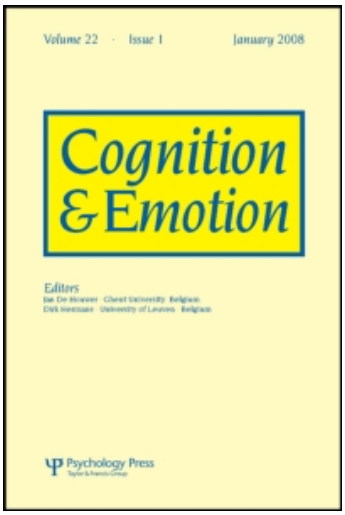
This article was downloaded by: *[University of Gent]*
On: *13 May 2009*
Access details: *Access Details: [subscription number 908717962]*
Publisher *Psychology Press*
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Cognition & Emotion
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713682755

Theories of emotion causation: A review

Agnes Moors [a]
[a] Ghent University, Ghent, Belgium

First Published on: 31 March 2009

To cite this Article Moors, Agnes(2009)'Theories of emotion causation: A review',Cognition & Emotion,23:4,625 — 662
To link to this Article: DOI: 10.1080/02699930802645739
URL: http://dx.doi.org/10.1080/02699930802645739

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

COGNITION AND EMOTION
2009, 23 (4), 625–662

Psychology Press
Taylor & Francis Group

INVITED REVIEW

Theories of emotion causation: A review

Agnes Moors
Ghent University, Ghent, Belgium

Downloaded By: [University of Gent] At: 10:20 13 May 2009

I present an overview of emotion theories, organised around the question of emotion causation. I argue that theories of emotion causation should ideally address the problems of elicitation, intensity, and differentiation. Each of these problems can be divided into a subquestion that asks about the relation between stimuli and emotions (i.e., the functional level of process description, cf. Marr, 1982) and a subquestion that asks about the mechanism and representations that intervene (i.e., the algorithmic level of process description). The overview reveals that theories of emotion causation sometimes differ with regard to the kind of process that they hold responsible for emotion causation. More precisely, they hold different assumptions regarding the conditions under which the process is supposed to operate (optimal versus suboptimal), the format of the representations involved (propositional versus perceptual), and the object or input of the central process (stimulus versus responses/experience). Further, the overview reveals that theories of emotion causation sometimes differ with regard to the level of process description that they focus on. Finally, the overview brings to light several similarities among the theories discussed.

Keywords: Emotion theory; Causation; Elicitation; Appraisal; Constructivist.

In this paper I review a selection of emotion theories. I propose a framework in which various theories can be placed and compared. The framework is organised around the question of emotion causation. The aim is to highlight what theories of emotion causation have in common and where they move apart. Before looking at the explanations for emotion provided by various theories, I briefly consider what it is that these theories try to explain. As

Correspondence should be addressed to: Agnes Moors, Department of Psychology, Ghent University, Henri Dunantlaan 2, B-9000 Ghent, Belgium. E-mail: agnes.moors@ugent.be

Agnes Moors is a postdoctoral fellow of the Scientific Research Foundation – Flanders (FWO).

I thank Klaus Scherer who acted as a reviewer for the valuable comments and suggestions.

© 2009 Psychology Press, an imprint of the Taylor & Francis Group, an Informa business
www.psypress.com/cogemotion DOI: 10.1080/02699930802645739

I illustrate in the first section, disagreement among emotion theories already starts here.

DEFINING EMOTION

Asked about a definition of emotions, many theorists start by listing a number of components that they consider as being part of a prototypical emotional episode. I use the term emotional episode to indicate anything starting from the stimulus to the later components or the immediate consequences of the emotion. The notion of emotional episode is thus potentially broader than the notion of emotion. Examples of components are: (a) a cognitive component; (b) a feeling component, referring to emotional experience; (c) a motivational component, consisting of action tendencies or states of action readiness (e.g., tendencies to flee or fight); (d) a somatic component, consisting of central and peripheral physiological responses; and (e) a motor component, consisting of expressive behaviour (e.g., fight and flight and facial and vocal expressions). These components correspond to functions such as: (a) stimulus evaluation or appraisal; (b) monitoring (which may serve the further function of control or regulation); (c) preparation and support of action; and (d) action. Table 1 depicts these components with their corresponding functions.

It should be noted that within this list of components, the definitions of the terms cognition and feeling is not unitary. The meaning of the term cognition seems to shift depending on the category with which it is contrasted. Cognition can be understood in the broad sense of the mental when it is contrasted with somatic and motor responses. Several scholars define mental processes as those that are mediated by representations. Representations are functional notions invoked to explain variable stimulus–response relations. They come into the picture when a stimulus does not invariably lead to the same response (with the same quality and intensity) at different points in time and in different contexts (Bermudéz, 1995; Moors, 2007). Cognition is understood in a more narrow sense when it is contrasted

TABLE 1
Examples of components and corresponding functions

Components	*Functions*
Cognitive	Stimulus evaluation/appraisal
Feeling	Monitoring → regulation
Motivational, Somatic	Preparation and support of action
Motor	Action

Downloaded By: [University of Gent] At: 10:20 13 May 2009

with other mental concepts such as motivation and feeling. It has been argued that goals are mentally represented but that they have special dynamic qualities that are not shared by other kinds of representations (e.g., the activation of goal representations accumulates over time and persists in the face of obstacles; Bargh & Barndollar, 1996). Thus, when contrasted with motivation, cognition can be defined as based on non-dynamic representations. When contrasted with feeling, cognition can be defined in the narrow philosophical sense of the Intentional[1] part of the mental (Green, 1996). Feeling corresponds to the phenomenal part of the mental. A mental state is Intentional by virtue of being directed at or about something. It is phenomenal by virtue of having irreducible qualia that are entirely subjective (e.g., Block, 1995; Nagel, 1974).[2] It is worth noting that there exist other narrow views of cognition. One narrow view is that cognitive processes are mediated by propositional representations (as opposed to perceptual ones, see below). Another narrow view is that cognitive processes are non-automatic (as opposed to automatic). A final narrow view is that cognitive processes are rule-based (as opposed to associative). In sum, the cognitive component can be understood in the broad sense of mental or in the more narrow sense of non-dynamic, Intentional, propositional, non-automatic, or rule based.

The component of feeling or emotional experience is sometimes understood in the narrow sense of the phenomenal part of the mental (see above) and sometimes in the broader sense of conscious experience, with both a phenomenal and an Intentional aspect. Some authors even argue that emotional experience only has an Intentional aspect. According to them, emotional experience is about the other components in the emotional episode (appraisal, action tendencies, and somatic and motor responses).

Emotion theorists disagree about the exact number and nature of the components they include in the emotional episode. The definition of components is one source of disagreement. For example, inclusion of a cognitive component is more likely when cognition is defined in a broad than in a narrow sense (cf. Lazarus, 1982, versus Zajonc, 1980). Needless to say, there are many other sources of disagreement about the components to include (cf. the special issue edited by Frijda, 2007, in *Social Science Information*).

[1] Following Searle (1983), I write Intentionality in philosophical use with a capital I and intentionality in ordinary use with a lower case i.

[2] A state can be directed at something by forming a representation of it. Thus, in this view, cognitive processes also correspond to representation-mediated processes. Note that according to this view, the mental is broader than the representational; it also includes phenomenal states that are non-representational.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Emotion theorists not only disagree about the components that they include in the emotional episode, but also about the component(s) that they include in or identify with the emotion (Prinz, 2004). Some theorists isolate one (or a few) component(s) from the emotional episode and call it emotion. For example, James (1890) equated emotion with the feeling component. Frijda (1986) singled out the motivational component as the phenomenon to be explained, equating emotions with states of action readiness. Several theorists include all or most components of the emotional episode in their definition of emotion (Clore & Centerbar, 2004; Scherer, 2005). It may be noted that some theorists treat the motor component as a consequence of emotion rather than as a part of it. Others distinguish between spontaneous and planned behaviour, treating the former as a part of emotion and the latter as a consequence.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Further, emotion theorists disagree about whether the components in the emotional episode occur sequentially, and, if so, whether they occur in a fixed order. Among those that accept a fixed order, there is disagreement about the particular order proposed. Theorists who assume a fixed order and who equate emotion with one component often consider the other components in the episode as causes and consequences of the emotion. Theorists who assume a fixed order and who equate emotion with the entire emotional episode can still split the emotional episode in an antecedent and a consequent part. It may be noted that the relation between sequentiality and causality is an asymmetric relation. Causality implies sequentiality (causes precede their effects), but sequentiality does not imply causality (early parts precede late parts, but do not necessarily cause them).

Essential for a definition of emotion is that it demarcates emotions from phenomena that are not emotions. I list a number of demarcation criteria that have turned up in the literature. Some theorists exclude from the class of emotions phenomena that lack one of the components that they consider essential for emotions or the emotional episode. For example, reflexes (e.g., startle reflex) have been refused the status of emotions because they do not have a cognitive component or because they bypass stimulus evaluation (cf. Leventhal & Scherer, 1987). Sensory experiences such as feeling cold or pain are not considered emotions because they are pure feelings that lack Intentionality (they lack a cognitive component, defined in the philosophical sense of the term). Attitudes and preferences have been excluded from the class of emotions because they lack clear somatic and motor correlates (Lang, 1985; Scherer, 2005).

