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Remembering emotions

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Abstract
Memories and emotions are both vital parts of everyday life, yet crucial interactions between the two have scarcely been explored. While there has been considerable research into how emotions can influence how well things are remembered, whether or not emotions themselves can be remembered is still a largely uncharted area of research. Philosophers and scientists alike have diverging views on this question, which seems to stem, at least in part, from different accounts of the nature of emotions. Here, I try to answer this question in a way that takes an intuitive notion of emotion and includes both scientific as well as philosophical aspects of both emotions and memory. To do this, I first distinguish between two different ways emotions can be expressed: as certain physiological responses, or as certain conscious experiences. Next, I show how each of these expressions of emotions can be remembered. Finally, I bring these two ways of expressing emotions, and the ways of remembering each of them, together into an explanation that also includes aspects often ascribed to emotions such as cognition. This interdisciplinary endeavor aims to serve as a starting point on what it could mean to remember emotions, and in doing so tries to build a bridge between scientific research and philosophical investigation of the memory of emotions.

Keywords Emotion · Memory · Feeling · Remembering · Episodic

Introduction

People often experience emotions when remembering events. Yet, it seems unclear in what ways a currently experienced emotion can be related to the remembering of an event. Put more specifically, is it possible to remember an emotion per se, that is, in a similar way someone remembers something like a visual experience?

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Philosophers and scientists alike have diverging opinions on this question (Debus 2007; James 1983; LeDoux 1992; Christianson and Safer 1996; Ribot 1897; Ross 1991; Titchener 1895; Levine et al. 2006), but a satisfactory answer is still lacking. At the same time, both memory and emotions arguably play a vital role in everyday life. This question gets even more complicated primarily because of the many different accounts surrounding the concept of emotions, and the lack of consensus on this matter—both, between and within different academic disciplines (Dixon 2012; Izard 2010; Mulligan and Scherer 2012). Therefore, to answer the question in a manageable way, I pick phenomena of interest, which form the foundation of a model of emotions that covers intuitive, scientific and philosophical aspects. By combining an empirical basis with a philosophical framework, I try to answer the question whether and how emotions per se can be remembered. Bringing these different approaches together, will enable this investigation to serve as a bridge between scientific research and philosophical debate on the interplay between memory and emotions.

Outline and objectives

After a general introduction that points out the main kind of memory that is under consideration here ("The issue at hand: remembering an emotion" section) and gives an overview of relevant accounts of emotions, I first lay out a differentiation between two expressions or components often attributed to emotions: physiological responses and conscious experiences ("Defining emotions" section). Having set the stage, I answer the question of what it might mean to remember each of these expressions of emotions ("What does it mean to remember an emotion?" section). Finally, I summarize how exactly these expressions of emotions and their respective memories can relate to an event, which includes taking a look at cognitive, evaluative and intentional aspects often attributed to emotions ("What is the relation between an event, an emotion and memory of that emotion?" section).

The issue at hand: remembering an emotion

Intuitively, it does not seem clear what exactly is meant when someone says *remember an emotion*. Different interactions between memory and emotions are imaginable, and it seems easiest to analyze this by using an analogy to a more familiar concept such as remembering a visual experience.

When I was a child, I moved from a rural mountain area to a busy metropolitan city. The thing that horrified me the most in my new life were the neighborhood dogs. All dogs I had encountered in the mountains were big livestock guardian dogs, which did a great job of scaring every child that would dare cross their field of view. Since a few neighbors in this new city had dogs, I was terrified of going outside in fear of an unwanted encounter with the dogs. One time, while I was on my way back home from school, one of the dogs got loose from its leash and stormed towards me. Suffice it to say, I ran for my life in a state of horror.

When I think back to those dogs there is a lot I can remember, but only a few of those things will be of immediate concern here. I can remember facts about them such as that one of them was ash-gray. Memory of concepts and facts like these is often termed *semantic* or *propositional memory* (Debus 2017; Squire 2004; Bernecker 2011), and does not require that one makes reference to something they have experienced. After having read this, you could also remember that one of the dogs was ash-gray, although you have never seen it. But intuitively speaking, you could not remember anything *experiential* about the dogs in the same way I do, as I have experienced events involving those dogs while you probably have not. You could remember seeing other dogs, but it seems that you could not remember seeing *those* dogs I mentioned earlier, unless you actually saw them. Memories of experiences like these are often subsumed under the terms *episodic* or *experiential memory* (Teroni 2017; Debus 2017; Squire 2004; Bernecker 2011). If I think back, I can in a way 'see' the color of that dog's fur again.[1]

Similar to remembering these visual impressions, one might ask if it is possible to experientially remember an emotional experience. If I think back to that dog breaking loose, barking, and chasing me, I can feel a slight shiver down my spine, and am overcome with a certain uneasiness. But is this enough to say that I remember the emotion of fear I had experienced back then?

Defining emotions

The debate on what an emotion is or what constitutes an emotion is long, arduous and with no agreed upon answer (Dixon 2012; Izard 2010; Mulligan and Scherer 2012). Likewise, I will not try and resolve it here. Instead, I will start with a commonsense notion and give a short overview of prominent accounts of emotions from science and philosophy to see how the initial definition fares in light of them and adjust it when it seems lacking.

Since the endeavor set out in this paper is an interdisciplinary one, adapting an already established definition seems disadvantageous, because it runs the risk of excluding entire disciplines or strands thereof (e.g., some would possibly exclude feelings since they see feelings as completely distinct from emotions, or should at least be viewed as such (Adolphs 2019)). Thus, so as not to exclude entire disciplines and to avoid scientists and philosophers talking past each other, as, I believe, might have been the case in the past, e.g. (Debus 2007; LeDoux 1992), I will start with a commonsense notion that serves as a working definition and assumes only so much as to sufficiently reflect the phenomena under consideration here, and from there on show its limitations given the described accounts, and if need be revise the definition accordingly. The choice of accounts (both, scientific as well as philosophical) will be necessarily subjective given the scope of the paper. However, I will

[1] In what follows, semantic or propositional memory will not be playing a role. Instead, experiential remembering is the kind of memory that will be the focus here.

include aspects of other prominent accounts later on (particularly in "What is the relation between an event, an emotion and memory of that emotion?" section).

As will be shown later, however, while I do think that the definition given at the end of this section will contain many important aspects from prominent theories, like others (Adolphs and Andler 2018), I do not claim it is the ultimate answer to the question of what an emotion is but hope it is enough to make an account of what it is to remember emotions possible.

