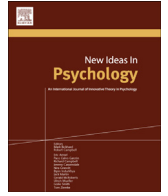


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Meaning and importance of weeping

C.V. Bellieni

Department of Mother and Infant, University Hospital, Siena, Viale M Bracci 8, 53100, Siena, Italy

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ABSTRACT

Most animals can cry but only humans have psychoemotional shedding of tears, also known as “weeping”. The aim of this review is to analyze and discuss the available data on the function and significance of weeping. It emerged that weeping is a behavior distinct from crying. Crying is the immediate reaction to pain or anger, it is not always associated with shedding tears, and indicates a peculiar and shocking change in behavior. Weeping is a more complex phenomenon: it is a behavior that induces empathy perhaps with the mediation of the mirror neurons network, and influences the mood through the release of hormones elicited by the massage effect made by the tears on the cheeks, or through the relief of the sobbing rhythm. It also emerged from the present review that weeping is not a “mild” or “weak” response to stress, but that it is a strong behavior with positive effects on health and social interaction.

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Humans and animals express their emotions in several ways. The strongest emotions provoke expressions with specific bodily behaviors, changes in gestures, in physiological parameters and in hormone production. Two important ways to express emotions are crying and weeping. The [Chambers's Etymological Dictionary \(1928\)](#) distinguishes the two terms: “Cry: To utter a shrill loud sound, especially one expressive of pain and grief”. “Weep: To express grief by shedding tears”. They are often confused, but a thorough observation can highlight distinct features and distinct meanings. Crying is a signal and a symptom ([Barr, Hopkins, & Green, 2000](#)). Most animals use crying to alert or to scare other animals, or as a reflex induced by sudden pain. Crying is characterized by bodily features (peculiar face changes, tremors, increased muscular tone or loud voice) and hormonal increase. Weeping appears in cases of sorrow, regret, or loneliness, but also happiness. It is always correlated to shedding tears, unlike crying ([Williams, 1966](#)).

The aim of this paper is to review theories and evidences about weeping, in order to assess whether it is really distinct from crying, and to highlight its function.

1. Most animals can express their sorrow and rage; some can cry

To different degrees, all animals feel affection, happiness,

jealousy, and fear. They express these feelings in different ways and in various degrees of intensity. [Darwin \(1871\)](#) stated that there are no fundamental differences between the mental faculties of upper mammals and humans. He further stated that a certain similarity exists between existing primitive vertebrate fish, such as the lamprey, and simians. He added that animals feel pleasure, happiness, fear, and anguish, as it can be clearly observed when young animals play together in ways similar to human children. [Darwin \(1872\)](#) then described how most non-human animals and humans express their emotions through their face and body (knitting their eyebrows, pursing their lips, moving their eyes, pricking up their ears, bristling their hair, etc.). The same organ can express different states of mind, e.g. a dog's tail tucked between its legs shows fear, raised shows anger, and wagging shows happiness. Animals can express suffering in many ways and they can even cry ([Blumberg & Sokoloff, 2001](#); [Custance & Mayer, 2012](#)) to express rage, hunger or fear.

2. Humans are the only animals who can weep

Weeping has been scientifically demonstrated only in humans. ([Frey, DeSota-Johnson, Hoffman, & McCall, 1981](#); [Murube, 2009](#)). *Homo sapiens* are the only animals that, in its ethological behavior, has at present been proven to have developed lachrymal psychoemotional hypersecretion in some specific emotional states of mind. ([Jones, 1966](#); [Montagu, 1960](#); [Records, 1979](#); [van Renynghe de Voxxrie, 1991](#)). Vocal crying is beneficial as a call for help, but

E-mail address: cvbellieni@gmail.com.

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weeping, with psycho-emotional shedding of tears, is of no use or benefit to the eye. Darwin (1872) wrote that weeping “must have been acquired since the period when man branched off from the common progenitor of the genus *Homo* and of the non-weeping anthropomorphous apes.” (p 154). The gorilla has not proved to have psycho-emotional weeping. Fossey said that she had never observed a gorilla weeping, except once, when a 3-year old female gorilla in captivity began to sob and shed actual tears when staring at her former jungle home where she had lived in liberty (Fossey, 1983). The chimpanzee has emotions and plays infantile games similar to those of human children (Fossey, 1983). Ladycina-Kots and DeWaal (2000) and Goodall (1986) studied the behavior of chimpanzees for many years, and observed many of their psychological characteristics, such as aggressiveness, curiosity, and responses produced by the death of beloved chimpanzees, but researchers –with the above quoted anecdotal exception - have not observed chimpanzees expressing their emotions through weeping (Frey & Langseth, 1985)

3. Crying vs weeping

The experience of crying is common in humans and animals; it is a reaction to pain and anger (Wickler, 1965). It is present at every age of life, and it is characterized by expressing with emphasis and aggressiveness of one's feelings. It is a symptom and a signal; it can be a symptom of pain, a signal of warning or of anger (Barr, Hopkins & Green, 2001). It is commonly represented by a series of changes in behavior, namely changes in heart rate, blood pressure, face color and expression, muscular tone, as well as in the tone of a voice, and by the production of specific hormones like adrenalin (Anderson & Bushman, 2002).