It may be true that some components are necessary for emotion, yet no component seems to be unique (Frijda, 2007; Parrott, 2007). Indeed, cognition, feeling, motivation, and somatic and motor responses may be present (even all at once) in phenomena that are not emotions. To illustrate this, Frijda (2007) mentioned the example of a piece of soap that slips

through one's fingers under the shower and that leads to a shift in action tendency, manifested in feeling, somatic responses, and the action of groping for the soap. All the components are there, yet many authors will be unlikely to categorise this as an emotional episode. Theorists have therefore proposed additional criteria that may help set the boundaries of the class of emotions. Some additional criteria have to do with the content of components. One criterion specifies the content of the appraisal component. Appraisal theorists have argued that emotions occur when a stimulus is appraised as relevant and/or (in)congruent to a central goal (Frijda, 1986; Lazarus, 1991; Oatley & Johnson-Laird, 1987; Moors, 2007; Scherer, 2005). In the soap example, the event may be relevant only to a goal of minor importance. Some theorists (even some appraisal theorists) have left the possibility open that emotions arise when the stimulus is appraised as positive or negative, independent of current goals (Frijda, 2007; Scherer, 2005, takes this to be the case for the emotion disgust and for emotions elicited by music). A second content criterion specifies the content of the experience component. Many theorists have argued that the experience of an emotion must have a positive or negative flavour (e.g., Ortony & Turner, 1990), thereby excluding neutral states such as surprise and interest. Other additional criteria are based on quantitative features. For example, Scherer (1984, 1993b) proposed that a phenomenon can be called an emotion when all (or most) components are recruited in a co-ordinated and synchronised manner. A final set of criteria has been proposed to delineate emotions from moods. These include duration (emotions: short; moods: long), intensity (emotions: high; moods: low), and the presence or absence of a specific target (emotions: present; moods: absent).

Emotion theorists not only disagree about the boundaries of the class of emotions, they also disagree about how they think the class of emotions or emotional phenomena should be internally structured. A first group of theorists takes a limited set of emotions with a special status, called basic emotions, as the building blocks of emotional life. Basic emotions can be recombined or elaborated to form non-basic emotions. Members of this group of theorists vary with regard to the number and identity of the emotions they enumerate as basic. This is because they rely on different criteria for inclusion and discrimination within this set. Examples of criteria are that each basic emotion has a unique neural signature (Darwin, 1872/1965; Ekman, 2007; Izard, 1977; Panksepp, 1982, 1998, 2000), a unique pattern of appraisal values (e.g., Roseman, 1991), a unique action tendency (Frijda, 1986), a unique physiological response pattern (Ekman, Levenson, & Friesen, 1983), a unique facial expression (Ekman, 1984), and a unique experiental quality (Oatley & Johnson-Laird, 1987). A second group of theorists takes a small set of sub-emotional variables as the building blocks of emotional life. Members of this group vary with regard to the number and

Downloaded By: [University of Gent] At: 10:20 13 May 2009

nature of the variables they postulate. For example, several appraisal theorists put forward six or more appraisal variables (e.g., novelty, valence, goal relevance, goal congruence, coping potential, and agency). These variables are conceived of as dimensional by some authors (e.g., Scherer, 1984, 1994) and as discrete by others (e.g., Lazarus, 1991; see Roseman & Smith, 2001). The combination of values on discrete/dimensional appraisal variables gives rise to a large/infinite number of specific emotions. For another example, Russell (2003) put forward the dimensional variables of valence and arousal. These are variables of experience and neurophysiological activity. Contrary to the appraisal variables mentioned above, however, Russell's building blocks do not combine to form specific emotions (see below).

Given the many ways in which emotion theories can differ, there are many ways in which an overview of them can be organised. I choose to organise theories according to their views of emotion causation, and, related to this, the order in which they place emotional components within an emotional episode. This means that I discuss only theories that have an explicit, unique view of emotion causation. It also means that I compare the selected theories especially with regard to their view of emotion causation. There are, of course, other ways in which to organise an overview of emotion theories. One could compare theories with regard to the way in which they structure the class of emotional phenomena (into discrete emotions versus sub-emotional variables; see above). One could also compare theories with regard to their preferred research method. It is good to keep in mind that different principles for organising overviews can lead to different groupings of theories.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

EMOTION CAUSATION

The question about the cause of emotions is a question about what is happening between the stimulus (the input) and the emotion (the output) or between the stimulus and the consequent part of the emotional episode. Ideally, an emotion theory that is concerned with emotion causation should explain the observation that some but not all stimuli in the environment elicit an emotion. I dub this "the elicitation problem" (Q1; Power & Dalgleish, 2007, called it "the event problem"). This problem subsumes two subquestions. The first subquestion (Q1A) asks which stimuli elicit an emotion and which stimuli do not. The second subquestion (Q1B) asks how the organism determines this. It is a question about the mechanisms (and representations) responsible for selecting the stimuli that elicit an emotion.

What else should a theory concerned with emotion causation explain, besides the presence or absence of an emotion? It should also explain certain characteristics of the emotion. As mentioned above, emotion theorists have different definitions of emotion. They are thus likely to disagree about the

to-be-explained characteristics of emotion. One way to escape from this impasse is to look for very general characteristics that all or most emotion theorists would agree on. I think that, at the very least, emotion theorists agree that an emotion (as many other natural and artificial phenomena) has quantity and quality. The quantity aspect refers to the intensity of an emotion and varies from no intensity (and hence no emotion) to very high intensity. The quality aspect, in a broad sense, refers to the valence (positive/negative) of an emotion, and, in a narrow sense, to specific emotions such as anger, fear, sadness, and joy (to name just a few). Theories concerned with emotion causation should ideally explain variations in quantity and quality. I refer to the quantity issue as "the intensity problem" (Q2), and to the quality issue as "the differentiation problem" (Q3). The intensity problem subsumes two subquestions: A first subquestion (Q2A) asks which stimuli elicit weak emotions and which elicit strong ones. A second subquestion (Q2B) asks about the mechanisms (and representations) that determine the intensity of the ensuing emotion. It may be noted that the elicitation problem can be seen as part of the intensity problem. The presence or absence of an emotion can be considered as a matter of intensity: The absence of an emotion can be situated at one extreme end of the intensity scale. The differentiation problem can also be split into two subquestions: A first subquestion (Q3A) asks which stimuli elicit positive emotions and which elicit negative ones or (for theories that distinguish more specific emotions) which stimuli elicit specific emotion such as anger, fear, sadness, and joy. A second subquestion (Q3B) asks about the mechanisms (and representations) that determine the quality of the ensuing emotion, the mechanisms that are charged with differentiation in the broad or the narrow sense.

Relying on Marr's (1982) proposal that processes can be described at different levels of analysis, one can say that the set of subquestions about stimuli (Q1A, Q2A, Q3A) and the set of subquestions about mechanisms and representations (Q1B, Q2B, Q3B) are *both* concerned with the process involved in emotion elicitation. They just deal with a different level of process description. Marr (1982) taught us that processes can be described at three levels of analysis. At the first, functional level, a process is described as a relation between input and output; it is specified what the process does. At this level can also be described the conditions under which the process operates. At the second, algorithmic level, a process is described in terms of the mechanisms that translate input into output. At this level can also be specified the format of the representations (or codes) on which the mechanisms operate. At the third, implementational level, the physical realisation of the process in the brain is specified. This level deals with the neurological structures, circuits, or networks involved. The subquestions about the stimuli that elicit emotions (Q1A, Q2A, and Q3A) can be said to deal with the functional level of process understanding: Stimuli are the

Downloaded By: [University of Gent] At: 10:20 13 May 2009

input; emotions are the output. The subquestions about the underlying mechanisms and representations (Q1B, Q2B, and Q3B) can be said to address the algorithmic level. One could argue that a complete theory of emotion causation should also address the third level of process understanding, and several theories have addressed this level. In the present overview, however, the focus is mostly (but not exclusively) on the first two levels (see Table 2). Theories concerned with emotion causation can differ in two important ways. First, they can diverge on the set of questions (A, B, C) and hence the level of process description (functional, algorithmic, implementational) that they address. Second, they can address the same set of questions but provide radically different answers.

I review a selection of emotion theories (some are families) that have made claims about the causation of emotion. Because of the growing interdisciplinary contacts among psychologists and philosophers, I have chosen not to restrict the overview to well-known psychological theories, but to also include dominant philosophical theories.[3] The theories discussed are: (T1) James' (1890) theory; (T2) Schachter's (1964) theory; (T3) appraisal theories; (T4) network theories; (T5) affect program theory; (T6) Barrett's (2006b) conceptual act theory; (T7) philosophical cognitivism; and (T8) philosophical perceptual theories.[4] The order in which these theories are discussed is partly determined by historical considerations (because later theories build on the insights developed by older theories and sometimes present solutions to problems of older theories) but not entirely so (several theories developed more or less in parallel, and most of them have early roots).

Examination of these theories shows that most of them assume that some kind of processing is involved in emotion elicitation. Theories differ with regard to the kind of processing that they propose. In this respect, it is worth pointing at three differences. A first difference has to do with the *conditions*

[3] In the present paper, the distinction between philosophical and psychological theories is based on the background of their authors and on a difference in approach that can be traced back to a difference in starting point. Philosophers often start from the structure of language in the hope of learning something about the structure of reality. Psychologists often start from the observation of reality. I further wish to note that I use the term theory in a liberal sense to indicate any internally coherent collection of hypotheses, regardless of whether these hypotheses have been submitted to empirical testing.

[4] The theories of Schachter (1964) and Barrett (2006b) have often been grouped together in the family of two-factor or constructivist theories, and James' (1890) theory has sometimes been added as the precursor of this tradition. In the present paper, I chose to discuss these theories separately because they occupy radically different positions on the criteria that I have set out to organise this review. James can indeed be considered as a precursor of Schachter, but both propose different components for the differentiation of emotions. Barrett's theory is undeniably a two-factor theory like Schachter's, but Barrett also builds on insights developed by appraisal theories. As a result, the processes that Barrett proposes for the elicitation of emotions differ from those proposed by Schachter in several important respects (see below).

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Downloaded By: [University of Gent] At: 10:20 13 May 2009

TABLE 2
Overview of questions that should be addressed by theories of emotion causation, linked to Marr's levels of analysis

	Problems related to emotion causation		
Marr's levels of process description	*Question 1: Elicitation*	*Question 2: Intensity*	*Question 3: Differentiation*
A. Functional level: Relation between input and output	Question 1A: Which stimuli elicit emotions and which do not? What are the conditions under which emotions are elicited	Question 2A: Which stimuli elicit weak versus strong emotions?	Question 3A: Which stimuli elicit positive versus negative emotions? (anger, fear, sadness, joy, etc.)
B. Algorithmic level: Mechanisms and format of representations (codes)	Question 1B: What are the mechanisms and representations that determine emotion elicitation?	Question 2B: What are the mechanisms and representations that determine the intensity of emotions?	Question 3B: What are the mechanisms and representations that determine the quality of emotions?
C. Implementational level: Neurological structures or routes	Question 1C: What is the neurological basis of emotion elicitation?	Question 2C: What is the neurological basis of emotion intensity?	Question 3C: What is the neurological basis of emotion differentiation?