A tentative commonsense start of what an emotion is

Intuitively, two aspects that seem prototypical of emotions are often mentioned in commonsense definitions of emotions. One is that emotions involve some kind of bodily change or physiological response,[2] such as fear involving an increase in heart rate or faster breathing. At the same time, emotions are often described as certain conscious experiences, or feelings, with a specific phenomenology, which can be difficult to describe intersubjectively. Fear often seems to involve a feeling of danger, for example. This establishes the initial definition of what an emotion is as follows:

> **Commonsense definition of emotion**
> An emotion is a certain physiological response usually accompanied by a certain conscious experience (called *feeling*), or vice versa.

As will be shown in the following, such a commonsense definition is a good start but has to be refined (LeDoux 2012; Adolphs 2019).

Scientific accounts of emotions

Scientific investigation and theories of emotions could be divided into two main streams due to recent additions to the field (Hoemann et al. 2020a, b). On the one hand are classical accounts, which use specific necessary and sufficient conditions to describe emotions, while on the other are more recent accounts, which generally do not. These other accounts either use prototypicality to categorize (and distinguish) emotions, or are described as constructionist accounts, which see emotions as something that is constructed ad hoc in contexts on which the realization of an emotion depends (Hoemann et al. 2020a, b). Here, I will start with relevant classical accounts and somewhat chronologically move to more recent accounts.

The James-Lange theory of emotions

While the study of emotions dates back millennia (Dixon 2012), the modern scientific study of emotions often starts with what is now referred to as the James-Lange theory of emotions, according to which something (the stimulus) is perceived which

[2] I will use the expression *physiological responses* to denote all bodily (neuronal, hormonal etc.) as well as behavioral responses attributed to a respective emotion.

causes physiological responses which are then felt by the subject having an emotion. This feeling of physiological responses is, according to the James-Lange theory, identical with the emotion in question (James 1983). Applied to the initial example here, this would mean that when I saw the neighborhood dog (the stimulus), certain physiological changes in my body occurred (e.g., heart rate increase) which I felt and interpreted as my being fearful.

However, the James-Lange theory of emotions is not without its fair share of criticism (Cannon 1927; Damasio and Damasio 2019; Dewey 1895), some of which establishes the reason why it is not used as the definition of emotion here. As large parts of current neuroscientific research on emotions are carried out on non-human animals such as mice, and since we lack a reliable source informing us of the contents of their conscious on-goings (LeDoux and Hofmann 2018; LeDoux 2012), emotions are often not seen as the perception or feeling of physiological responses, but as the physiological responses themselves. This notion is further supported by cases where subjects do not have any kind of particular conscious emotional experience but still show physiological responses usually attributed to certain emotions (Winkielman et al. 2005; Zajonc 2000; Prinz 2005).

As I elaborate later (see "Perception and cognition can be emotion-eliciting events" section), perception or feeling of physiological responses, as suggested by the James-Lange theory, is incorporated in the view I defend here as well, but as an, potentially emotion-eliciting, event of its own. Thus, there is no need to change the commonsense definition of emotion given above, and the James-Lange theory can be seen as one of many types of cases described here.

The Cannon-Bard theory of emotions

The account presented in this paper comes closest to what is now termed the Cannon-Bard theory of emotions (Cannon 1927; Bard 1928), according to which a stimulus causes both certain physiological responses attributed to emotions and certain conscious feelings. Applied to the initial example here, seeing the dogs caused me to show a certain physiological response (e.g., heart rate increase) and a certain conscious feeling (feeling of danger) both of which form the emotion of fear.

In contrast to the Cannon-Bard theory, however, I do not presuppose (nor deny) that physiological responses and conscious emotional experiences (or feelings) are independent, and do not imply the role of a specific brain region. While, as mentioned before, physiological responses (usually attributed to emotions) without conscious emotional experiences do seem to occur, it seems questionable if one can only have a conscious emotional experience without any kind of physiological response usually attributed to emotions. There is some evidence speaking for (Johnsen et al. 2009) as well as against (Laird and Lacasse 2014) the independence of physiological responses and conscious emotional experiences. Thus, I leave this question open here as it does not seem to have an established answer yet. Put differently, in contrast to the Cannon-Bard theory, the account presented here states that an emotion-eliciting event causes certain physiological responses attributed to emotions *or* certain conscious experiences

or both (i.e., the account uses an inclusive *or* instead of an *and*). Accordingly, the definition will be revised to reflect insights from discussion of the Cannon-Bard theory.

A two-part definition of emotion
An emotion is the response to an emotion-eliciting event expressed in the form of certain physiological response(s) or certain conscious experience(s) (called *feeling*) or both.

Emotions as functional states

The scientific theories so far struggle with offering a clear way to distinguish emotions from other cognitive faculties (Adolphs and Andler 2018). In some cases, for example, perception can also be seen as certain physiological responses to a stimulus, and (experiential) memory can be seen as a certain conscious experience (and vice versa). Functional approaches to emotions posit that what makes an emotion an emotion are not certain physiological responses or conscious experiences, but, instead, the functional role it fulfills (Adolphs 2019). Such an approach will make it difficult to say what it may mean to remember an emotion given the conditions listed in the argument below (see "Remembering emotions expressed as physiological responses" section). Specifically, the "certain physiological response(s)" part of the definition above would have to be replaced (unless there is a necessary connection between a function and a set of certain physiological responses). However, I think the conditions could be adapted to a functionalist version if need be. Concretely, this would mean that certain physiological responses would have to be replaced with certain functional roles or realizations thereof. It would also be possible to adapt the conditions of the definition of remembering emotions in such a way as to include both physiological responses as well as functionalist descriptions. However, this seems to make any useful definition unnecessarily vague.

The problem with functional theories so far is that they often remain rather agnostic as to what aspects emotions (need to) have in order to fulfill their "normal" function (Adolphs and Andler 2018). This makes it difficult to employ the concept in interaction with other concepts (such as memory). Nevertheless, judging by one of the most prominent functionalist approaches (Adolphs and Andler 2018), where the criteria proposed are concrete enough, they either do not seem important for the question of whether we can remember emotions (e.g., by and large, it does not seem relevant how persistent an emotion is for the question if it can, in principle, be remembered), or already included in other approaches that are considered by other theories, which are described below (such as valence being contained in evaluations).

Thus, while I have not opted for a functionalist definition here, it should be kept in mind that the argument provided here could be adaptable to such views as well. Whether or not this is indeed the case will be answerable when a more clearly defined set of criteria for a functionalist theory of emotions is suggested.

