstrated negative effects as a result of the shedding of emotional tears. Specifically, people who cried while watching a sad film, without exception, felt sadder and more depressed afterwards than people who did not cry (see Cornelius, 1997; Stougie, Vingerhoets & Cornelius, 2004 for a review). In contrast, naturalistic studies in which participants are asked to report on their last crying episode using survey or experiential sampling techniques yield a very different picture. For example, as reported in Bylsma, Vingerhoets, and Rottenberg (submitted), when participants across 37 countries were asked about their most recent crying episode, most reported feeling better mentally after crying compared to how they felt before crying (51.4%), while 38.3% reported feeling the same, and 9.7% felt worse. In terms of physical improvement, 27% felt better physically after crying, 56.4% reported feeling the same and 15.6% felt worse.

How can we explain these seeming contrasting findings? Are the retrospective self-reports biased and do they rather reflect what the respondents think that should have happened (so called "implicit theories") rather than their actual feelings? Or is there a bias in their memory? For example, are they more likely remember and/or report crying episodes that are associated with feelings of relief? Alternatively, do the positive effects of crying occur gradually over an extended period of time, making the timing of the measurements in the quasi-experimental film studies not

optimal, since they generally are taken a very short period of time after the crying is elicited? Could it be that the “no pain, no gain” hypothesis is valid, stating that the crying individual first has to experience the deepest and most negative feelings, before the recovery sets in? May people feel embarrassed when crying in the laboratory? A final explanation that deserves attention concerns Cornelius’ (1997) suggestion that crying in response to a film does not bring any resolution to the situation that precipitated the crying episode, whereas in real life crying may stimulate individuals who are present, to change the conditions that caused the individual to cry or to provide emotional support, such as comforting words and behaviors. In other words, perhaps it is not the act of crying itself that might bring relief, but rather the positive and comforting reactions from others. Indeed, in an international study spanning 37 countries and including over 5500 respondents, Becht and Vingerhoets (2001) established that self-reported mood improvement was negatively associated with the shame induced by crying. Also using data from this same set of respondents, Bylsma et al. (submitted) found that self-reported mood improvement after crying was related to receipt of positive social support and resolution of the situation that caused the crying to occur. Furthermore, suppression of crying and the experience of shame during crying were negatively related to mood improvement after crying. Additionally, Cornelius (1997) showed that there was an association between the self-reported effects of crying on one’s mood and the effects of crying on the situation or the relationship with the other present people. On the other hand, the comparison of the self-reported mood effects of crying alone situations versus crying with others present, revealed that, contrary to expectations, there was no difference in the effects of shedding tears on one’s well-being. In addition, a comparison with data obtained in a retrospective study on crying induced by music, in which it is unlikely that there is a resolution of a problem, yielded very similar data than the study on crying in general. These findings challenge the view that possible positive effects of crying are determined by the reactions of the social environment and the impact of crying on the situation. In conclusion, the issue of the immediate effects of crying on one’s mood is not yet definitively settled. More precisely, it is not yet clear to what extent the reactions of the social environment play a role, and we neither have adequate insight into the developmental issues or the putative underlying mechanisms.

There are also a few studies in which cardiovascular activity has been measured before, during, and after crying, although it is not easy to determine its precise onset and offset (see Hendriks, Rottenberg & Vingerhoets, 2007). These studies unequivocally show that there is an initial increase in heart rate; crying is associated with physical arousal. However, there is also some evidence that in a later phase crying is associated with increased activity of the parasympathetic nervous system, which is linked specifically with recovery processes and relaxation (but also with helplessness and passive coping!). Rottenberg, Wilhelm, Gross and Gotlib (2003) reported interesting findings suggesting that crying might stimulate parasympathetic physiological activity (as indexed by respiratory sinus arrhythmia,

RSA) in healthy individuals, but not in depressed individuals. RSA refers to heart rate variability, thought to be an index of self regulation capacity that helps individuals react to stressors. Therefore, these results suggest that crying may have a physiologically adaptive effect in healthy but not in depressed individuals. However, more recently, Hendriks et al. (2007) could not establish whether the increased parasympathetic activity followed or preceded the crying; therefore, a causal relationship cannot yet be established. Finally, there are two studies (Labott, Ahleman, Wolever & Martin, 1990; Martin, Guthrie & Pitts, 1993) investigating the effects of crying on secretory immunoglobulin A (S-IgA), an immunologic variable that serves as a first-line defense against invasion by potential pathogens. When people cried in this study, there were significant decreases of S-IgA levels, reflecting decreased protection against pathogens. Such decrements in S-IgA were not found when subjects only felt sad but did not cry. In other words, not the mere feeling of sadness, but the specific act of crying appears to have a negative influence on the body's defense mechanisms.

Taken together, there is little evidence that crying has a relaxing effect on our body, although there is also no evidence unambiguously against this view. However, on the other hand, some remarkable findings have been reported in some clinical and animal studies, indeed suggesting a beneficial effect of shedding emotional tears for one's health. For example, over 60 years ago, Saul and Bernstein (1941) and French (1939) found intriguing relationships between crying and course of urticaria (i.e., hives) and asthma, respectively. Saul and Bernstein described a reciprocal relationship with symptom development and weeping in a patient. When the patient cried she did not have urticaria and the attacks usually terminated with weeping. Conversely, when she suppressed her tears she developed urticaria. According to French (1939), his clinical observations led him to believe that many asthma attacks terminate when crying begins. Kepecs, Robin and Brunner (1951) reported a relationship between crying and exudation into cantharides blisters in the skin. When inducing emotional states through hypnosis, these authors demonstrated that the inhibition of crying was followed by an initial drop in the exudation rate, later followed by an increase if the inhibition continued. More recently, two remarkable Japanese studies on the effects of crying in clinical samples have been published. The first study, among patients with rheumatoid arthritis (RA), suggested that shedding tears reduces the negative influence of stress on the neuroendocrine and immune responses in peripheral blood (Ishii, Nagashima, Tanno, Nakajima & Yoshino, 2003). As a result, patients who were moved to tears appeared to have a more easily controlled RA compared with those who were emotionally affected but not moved to tears. The second study (Kimata, 2006), demonstrated that the allergic reactions of patients suffering from latex allergy were significantly reduced after having cried while watching an emotional movie. Furthermore, no reductions in allergic symptoms were observed for the group exposed to the emotional film but failed to shed tears, or for either group after a non-emotional video. A final most intriguing study was conducted by