Note: The C-questions are not discussed in the present paper.

under which they think emotion-eliciting processes can operate. Some theories (e.g., T2 and T7) assume that the processes involved in emotion causation are non-automatic (i.e., conscious, controlled, non-efficient, and/or slow) whereas others (e.g., T3, T4, T5, T6, and T8) emphasise that they can also be automatic (i.e., unconscious, uncontrolled, efficient, and/or fast). As argued by Bargh (e.g., 1989; see also Moors & De Houwer, 2006a, 2006b) automaticity has to do with the conditions under which a process is able to operate. A process is automatic when it operates under suboptimal conditions (such as when there is subliminal stimulus input, no goal to engage in the process, a goal to counteract the process, a lack of attentional capacity, and/or a lack of time); a process is non-automatic when it only operates under optimal conditions (such as when there is supraliminal stimulus input, the goal to engage in the process, no goal to counteract the process, abundant attentional capacity, and/or abundant time).

A second difference among theories of emotion causation has to do with the *format of the representations* they put forward. Some theories (e.g., T7) hold that emotions are elicited by mechanisms operating on propositional representations whereas others (e.g., T3, T4, T5, T6, and T8) argue that they can also be elicited by mechanisms operating on perceptual representations. It is important to note that various authors have characterised the distinction between propositional and perceptual representations in different ways. Some authors state that propositional representations are verbal-like or abstract whereas perceptual representations are image-like in that they contain concrete modality-specific sensory features (e.g., Barrett, 2006b). Others state that propositional representations are mental contents to which one ascribes truth value, whereas perceptual representations are mental contents that one entertains without necessarily believing them (Charland, 1997). Still others stress that propositional, but not perceptual, representations have a similar compositional structure as propositions. Propositions are composed of meaningful parts that can be recombined to form new propositions (e.g., Fodor, 1980; but see Bermudéz, 1995).

A third difference among theories of emotion causation has to do with the *object or input* of the emotion-eliciting process. In most theories, the input of the crucial process is the stimulus. In the theories of James (1890) and Schachter (1964), however, the input of the crucial process is the physical responses of the person to the stimulus. Barrett's (2006b) theory gives equal weight to one process that has the stimulus as its input and another process that has the output of the other process (i.e., an experience) as its input.

As mentioned, theories of emotion causation not always propose different kinds of processes; they sometimes just differ with regard to the levels of process understanding that they address. Many theories are concerned with the algorithmic level (T3, T4, and T6, and to some extent T7 and T8) and some with the implementational level (T1, T5, and T6, and some theories in

Downloaded By: [University of Gent] At: 10:20 13 May 2009

T3 and T4). Only few theories (T3, and to some extent T7) seriously address the functional level. In the next sections, the selected theories are discussed one by one. The aim is to identify the components that theories invoke to solve the problems of elicitation (Q1), intensity (Q2), and differentiation (Q3), and to report on the order in which they place components within a prototypical emotional episode. Another aim is to detail the above claim that theories differ with regard to the kind of processing they propose (i.e., *conditions*, *format of representations*, and *object*) and the levels of process description they address (functional, algorithmic, and implementational).

It is worth reiterating that theories of emotion causation differ with regard to the component(s) that they identify with the emotion and hence the phenomenon they set out to explain. Some theories equate emotion with a single component, such as the feeling component (T1 and T2) or the cognitive component (members of T7 and T8). Other theories take emotion to be a syndrome composed of several components such as feelings, cognition, motivation, somatic and/or motor responses (most members of T3, T4, and T5).

Downloaded By: [University of Gent] At: 10:20 13 May 2009

JAMES' THEORY

According to James (1884, 1890) a stimulus activates the sensory cortex, which directly (or in some unspecified way) elicits peripheral somatic and/or motor responses. Feedback of these bodily responses returns to the sensory cortex where it produces emotional experience (Figure 1). Emotional experience is nothing but the conscious experience of bodily responses. James equated emotion with emotional experience (i.e., the feeling component) so his theory has been called a feeling theory. James' theory was revolutionary at the time because it turned around the conventional order of events within an emotional episode. Whereas folk theory assumed that emotional experience precedes bodily responses ("we run/tremble because we feel afraid"), James postulated that bodily responses precede emotional experience ("we feel afraid because we run/tremble"). It is fair to note that before James, Descartes (1644/1998) had already proposed this order of events to occur within an emotional episode.

In James' (1890) theory, both the intensity (Q2A) and the quality (Q3A) of emotions are determined by the intensity and quality of the bodily

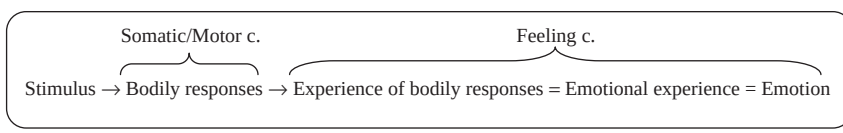


Figure 1. Order of components in James' theory.

responses (i.e., the somatic and motor components) that occur in response to the stimulus. The quality of the emotion is determined by the specific response pattern elicited by the stimulus. Each specific emotion has its own response signature. An important shortcoming is that James does not explain how bodily responses are produced in the first place. In other words, he does not address the elicitation problem (Q1).

James' (1890) theory has been criticised on empirical and theoretical grounds. On the empirical side, Cannon (1927) argued: (a) that the autonomous responses that accompany specific emotions lack specificity (e.g., both anger and fear come with increased heart rates); (b) that artificial induction of physical arousal (e.g., by injection of adrenalin) does not produce real emotions; and (c) that disconnection of peripheral organs from the central nervous system (disrupting feedback) does not eliminate emotions. After Cannon, renewed interest has arisen for each of these issues, but there is currently no consensus (Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000; Christie & Friedman, 2004; Chwalisz, Diener, & Gallagher, 1988; Ekman, Levenson, & Friesen, 1983; Levenson, 1992; Levenson, Ekman, & Friesen, 1990; see Barrett, 2006a, 2006b; Cornelius, 1996; Niedenthal, Krauth-Gruber, & Ric, 2006, for reviews; see also, the rise of neo-Jamesian theories, e.g., Damasio, 1994; Prinz, 2004). The theoretical criticism was that James (1890) reduced emotions to experiences of bodily responses and therefore failed to account for the fact that emotions have Intentional objects (e.g., Solomon, 1976). For example, sadness is not just the experience of a pattern of bodily responses. It is also about something, for example, about the fact that something valuable is lost forever.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

SCHACHTER'S THEORY

Schachter (1964) reconciled James' (1890) notion that somatic responses precede emotional experience with Cannon's (1927) criticism that these responses lack specificity and are therefore not capable of bringing forth specific emotions. Schachter's theory is a two-factor or two-step theory. In the first step, stimulus input produces an undifferentiated state of physiological arousal.[5] In the second step, the arousal is interpreted in light of the characteristics of that input. It is this cognitive process of attribution of arousal to the presumed cause of the arousal that produces a specific

[5] Two different meanings of the term arousal circulate in emotion literature. In the first sense, arousal refers to physical arousal (i.e., the somatic component). In the second sense, arousal refers to intensity (activation–deactivation) and can be a property of several components (e.g., the feeling component).

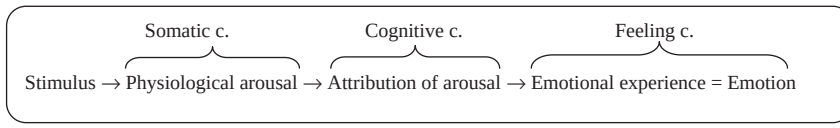


Figure 2. Order of components in Schachter's theory.

emotional experience (see Figure 2). Like James, Schachter equated emotion with emotional experience (i.e., the feeling component).

The degree of arousal (i.e., the somatic component) determines the intensity of the emotion (Q2) whereas the additional element of attribution (i.e., the cognitive component) provides the quality of the emotion (Q3). Attribution of arousal to different eliciting events produces different emotions. Initially, the confrontation with a dangerous dog and the reunion with a beloved person cause similar physical arousal. It is only after attribution of this arousal to the danger versus the reunion that an emotion of fear versus joy is elicited. Schachter and Singer (1962) supported their view with an experiment in which injections of adrenaline (causing physical arousal) led to joy versus anger depending on whether they were in the presence of a happy versus angry bystander. It was assumed that the bystander's emotion led participants to interpret their own arousal as joy versus anger.

Within the prevailing scientific climate, Schachter's (1964) cognitive attribution process was conceived of as a conscious process, as if physical arousal can be coloured in an arbitrary manner by conscious thoughts. Although Schachter built in a cognitive component in charge of emotion differentiation, he did not specify a component that determines which stimuli lead to arousal in the first place. The cognitive component does not precede arousal and therefore cannot determine which stimuli elicit arousal (and hence an emotion) and which do not. In other words, the theory fails to address the elicitation problem (Q1).

Critics have challenged the empirical evidence for Schachter's theory (see Reisenzein, 1983, for a review) as well as the theory itself (Zajonc, 1980). Zajonc argued against Schachter's (1964) idea that cognition is a necessary cause of emotions. Kunst-Wilson and Zajonc (1980) demonstrated that mere (repeated) exposure to stimuli led to an increase in liking of those stimuli, even when the stimuli were presented subliminally so that conscious identification of them was not possible. This and other arguments led Zajonc to conclude that cognition is unnecessary for affect.[6] Appraisal theories of emotion

[6] Zajonc (1980) claimed that cognition is unnecessary for affect (by which he meant raw positive–negative quality or valence), but not that cognition is unnecessary for full-blown specific emotions. His data are nevertheless relevant for theories concerned with emotion causation, at least for those theories that conceive of affect as a minimal form of emotion or as an early step in emotion causation (e.g., Barrett, 2005; Scherer, 1984).

Downloaded By: [University of Gent] At: 10:20 13 May 2009

envisaged another solution for the problem raised by the data of Kunst-Wilson and Zajonc. These theories are discussed in the next section.