Constructionist theories of emotions

A rather novel approach to emotions that has been pioneered by Barrett (2017) views emotions from a markedly different perspective. Similar to the functionalist approach of emotions described above, emotions are not taken to be realized as specific physiological responses. Instead, emotions, according to Barret, should be understood as abstract categories (Hoemann et al., 2020a, b), which can account for the spectrum of different physiological responses that are attributed to a single emotion category (e.g., a subject can run away in fear or be immobilized by it). What different instances of the same emotion category *usually* share, then, is not their physiological, behavioral or neuronal similarity, but rather their functional similarity (Bradley and Lang 2019). However, in contrast to the type of functionalist approach described above, Barret takes the functional aspect to be variable as well, i.e., depending on the situational context (Barrett 2017). Consequently, emotion categories are constructed according to the contextual demands of a currently occurring situation.

Applied to the initial example with the neighborhood dog, it could be said that the 'fear' category will be constructed functionally different depending on the situation. When I encounter dogs outside where there are many escape routes, an instance of the fear category might be constructed in such a way that its function is running away. But in cases where I am trapped in the house entrance with one of the dogs, the instance of the fear category will be constructed in such a way that its function is freezing still. How the fear category is constructed in each situation will depend on what I have learned given my individual and socio-cultural history (Hoemann et al. 2020a, b).[3] Thus, it might be that the same abstract category (in this case fear) is realized in very different, observable ways.

On the surface, the two-part definition of emotion I have given above seems incompatible with such an approach, as it presupposes "certain" physiological responses or conscious experiences. However, this incompatibility arises only if one defines "certain" physiological responses or conscious experiences in the way of concrete (non-variable) necessary and sufficient conditions. The definition does not exclude the possibility that these responses or experiences are abstract, variable and context dependent. In fact, similar to as I show later for memory of emotions ("Remembering emotions expressed as conscious experiences" section), how similar two different instances of an emotion category have to be to count as the same, can be seen as dependent on the actual context and speech community. *Certain* can be understood here in contrast to *random* or *arbitrary*, which, given my reading of Barrett (Adolphs et al. 2019), would fit with her constructed theory of emotions.

Thus, whether one adopts the idea that there are concrete physiological markers for each emotion (Damasio 1994; Prinz 2005), or whether there are instances of emotion categories which are variable, context-dependent and determined by

[3] Strictly speaking, Barrett suggests that the brain, not I, has learned things and constructs these emotion categories accordingly. However, as this seems to possibly commit the so-called *mereological fallacy* (Bennett and Hacker 2022), I have replaced *the brain* with a generic *I*.

different speech or cultural communities, the definition given above seems to be applicable in both cases.

Philosophical accounts of emotions

The philosophical landscape provides many different views on the question of what an emotion is (Deonna and Teroni 2012; Goldie 2009; Scarantino 2016), and I will only mention a few points that are relevant for the definition of emotion used here, and deal with others throughout the rest of the paper (but particularly in "What is the relation between an event, an emotion and memory of that emotion?" section).

Emotions as feelings

For the "certain conscious experience(s)", I will mostly follow a feelings account, since it seems to account quite well for the phenomena under consideration here. Under this view, emotions are (or are constituted by) a kind of subjective conscious experience, sometimes also referred to as the *phenomenological part* of emotions (Deonna and Teroni 2012). In contrast to physiological responses, this phenomenological part is, in the account presented here, always a conscious experience. Therefore, there cannot be an unconscious (or 'unfelt') phenomenological part of an emotion under this definition. The James-Lange account of emotions contained feelings as well, namely the feeling of physiological responses. In the two-part definition given above, however, I separate the physiological responses from the feelings, unless the feelings are due to or about the physiological responses (in which case those physiological responses would be a new emotion-eliciting event; see "Perception and cognition can be emotion-eliciting events" section).

In the sense of being a subjective conscious experience, the phenomenological part of an emotion is similar to perceptual experiences. For example, having the visual experience of an ash-gray dog means that I consciously experience something which has the visual appearance of an ash-gray dog.[4] Generally speaking, I could have such a visual experience of an ash-gray dog by for example seeing a dog or visually hallucinating one. Similarly, since I define that such an experience has to be conscious, it is not enough to 'see' an ash-gray dog, for example by it being presented only for a fraction of a second (Zajonc 1980), if I do not consciously experience it. There most likely is a gray area in which it is difficult to decide whether or not something was consciously perceived, but it is not my intention to sort out such atypical examples here. For the purposes of this investigation, it is enough to look at prototypical examples where one clearly does, or does not, consciously experience something.

I take the phenomenological part of emotions to be much like these perceptual experiences just described. However, there might be some notable differences between the two, some of which are mentioned here. First, as might seem rather

[4] I do not take a stance here on the debate whether a concept of an ash-gray dog is needed to have the experience of an ash-gray dog, or any closely related debates such as in (Siegel, 2016).

trivial, most higher animals, including humans, have dedicated sensory organs for perception (such as eyes for visual perception), while this does not seem to be the case for emotions (although some, like Prinz 2004, might disagree here as well). Suggestions for emotion-specific brain/neural, hormonal, physiological or behavioral patterns have been questioned recently (Lindquist et al. 2012; Barrett et al. 2019; Barrett 2017). Second, depending on how the phenomenological part of emotions is viewed, it has been argued that emotional phenomenology is in and of itself different from perceptual phenomenology (e.g., with emotions being felt attitudes to act in certain ways such as fear being the felt attitude to flee) (Deonna and Teroni 2015). Lastly, if emotions are viewed as kinds of motivations (Scarantino 2014), emotions and perceptions are entirely different things, with the latter not necessarily being related to actions.

As with physiological responses, I do not intend to sort out if a particularly atypical conscious experience should count as an emotion or not. Instead, I stick to those conscious experiences which are usually quite clearly recognized as emotions, such as fear (Fehr and Russel 1984).

However, if emotions are not (necessarily) felt physiological responses (such as feeling one's heart rate increase in the case of fear), then what is their phenomenology? As with physiological responses, the answers to this question vary considerably. Some deny that emotions even have or are a kind of experience (but rather, for example, claim that they are judgments) (Scarantino 2016). As mentioned above, others claim that emotions are felt attitudes and this feeling of an attitude is the phenomenological part of emotions (Deonna and Teroni 2015). Another, quite obvious, approach is to say that emotions are feelings in general that are not further reducible. I do not take a stance on this debate here, as for the investigation of the interaction of memory and emotion as presented here, it is enough to talk of certain conscious experience(s), however they are realized so long as they indeed establish certain conscious experience(s). This means that if one defines that emotions are, for example, feelings that are not further reducible, then its phenomenology (the certain conscious experiences) will be taken to be those irreducible feelings.