Il'inskii Spevak, Kochetkov, Solovéva, Krsnikova and Radyukhin (1985) which demonstrated that stimulation of the lacrimal system facilitated wound healing in rats. Given the recent evidence that psychological pain and physical pain are neurobiologically closely connected (Eisenberger, Lieberman & Williams, 2003), one may wonder whether crying, which typically occurs when people are in pain, has been developed to sooth psychological pain and to promote physical recovery in case of injury. In summation, there is some evidence that crying may be beneficial in reducing symptoms for a variety of health problems, including asthma, arthritis, and allergic reactions, and it may even promote recovery and healing processes.

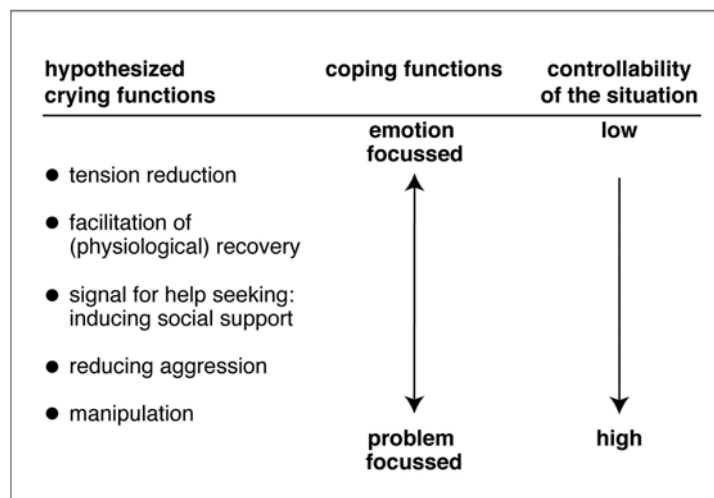
In addition, there is some intriguing animal work by Bayart, Hayashi, Faull, Barchas, and Levine (1990) who examined the reactions of juvenile monkeys to separation from their mothers. A particularly remarkable finding was the negative association between plasma cortisol levels and vocalizations expressing distress. In other words, screaming was related to a reduction in cortisol secretion. Assuming that human crying is equivalent to these distress reactions, it may be hypothesized that human crying also reduces cortisol production, therefore, promoting the recovery of the homeostatic balance within the body. Vingerhoets and Kirschbaum (1997) measured mood and saliva cortisol in women exposed to an emotional movie and found moderate but significant associations between self reported intensity of the crying and decrease in cortisol, but no differences were found between the mean levels of crying and non-crying participants. In conclusion, there is some evidence in support of the hypothesis that crying may reduce stress responses.

Regarding the second question, whether the chronic inhibition of crying may put individuals at risk for the development of health problems, two kinds of studies are important to consider. First, one may wonder whether people who never or rarely cry have a greater risk of developing health problems. Alternatively, similar to the so-called "buffer-hypothesis" of social support (cf. Cohen & Wills, 1985), one could speculate that the hypothesized beneficial effects of crying are only present in case of exposure to emotionally stressful events, whereas crying has no relation with health if one is spared the confrontation with emotionally demanding situations. Unfortunately, the limited number of relevant studies all suffer from serious methodological limitations, preventing definitive conclusions from being drawn. We have conducted a few studies to establish the relationship between crying proneness or estimates of crying frequency and self-reported health status. These studies typically found zero or very weak negative correlations, suggesting, if anything, that people who cry more often feel less, rather than more, healthy (see Vingerhoets & Scheirs, 2001, for review). In addition, there are some studies that have compared crying behavior of patients groups and, in some cases, healthy controls. For example, Sadoff (1965) investigated the attitudes towards crying of two patient groups (i.e., "psychosomatic" patients, who came from allergy and

dermatology clinics, and hospitalized schizophrenic or depressed psychotic patients) and healthy students. The psychiatric patients indicated crying more easily than the other two groups, but no differences in the meaning attributed to crying or the attitudes toward crying were found between the groups. Crepeau (1981) compared ulcer and colitis patients with healthy controls and concluded that healthy persons cry more and have a more positive attitude toward tears than both patient groups. However, the retrospective nature of these studies and other methodological weaknesses prevent definitive conclusions about the precise nature of the relationships found. More specifically, the demonstrated differences might be the consequence of their afflicted health state. In particular, in relation to asthma, there is not only evidence that crying may stop asthma attacks (see above), but, the other way around, asthma patients may learn to refrain from crying because this behavior can trigger or exacerbate an asthma attack (Miller, 1987; Miller & Wood, 1997). Similar observations have been made with respect to migraine, which also may be induced by crying (Evans, 1998). Schlosser (1986) also failed to find an association between crying frequency and physical disorder.

Finally, there is one study (Labott & Martin, 1987) in which the effects of crying as a coping mechanism have been investigated. The results demonstrated that individuals with a high number of stressors who cried frequently did not feel better – actually even worse – than comparable persons who failed to cry in similar conditions. Nevertheless, this study is interesting because it is tempting to speculate about the value of crying as a coping mechanism. As summarized in Figure 1, crying may theoretically be considered a unique coping behavior, because it unites in itself both emotion-focused and problem-focused coping strategies. Future studies should be specifically designed to examine this idea.