APPRAISAL THEORIES

Appraisal theories of emotion (e.g., Arnold, 1960; Frijda, 1986; Lazarus, 1966, 1991; Oatley & Johnson-Laird, 1987; Ortony, Clore, & Collins, 1988; Roseman, Antoniou, & José, 1996; Scherer, 1984; Smith & Ellsworth, 1985) retained Schachter's (1964) idea that cognition is an antecedent of emotion, but they no longer equated cognition with conscious cognition. These theorists suggested that much of the cognitive work involved in the elicitation of emotion is unconscious or otherwise automatic (e.g., Arnold, 1960; Scherer, 2001, 2004). Kunst-Wilson and Zajonc's (1980) data showed that conscious cognition is unnecessary for emotion or affect, but not that unconscious cognition is unnecessary. Arnold (1960) coined the term appraisal to refer to the cognitive process involved in emotion elicitation, and, accordingly, theories in this tradition have been dubbed appraisal theories.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Appraisal theories also differ from Schachter (1964) in that they place the cognitive component at the very onset of the emotional episode (after the stimulus), prior to bodily responses. Thus, the cognitive component can be invoked as the one that determines which stimuli lead to an emotion and which do not (cf. elicitation problem, Q1). This component also determines which emotion should be produced (cf. differentiation problem, Q3) and how intense it should be (cf. intensity problem, Q2; see below). Further, appraisal theories shift Schachter's conscious attribution process to the end of the emotion episode. Thus, unconscious appraisal of stimuli takes place prior to the emotion whereas conscious attribution of the emotion to a cause and/or labelling of the emotion (e.g., as fear or anger) takes place after the emotion. It is important to note that the crucial distinction between emotion-antecedent appraisal and emotion-consequent attribution is not so much the nature of the cognitive operations involved (appraisal can include causal attribution, cf. the appraisal variable of agency) or the degree to which they are conscious (both can probably be conscious or unconscious), but the object or input of these processes. In the case of emotion-antecedent appraisal, the input is the stimulus; in the case of emotion-consequent attribution, the input is the emotion.

It is somewhat precarious to detail the order of the remaining components within the emotional episode because there is divergence among appraisal theories. By way of illustration, I present a much-cited order (see Figure 3). Appraisal of the stimulus causes an action tendency (i.e., the motivational component). The action tendency can be manifested in

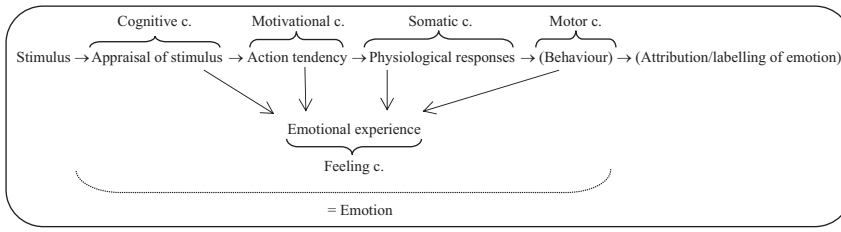


Figure 3. Order of components in appraisal theories.

physiological responses (i.e., the somatic component), which prepare and support the occurrence of behaviour (i.e., the motor component). Emotional experience (i.e., the feeling component) is often considered as the totality of the traces that all the other components leave in consciousness. Thus, it is difficult to picture emotional experience as a separate phase in the emotional episode.

Contemporary appraisal theorists (e.g., Scherer, 2001) have proposed refinements to the sequence of components presented above. I mention three refining assumptions. First, organisms always occupy some value on the components proposed. Thus, a sequence of components is actually a sequence of *changes* in these components. Second, the processes involved in one component need not be entirely completed before they can initiate changes in subsequent components. For example, partial completion of the appraisal component can already trigger changes in the components of action tendencies, responses, and experience. Third, the changes caused in subsequent components feed back into prior components. This is called recurrence. For example, changes in response components feed back into the appraisal component, causing re-appraisal. It may be noted that these refinements are not incompatible with the sequence of components presented above. Despite the fact that at any point in time, several recurrent cycles are running simultaneously so that the processes in several components occur in parallel, the order within each cycle is fixed. In each cycle, stimuli must be appraised before they lead to action tendencies and responses.

Appraisal theories have traditionally focused on the first subquestion of the problems of elicitation, intensity, and differentiation. They have addressed the questions of which stimuli elicit an emotion versus no emotion (Q1A), which stimuli elicit weak versus strong emotions (Q2A), and which stimuli elicit which specific emotions (Q3A). Several appraisal theories have also addressed the second subquestion about the mechanisms and representations involved in the elicitation (Q1B), intensity (Q2B), and differentiation (Q3B) of emotions. In trying to develop hypotheses regarding the A-Questions, appraisal theorists have quickly come to the conclusion that it

Downloaded By: [University of Gent] At: 10:20 13 May 2009

is impossible to make a fixed list of stimuli that elicit an emotion (or an emotion of the same intensity and quality) in all people or on all occasions. They have emphasised that there are few if any one-to-one relations between specific stimuli and specific emotions (Roseman & Smith, 2001). The same emotion can be produced by very different stimuli, and the same stimulus can lead to different emotions in different individuals or on different occasions. For example, anger can be produced by an insult, a computer crash, or by accidentally hitting one's head against the kitchen cabinet. A computer crash can lead to anger in one person or on one occasion, but to fear or panic in another person or on another occasion. Appraisal theorists have tried to discover the commonalities among stimuli that elicit emotions (or the same ones) and the differences among stimuli that do and those that do not elicit emotions (or different ones). As a result of this exercise, they have come up with a set of appraisal variables. Each variable deals with one aspect of the encounter. The values on these variables combine to form an appraisal pattern. It is assumed that each specific emotion is caused by a unique appraisal pattern. I now turn to a discussion of a few important appraisal variables.

A first variable is goal relevance. A stimulus elicits an emotion when it is goal relevant, that is when it provides information about the satisfaction status of a goal or concern. Emotions are reliably caused by constellations of stimuli and goals. For example, hearing a noise in the hall at night is not inherently emotion provoking; it is only so because it is relevant for one's goal for physical safety (it might indicate that a violent robber is trying to break into the house). The variable of goal relevance is also responsible for the intensity of emotions. The more important the goal at stake, the stronger the ensuing emotion. A second variable is goal congruence. Specific emotions are not evoked by specific classes of stimuli but instead by specific classes of constellations of stimuli and goals. A constellation of a match between a stimulus and a goal leads to a positive emotion whereas a constellation of a mismatch leads to a negative emotion, irrespective of the specific stimuli or the specific goals at stake. A noise in the hall elicits a negative emotion when it constitutes a mismatch with one's goal for physical safety, but so does any stimulus that constitutes a mismatch with some goal. Appraisal theorists have identified a number of other variables such as certainty, coping potential, and agency/blame for the further breakdown of positive and negative emotions into more specific emotions such as joy, hope, pride, anger, fear, and sadness. Examples of hypotheses developed by appraisal theorists are that anger and sadness are elicited by an actual mismatch, whereas fear occurs in response to a pending mismatch (Arnold, 1960), that events are more easy to cope with in the case of anger than in the cases of fear and sadness (Scherer, 1988), and that anger occurs when the mismatch is caused by an animate agent, especially when it was on purpose

Downloaded By: [University of Gent] At: 10:20 13 May 2009

(Lazarus, 1991; but see Berkowitz & Harmon-Jones, 2004). In sum, the appraisal variable of goal relevance is appraisal theory's solution to the problems of elicitation (Q1A) and intensity (Q2A). The remaining appraisal variables (goal congruence, coping potential, agency/blame) provide a solution to the differentiation problem (Q3A).

Despite a fair degree of overlap, individual appraisal theories disagree about the precise number and identity of the appraisal variables that they include. According to Scherer (1999), part of the disagreement stems from differences in the number and identity of the emotions that appraisal theories set out to explain. A theory that tries to explain anger, fear, sadness, and joy needs less appraisal variables than a theory that also tries to explain surprise, disgust, shame, jealousy, pride, and guilt. Scherer ascribes another part of the disagreement to methatheoretical choices. Some theories put emphasis on parsimony, restricting their list of variables to the necessary and sufficient ones (or even the typical ones); others put emphasis on exhaustivity, trying to explain the greatest variety within emotion categories, such as different shades of anger and fear. There is also disagreement about the precise appraisal patterns that they postulate for each emotion. For example, some appraisal theorists consider the appraisal variable of agency/blame as necessary for anger (e.g., Lazarus, 1991) whereas others do not (e.g., Frijda & Zeelenberg, 2001).

Appraisal researchers have investigated hypotheses about the relation between specific appraisal patterns and specific emotions, using self-report methods as their primary source (e.g., Roseman, 1991; Scherer, 1993b, 1997; Smith & Ellsworth, 1985; Smith & Lazarus, 1993). Participants have been asked, for instance, to recall how they appraised a particular emotion-evoking event or to imagine which emotion they would feel given certain appraisals. The use of self-report for discovering appraisals involved in emotion causation has been the target of severe criticism (e.g., Davidson, 1992; Parkinson & Manstead, 1992). Apart from the limited evidential value of correlative studies for causal relations, self-report data have been characterised as an unreliable source for gaining insight in automatic processes. Given the assumption that appraisal is assumed to be automatic most of the time, it is unlikely that it would be available for self-report. Appraisal theorists (e.g., Frijda, 1993; Frijda & Zeelenberg, 2001; Lazarus, 1991; Scherer, 1993a) are aware of the limitations of self-report studies. They acknowledge that self-report data are an unreliable source for tracing the actual appraisal variables involved in emotion causation. They suspect instead that the appraisal patterns found in their studies reveal the structure of the content of emotional experience (e.g., Frijda, 1993; Scherer, 1993a) or that they reflect post hoc causal attributions (Nisbet & Wilson, 1977; Parkinson & Manstead, 1992; Rimé, Philippot, & Cisamolo, 1990; Robinson & Clore, 2002). Such attributions are often based on stereotypic

Downloaded By: [University of Gent] At: 10:20 13 May 2009

scripts about the relation between appraisals and emotions. Participants may be particularly encouraged to draw from stereotypic scripts because of the fact that self-report studies make use of emotion words. Asked about the cause of an emotion labelled as fear, participants may mention an event appraised as dangerous (threatening the goal of safety) because they make use of the stereotypic script according to which fear occurs in response to danger (Frijda & Zeelenberg, 2001; Izard, 1993). To break out of this circularity, several authors have proposed to abandon the use of emotion words and to change the dependent variable from emotional experience to action tendencies (Frijda & Zeelenberg, 2001), physiological response patterns (Pecchinenda, 2001), or behavioural responses (such as vocal and facial expressions; Johnstone, van Reekum, & Scherer, 2001; Kaiser & Wehrle, 2001). These other correlates of emotions have the advantage that they are logically independent of appraisal and that they suffer less from the influence of stereotypic scripts (Frijda & Zeelenberg, 2001).