Evaluative theories of emotions

A variety of contemporary theories define emotions not simply through physiological responses or conscious experiences, but also include evaluations (Deonna and Teroni 2012; Goldie 2009; Scarantino 2016). Evaluative theories come in diverse flavors and, given spatial concerns, I cannot give a review of them here (see e.g. Scarantino 2016 for a comprehensive review). These theories either equate emotions with evaluations or see evaluations as causes of emotions.

Philosophical theories, especially in contrast to scientific theories, usually equate (parts of) emotions with evaluations and see emotions as being evaluations that something the emotion is directed at instantiates a specific property. For example, when I felt fear towards the neighborhood dogs, I (implicitly) evaluated that they instantiate danger. What these evaluations actually look like is a highly contentious topic in the philosophy of emotions (Scarantino 2016). Scientific theories, on the other hand, usually see evaluations (or 'appraisals') as the causes for emotions and

do not necessarily think they involve any kind of (conscious) judgment or reflective interpretation (Arnold 1960; Lazarus 1991; Zajonc 2000; Scherer and Moors 2019). In the example above, the emotion of fear is realized because I evaluated the situation with the neighborhood dog as being bad, harmful or something to avoid. Similar to the philosophical debate about what kinds of evaluations emotions are, there is widespread disagreement about what kinds of appraisals emotions are, or even if they are part of emotions themselves (Scarantino 2016).

As described later ("What is the relation between an event, an emotion and memory of that emotion?" section) the account presented here is compatible with the idea that emotions can be caused by evaluations, which however only constitutes a subset of possible cases (since emotions could, under my view, be caused by other things such as perceptions or memories). Evaluative theories which equate emotions with evaluations, however, would be incompatible with the definition presented above. Including that part in the definition of emotion here is conceivable but seems to make it unnecessarily complicated when it comes to remembering emotions. However, as is described in the next section, since I do not presuppose that emotions necessarily need to have intentional objects, it does not seem necessary to include evaluations as a constitutive part of emotions, but they can be useful nonetheless (such as in distinguishing emotions from each other; see "Evaluations can help distinguish emotions and influence behavior" section).

Intentional objects of emotions

While not a theory of emotions of its own as such, most prominent philosophical theories of emotions today make so-called *intentional objects* a necessary part of their definition of emotions (Deonna and Teroni 2012; Goldie 2009; Scarantino 2016). Under such views, emotions are directed at something, that is, they have an intentional object (i.e., an object which they are about) (Searle 1983; de Sousa 1987). In the case of fear for example, someone is usually fearful *of* something, such as being fearful of a dog, usually because it is evaluated as being dangerous. Even though these aspects are quite popular in the current literature on emotions, I will not make intentionality a necessary condition of emotions here, primarily because it is often thought to exclude states such as moods, which do not seem to be about anything, and because such 'objectless emotions' seem to play an important role when it comes to anxiety or in psychiatric disorders that involve an interplay between memories and emotions (Arun et al. 2019; LaBar 2016).

Since not including intentionality is rather unusual, it seems advisable to say a bit more about it. In some cases, the intentional object of an emotion is rather clear. In my childhood I was fearful of the neighborhood dog that chased me, meaning that the intentional object of my fear was the dog. When looking at the different aspects of emotions, this already becomes slightly trickier. My conscious experience of fear will arguably be about the dog (or the danger it instantiates). Similarly, my physiological responses (such as heart rate increase) could be seen as being in some way about the dog as well, although a description of being caused by the perception of the dog might seem more natural.

However, I see no theoretical reason why the very same physiological responses and conscious experience would not be an emotion anymore if they were caused by something I was not aware of at all. While not usually the case, it does happen that someone simply feels fearful or anxious, or shows physiological responses usually attributed to fear, without knowing why or what, if anything, they are afraid of. It seems true that those physiological responses and that conscious experience must have been caused by something, but as others have noted (Deonna and Teroni 2012, p. 3), an emotion is not necessarily about the thing or event that caused it. Certainly, it is possible to object here that an emotion's being about something does not mean that one is consciously aware of the thing it is about or that it caused the emotion. I could, for example, be afraid of the dog without being aware that it is the dog I am afraid of. Yet, this does still not seem to answer why the same physiological responses and conscious experience would not be emotions if they were caused by, say, random neural activation or hormonal fluctuations. It seems questionable to say here that the physiological responses or conscious experiences caused by such random events would be what the emotion is then about. If one considers emotions to a priori be intentional, then naturally, an example such as that one would not be considered an emotion. Yet, a further explanation as to why intentionality is *necessary*, and not just probable, has to my knowledge yet to be provided.

However, it should be noted that I do not negate that emotions can have intentional objects, and in almost all cases, and certainly all cases mentioned here, emotions have intentional objects. Thus, if one takes emotions to necessarily be intentional, the account of remembering emotions here can be confined to only those cases in which emotions have intentional objects. Furthermore, I will later mention why intentionality is still useful even under this account (see "What is the relation between an event, an emotion and memory of that emotion?" section).

Beyond physiological responses and conscious experiences

Downsides of excluding aspects such as intentionality or evaluations from emotions include that motivational aspects and differentiation between some emotions will be lacking. Having or not having an intentional object can lead to different consequences concerning the actions one takes. Being afraid of a dog can lead me to thinking of ways to flee from that dog, but simply feeling anxious without knowing what is eliciting it puts me in a position that is a lot different. Similarly, some emotions we typically differentiate on cognitive grounds will ultimately be regarded as the same. Errol Bedford for example mentions that indignation and annoyance are not distinguished because they feel different (1956). Consequently, if only physiological responses and conscious experiences are taken into account for emotions, some of the emotions we usually refer to by different names will be regarded as the same. However, my primary concern here is not to try and distinguish closely related emotions or give a detailed taxonomy of emotions, but to analyze if emotions can be remembered. Thus, I take prototypical cases of emotions, such as fear, without trying to distinguish closely related emotions from another, such as fear, panic and angst. I leave it open to further distinguish closely related emotions on other

grounds such as their intentional objects or evaluation for future accounts (Arnold 1960; de Sousa 1987; Lazarus 1991; Scherer and Moors 2019).

Thus, for now I will only look at physiological responses and conscious emotional experiences as characterized above and show how each of them can be remembered, and later consider other aspects of emotions, such as evaluations, as well. The two-part definition given above should therefore be adequate for the purpose of this paper. For theoretical purposes, instead of a single physiological response or conscious experience, the possibility of a set of physiological responses or a set of conscious experiences is added to include more possible and relevant cases.[5] Consequently, the definition of emotion used here will be:

A general two-part definition of emotion
An emotion is the response to an emotion-eliciting event expressed in the form of (a set of) certain physiological response(s) or (a set of) certain conscious experience(s) (called *feeling*) or both.