Figure 1. Crying as a coping behavior



In order to be able to determine whether there is a causal relationship between two variables, it is important to have insight into the putative underlying mechanisms that might be responsible for the supposed positive effects of crying on mood, well-being, and health. The following four possibly relevant hypotheses have been identified. The first idea, mentioned earlier, is that crying stimulates the activity of the parasympathetic nervous system. This branch of the autonomic nervous system – the counterpart of the sympathetic branch, which is associated with stress and activity - is connected to relaxation and recovery, but also to helplessness and giving-up (Vingerhoets, 1985). Along these lines, both Rottenberg et al. (2003) and Hendriks et al. (2007) have demonstrated that crying is indeed associated with a parasympathetic rebound mechanism, but it could not be concluded whether this parasympathetic activity might have elicited or simply accompanied the tears rather than being the result of it (Hendriks et al., 2007). In other words, crying may not speed up the recovery of psychological or physiological homeostasis; it just may be an indicator of increased parasympathetic activity. Another possible mechanism that has received much attention in the popular media is Frey's (1985) idea that tear glands function in the removal of toxic waste products (including stress hormones), which are released in the blood when we are in distress. According to this author, cleansing the blood from these substances will result in a better mood and perhaps even better health. However, the amount of toxic waste products removed by tears is very small at best. Furthermore, tears are, to a great extent, again reabsorbed in our nose. This formulation further would expect that crying induced by irritants, such as onions or tear gas, especially in individuals who inhibit their crying, would also have a positive effect on one's well-being, which seems unlikely. A third idea is that sobbing increases the amount of inspired cold air, which may result in the cooling of the hypothalamus, a very important structure in the emotional brain, or that the accompanying changes in the facial muscles and vasculature influence one's mood by facilitating or inhibiting neurochemical processes in the brain (McIntosh, Zajonc, Vig & Emerick, 1997; Zajonc, Murphy & McIntosh, 1993). There is indeed some limited evidence that a lowered brain temperature has a positive effect on mood (Parr & Hopkins, 2000). Remarkably, in the facial feedback literature, both increases and decreases of the emotional experience as a result of facial expressions of emotion have been suggested. Finally, based on preliminary animal work by Panksepp (1998), one could speculate that crying promotes the release of substances like endorphins (i.e., morphine-like substances that are released in the brain that increase our pain tolerance and improve our mood). However, we are not aware of any direct test of this hypothesis. More research on this question is clearly needed.

In conclusion, this review of the literature reveals a serious lack of well-designed studies directly relevant to the questions of interest. There is currently no evidence suggesting that the chronic inhibition of crying is causally related to the development of health complaints. However, given the poor quality of the studies

conducted until now, there is neither any strong evidence for or against this idea. Apparently, this is a blank field needing theory guided, well-designed, methodologically-sound studies, meeting the methodological requirements formulated by Nyklíček, Denollet and Vingerhoets (2002). Finally, we would like to ask attention for two important, but as yet unresolved issues. First, it is remarkable that, when in the popular literature, one speaks about the beneficial effects of crying, one always refers to adult crying. We are not aware of any quotes suggesting that the crying of babies or children will bring them relief, but rather the communicative function of crying in youngsters is emphasized. This would imply that somewhere in the course of development, the catharsis function develops. This raises of course the question, when this important development takes place. Does this cathartic function first develop when the communicative function is no longer important, because the child has acquired verbal skills for communication purposes? Second, there is the question why would, in particular, would be important for our health, while, for example, blushing, which shares a lot of features with crying, is never mentioned in popular media as relevant in this respect? For a good understanding of the effects of crying on our health status, such questions should be empirically addressed and definitely answered.

Crying as a sign or symptom of disease states

There is little doubt that the crying of babies serves the purpose of communicating to others that they are in need of help or support. The caregiver's attention is attracted and the clear request is made that certain action must be undertaken (e.g., removal of the source of one's distress, feeding, or just physical proximity).

Frequent crying in babies may be related to the pain and discomfort caused by many acute health problems, including infectious disease, gastro-intestinal and metabolic disease. It may also be associated with child abuse and drug withdrawal (see Merkley, 2006, for an overview). Crying is also considered a pain behavior in pain assessment systems for neonates (Stevens, Johnston & Gibbins, 2000).

However, the crying of babies is probably more than just an alarm signal, and, in the case of chronic ill health conditions, there appears to be not just a quantitative but also a qualitative difference in the acoustical characteristics of the crying of sick compared to healthy babies (Furlow, 1997; Soltis, 2004). Most notable is that babies with a compromised health status, such as neurological disorders, disturbed metabolism, and infectious diseases cry not only more often and more intensely, but also at a higher pitch than healthy babies. Whereas normal crying is in the range of 300 – 600 Hz, crying of babies with health problems typically is in the over 600 Hz range (Furlow, 1997). The crying signal thus provides the parents with information about the health status, or in evolutionary terms, the fitness of the baby.

In prehistoric times, this would have been particularly relevant, because, from an evolutionary point of view, it does not make sense to invest time and energy in offspring that is not very likely to forward its genes to a next generation. Although there is hardly any human research addressing this issue, it has been demonstrated in twin studies that mothers react faster to the crying of healthy babies than to the distress vocalizations of those with a compromised health status (Mann, 1992). Studies on the acoustic characteristics of crying have limited themselves to the crying of infants; we are not aware of similar studies in older children or adults.

In adults, the research on crying in pathological groups is mainly concentrated on patients with neurological disorders, particularly stroke and multiple sclerosis. A significant minority of these patients suffer from what has been labeled, among other things, pathological crying, emotional incontinence, or involuntary emotional expression disorder (IEED, Cummings et al., 2006). In addition, there is a limited research devoted to crying in depression. Finally, there is some, mainly anecdotal evidence, of increased crying associated with a number of other adverse health conditions, which we will briefly discuss later. It is generally not clear to what extent in such cases the increased emotionality reflects adjustment problems to the disease, co-morbid depression symptomatology, medication effects, or a real symptom of the disorder or disease.

To start with the relationship between crying and depression, similarly as it applies to the presumed health promoting effects of crying, it is quite easy to find quotes in the popular and (semi-)scientific literature suggesting that depression and crying are very closely linked. For example, Timothy Bright described as the most important student of melancholy of 16th century England wrote in his famous work "A Treatise of Melancholie" (1586, p. 135) that "Of all the actions of melancholie. ... none is so manifolde and diverse in partes, as that of weeping". In a similar way, Charles Darwin noted in his work on the expression of emotions in men and animals (1865/1972, p. 154):

"The insane notoriously give way to all their emotions with little or no restraint; and I am informed by Dr. J. Crichton Browne, that nothing is more characteristic of simple melancholia, even in the male sex, than a tendency to weep on the slightest occasions, or from no cause. They also weep disproportionately on the occurrence of any real cause of grief. The length of time during which some patients weep is astonishing, as well as the amount of tears they shed."