Downloaded By: [University of Gent] At: 10:20 13 May 2009

As pointed out above, appraisal theories address the functional level of process understanding. Their aim is to understand the relation between specific appraisal patterns and specific emotions. They are guided by the question of which information is minimally or typically processed before specific emotions occur. Several appraisal theorists have also ventured hypotheses about the algorithmic level of process understanding (B-Questions). Most of them propose a dual-mode (or multi-mode) model. They put forward two (sometimes three) mechanisms for emotion elicitation: one is rule based, the other is associative (e.g., Clore & Ortony, 2000; Smith & Kirby, 2000, 2001; Teasdale, 1999; van Reekum & Scherer, 1997; see Smith & Neumann, 2005, for a review). Rule-based mechanisms compute the values for individual appraisal variables and combine them in order to select the appropriate emotion. The associative mechanism corresponds to the retrieval or reinstatement of previously computed and stored appraisal patterns. Some theorists add a third mechanism: the activation of innate sensory-motor connections (Leventhal & Scherer, 1987). A limited set of stimuli (e.g., faces, loud noise, and sudden loss of support) is thought to have the innate capacity to elicit emotional responses. Other theorists refuse to stretch the notion of appraisal so that it includes the activation of sensory-motor connections.

Advocates of multi-mode models have made a priori assumptions about (a) the format of the representations that serve as the input to these mechanisms and (b) the conditions under which these mechanisms can operate. The rule-based mechanism is said to operate on propositional representations and the associative mechanism on perceptual representations (Leventhal & Scherer, 1987; but see Smith & Kirby, 2001). Sensory-motor connections can be triggered by sensory features that are not yet integrated into a perceptual representation. To the extent that the

sensory-motor mechanism is not mediated by representations, it falls out of the cognitive realm. The rule-based mechanism is said to be flexible but non-automatic; the activation of learned and innate stimulus–emotion connections is said to be rigid (and hence more error prone) but automatic (Clore & Ortony, 2000; Smith & Kirby, 2001; but see Moors, 2008). For example, when processing conditions are optimal, hearing an insulting remark may cause a person to weigh the implications of the event for her/his goals and the possibilities for taking action. When processing conditions are sub-optimal, however, the person has to rely on memory recordings of previous insults and the associated appraisal pattern. The associative mechanism that figures in multi-mode models of emotion causation is highly reminiscent of the mechanism for emotion elicitation proposed by network theories of emotion. It is to network theories that I now turn.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

NETWORK THEORIES

Network theories of emotion (e.g., Berkowitz, 1990; Bower, 1981; Lang, 1985; Leventhal, 1980, 1984) have their roots in associative models from the conditioning literature and semantic network models from the memory literature. Common to all network theories is the assumption that emotions are recorded in memory and that activation of these recordings is the principal cause of emotions (Q1). Network models assume that initially only a handful of biologically relevant stimuli elicit unconditioned emotional responses and that the range of stimuli that evoke these emotional responses is progressively elaborated through conditioning procedures (Martin & Levey, 1978). When an emotional episode takes place, information about the stimulus, action tendencies, and responses (in all models), as well as about conceptual meaning and emotional experience (in some models) is encoded in memory in distinct nodes. For each specific emotion, these nodes are organised in a schema (Leventhal, 1980) or a network structure (Bower, 1981; Lang, 1985). A newly encountered, neutral stimulus acquires emotion-eliciting power through repeated pairings with a stimulus that was already represented in memory as part of an emotional schema. The (consistent) co-occurrence in time and space of the new stimulus with the old stimulus is sufficient for the new stimulus to become associated with the same schema (i.e., learning). In this way, existing schemata are elaborated. On a later occasion, when the new stimulus is encountered in isolation, the associated schema is activated (i.e., retrieval) and an emotion ensues.

Schemata may be triggered by stimuli that are either identical or similar to the ones represented in the schema (i.e., generalisation). Another characteristic of schemata or networks is that they may be activated via different entry points. An emotion schema can be activated via stimuli, but

also via responses, for instance, when emotion-specific facial expressions are mimicked (e.g., Lang, 1994; cf. facial feedback hypothesis). Note that if responses are to trigger the schema for one specific emotion in an unambiguous way, there must be a unique response pattern for that emotion. The debate about the existence of emotion-specific response patterns is thus also important for network theories (at least for their assumption that schema's can be activated via responses).

There is no consensus about whether, during *learning* or *acquisition*, the creation of an associative link between the old and the new stimulus requires anything beyond the mere co-occurrence in time and space of these stimuli. Some investigators claim that persons must also be aware of this co-occurrence (e.g., Pleyers, Corneille, Luminet, & Yzerbyt, 2007; Shanks & Dickinson, 1990) whereas others posit that awareness is not always required (Baeyens, Eelen, & Van den Bergh, 1990). With respect to *retrieval* or *deployment*, on the other hand, there is general consensus that both the activation of an emotion schema and the further spreading of activation among the nodes within the schema can take place in an unconscious (and otherwise automatic) fashion. The content of a node becomes conscious when the strength of activation in this node exceeds a certain threshold.

Network activation is regarded as a form of cognition (if cognition is understood in the broad sense of representation-mediated processing). Thus, in network theories, emotions are elicited by the cognitive component (cf. elicitation problem, Q1). The quality of the emotion is also delivered by the cognitive component (cf. differentiation problem, Q3). A stimulus activates the stored emotional schema of a previously encountered stimulus to which it is most similar. The intensity of the emotion is determined by the strength of activation of the schema (cf. intensity problem, Q2). Network activation is a mechanism (i.e., an associative mechanism), to be situated on the algorithmic level of process understanding. In other words, network theories address the second subquestion of the problems of elicitation (Q1B), intensity (Q2B), and differentiation (Q3B). They are less concerned with the first subquestion of these problems, which is to know which stimuli elicit emotions (Q1A), which stimuli elicit strong versus weak emotions (Q2A), and which stimuli lead to which specific emotions (Q3A). From a purely associative point of view, each stimulus should be capable of eliciting any emotion (except perhaps a limited set of unconditioned stimuli; Öhman & Mineka, 2001). Whether or not a stimulus elicits an emotion, and which one, is entirely dependent on the other stimuli with which the stimulus was previously paired. This does not seem very plausible. Purely associative models probably meet their limits here. Most network theories (e.g., Lang, 1994; Teasdale, 1999) therefore leave room for a rule-based mechanism that computes the values of stimuli on a number of variables, much like the variables proposed in appraisal theories. They thus present a multi-mode

Downloaded By: [University of Gent] At: 10:20 13 May 2009

view similar to that discussed in the section on appraisal theories (see also the joint publication of Leventhal and Scherer, 1987).

At the time that network theories of emotion were first developed, the computational metaphor of the mind ruled. Recent theories of emotion elicitation that are based on the connectionist or dynamic systems metaphor of the mind (e.g., Lewis, 2005) can be considered modern variants of network theory. In both classic and new network theories, the central mechanism for emotion elicitation is associative. In classic networks models, an emotion is represented as a schema, in which each constitutive component has a separate localist representation (i.e., a node). The assumption that the schema can be activated via different entry points (stimulus side, response side) gives the impression that network activation is a sequential affair. In network models inspired by connectionism or dynamic systems theory, components are represented in distributed form and multiple components can be activated in parallel. These components constrain each other mutually (with numerous feedback loops) until a stable solution emerges.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

AFFECT PROGRAM THEORY

Emotion causation has to do with the part ranging from the stimulus to the emotion or the consequent part of the emotion. This part can further be subdivided in a part in which evaluation of the stimulus takes place and a part in which evaluation of the stimulus is translated into the (other) components of the emotion (see also Reisenzein, 2001). The first part is the traditional territory of appraisal theories. Affect program theory (e.g., Ekman, 1992, 2007; Izard, 1977; Panksepp, 1998, 2000; Tomkins, 1962) proposes a hypothesis about the second part, a hypothesis that is situated, moreover, on the implementational level. The hypothesis is that each basic emotion has a unique neural circuit (or other neural signature). These circuits are said to be installed by evolution to serve specific adaptational functions. For example, the neural circuit of fear serves survival whereas the neural circuit of anger serves territorial concerns. A neural circuit is triggered when it receives an input of a certain nature. Specification of the nature of this input is left to other theories (or it is similar to what other theories have proposed). Ekman (1992), for example, accepts that neural circuits are triggered by prior appraisals (in the multi-modal sense). In the default case, once the neural circuit of a specific emotion is triggered, it runs to completion and gives rise to specific action tendencies, specific responses, and specific emotional experience. The default case obtains when activation of the neural circuit exceeds a certain threshold and when counteracting influences are either absent or not strong enough (cf. Ekman, 1992). Affect

program theory is intrinsically dedicated to the view that basic emotions are the building blocks of emotional life (the principle for inclusion and discrimination being the existence of a unique neural substrate; see above).