What does it mean to remember an emotion?

Physiological responses and conscious experiences as described above differ in many aspects and are also used differently with regards to how essential each of them is to the concept of emotion depending on the field of study. Likewise, it seems advisable to consider different definitions of memory, not only regarding the different uses of the term between disciplines, but also with the different types of memory which are usually distinguished. Physiological (or behavioral) responses, in the popular memory taxonomies, come closest to phenomena which belong to *nondeclarative* memory, which is taken to be an umbrella term for those memories expressed through performance (Squire 2004; Bernecker 2011). On the other hand, conscious experiences (or feelings) come closest to phenomena in the context of *episodic* or *experiential* memory (Teroni 2017; Debus 2017; Squire 2004; Bernecker 2011). Since these notions of emotions and the corresponding memory types are quite different, it seems reasonable to suggest that they have different conditions for when someone remembers emotions expressed through physiological responses compared to when someone remembers emotions expressed through conscious experiences (similar to how it seems to be different to remember how to do something than experientially remembering what one experienced).

Remembering emotions expressed as physiological responses

Different scientific disciplines usually define memory or remembering differently. The traditional definition in biology (and related scientific fields) usually held that "memory is an imprinting of past experience" (Dudai 2007a, b, p. 11). For

[5] Throughout the text the more practical descriptions *physiological responses* or *conscious experiences*, instead of explicitly mentioning possible sets of these, is used in order to ease the flow of reading.

experimental purposes, the traditional definition often was (and still is) that (especially nondeclarative) memory is the change of (the potential for) behavior due to previous experience (Dudai 1992). This imprinting approach has been questioned considerably in the last decades, leading to more and more scientists shifting to views that see memories as retention or reconstruction of representations which are formed through experience (Dudai 1992, 2007a, b). Similar as in the case of other concepts (Adolphs and Andler 2018), not wanting to deal with defining the concept of memory further, contemporary experimental neuroscientific research often (implicitly) takes memories to be at least inferable from behavioral or physiological data. If, for example, a mouse solves the same maze faster and faster (compared to a control), it is usually concluded that this increase in task completion speed is due to memories the mouse has formed concerning the maze or task (Olton 1979; Morris 1981). Whether or not the actual memories amount to more than this change of behavior or are based on some kind of representation is then (implicitly) taken to not be of primary interest.

Similarly, much of contemporary neuroscientific research dealing with emotions is concerned with changes in behavioral or physiological responses, both in theorizing as well as in experimentation. Often, emotions are (implicitly) reduced to or identified with these responses, either for pragmatic reasons to specify the research topic, or to further experimentation (Nader et al. 2000; Ramirez et al. 2013; Arun et al. 2019). Usually, it is not denied that such behavioral or physiological responses are accompanied by, or can lead to, a conscious emotional experience, but such an experience is often not considered a necessary aspect of an emotion in these frameworks.

Since I am concerned with certain physiological (or behavioral) responses, which are studied primarily in neuroscientific research, the standard definition of certain changes of behavior or physiology due to experience will suffice, although the kinds of experience will have to be limited to intuitive and prototypical cases.[6] To do this, I will go through all conditions one at a time, which are judged to be individually necessary and jointly sufficient for the subject x to remember the emotion E expressed through physiological responses.

For illustration I will take the example of fear as an emotion. The experimental paradigm chosen is associative learning, in particular conditioning as one of the simplest, and thoroughly studied, paradigms which fulfills all of the conditions described and, additionally, is thought to be helpful for explanations of psychiatric disorders that involve an interplay between memories and emotions (Arun et al. 2019; Briscione et al. 2014). Furthermore, given the recent interest in false memory, or confabulation, phenomena in the philosophy of memory (Bernecker 2017; Robins 2020; Retkoceri 2021; Michaelian 2021), fear conditioning, particularly fear generalization, might be of interest for accounts trying to incorporate emotions into their

[6] This is done to avoid common objections, such as that we would usually not call being shot in the foot and because of that limping a kind of memory (Dudai, 2007a, b; Hacker, 2013). Naturally, such an approach runs the risk of being circular by already assuming a definition of memory which enables us to restrict the kinds of experiences that count as relevant for memory and those that do not.

descriptions of false memory. It should be kept in mind, however, that conditioning studies have largely, but not exclusively, been performed on non-human animals and applications of the findings outside the lab are limited (Kim and Jung 2006; Sehlmeyer et al. 2009; Lonsdorf et al. 2017; Fendt and Koch 2013).

P1: x responds to stimulus S at time t(2) in a manner M that constitutes (part of) emotion E, given the appropriate circumstances

Given that memory is taken to be changed behavioral or physiological response due to experience, and emotion as expressed through physiological (or behavioral) responses, it is necessary that there actually is a certain kind of response. This response can either be a behavioral response, such as fidgeting, or, more broadly, a physiological response, such as heart rate increase, but can also be the lack thereof, such as no movement at all or no increase in heart rate, which is especially important in extinction (Quirk and Mueller 2008).

For example, in the standard conditioning experiments (see Lonsdorf et al. 2017 for details and a recent review on human fear conditioning), a subject (x) (or typically a group of subjects for statistical purposes) are first exposed to a stimulus (S) which causes no particularly distinctive emotional response, such as my for the first time encountering a dog and reacting in no particularly emotional way. Then the subject is exposed to that stimulus again, but it is paired with an event that innately causes an adverse reaction, such as my breaking out in sweat or having an increased heart rate (M) when the dog barked at me loudly. It is usually concluded that the subject formed a memory, which is recalled, if the subject responds in a certain manner which constitutes a fear response (E) when exposed to the stimulus again, compared to a control group, i.e. a subject who was exposed to the same stimulus, but was not simultaneously exposed to the event that innately causes an adverse reaction, and does not show such a fear response. In the neighborhood dog example, I (x) now (t(2)) respond in a way (M, for example by, among other things, breaking out in sweat) that constitutes (part of) the emotion of fear (E) when seeing the dog (S) that chased and barked at me years ago (given the appropriate circumstances). A control group in this case could be a random neighbor who also encountered and encounters again the dog but who the dog never barked at and who would not show any such reaction when seeing the dog.