These statements leave little doubt that (excessive) crying is considered a characteristic symptom of depression. However, this is in sharp contrast to the lack of attention to crying in currently applied diagnostic tools to identify major depression, such as the Statistical Manual of Mental Disorders (DSM), or specific interviewing techniques (e.g., Composite International Diagnostic Interview, CIDI), and some depression questionnaires (e.g., Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), Montgomery-Åsberg Depression Rating Scale (Montgomery & Åsberg, 1979).

In short, scrutinizing the different editions of the DSM (see Patel, 2001; Vingerhoets et al., 2007) reveals that crying or tearfulness has not been consistently considered a diagnostic criterion for various mood disorders (e.g., dysthymia, bipolar disorder, and major depressive disorder). Whereas in DSM-III, crying proneness and fits of crying are among thirteen symptoms, of which three must be met for the diagnosis of dysthymia in the DSM-IV, crying is no longer mentioned as a symptom of dysthymia. Crying is also not required in the diagnosis of adjustment disorder. This latter disorder may obtain the qualifier “with depressed mood” in the last four editions of DSM by virtue of increased tearfulness, or by other manifestations of depressed mood such as reports of depressed mood or feelings of hopelessness. Finally, neither the DSM-III or the DSM-III-R mention crying or tearfulness as a symptom of major depressive disorder (MDD). Subsequently, in the DSM-IV one of the two symptoms, at least one of which should be met for the diagnosis MDD, is depressed mood, a psychological state that can be derived from a list of symptoms that include feeling or appearing “tearful” based on subjective reports or observations of others. In sum, while crying has often been mentioned as a sign of mood disorders, the evaluation of crying as relevant for a diagnosis of depression by the DSM has been inconsistent, and it is neither a necessary nor a sufficient criterion to diagnose any of the mood disorders. This also holds for other diagnostic tools. For example, in the ICD-10, crying is not a necessary or a sufficient condition for diagnosis of any of the mood disorders, and the same applies for the MDD module in the CIDI. Only the dysthymia module in the CIDI has an item “During a two year period of being depressed, were you often in tears?”

Examination of some of the most frequently applied depression inventories (see Vingerhoets et al., 2007 for details) discloses that most of them contain an item on crying or tearfulness, although the precise wording may differ considerably. For example, in some inventories, (e.g., the Zung Self-Rating Depression Scale), not the actual shedding of tears but rather “feeling like” crying is the focus of the items. With only one exception (i.e., BDI-II), all inventories which include a crying item assume a linear relationship between crying and depression, with more frequent and easier crying being scored as indicative of a more severe level of depression. To a certain extent, this also holds for the BDI-II, but in contrast to all other measures, here it is the inability to cry which obtains the highest score and which is considered a sign of severe depression. The BDI-II is also the only inventory that specifically measures changes in reported crying behavior (i.e., I don’t cry any more than I used to, I cry more than I used to, I cry over every little thing, I feel like crying but I can’t).

A limited number of mainly older studies have examined the relationship between crying and depression in non-clinical and clinical samples. Kraemer and Hastrup (1988) found no relationship between general depression levels and estimated yearly crying frequencies in a non-clinical sample. Labott and Martin

(1987) also failed to find a relation between self-reported mood disturbances and measured crying frequency. In contrast, Hastrup, Baker, Kraemer and Bornstein (1986) demonstrated a significant correlation between the frequency of feeling like crying and the BDI total score, in a non-clinical sample of elderly volunteers. No association was found between the annual crying frequency and the BDI score, but when the sample was divided into a mildly depressed (BDI score between 4-10) and a nondepressed group (BDI < 4) a higher crying frequency was found in the mildly depressed than in the nondepressed group. Frey, Hoffman-Ahern, Johnson, Lykken and Tuason (1983) reported a significant difference in monthly crying frequency, when comparing a depressive group and healthy controls. These investigators noted, however, that the distributions of the crying frequencies of both groups were quite similar, and emphasized that this overlap limits the usefulness of crying as a diagnostic criterion for depression. In a non-clinical sample of 82 men and 118 women with a BDI score of 15 and higher, 43% of the depressed men reportedly were unable to cry, even if they wished to, compared to 14% of the depressed women, which suggests that gender may moderate the association between crying frequency and depression (Hammen & Padesky, 1977). More recently, Gran (2003) conducted a population-based study among Norwegian women on depression, with special attention to the postpartum period. She concluded that crying was not related to other depression symptoms and, therefore, could not be considered a useful indicator of depression.

One may wonder whether a more robust association between depression and crying would be found if clinically depressed individuals were studied or if behavioral measures of crying were used. Unfortunately, the few studies of crying in clinically depressed samples have largely been limited to describing demographic and clinical features associated with this behavior. In addition, since these were older studies, obsolete concepts were sometimes focused on. For example, based on ward observations, Davis, Lamberti and Ajans (1969) concluded that crying was more common among neurotic than among psychotic depressives.

Rottenberg, Gross, Wilhelm, Najmi and Gotlib (2003) examined crying behavior of clinically depressed individuals in an experimental study. No difference in the likelihood of crying in response to a sad film between the depressed and the nondepressed group was found. Thus, these results again fail to support the idea that a lower crying threshold is characteristic of depression. On the other hand, Rottenberg, Cevaal and Vingerhoets (in press) recently found that people diagnosed with mood disorders reported increased cry proneness to negative antecedents and increased crying frequency, whereas post-crying mood improvement was reportedly low relative to a normative comparison group. Finally, to make things more confusing, there is also some evidence – admittedly rather weak – suggesting that depressed patients not only have a reduced capacity to weep, but may also experience a general emotional blunting and feelings of indifference (see Vingerhoets et al., 2007). In conclusion, there is currently no clarity regarding the

influence of mood disorders on crying behavior. One may wonder if certain premorbid characteristics (specific personality features, attachment style; see Nelson, 2005) play a role as determinants of the precise nature of the changes.