Evidence adduced in support of affect program theory is either direct or indirect (see Ortony & Turner, 1990, for a review). Direct evidence is neurological evidence for the existence of emotion-specific neural circuits (e.g., Panksepp, 1998, 2000). Examples of indirect evidence are: (a) evidence for the existence of emotion-specific responses (e.g., facial expressions and physiological response patterns; e.g., Ekman, 1972; Ekman, Levenson, & Friesen, 1983); (b) evidence that these emotion-specific responses are universal (Ekman, 1972); and (c) evidence for a high degree of co-ordination among the various components of each specific emotion. It may be noted that in the case of indirect evidence, research on the consequent part of emotions is used to support assumptions about the antecedent part.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Affect program theory only speaks about the implementational level of the second part of emotion causation. It is therefore in principle compatible with the previous theories discussed. James' (1890) notion of emotion-specific response patterns is easily reconcilable with affect programs (cf. Damasio's, 1999, neo-Jamesian theory). Appraisal theorists could agree that specific appraisal patterns trigger specific affect programs. Network theorists could agree that some associations in the network are hard-wired whereas others are added as a result of learning (e.g., Lewis, 2005). On the other hand, these other theories are also compatible with the alternative view that the neural circuitry underlying emotions is not organised into emotion-specific modules, but rather into structures that are specific to sub-emotional variables (Ortony & Turner, 1990). These brain structures are not developed uniquely for emotions but are shared with other psychological functions. For example, certain brain structures are involved in approach and avoidance behaviour, regardless of whether this behaviour is emotional or not. According to some appraisal theories (e.g., Scherer, 2001), appraisal variables induce parts of action tendencies, leading to parts of physiological response patterns and parts of expressive behaviour. James and classic network theories assume that each emotion has a unique response pattern. This does not force them, however, to accept that the number of response patterns—and hence the number of emotions—is limited to six.

BARRETT'S CONCEPTUAL ACT THEORY

Barrett's (2006b) conceptual act theory builds on Russell's (2003) core affect theory. Russell contested the assumption held by affect program theory that basic emotions are the building blocks of emotional life, casting doubt on both direct and indirect evidence for the existence of affect programs (e.g.,

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Russell, 1994; see also Barrett, 2006b; Russell & Barrett, 1999). Instead, he put forward the sub-emotional variables of valence and arousal as the building blocks of emotional life. These variables can be considered as properties of stimuli, properties of neurophysiological states, and properties of conscious experience. Stimuli vary on the dimensional variables of valence and arousal. The combination of values on both variables is called "affective quality". The affective quality of stimuli causes in the person a state called "core affect", which has both a neurophysiological side (i.e., valence and arousal are associated with distinct neural systems) and a mental side (i.e., the conscious experience of affective quality; Russell & Barrett, 1999). Thus, the building blocks of emotional life combine to form core affect but not specific emotions. According to Russell, what traditional theories call specific emotions is nothing but the categorisation of core affect into one of the so-called emotion categories (e.g., anger, fear, sadness, and joy). These categories are not given in nature (i.e., natural kinds) but are socio-cultural constructions (i.e., artefacts). Russell's theory has accordingly been dubbed a constructivist theory. It may be noted that Russell not only rejects that individual basic emotions are natural kinds, but also that the entire class of specific emotions is a natural kind.

Barrett (2006b) agrees with Russell (2003) that basic emotions and the class of specific emotions are not natural kinds. She disagrees, however, with his premise that a phenomenon merits explanation only when it is filed as a natural kind. Even if specific emotions are artefacts, they still require an explanation. In line with Russell, Barrett proposes a two-factor theory. In one factor, stimuli elicit core affect; in another factor, core affect is categorised. Unlike Russell, however, Barrett does not picture the categorisation of core affect as something that happens after experience, but rather as something that helps shape the experience (see Figure 4). In Barrett's theory, the end result is a specific emotional experience.

Barrett conceives of the categorisation of core affect as a form of perception. She emphasises that perception is influenced by previously acquired conceptual knowledge. This is why she sometimes uses the term conceptual act to refer to the categorisation of core affect. Barrett draws an

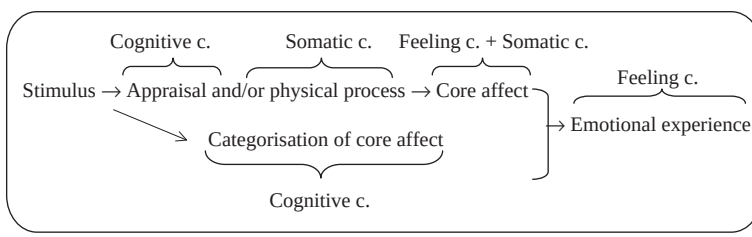


Figure 4. Order of components in Barrett's theory.

analogy between the categorisation process in emotion perception and colour perception. The retina registers light of different wave lengths. The spectrum of wave lengths is a continuum. Yet people perceive categories of colours (red, green, yellow, blue) depending on previously acquired conceptual knowledge. The same happens with emotion. Whether people categorise an episode of core affect as anger, fear, or sadness depends on acquired conceptual knowledge (emotion scripts).

Barrett (2006b) describes the mechanisms involved in the two factors of her theory (Q1B). Core affect can be generated by multiple mechanisms (in line with multi-mode models proposed by appraisal theories and network theories), such as rule-based computation, activation of learned and innate associations, and even purely physical mechanisms (e.g., being tired can cause low arousal and negative valence; see also Izard, 1993). The subsequent categorisation of core affect can also be obtained with rule-based or associative mechanisms, but emphasis is on the associative mechanism. The associative mechanism in Barrett's theory resembles the complex associative mechanism proposed by connectionist and dynamic systems models. It is governed by principles of constraint satisfaction. That is, various sources of information (the stimulus and previous knowledge) constrain each other mutually until a stable solution (i.e., an emotion category) emerges.

Category representations are not propositional[7] or static, but perceptual, embodied, and situated (Barsalou, 1999). They are perceptual in that they have modality-specific sensory/perceptual features. They are called embodied because they also have motor features so that activation of them leads to partial re-enactment or simulation of previous instances of the category (see Damasio, 1994, for a similar proposal). Situated representations have content that is context dependent. A person may have different scripts of anger and the context determines which script becomes activated. For example, anger may be manifested in fighting in the context of a playground, in shouting in the context of traffic, and in biting one's lip in the context of a waiting room. Barrett further assumes that the processes in both factors (core affect and categorisation) are often completed in an automatic way. In addition, she does not conceive of the two factors as sequential steps but as two sources of influence that constrain each other until they reach a stable solution. Given that the factors of core affect and categorisation are not separated in time and that they can rely on similar mechanisms, one may wonder about the basis for keeping a distinction between them. One

[7] It is potentially confusing to say, on the one hand, that category knowledge is conceptual, and on the other hand, that it is not stored in propositional form. Other scholars tend to group conceptual and propositional representations.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

possibility is that core affect is obligatory and ubiquitous, whereas categorisation is optional.

Like network theories, Barrett (2006b) addresses the second (but not the first) subquestion of the problems of elicitation (Q1B), intensity (Q2B), and differentiation (Q3B). The mechanisms involved in producing core affect are responsible for the elicitation, intensity, and raw positive–negative differentiation of emotions. The mechanisms involved in the categorisation of core affect are responsible for the further differentiation of emotional quality, leading to experiences of anger, fear, and sadness. An important question is which criteria are used as a basis for categorisation. The bodily correlates of core affect are (according to Barrett) insufficiently differentiated to fulfil this role. One option is that categorisation is based on the stimulus or its deep structure (i.e., appraisal). Suppose a person loses a valued object and feels bad (i.e., core affect). The person's conceptual knowledge that in his/her culture, the loss of a valued object is associated with sadness could be sufficient for categorising the bad feeling as a sad feeling.

This raises the question of how to distinguish Barrett's theory from appraisal theories. A possible answer is that appraisal theories assume that the loss of a valued object produces sadness regardless of one's learning history (influenced by culture). According to these theories, a person's learning history can determine which objects he/she considers as valued and hence which events he/she appraises as losses, but it does not determine which relations hold between appraisals and emotions. In Barrett's view, there are no intrinsic relations between appraisals and emotions. The loss of something valued is not intrinsically bound up with sadness, and danger is not intrinsically bound up with fear. These relations exist only in people's minds, and activation of these relations determines the narrow quality of the emotion.[8]

Another difference between Barrett and appraisal theories concerns the role of emotion categories (e.g., anger, fear, sadness). For Barrett, emotion categories are an intrinsic part of emotional experience. They are used to endow (low-specific) core affect with specificity. For appraisal theories, emotion categories tend to come into the picture consequent upon emotional experience. They can be used to label emotions or emotional components that are already specific. The specificity of these components stems from the appraisals that caused them.

Emotional experience is the only component in Barrett's theory that has specificity in the narrow sense. It is therefore tempting to consider this

[8] Barrett's (2006b) theory can explain but does not predict cultural variation. If research could reveal that fear is universally linked to danger, this would demonstrate that this link exists in the conceptual knowledge of all individuals of all cultures.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

theory as a feeling theory (i.e., a theory that equates emotion with emotional experience) like the theories of James (1890) and Schachter (1964).

Like Schachter (1964) and Russell (2003), Barrett (2006b) has a two-factor theory. The output of the first factor is less differentiated than that of the second factor. In addition to this obvious similarity, the three theories have other similarities and differences. First, in Schachter's theory, the first factor results in a state of undifferentiated arousal, whereas in the theories of Russell and Barrett, the first factor results in core affect, which is a state in which valence and arousal are combined. Thus, in Schachter's theory, the first factor only delivers intensity whereas in the theories of Russell and Barrett, the first factor delivers intensity and raw positive–negative quality. Second, Barrett and Russell, but not Schachter, allow cognitive processes to intervene in the first factor. Third, Schachter conceived of the process in the second factor as conscious; Barrett takes it to be unconscious (and otherwise automatic) most of the time. Fourth, according to Schachter and Barrett, the result of the second factor is emotional experience. The process in this factor (attribution or categorisation) shapes the emotional experience. According to Russell, however, the categorisation in the second factor is a cold cognitive affair that comes after experience. Unlike Schachter and Barrett, Russell does not consider the product of the second factor as the phenomenon to be explained.