The ‘appropriate circumstances’ clause is introduced to counteract objections such as whether or not I would still be said to remember when I see the dog, but it is too cold outside to sweat. What exactly falls under appropriate circumstances, will be difficult to define and will depend on the context. In many cases there probably is not a clear-cut distinction, but it seems reasonable to make these conditions not too wide nor too narrow, so that only relevant phenomena are captured. It does not seem to be reasonable to say that if I am deaf, blind and crippled I would still have to be expected to respond in the exact same manner to the stimulus S (and interpret my lack of response as some kind of forgetting or extinction). At the same time, it seems plausible that the circumstances should be allowed to vary at least in some degree from the time stimulus S was experienced before, as it seems, at least

outside a controlled environment, that a stimulus is rarely encountered under exactly the same conditions.

P2: x has learned to respond in the manner M that constitutes (part of) the emotion E to stimulus S at time t(2), given the appropriate circumstances, at a time(span) t(1) which preceded t(2)

Both, the intuitive understanding of the word *remembering*, and the scientific idea of memory as stated above, seem to presuppose that there must have been some kind of experience at an earlier time.[7] There might be some responses to certain stimuli which could be classified as the expression of an emotion E, but which are not responses to previously encountered stimuli and therefore not memories (such as stimuli that innately cause emotional reactions). For example, hearing a lion roar for the first time in my life (as an infant) might lead to my showing physiological responses that are clearly classified as the expression of the emotion of fear. But it does not seem to make sense to say that a one-year-old who has never encountered a lion or anything similar before in their life remembers something specific about it. Remembering seems to presuppose that the changed behavioral or physiological response due to experience has been acquired in the past through learning. In the case of the neighborhood dogs, this would mean that I (x) have encountered the dog (S) at a previous time (t(1)) and because of the pairing of the exposure to the dog and its loudly barking learned to respond in a manner (M) that constitutes (part of) the emotion of fear (E) when seeing the dog (given the appropriate circumstances).

P3: P2 establishes a cause of P1

It is conceivable that a subject responds to a stimulus S in a manner M that constitutes (part of) the emotion E without ever having encountered that stimulus, even though such a response to such a stimulus is usually acquired and not innate (such as in maladaptive fear generalization (Arun et al. 2019; LaBar 2016)). However, to speak of remembering in the intuitive sense as well as according to the traditional biological definition of memory described above, the change of behavior or physiology needs to causally depend on the learning experience. For experimental purposes this is often expressed in the way of a counterfactual condition such as *if not P2, then not P1*, i.e. had the subject not had the learning experience at t(1), it would not respond in the corresponding manner at t(2). This counterfactual condition often seems to be what is the motivation behind including control groups, i.e. in the example above a random neighbor that might have encountered the same dog but has never been barked at and therefore did not learn to respond to the dog in a fearful manner.

[7] Some recent accounts of memory explicitly deny the necessity of the dependence on (particular) earlier experiences for mental states to count as memories however (Michaelian, 2016; Michaelian & Robins, 2018).

Caveats

While such an analysis might seem rather straightforward and is often used in neuroscientific studies, it is not without its fair share of problems. For one, scientists are moving away from a simple definition of memory as change in (the potential of) response due to previous experience to other notions of memory. More and more findings are suggesting that there is no simple connection between stimulus and acquired response as often portrayed, since other factors such as context or body position seem to play an important role (Mendes 2016; Dickinson 2007). At the same time, this might be a result of experimental constraints and not the learning paradigm itself, as some evidence suggests that if, for example, context is taken into account, it is possible to extend the explanatory range of the paradigm presented (Maren et al. 2013). Nevertheless, serious doubts have recently been voiced whether there actually are any stable patterns in physiological or behavioral response that could be ascribed to any specific emotion (Lindquist et al. 2012; Barrett et al. 2019; Barrett 2017; Clark-Polner et al. 2016). Lastly, as the following section on remembering emotions expressed through conscious experiences show, a simple counterfactual dependence as a realization of condition P3 mentioned above often seems insufficient (at least on epistemic grounds) to exclude cases outside the lab, where circumstances and experiences cannot be controlled for, and are much more diverse and interdependent.

Remembering emotions expressed as conscious experiences

As mentioned before, one way in which emotions can be expressed is in the way of conscious experiences, usually called feelings. As will be elaborated later, such experiences can be triggered by different events. Hearing a lion's roar for the first time might lead to an intense feeling of fear. Likewise, remembering something can lead to feeling fearful. However, just because a current emotion expressed through conscious experiences is triggered by the remembering of something does not establish that that emotion was remembered. Debus (2007), for example, argued that it is impossible to remember emotions, and that every emotion we have is a new emotion. I agree that not *every* emotion we have necessarily is a remembered one, but I think that it is nevertheless possible to remember emotions. Similarly, it is important to note again here, that the kind of memory under consideration here is experiential or episodic memory, not propositional or semantic memory, i.e. remembering *that* I felt fearful of a dog would be a propositional or semantic memory, not an experiential one. What it takes for an experiential memory of an emotion will be described now.

As in the case of remembering emotions expressed through physiological responses, I will take the example of feeling fear for illustration in the following and go through the conditions one at a time, which are judged to be individually necessary and jointly sufficient for the subject x to remember the emotion E expressed as conscious experiences or feelings.

P1: x felt emotion E1 at event(1) at time t(1) which precedes t(2)

Similar to remembering perceptual experiences and emotions expressed as physiological responses, it seems to be the case that to remember emotions expressed as feelings, I must have experienced such a feeling at a previous point in time. If I want to remember the experience of seeing ash-gray for example, it seems necessary to have had the experience of seeing ash-gray at some previous point in time. To say that I remember what ash-gray actually looks like to me without ever having had any experience of the color ash-gray seems to be contradictory from an intuitive viewpoint. Likewise, if I try to remember the felt fear emotion I had when confronted with the ash-gray dog that haunted my childhood, I need to have felt that fear in the past, otherwise it seems doubtful if 'remember' would be the right word.

P2: x feels the emotion E2 at time t(2)

To say that I experientially remember the fur color of my neighbor's dog, presupposes that I now have some kind of (visual) experience. If I do not have any kind of (visual) experience, it does not seem to make much sense to say that I am *experientially* remembering something. I could be remembering something propositionally and remember *that* the dog was ash-gray. However, this would not be an experiential memory, but a propositional one, which anyone who knew that proposition in the past could remember. Similarly, to say that I experientially remember an emotion expressed as conscious experiences, presupposes that I am now having some kind of emotional experience. Saying that I remember the fear I had as a child when that dog chased me but feeling nothing seems to be contradictory, or to refer to something else, such as propositional memory.