There are also a few studies that have explicitly focused on the effects of anti-depressive medication on crying in depressed patients. Opbroek and colleagues (2002) compared self-reported emotional responses of 15 patients diagnosed for MDD with healthy controls. It appeared that the patients, among others, reported a significantly reduced capacity to cry compared to controls. Because the design had some weaknesses and the validity of the measure is questionable, care should be exercised in attaching too much value to these findings. However, given the results of studies among neurological patients, this finding is not unanticipated. Research among patients with neurological disorders suffering from "pathological crying" suggests dramatic and fast decreases in crying even after rather low doses of antidepressants, particularly SSRI's (Horrocks, Hackett, Anderson & House, 2004; Shaibani, Sabbagh & Kahn, 2001).

Crying and neurological disorders

Since the end of the 19th century, clinicians have been aware that brain lesions may be accompanied by increased emotionality as well as pathological laughing and crying (PLC). The terminology for this disorder is rather confusing in that many labels are used in the literature to describe this phenomenon, while at the same time some important differences can be noted in the definitions. To illustrate this issue, in the literature one also comes across terms such as pseudobulbar affect, emotionalism, emotional incontinence, and the recently introduced term Involuntary Emotional Expression Disorder (IEED; Cummings et al., 2006). There is some disagreement regarding whether or not the displayed emotions reflect real affect or not. Some clinicians assert that pathological crying has nothing to do with emotional experience, but rather just with the motor aspects of emotional expression. The behavior is considered to be pathological because it is not appropriate to the context of the situation and it may continue unabated. Some clinicians claim that this condition is primarily a motor problem, rather than an emotional disorder. Others, however, emphasize that the main characteristics of this condition imply that the person has difficulty in keeping his/her emotions and/or behavior under control. They admit that there is always a trigger for the tears and therefore prefer terms like emotionalism or emotional incontinence.

Manzo, Heath and Blonder (1998) qualitatively studied the effects of IEED on interpersonal interactions (i.e., how the patients and others in their social environment deal with the symptoms). They identified four types of reactions. A first major reaction is empathy, which refers to the capacity to feel or express the same feelings as those felt and expressed by another person. In this context,

empathic responses (e.g., crying along with the patients) establish that crying is normal and explicable rather than pathological. A second management technique, initiated by the crier, is derision of the crying. A minority of the patients are able to clearly indicate that they are not crying because they are sad, but rather the other way around (i.e., that they are sad because they suffer from this uncontrolled condition). This strategy may help patients to distance themselves from their crying behavior. By regarding the crying as intrusive and unwanted, it may paradoxically be *normalized* in some sense. A third strategy is to search for an explanation or excuse for the crying. For example, the crying may be explained by referring to emotional or medical (non-stroke related) issues, such as sinus congestion or allergy. Finally, in a similar vein, the explanation can be related to the premorbid characteristics of the patient – more specifically, that the person always has been a sensitive, emotional person, who rather easily let his/her tears flow.

It is likely that such coping responses determine to what extent the patients suffer from this condition. There is some evidence suggesting a negative effect of IEED on both self-image and/or social interactions (Mukand, Kaplan, Senno & Bishop, 1996). For example, anxiety about losing control over one's emotions can even lead to the development of a social phobia (Robinson, Parikh, Lipsey, Starkstein & Price, 1993). In addition, these kinds of coping strategies may prevent others, including health professionals, from becoming aware that the patient really suffers. The ultimate consequence can be that these patients are not properly diagnosed and, therefore, do not receive adequate treatment. Moreover, the uninhibited crying can seriously hinder rehabilitation. Finally, Brown, Sloan, and Pentland (1998) suggested that the limitations caused by IEED can be as life-inhibiting as the physical effects of stroke. In some cases, IEED attacks may even be life-threatening (e.g., if they occur while swallowing food during eating).

While IEED is annoying for both patients and their caregivers, the patients themselves rarely complain about it. This could be due to several factors, including the fact that many of them do not realize that treatment is possible, or they feel ashamed to talk about it or scared that just talking about it in itself will bring on an attack (Shaibani et al., 2001). Doctors often do not pay adequate attention to this condition or fail to recognize it because the appropriate questions about laughing or crying attacks are often not asked. In addition, many health professionals are not aware of all the symptoms and associated problems of IEED or the possible treatments (Brown et al., 1998; Shaibani et al., 2001). On the other hand, there is a consensus that mood and behavioral changes in these patients need to be treated adequately in order to improve their quality of life (Carota, Staub & Bogousslavsky, 2002).

There have been several studies suggesting that anti-depressive medication, particularly SSRI's, are rather effective in treating these problems (Horrocks et al., 2004; Shaibani et al., 2001). Even in rather low doses — actually too low to achieve

improvement in depressive symptomatology – these agents have a positive effect on the uninhibited crying.

Other disease conditions

A review of the literature suggests that there are quite a few illustrations, mainly individual cases, which suggest increased crying in different patient groups. The following psychiatric disorders may be associated with uncontrolled crying: schizophrenia, hysteria, bipolar disorder and psychoses. But also cancer patients may report an increase in crying (Carelle, Piotto, Bellanger, Germanaud, Thuillier & Khayat, 2001; see also Redd, 1982). Often, it is not always clear to what extent crying should be considered a symptom of a specific disease, a side effect of treatment, or alternatively, should be attributed to the general psychological effects of coping with a serious illnesses. Carelle et al. (2001) showed that increased crying was reported, in particular, by unmarried patients. These results suggest a relationship with a potential lack of social support and problematic coping, but also quite specifically with gastro-intestinal cancer, which leaves the possibility that there is some specific link with this type of cancer or its treatment. Finally, there is at least some anecdotal evidence suggesting that prostate patients, particularly those being treated with Lupron injections, may suffer from increased emotionality and/or increased tearfulness (Gray, 2004). Here again, it is not clear whether these changes are related to the awareness of one's vulnerability or to the decreased testosterone levels. Also in women treated with Lupron for endometriosis, this substance may cause irritable mood, mania and crying spells (Rachman, Garfield, Rachman & Cohen, 1999). The patient in the case study described by De Assis Aquino Gondim and Thomas (2002) exhibited short attacks of crying during vestibular migraine attacks. Dark, McGrath and Ron (1996) suggested that IEED may also be the result of exposure to diverse chemical substances, including interferon-alpha (Gleason & Yates, 1999) and barbiturates (Dark et al., 1996). Patients who have suffered from transient ischemia (Mendez & Bronstein, 1999) and those who have undergone cardiovascular bypass surgery (Pilowsky, 1992) have also been found to be vulnerable to IEED. Finally, Bartholomew (2000) provides an example of an outbreak of motor hysteria among adolescent Muslim girls in Malaysia, accompanied by crying fits and screaming.