I now turn to the philosophical theories. Philosophers are less concerned with questions of causation and mechanics, but more with questions of ontology (What kind of a thing is an emotion? Is it a feeling, a cognition, or a perception?) and rationality (cf. de Sousa, 1987). Nevertheless, philosophical theories can be examined according to the criteria put forward in this review.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

PHILOSOPHICAL COGNITIVISM

Cognitivist philosophers (e.g., Lyons, 1980; Nussbaum, 1990; Solomon, 1976) reacted against James' (1890) proposal to identify emotions with feelings. In doing so, these philosophers relied on a narrow meaning of feeling as the purely phenomenal part of the mental, the part that is not about something and that cannot be captured in representational form. To do justice to the Intentionality of emotions, cognitivist philosophers proposed that emotions are caused by or identical to cognitions, more in particular, judgements of the stimulus. In discussing this proposal, philosophers elaborated on the kind of representations that judgements are but they neglected the mechanisms that operate on or produce these representations. Thus, they addressed only part of the algorithmic level of

process understanding (QB). Judgements are propositional representations, understood here as mental contents to which one ascribes truth value.

Cognitivism comes in two varieties. In a first variety, emotion is equated with cognition (Nussbaum, 1990; Solomon, 1976). In this variety, bodily components (somatic and motor responses) are either neglected or placed near the end of the emotional episode (see Figure 5, top panel). Some proponents of this variety add that emotion is a special type of judgement. For example, Nussbaum (1990) argued that emotions are judgements that are relevant to the person's concerns (cf. appraisal theories). In a second variety, emotion is caused by but not identical to cognition (e.g., Lyons, 1980). Proponents of this variety equate emotion with one or several other components (such as feeling, motivation, and somatic and/or motor responses; see Figure 5, bottom panel).

The cognitive component is responsible for the elicitation of emotions (Q1; at least in the second variety) and the differentiation of emotions (Q3; in both varieties). Emotions differ when the content of their judgements differs. For example, anger corresponds to the judgement that one has purposefully been harmed, fear to the judgement that one is in danger, and sadness to the judgement that one has lost something valued forever. Hypotheses about the relation between judgements and emotions can be situated on the functional level of process understanding (Q1A, Q3A). They are often similar to the hypotheses put forward by appraisal theorists about the relation between appraisals and emotions.

Critics of cognitivism have argued that babies and animals cannot form judgements or propositional representations, yet they seem to have emotions. Another criticism is the "fear-of-flying" objection (de Sousa, 2007). One can judge that flying is the safest means of transportation (based on statistical information) but still experience fear of flying. Thus, the judgement that one is in danger does not seem necessary for the emotion of

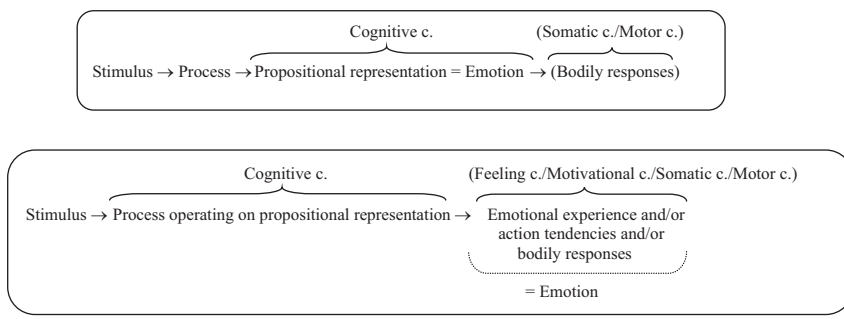


Figure 5. Order of components in cognitivist theories.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

fear. A final criticism is that the first variety of cognitivism disregards the somatic aspects of emotion and reduces emotions to cold thoughts (see Scarantino, in press, for a more elaborate set of criticisms).

PHILOSOPHICAL PERCEPTUAL THEORIES

Perceptual theorists of emotion (e.g., Clarke, 1986; de Sousa, 1987; Goldie, 2000) argued that emotions need not be identified with propositional representations but can also be identified with perceptual representations of the stimulus (see Figure 6). Here also, the distinction between propositional and perceptual is seen as a matter of truth evaluability. Propositional representations are those that one holds to be true whereas perceptual representations are those that one entertains without necessarily believing them. To become scared, it is sufficient to see or construe a situation as dangerous, without believing it for a fact. Perceptual theorists reacted against the cognitivist view that emotion is a form of judgement. As de Sousa (2007) put it, emotions are not so much judgements but ways of seeing. Perceptual theorists proposed that processes involved in emotion have more in common with those involved in perception than those involved in judgement. For one thing, both emotion and perception arise automatically. That is, they arise instantly, unintentionally, and efficiently (i.e., with minimal use of attentional capacity), and they are difficult to counteract. People lack control over their emotions in a similar way as they lack control over their perceptions. One cannot choose to be angry or frightened (i.e., perceive a stimulus as irritating or frightening) just as one cannot choose to perceive an apple as an apple. For another thing, so-called irrational emotions (i.e., emotions that run counter to one's beliefs, e.g., fear of flying, fear of spiders) show resemblance to perceptual illusions. Perceptual illusions appear real and compelling, yet the person knows (rationally—from propositional knowledge) that they are not; the person does not necessarily believe what he/she sees. Likewise, irrational emotions do not arise from judgements in the sense that a person believes that he/she is in danger, yet he/she cannot escape seeing or construing the stimulus as dangerous (cf. Goldie, 2000).

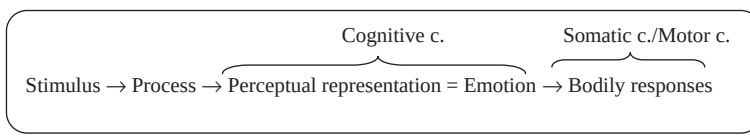


Figure 6. Order of components in perceptual theories.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

The opposition between perception and cognition evoked in this literature stems from a narrow view of cognition. Cognitive processes are restricted to those that operate on propositional representations (see above). Many contemporary scholars, however, entertain a broader definition of cognition. They argue that processes are cognitive when they are mediated by representations, irrespective of the format of these representations (cf. Moors, 2007). This view of cognition is broad enough to include processes that operate on or produce perceptual representations. It is also broad enough to include automatic processes. Thus, it turns out that philosophical perceptual theories have a lot in common with contemporary psychological theories that assign an important role to cognition (e.g., appraisal theories, network theories, and Barrett's, 2006b, theory).

Some scholars (e.g., Charland, 1997) have called James' (1890) theory a perceptual theory and have grouped it together with philosophical perceptual theories (Charland, 1997). The central process in James' theory is the experience of bodily responses. And it is often argued that the experience of bodily responses is a form of (self-)perception. It is important to note, however, that the perception in philosophical perceptual theories has a different object or input than the perception in James' theory. In the former, the input of perception is the stimulus; in the latter, it is the person's bodily responses to the stimulus. Put differently, even if one would argue that the feeling in James's theory is not purely phenomenal and has an Intentional aspect, it must still be stressed that the feeling in his theory is about bodily responses and not about the meaning of the stimulus.

An obvious similarity between Barrett's (2006b) theory and philosophical perceptual theories is that both emphasise the role of perceptual representations. The meaning of the term perceptual representation, however, is somewhat different in both theories. Barrett emphasises the sensory (image-like) properties of perceptual representations. Philosophical perceptual theories stress that perceptual representations have content that one entertains without necessarily believing it. Such content can still be coded in a verbal-like format.

CONCLUSION

I have presented an overview of theories concerned with emotion causation selected from both the psychological and philosophical literature. I have used psychological terminology to draw similarities and indicate differences among these theories. Five sources of variation among theories were identified.

A first source of variation is the definition of emotion endorsed. Most emotion theories have a list of components that they consider part of an

Downloaded By: [University of Gent] At: 10:20 13 May 2009

emotional episode. Individual theories differ with regard to the number and nature of the components that they include in the emotional episode as well as the components that they identify with the emotion. Part of the disagreement about the explanation of emotion stems from disagreement about what to count as emotion. Theories further disagree about the building blocks of emotional life (basic emotions versus sub-emotional variables), about the status they confer to the class of specific emotions (natural kind versus artefact) and about the boundaries of this class.

A second source of variation has to do with the components that theories invoke to solve the problems of elicitation (Q1), intensity (Q2), and differentiation (Q3). These are three problems that I think theories of emotion causation should address. The theories of James (1890) and Schachter (1964) put forward the somatic component to account for the intensity of emotion. Differentiation in James' (1890) theory is accounted for by the somatic component; in Schachter's (1964) theory it is accomplished by a cognitive component. James and Schachter both fail to address the elicitation problem. Appraisal theories and network theories take cognition to account for elicitation, intensity, and differentiation of emotions. In both theories, however, there is room for the activation of direct stimulus–response connections that count as non-cognitive according to most views of cognition. In Barrett's theory, elicitation, intensity, and raw positive–negative differentiation of emotions can be accounted for by cognitive as well as purely physical processes. The further differentiation into specific emotional experiences is a matter of cognition (i.e., categorisation process). The two philosophical theories discussed take the cognitive component to be responsible for the elicitation and differentiation of emotions, at least if cognition is understood in a broad representation-mediated sense.

The problems of elicitation, intensity, and differentiation can be considered at the functional level, the algorithmic level, and the implementational level. A third source of variation among theories is the levels of process description that they address. At the functional level, it can be asked which stimuli elicit emotions versus no emotions (Q1A), which stimuli elicit weak emotions versus strong ones (Q2A), and which stimuli elicit which emotions (positive versus negative ones, or specific ones; Q3A). These questions have received most attention from appraisal theories, and to some extent, from philosophical cognitivist theories. Another question that can be situated on the functional level concerns the conditions (optimal versus suboptimal) under which emotion-eliciting processes occur. Many of the theories discussed have taken position with regard to this question (appraisal theories; network theories; Barrett, 2006b; perceptual theories) and some have been ascribed a position (Schachter, 1964; cognitivist theories). At the algorithmic level, it can be asked which mechanisms (rule-based versus associative) and which formats of representation (propositional versus

Downloaded By: [University of Gent] At: 10:20 13 May 2009

perceptual) are involved in the elicitation (Q1B), intensity (Q2B), and differentiation (Q3B) of emotions. Appraisal theories, network theories, and Barrett (2006b) have discussed mechanisms and formats of representation. The two philosophical theories have only discussed formats of representation. At the implementational level, it can be asked which neurological structures or circuits are involved in the elicitation (Q1C), intensity (Q2C), and differentiation (Q3C) of emotions. The unique contribution of affect program theory to the issue of emotion causation can be situated on this level. This is not to say that other theories have neglected this level (see James, 1890; Barrett, 2006b, Scherer & Peper, 2001).