P3: E2 is sufficiently similar to E1

The concept of memory seems to presuppose at least some kind of identity, similarity or entailment relation. It strikes me as counterintuitive to say that I remember the visual experience of my neighbor's ash-gray dog, when I am now having the auditory experience of a frog's croak. These two experiences seem too dissimilar to warrant that one is a genuine memory of the other. Thus, for two experiences to be in an experiential memory relation they need to be at least type-identical (among other things). In the case of emotions, it seems false to say that I remember the fear I had of that dog, when I am now experiencing only joy.[8] How similar two type-identical experiences need to be for them to count as memory-related, seems to be rather dependent on the actual context and speech community. When I am now having the visual experience of charcoal instead of ash-gray, some who do not distinguish those colors might say that they are sufficiently similar to count as the same, while in a

[8] Indeed, as Debus (2007) notes, it can be the case that when remembering a past emotional event, I feel a different emotion. As mentioned before, however, an emotion caused by a memory is not the same as the experiential memory of an emotion here.

suit tailoring class it might be considered as too dissimilar to be the same. Consequently, the two experiences, in this case emotions expressed as feelings, have to be at least sufficiently similar for one to count as a memory of the other, even if they might not be completely identical.

P4: If E1 were substantially different, E2 would be different in such a way that P3 would still be true

Thinking back at the incident where my neighbor's dog broke loose and chased me, I could try and remember it as vividly as possible. In case I have not overcome my fear of dogs, it could also very well be that I would experience an emotion expressed as feelings E2* that is sufficiently similar to the emotion E1 I had felt when I was actually chased by the dog. However, this would not be enough to say that I actually remember the emotion E1, because the two emotions could be sufficiently similar by coincidence. Even if I had completely forgotten the experience, including all experiential aspects, I could be told this story by a friend who witnessed it and develop the completely new emotion E2* that just happens to be sufficiently similar to the one I had felt at the time of the event (cf. Martin and Deutscher 1966 for a similar example concerning memory in general).

There are other ways of coming up with experiences of emotions that coincidentally are sufficiently similar, but the important thing is that emotion E2 should be determined by emotion E1 to count as memory-related (cf. (Bernecker 2017, 2010) in the case of memory and more generally (Nozick 1981) for so-called 'tracking' conditions). Had I felt joy (instead of fear) back then, I should feel something sufficiently similar to that joy now. This also seems to be true for memories concerning perceptual experiences. If in my childhood I have had the visual experience of orange instead of ash-gray when seeing that dog, I should now 'see' orange when I remember my visual experience of the dog's fur color, and not ash-gray or something completely different from orange or ash-gray.

P5: P1 produces the structuring cause of P2

It is conceivable that P1 through P4 would be met, but we would be hesitant to call something an experiential memory. To rule out that P3 and P4 are not true simply by coincidence, it seems to require that P1 is instrumental in, or is causally related to, P2. Traditionally such connections have been established by appeal to so-called *memory traces*, which have been described with varying degrees of abstraction but generally seem to express 'that which makes past information/representations available or carries the causal connection' (Bernecker 2010, 2017; Debus 2017; Martin and Deutscher 1966; Robins 2017). Instead of an appeal to memory traces, I use the notion of structuring and triggering causes described by Fred Dretske (1998, 2010).[9] These two views might not be mutually exclusive and

[9] I take it that an analogous account using memory traces instead of structuring and triggering causes could establish the causal connection just as well, but would presuppose different things.

describe overlapping notions, but it seems that viewing the dependence between the past experience and the current state of remembering in terms of structuring and triggering causes presupposes fewer things which seem to be contingent (but reasonable), such as the reliance on neurons or neural networks, and at the same time allows for variability of memories depending on retrieval cues.

According to Dretske, a structuring cause is that which produces conditions under which certain triggering causes can produce certain events (1988, 2010). Applied to my cases of remembering, this can be described as follows. Something, the triggering cause, causes P2. But, according to P5, in the case of remembering, the triggering cause causes P2 only if the structuring cause is instantiated by P1. More concretely, thinking back (triggering cause) to the experience where the dog chased me causes me to feel an emotion of fear (E2). However, intuitively we would only say that this is a case of remembering if my former emotional experience with the dog is in a certain way instrumental in this triggering of E2. The emotional experience with the dog at t(1), which established E1, is therefore a structuring cause of the later emotional experience of E2. Without the initial emotional experience, the triggering cause should not lead to E2, if the initial emotional experience is a structuring cause for my thinking back causing me to experience E2.

An advantage of this view is that it allows to not only give an answer to what happens how (thinking back to P1 leading to experience E2), but also why it happens. P2 could happen for a number of reasons, which are not cases of remembering. But viewing P1 as a structuring cause of P2, can explain why in the case of remembering P2 is happening. Yet, at the same time such a view is not restricted to cases which contingently depend on certain physiological aspects, such as specific neural architectures, and thus captures the broad concept of what remembering often is taken to be.

Caveats

The account proposed here for remembering emotions expressed as certain conscious experiences (or feelings) is in many respects similar to more traditional accounts of memory, which are often termed *causal theories of memory* (Martin and Deutscher 1966; Bernecker 2017; Debus 2017). Yet, causal theories of memories have been somewhat questioned in recent years, which seems in large part to be due to issues concerned with the nature of memory traces, and constructivists account are on the rise, most notably in the form of reliabilist or simulationist alternatives, which take a reliably working memory system, and not the dependence on past representations, as the distinguishing feature of memories (Michaelian 2016, 2021; Michaelian and Robins 2018; Robins 2017). Since the presented account above does not explicitly rely on memory traces, I suggest that it could be adapted to either a traditional causal theory of memory with memory traces, or a reliabilist variety which combines reliability and causality if one wanted to. Yet, such an endeavor would be far beyond the scope of this paper.

What is the relation between an event, an emotion and memory of that emotion?

So far, I have considered emotions expressed as physiological responses and emotions expressed as conscious experiences separately. However, usually both of these aspects are mentioned to occur or even be necessary for someone to have an emotion. Not showing any significant behavioral or physiological response but still claiming that someone is afraid, strikes many as missing a vital point about emotions. At the same time, it has been questioned whether or not certain physiological changes really correspond to only one emotion and it has been proposed that the distinguishing factor might be outside behavioral or physiological changes (Clark-Polner et al. 2016; Bedford 1956; Deonna and Teroni 2012; Schachter and Singer 1962).