In sum, crying may be seen in patients suffering from a wide variety of diseases. However, the specific status of it may differ considerably – it may be a symptom, a side effect of a treatment, the symptom of co-morbid depression, a reflection of problems with adjustment, among other possibilities. In some cases there seems to be a close association with mood, in other examples the tearfulness may come quite suddenly, and is the association with mood rather loose. It will be clear that this complex picture prevents the formulation of simple advice regarding

how to deal with the crying of (medical) patients. A careful evaluation and systematic examination of all possible causes is a first requirement.

CONCLUSION

In the present contribution, we have summarized and contrasted the popular lore and research evidence that has examined the relationship between crying and health. The focus was both on the immediate psychological and physiological effects of crying, suppression of crying as a risk factor for the development of health problems, and crying as a sign or symptom of a compromised health status. We have demonstrated that there is a wide gap between what the general public and clinicians believe and what actually has been scientifically demonstrated. More specifically, there is little empirical evidence supporting the popular idea that crying brings relief and that the inhibition of crying may be damaging for one's health. However, the results of some specific studies definitively warrant further exploration of the effects of crying on stress hormones and specific effects in certain patient groups.

The notion that there is a strong relationship between crying and depression is also not supported by the current available data. In contrast, there is more evidence that uncontrolled crying is a relatively common problem in patients with neurological disorders; in particular stroke, multiple sclerosis and ALS.

Crying may have been neglected in the behavioral sciences, because it has been considered merely a symptom of sadness or depression. Therefore, in the same way as there is no interest to examine specifically the "butterflies in the stomach" in the context love or the symptom of weak at the knees in the case of anxiety, investigators probably do not consider crying as an important research topic. However, upon closer examination, it appears that crying is much more than just a symptom of a negative mood state. In actuality, it is a complex behavior with unique evolutionary and developmental features, as well as remarkable intra- and inter-individual differences. For an adequate understanding and appreciation of this complex phenomenon, the collaboration of scientists with different backgrounds, including neurobiologists, ethologists, clinical, cross-cultural and developmental psychologists, as well as psychiatrists is greatly needed.

REFERENCES

- Bartholomew, R. (2000). *Exotic deviance: Medicalizing cultural idioms – from strangeness to illness*. Boulder: University Press of Colorado.
- Bayart, F., Hayashi, K.T., Faull, K., Barchas, J.D., & Levine, S. (1990). Influence of maternal proximity on behavioural and physiological responses to separation in infant rhesus monkeys (*Macaca mulatta*). *Behavioral Neurosciences*, 104, 98-107.

- Becht, M.C., & Vingerhoets, A.J.J.M. (2001). Crying and mood change: A cross-cultural study. *Cognition and Emotion*, 16, 87-101.
- Breuer, J., & Freud, S. (1895/1968). *Studies on hysteria*. In *The standard edition of the complete psychological works of Sigmund Freud* (pp. 3-17). London: Hogarth Press.
- Brown, K.W., Sloan, R.L., & Pentland, B. (1998). Fluoxetine as a treatment for post-stroke emotionalism. *Acta Psychiatrica Scandinavica*, 98, 455-458.
- Bright, T. (1586). *A treatise of melancholie. Containing the causes thereof, & reasons of the strange effects it worketh in our minds and bodies: with the physicke cure, and spirituall consolation for such as have thereto adioyned an afflicted conscience*. London: Thomas Vautrollier.
- Bylsma, J, Vingerhoets, A.J.J.M., & Rottenberg, J. (submitted). When is crying cathartic? An international study.
- Carelle, N., Piotto, E., Bellanger, A., Germanaud, J., Thuillier, J., & Khayat, D. (2002). Changing patient perceptions of the side effects of cancer chemotherapy. *Cancer*, 95, 155-163.
- Carota, A., Staub, F., & Bogousslavsky, J. (2002). Emotions, behaviours and mood changes in stroke. *Current Opinion in Neurology*, 15, 57-69.
- Cohen, S., & Wills, T.A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98, 310-357.
- Cornelius, R.R. (1986). Prescience in the pre-scientific study of weeping? A history of weeping in the popular press from the Mid-1800's to the present. *57th Annual Meeting of the Eastern Psychological Association*, New York.
- Cornelius, R.R. (1997). Toward a new understanding of weeping and catharsis? In A.J.J.M. Vingerhoets, F.J. van Bussel, & A.J.W. Boelhouwer (Eds.), *The (non-) expression of emotions in health and disease* (pp. 303-321). Tilburg: Tilburg University Press.
- Crepeau, M.T. (1981). A comparison of the behavior patterns and meanings of weeping among adult men and women across three health conditions“. *Dissertation Abstracts International* 42, 137-138B.
- Cummings J.L., Arciniegas, D.B., Brooks, B.R., Herndon, R.M., Lauterbach, E.C., Piro, E.P., Robinson, R.G., Scharre, D.W., Schiffer, R.B., & Weintraub, D. (2006). Defining and diagnosing involuntary emotional expression disorder. *CNS Spectrums*, 11, A1-A7.
- Darwin, Ch. (1872/ 1965). *The Expression of Emotions in Man and Animals*. Chicago: University of Chicago Press.
- Davis, D., Lamberti, J., & Ajans, A.Z. (1969). Crying in depression. *British Journal of Psychiatry*, 115, 597-598.
- Dark, F.L, McGrath J.J, & Ron, M.A (1996). Pathological laughing and crying. *Australian and New Zealand Journal of Psychiatry*, 30, 472-479.
- De Assis Aquino, F., Gondim, M.D., Florian, P., & Thomas M.D. (2002). Crying migraine: Emotional incontinence associated with attacks of vestibular migraine. *Headache: The Journal of Head and Face Pain*, 42, 1066-1067.