Weeping is a phenomenon limited to humans, though not all humans weep and not all to the same extent. The frequency of weeping varies with age. Infants and young children weep very often, but with age people learn to control their weeping behavior, according to the impression they wish to convey. Weeping in dismay may be repressed so as not to convey weakness. On the other hand, a person weeping in response to a happy emotional situation is likely to be viewed in a positive way, as is a person weeping in empathy to another's pain or loss. Traditionally, weeping has been considered more acceptable in women than in men. The duration of weeping is four times longer in women than in men (Vons, 2014). In women, the frequency of weeping changes with their menstrual cycle, and is more frequent a few days before the onset of pre-menstruation and menstruation (Frey & Langseth, 1985; Moos, 1968) and around ovulation. Newborns cry but do not weep, they do not produce tears until about 2–3 months of age (Touwen, 1976).

When pain is moderate the subject can weep, but when it exceeds a certain threshold, it is no more associated with shedding tears but is replaced by crying. Weeping is not necessarily a social event, but can happen when alone: in cases of sorrow or psychological stress, people weep even when others are not present. Weeping is not always due to sorrow: in some cases people weep for positive emotions, e.g. during a marriage, or a romantic movie. Weeping is supposed to be associated to endorphin production (see later).

4. The origin of weeping

TS Szasz (1959) described the soothing sensation due to tears as a return to the wet of the amniotic fluid and to the rhythmic movements induced by the mother in the womb, which sobbing can mimic. Nevertheless, this hypothesis did not receive sufficient endorsement from further studies. Another hypothesis was that

when prehistoric humans began to use fire in farewell ceremonies and funeral cremations, they associated the reflex of tears being produced by the smoke with the act of separation, and, thus, they began to connect the sadness of separation with the shedding of tears. (MacLean, 1993). Nevertheless, smoke was used much less frequently in situations of loss or bereavement than in practical activities associated with stress or relief of stress, such as cooking (discomfort from hunger, relief from hunger), heating (discomfort from cold, relief from cold), and maintaining the fire source (requirement to work, physical exertion), and in none of these situations did humans develop associated psychological shedding of tears. This shows the weakness of MacLean's argument (Strieder, 2005). Another hypothesis that has received scarce attention is that weeping clears toxic substances from the body. Frey wrote: “Like the excretory processes of exhaling, urinating, perspiring, and defecating, emotional shedding of tears may play a vital role in maintaining homeostasis by removing waste and harmful substances ... perhaps the reason people feel better after weeping is that through their tears they may be removing chemicals that have built up as a result of emotional stress.” (Frey et al., 1981) Nevertheless, blood composition changes in some normal states (e.g. asleep vs awake), as well as in physiologic extreme situations (e.g. hypo- or hyperhydration), pathologies and intoxication. However, these conditions do not produce homeostatic hyperlacrimation in order to eliminate any specific product, nor has it been proven through tear analyses that blood products are present in tear composition. Humans have homeostatic systems and organs, such as kidney/urine, lungs/breath, intestines/defecation, skin/perspiration, which serve to clear the blood efficiently and on a constant basis. Each lacrimal gland has a mean volume of only 0.19 cc in males and 0.17 cc in females, (Koutrouza-Tavlaridis & Elzarka, 2003) and its blood flow is about 0.6 cc/minute in each gland. This quantity is insignificant in relation to the 5000 cc of blood in the body.

Montagu (1960) suggested that when children weep, tears are produced to protect the nasopharynx from desiccation because, although some of the produced tears spill out, some go into the nose and nasopharynx: “Even a fairly short session of tearless crying in a young infant has a drying effect upon the mucous membranes of the nasopharynx ... Excessive intake and expulsion of air, even in adults, will quickly dry mucous membranes ... When for any reason drying is produced in the mucous membrane, the cilia tend to lose their function and soon die ... The consequences of this are not infrequently lethal ... crying with tears, on the other hand, serves to keep the mucous membrane wet and to assist in maintaining its function ... those who were not so able would be more likely to succumb more frequently at any age, and leave the perpetuation of the species to those who could weep.”. However, there are several reasons to doubt this hypothesis. Firstly, newborns do not produce emotional tears in their first weeks of life, when they are at their most defenseless, and, adolescents and adults usually weep with the excretion of emotional tears but without phonic crying. Secondly, weeping dries up the trachea, the vocal chords, the oropharynx, the nasopharynx, the mouth and the nose. Swallowing ones tears only wets the nose, rhinopharynx and esophagus, but not the vocal chords or trachea. Saliva is a better source of wetting, because it does not need the complex lacrimal pathway to reach the nasopharynx and vocal apparatus and because it is much more abundant and less conspicuous than tears. Thirdly, many mammals bleat, bellow, and roar for long periods without developing a concomitant lacrimal hypersecretion. Conversely, humans have developed weeping, but they have not developed hyper-lacrimation during other activities that require extreme levels of inhaling/exhaling, e.g. during intense physical exercise, shouting, singing or speaking for a long period of time.

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