Events can cause emotions expressed as physiological responses or conscious experiences, or both, each of which can be remembered

As mentioned before, it is possible to have no conscious emotional experience but still show certain physiological responses usually attributed to emotions (such as not feeling fearful but still showing increased sweating in the form of increased skin conductance in response to an aversive stimulus because of a previous fearful encounter). At the same time, there is evidence that the same physiological responses can lead to conscious experiences that are described as different emotions (Clark-Polner et al. 2016; Schachter and Singer 1962). To include such phenomena, I propose that a single event can cause an emotion expressed as physiological responses or expressed as conscious experience, or both, each of which can be remembered in the respective way described above (see "What does it mean to remember an emotion?" section). Thus, it is possible to show the same affective physiological response, but, depending on the evaluation, have different conscious emotional experience. For example, heart rate increase when seeing a dog could be evaluated as fear or as excitement/joy and thus lead to a different conscious emotional experiences.

However, it should be noted here, that (as is mentioned in "Perception and cognition can be emotion-eliciting events" section) (cognitively) evaluating physiological responses is, in the account presented here, seen as a new event, i.e., perceiving a dog is one event, but later labeling one's own physiological responses (which are caused by the perception of the dog) is another. If one wanted to say that a conscious emotional experience can *only* arise because of (and after) such an evaluation, then this would not be incompatible with either the definition of emotion given here (see end of "Defining emotions" section), nor with how emotions expressed as conscious experiences are remembered (see "Remembering emotions expressed as conscious experiences" section) according to the account presented here. While it is not the route taken here, I leave it open to include intermediary causes between the emotion-eliciting event and the respective conscious emotional experience.

Consequently, an event can cause an emotion expressed as physiological responses or as conscious experience, or both, and each of these, or both, can later be remembered.

Perception and cognition can be emotion-eliciting events

According to the James-Lange theory, emotions are perceptions of bodily changes. In the account presented here, such bodily changes alone are described as emotions expressed as physiological responses and are not taken to be the only thing that should be regarded as emotions. I take the perception of physiological changes as a separate event, that can again cause certain physiological responses or conscious experiences, or both, usually attributed to emotions. If I see a dog, my heart rate might increase, and I might experience fear. However, it might also be the case that I do not experience fear at first, but my heart rate increases, which I perceive, leading me to worry (or, as described above, evaluate the situation as dangerous) and feel fear as a result. But the perception of my heart rate increase is a different event than the perception of the dog.

Similarly, I take that cognition can work in much the same way. Some physiological responses or conscious experiences which we attribute to emotions are caused by events that are complex and which necessarily presuppose some degree of cognition or judgment. Take complex emotions such as *schadenfreude* for example, which is the pleasure derived from becoming aware of someone else's misfortune. During my undergraduate studies I once saw a classmate who carefully peeled a mandarin for over ten minutes during class to remove all the peel and pith, only to accidentally drop it on the floor when he was finished, causing me to burst into laughter. Such an outburst on my side would generally not be given every time I see someone drop a mandarin. What made the whole situation so amusing to me was the (in my opinion) excess amount of work he had put into peeling that mandarin which ultimately was wasted. But taking all this into account presupposes that I can think about the relatively complex situation that transpired.

Concerning cognitive involvement, this seems a lot different from hearing a lion's roar and as a result feeling intense fear, before even realizing what exactly occurred, or, such as seems to be the case in moods, being overcome with a conscious emotional experience without any, to the experiencing individual, distinguishable outside cause. However, both are events (perceiving and cognizing) that can elicit emotions expressed as physiological responses or conscious experiences or both. I take remembering to be a form of cognizing, which can of course also elicit emotions, such as me thinking back to that mandarin incident and still having to smirk. But, as described before (see "Remembering emotions expressed as conscious experiences" section), in the account presented here, an emotion caused by remembering (or any other way of cognizing or perceiving) is different than a remembered emotion.

Evaluations can help distinguish emotions and influence behavior

Evaluative theories of emotions in philosophy usually pose that judgments or evaluations stand in a relation of necessity to emotions, such as being a part of emotions or being a cause of emotions (Deonna and Teroni 2012; Nussbaum 2001;

Arnold 1960; Lazarus 1991; Scarantino 2016). However, I think that such evaluations are either one form of emotion-eliciting events as described above, or one way of how we can distinguish closely related types of emotions which might neither be physiologically different nor feel much different. To feel fear or show physiological responses usually attributed to fear can in some cases presuppose that some kind of judgment or evaluation has taken place, but it does not seem to always be so. As mentioned above, hearing a lion's roar and immediately afterwards having an increased heart rate as well as an intense feeling of fear, does not seem to necessitate that I think about what actually happened—it just happens.

As mentioned before, it sometimes is difficult to pinpoint whether and how closely related emotions such as fear, panic and angst differ in physiological responses or regarding how they feel. Evaluations and intentional objects, on the other hand, can help distinguish these. Fear could be seen as a more general word for the emotion to be described. Panic usually describes a more sudden outburst of fear, and angst a diffuse kind of fear not directed at anything in particular. Evaluations about factors such as the eliciting circumstances can lead to differentiation of emotions into types which are physiologically or phenomenologically indistinguishable, and also influence behavior (such as fleeing when one takes a certain object to be the cause of fear as compared, for example, not knowing how to act when one is overcome by fear without knowing what caused it).

Consequently, evaluations and intentionality can play an important role when it comes to emotions (such as distinguishing different emotions on cognitive grounds) but do not seem to be generally necessary for emotions expressed as physiological responses or conscious experiences I set out to analyze here.

Conclusion

Here I have tried to sketch an initial account of what it could mean to remember emotions per se by combining insights from both science as well as philosophy. By first distinguishing between emotions expressed as physiological responses or as conscious experiences, a first step was taken to disentangle misunderstandings that sometimes arise in the debates between scientists and philosophers. Furthermore, such a distinction allows to relate the relevant physiological responses to nondeclarative memories and the relevant conscious experiences to experiential memories, which helps incorporate both phenomena into the framework of memory research.

However, as was noted throughout the text, both the definition of emotion as well as memory in scientific research are subject of lively debates, which will have to be clarified in the near future to enable fruitful collaborations between the disciplines. Similarly, while I have opted for a largely causal account of memory, a reliabilist alternative with its focus on empirical findings might make for an interesting addition. Additionally, while I only had the chance to hint at it here, how this framework would fare in the light of false memory phenomena (both on the level of physiology as well as phenomenology) is an exciting question left open for future investigation.

Aspects such as intentionality, motivation or appraisal have not played a major role in the account of remembering emotions here but did play a role in the how

emotions or memories could be initiated or distinguished. Yet, I hope that this analysis can be the starting point for future accounts of what it means to remember emotions that can cover such aspects as well, both in science as well as in philosophy.

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