- Eisenberger, N.I., Lieberman, & Williams, K. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science*, 302, 290-292.
- Evans, R.W. (1998). Crying migraine. *Headache: The Journal of Head and Face Pain*, 38, 799-800.
- Frey, W.H. (1985). *Crying: The mystery of tears*. Minneapolis: Winston Press.
- Frey, W.H., Hoffman-Ahern, C., Johnson, R.A., Lykken, D.T., & Tuason, V.B. (1983). Crying behavior in the human adult. *Integrative Psychiatry*, 1, 94-100.
- French, T.M. (1939). Psychogenic factors in asthma. *American Journal of Psychiatry*, 96, 87-101.
- Furlow, F.B. (1997). Human neonatal cry quality as an honest signal of fitness. *Evolution and Human Behavior*, 18, 175-193.
- Gleason, O.C., & Yates, W.R. (1999). Five cases of interferon-alpha-induced depression treated with antidepressant therapy. *Psychosomatics*, 40, 510-512.
- Gran, M.E. (2003). *Depression in women with focus on the postpartum period*. Doctoral Dissertation, Oslo: Oslo University.
- Gray, R. (2004). No longer a man: Using ethnographic fiction to represent life history research. *Auto/Biography*, 12, 44-61.
- Hammen, C.L., & Padesky, C.A. (1977). Sex differences in the expression of depressive responses on the Beck Depression Inventory. *Journal of Abnormal Psychology*, 36, 609-614.
- Hastrup, J.L., Baker, J.G., Kraemer, D.L., & Bornstein, R.F. (1986). Crying and depression among older adults. *Gerontologist*, 26, 91-96.
- Hendriks, M.C.P., Rottenberg, J., & Vingerhoets, A.J.J.M. (2007). Can the distress-signal and arousal-reduction views of crying be reconciled? Evidence from the cardiovascular system. *Emotion*, 7, 458-463.
- Il'inskii, O.B., Spevak, S.E., Kochetkov, N.V., Solov'eva, A.I., Krsnikova, T.L., & Radyukhin, V.A. (1985). Role of lacrimal glands in wound healing. *Bulletin of Experimental Biology and Medicine*, 100, 948-950.
- Ishii, H., Nagashima, M., Tanno, M., Nakajima, A., & Yoshino, S. (2003). Does being easily moved to tears as a response to psychological stress reflect response to treatment and the general prognosis in patients with rheumatoid arthritis? *Clinical and Experimental Rheumatology*, 21, 611-616.
- Horrocks, J.A., Hackett, M.L., Anderson, C.S., & House, A.O. (2004). Pharmaceutical interventions for emotionalism after stroke. *Stroke*, 35, 2610-2611.
- Il'inskii, O.B., Spevak, S.E., Kochetkov, N.V., Solov'eva, A.I., Krsnikova, T.L., & Radyukhin, V.A. (1985). Role of lacrimal glands in wound healing. *Bulletin of Experimental Biology and Medicine*, 100, 948-950.
- Ishii, H., Nagashima, M., Tanno, M., Nakajima, A., & Yoshino, S. (2003). Does being easily moved to tears as a response to psychological stress reflect response to treatment

- and the general prognosis in patients with rheumatoid arthritis? *Clinical and Experimental Rheumatology*, 21, 611-616.
- Kepecs, J.G., Robin, M., & Brunner, M.J. (1951). Relationship between certain emotional states and exudation into the skin. *Psychosomatic Medicine*, 13, 10-17.
- Kimata, H. (2006). Emotion with tears decreases allergic responses to latex in atopic eczema patients with latex allergy. *Journal of Psychosomatic Research*, 61, 67-69.
- Kraemer, D.L., & Hastrup, J.L. (1988). Crying in adults: Self-control and autonomic correlates. *Journal of Social and Clinical Psychology*, 6, 53-68.
- Labott, S.M., & Martin, R.B. (1987). The stress-moderating effects of weeping and humor. *Journal of Human Stress*, 13, 159-164.
- Labott, S.M., Ahleman, S., Wolever, M.E., & Martin, R.B. (1990). The physiological and psychological effects of the expression and inhibition of emotion. *Behavioral Medicine*, 16, 182-189.
- Mann, J. (1992). Nurturance or negligence: maternal psychology and behavioral preference among preterm twins. In J.H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 367-390). New York: Oxford University Press.
- Martin, R.B., Guthrie, C.A., & Pitts, C.G. (1993). Emotional crying, depressed mood and secretory immunoglobulin A. *Behavioral Medicine*, 19, 111-114.
- Manzo, J.F., Heath, R.L., & Blonder, L.X. (1998). The interpersonal management of crying among survivors of stroke. *Sociological Spectrum*, 18, 161-184.
- McIntosh, D.N., Zajonc, R.B., Vig, P.S., & Emerick, S.W. (1997). Facial movement, breathing, temperature, and affect: Implications of the vascular theory of emotional efference. *Cognition & Emotion*, 11, 171 – 196.
- Mendez, M.F., & Bronstein, Y.L. (1999). Crying spells as symptoms of a transient ischaemic attack *Journal of Neurology, Neurosurgery and Psychiatry*, 67, 255.
- Menninger, K., Mayman, M., & Pruyser, P.W. (1964). *The vital balance*. New York: Viking Press.
- Merkley, K. (2006). The crying infant in the emergency department. *Journal of Emergency Nursing*, 32, 535-540.
- Miller, B.D. (1987). Depression and asthma: A potentially lethal mixture. *Journal of Allergy and Clinical Immunology*, 80, 481-486.
- Miller, B.D., & Wood, B.L. (1997). The influence of specific emotional states on autonomic reactivity and pulmonary function in asthmatic children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 669-677.
- Mills, C.K., & Wooster, A.D. (1987). Crying in the counselling situation. *British Journal of Guidance and Counselling* 15, 125-131.
- Montgomery, S, & Åsberg, M. (1979). A new depression scale designed to be sensitive to change. *British Journal of Psychiatry*, 134, 382-389.

- Mukand, J., Kaplan, M., Senno, R.G., & Bishop, D.S. (1996). Pathological laughing and crying. *Archives of Physical and Medical Rehabilitation*, 77, 1309-1311.
- Nelson, J.K. (2005). *Seeing through tears: Crying and attachment*. New York: Brunner-Routledge.
- Nyklíček, I., Vingerhoets, A.J.J.M., & Denollet, J. (2002). Emotional (non-)expression and health: Data, questions, and challenges. *Psychology and Health*, 17, 517-528.
- Opbroek, A., Delgado, P. L., Laukes, C., McGahuey, C., Katsanis, J. Moreno, F.A., & Manber, R. (2002). Emotional blunting associated with SSRI-induced sexual dysfunction. Do SSRIs inhibit emotional responses? *International Journal of Neuropsychopharmacology*, 5, 147-151.
- Parr, L.K., & Hopkins, W.D. (2000). Brain temperature asymmetries and emotional perception in chimpanzees (*Pan troglodytes*). *Physiology & Behavior*, 71, 363-371.
- Panksepp, J. (1998). *Affective neuroscience*. New York: Oxford University Press.
- Patel, V. (2001). Crying and psychiatric disorder. In A.J.J.M. Vingerhoets & R.R. Cornelius (Eds.), *Adult crying: A biopsychological approach* (pp. 247-264). Hove: Brunner-Routledge.
- Pilowsky, I. (1992). Easily provoked crying. *The Medical Journal of Australia*, 157, 576.
- Rachman, M., Garfield, D.A.S., Rachman, I., & Cohen, R. (1999). Lupron-induced mania. *Biological Psychiatry*, 45, 243-244.
- Rees, W.D. (1972). Bereavement and illness. *Journal of Thanatology*, 2, 814-819.
- Redd, W.H. (1982). Treatment of excessive crying in a terminal cancer patient: A time-series analysis. *Journal of Behavioral Medicine*, 5, 225-235.
- Robinson, R.G., Parikh, R.M., Lipsey, J.R., Starkstein, S.E., & Price, T.R. (1993). Pathological laughing and crying following stroke: Validation of a measurement scale and a double-blind treatment study. *American Journal of Psychiatry*, 150, 286-293.
- Rottenberg, J., Cevaal, A., & Vingerhoets, A.J.J.M. (in press). Do mood disorders alter crying? A pilot investigation. *Depression and Anxiety*.
- Rottenberg, J., Gross, J.J., Wilhelm, F.H., Najmi, S., & Gotlib, I.H. (2002). Crying threshold and intensity in major depressive disorder. *Journal of Abnormal Psychology*, 111, 302-312.
- Rottenberg, J., Wilhelm, F.H., Gross, J.J., & Gotlib, I.H. (2003). Vagal rebound during resolution of tearful crying among depressed and non depressed individuals. *Psychophysiology*, 40, 1-6.
- Sadoff, R.L. (1965). Crying and weeping in emotional and psychosomatic illness. *Psychosomatics*, 6, 229-240.
- Saul, L.J., & Bernstein, C. (1941). The emotional settings of some attacks of urticaria. *Psychosomatic Medicine*, 3, 349-369.
- Schlusser, M.B. (1986). *Anger, crying, and health among females*. Annual Meeting of the American Psychological Association, Washington DC.

- Solter, A.S. (1995). Why do babies cry? *Pre- and Perinatal Psychology Journal*, 10, 21-43.
- Soltis, J. (2004). The signal functions of early infant crying. *Behavioral and Brain Sciences*, 27, 443-490.
- Stevens, B., Johnston, C., & Gibbins, S. (2000). Pain assessment in neonates. In K.J.S. Anand, B.J. Stevens, & P.J. McGrath (Eds.), *Pain in neonates. Pain research and clinical management*, (pp. 101-134). Amsterdam: Elsevier.
- Shaibani, A.T., Sabbagh, M.N., & Khan, B.N. (2001). Pathological human crying. In A.J.J.M. Vingerhoets, & R.R. Cornelius (Eds.), *Adult crying. A biopsychosocial approach* (pp. 265-276). Hove: Brunner-Routledge.
- Stougie, S., Vingerhoets, A.J.J.M., & Cornelius, R.R. (2004). Crying, catharsis, and health. In I. Nyklíček, L. Temoshok, & A.J.J.M. Vingerhoets (Eds.), *Emotional expression and health* (pp. 276-286). Hove: Brunner-Routledge: 276-286.
- Vingerhoets, A.J.J.M. (1985). The role of the parasympathetic division of the autonomic nervous system in stress and the emotions. *International Journal of Psychosomatics*, 32, 28-34.
- Vingerhoets, A.J.J.M., & Kirschbaum, C. (1997). Crying, mood and cortisol. *Psychosomatic Medicine*, 59, 92-93.
- Vingerhoets, A.J.J.M., & Scheirs, J.G.M. (2000). Sex differences in crying: Empirical findings and possible explanations. In A. H. Fischer (Ed.), *Gender and emotion: Social psychological perspectives* (Studies in emotion and social interaction, 2) (pp. 143-165). Cambridge: Cambridge University Press.
- Vingerhoets, A.J.J.M., & Scheirs, J.G.M. (2001). Crying and Health. In A.J.J.M. Vingerhoets & R.R. Cornelius (Eds.), *Adult crying: A biopsychosocial approach* (pp. 227-246). Hove: Brunner-Routledge.
- Vingerhoets A.J.J.M., Rottenberg, J., Cevaal, A., & Nelson, J.K. (2007). Is there a relationship between depression and crying? A review. *Acta Psychiatrica Scandinavica*, 115, 340-351.
- Zajonc, R.B., Murphy, S.T., & McIntosh, D.N. (1993). Brain temperature and subjective emotional experience. In M. Lewis & M. Haviland (Eds.), *Handbook of emotions* (pp. 209-220). New York: Guilford.

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