A fourth source of variation has to do with the kind of process that emotion theories hold responsible for emotion elicitation. Some theories have different assumptions about the *conditions* (optimal versus suboptimal) under which this process can operate. In philosophical cognitivist theories and Schachter's theory, the cognitive process that causes emotions is most likely conceived of as a conscious process. In most other theories, the emotion-antecedent process is assumed to be unconscious (and otherwise automatic) most of the time. Theories sometimes propose a different *format* for the *representations* involved in emotion causation. Cognitivist theories choose representations with a propositional format; perceptual theories appraisal theories, network theories, and Barrett (2006b) leave room for representations with a perceptual format. Theories may also differ with regard to the *mechanism*s that they put forward. Some of the theories discussed do not provide details about mechanisms (James, 1890; Schachter, 1964; philosophical theories), but it is unlikely that they all envisage the same mechanism. The theories that do elaborate on mechanisms seem to be largely in agreement with each other. Appraisal theories, network theories, and Barrett all agree that stimulus evaluation can be accomplished by multiple mechanisms: rule-based, associative, sensory-motor, and (for some) purely physical mechanisms. In most theories, it seems that the associative mechanism plays the leading part. The associative mechanism that figures in older versions of network theory and appraisal theory have localist representations and seem to be activated in a sequential manner. The associative mechanism that figures in Barrett's theory and in modern versions of network theory (e.g., Lewis, 2005) and appraisal theory (e.g., Scherer, 2000) is modelled after the complex associative mechanism proposed in connectionist or dynamic systems models.

A fifth and final source of disagreement is the order in which emotion theories place the components of the emotional episode. James (1890) placed the somatic component prior to the feeling component. Schachter (1964) kept James' order of events except that he interposed a cognitive component between the somatic and the feeling components. In appraisal theories, the cognitive component occurs prior to the motivational component. This

Downloaded By: [University of Gent] At: 10:20 13 May 2009

motivational component is followed by the components of somatic responses and behaviour. Each of these components is logically prior to the feeling component. Network theories do not prioritise one specific order of components. Cognition may precede somatic responses, but somatic responses may also precede cognition. Unlike Schachter (1964) and Russell (2003), Barrett (2006b) does not suppose that the two factors in her theory (core affect and categorisation) happen sequentially. They are triggered simultaneously and constrain each other mutually. Given the embodied nature of the representations in her theory, there is not a strict separation between somatic and cognitive components. The sharp distinction between mind and body is eluded.

In addition to disagreement, the above summary also reveals that there is a great deal of agreement among theories. For one thing, all the theories discussed can be fitted into the componential mould. Several theories even agree on the majority of the components that they include. For another, several theories assume that emotion-antecedent processing is cognitive (at least in a broad representation-mediated sense), that it can be automatic, and that multiple mechanisms and representations can be involved. Finally, the overview shows that there is an evolution from assumptions of non-automatic, propositional, and step-wise processing toward assumptions of more automatic, perceptual, and parallel processing. This evolution corresponds to evolutions in other domains of psychology. In conclusion, the proposed framework brings to the surface differences as well as similarities among theories of emotion causation. This may be helpful in reducing confusion and in pointing out new directions for future research. By relativising superficial differences among theories, there is more energy left to concentrate on the fundamental ones and to move the field forward. It is my hope that the present framework will also prove useful for the comparison of emotion theories that were not discussed in the present paper and for emotion theories that will be proposed in the future.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Manuscript received 28 January 2008
Revised manuscript received 14 November 2008
Manuscript accepted 20 November 2008
First published online 31 March 2009

REFERENCES

Arnold, M. B. (1960). *Emotion and personality*. New York: Columbia University Press.

Baeyens, F., Eelen, P., & Van den Bergh, O. (1990). Contingency awareness in evaluative conditioning: A case for unaware affective-evaluative learning. *Cognition and Emotion*, *4*, 3–18.

Bargh, J. A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 3–51). New York: Guilford Press.

Bargh, J. A., & Barndollar, K. (1996). Automaticity in action: The unconscious as repository of chronic goals and motives. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 457–481). New York: Guilford Press.

Barrett, L. F. (2005). Feeling is perceiving: Core affect and conceptualization in the experience of emotion. In L. F. Barrett, P. Niedenthal, & P. Winkielman (Eds.), *Emotion and consciousness* (pp. 255–284). New York: Guilford Press.

Barrett, L. F. (2006a). Are emotions natural kinds? *Perspectives on Psychological Science*, *1*, 28–58.

Barrett, L. F. (2006b). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review*, *10*, 20–46.

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences*, *22*, 577–660.

Berkowitz, L. (1990). On the formation and regulation of anger and aggression: A cognitive-neoassociationistic analysis. *American Psychologist*, *45*, 494–503.

Berkowitz, L., & Harmon-Jones, E. (2004). Toward an understanding of the determinants of anger. *Emotion*, *4*, 107–130.

Bermudéz, J. L. (1995). Nonconceptual content: From perceptual experience to subpersonal computational states. *Mind and Language*, *10*, 333–369.

Block, N. (1995). On a confusion about a function of consciousness. *Behavioral and Brain Sciences*, *18*, 227–287.

Bower, G. H. (1981). Mood and memory. *American Psychologist*, *36*, 129–148.

Cacioppo, J. T., Berntson, G. G., Larsen, J. T., Poehlmann, K. M., & Ito, T. A. (2000). The psychophysiology of emotion. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed, pp. 173–191). New York: Guilford Press.

Cannon, W. B. (1927). The James–Lange theory of emotions: Critical examinations and an alternative theory. *American Journal of Psychology*, *39*, 106–124.

Charland, L. C. (1997). Reconciling cognitive and perceptual theories of emotion: A representational proposal. *Philosophy of Science*, *64*, 555–579.

Christie, I. C., & Friedman, B. H. (2004). Autonomic specificity of discrete emotions and dimensions of affective space: A multivariate approach. *International Journal of Psychophysiology*, *51*, 143–153.

Chwalisz, K., Diener, E., & Gallagher, D. (1988). Autonomic arousal feedback and emotional experience: Evidence from the spinal cord injured. *Journal of Personality and Social Psychology*, *54*, 820–828.

Clarke, S. G. (1986). Emotions: Rationality without cognitivism. *Dialogue*, *25*, 663–674.

Clore, G. L., & Centerbar, D. (2004). Analyzing anger: How to make people mad. *Emotion*, *4*, 139–144.

Clore, G. L., & Ortony, A. (2000). Cognition in emotion: Always, sometimes, or never? In R. D. Lane & L. Nadel (Eds.), *Cognitive neuroscience of emotion* (pp. 24–61). New York: Oxford University Press.

Cornelius, R. R. (1996). *The science of emotion: Research and tradition in the psychology of emotion*. Upper Saddle River, NJ: Prentice-Hall.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Putnam.

Damasio, A. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. New York: Harcourt.

Davidson, R. J. (1992). Prolegomenon to the structure of emotion: Gleanings from neuropsychology. *Cognition and Emotion*, *6*, 245–268.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Darwin, C. (1965). *The expression of the emotions in man and animals* (p. 1872). Chicago: University of Chicago Press. (Original work published).

de Sousa, R. (1987). *The rationality of emotion*. Cambridge, MA: MIT Press.

de Sousa, R. (2007). Emotion. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Available at: http://plato.stanford.edu/archives/sum2007/entries/emotion/)

Descartes, R. (1998). The passions of the soul. In J. Cottingham, R. Stoothoff, & D. Murdoch (Eds.), *Selected philosophical writings of René Descartes*. Cambridge, UK: Cambridge University Press. (Original work published 1644).

Ekman, P. (1972). Universals and cultural differences in facial expressions of emotion. In J. Cole (Ed.), *Nebraska symposium on motivation 1971* (Vol. 19, pp. 207–283). Lincoln, NE: University of Nebraska Press.

Ekman, P., Levenson, R. W., & Friesen, W. V. (1983). Autonomic nervous system activity distinguishes among emotions. *Science*, *221*(4616), 1208–1210.

Ekman, P. (1984). Expression and the nature of emotion. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 319–343). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Ekman, P. (1992). An argument for basic emotions. *Cognition and Emotion*, *6*, 169–200.

Ekman, P. (2007). The directed facial action task. In J. A. Coan & J. J. B. Allen (Eds.), *Handbook of emotion elicitation and assessment* (pp. 47–53). Oxford, UK: Oxford University Press.

Ekman, P., Friesen, W. V., & Ellsworth, P. (1972). *Emotion in the human face: Guidelines for research and an integration of findings*. New York: Pergamon Press.

Fodor, J. A. (1980). *Representations: Essays on the foundations of cognitive science*. Cambridge, MA: MIT Press.

Frijda, N. H. (1986). *The emotions*. New York: Cambridge University Press.

Frijda, N. H. (1993). The place of appraisal in emotion. *Cognition and Emotion*, *7*, 357–387.

Frijda, N. H. (2007). What emotions might be? Comments on the comments. *Social Science Information*, *46*, 433–443.

Frijda, N. H., & Zeelenberg, M. (2001). What is the dependent? In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion* (pp. 141–155). New York: Oxford University Press.

Goldie, P. (2000). *The emotions: A philosophical exploration*. Oxford, UK: Oxford University Press.

Green, C. D. (1996). Where did the word "cognitive" come from anyway? *Canadian Psychology*, *37*, 31–39.

Izard, C. E. (1977). *Human emotions*. New York: Plenum Press.

Izard, C. E. (1993). Four systems of emotion activation: Cognitive and noncognitive processes. *Psychological Review*, *100*, 68–90.

James, W. (1884). What is an emotion? *Mind*, *9*, 188–205.

James, W. (1890). *The principles of psychology*. New York: Dover.

Johnstone, T., van Reekum, C. M., & Scherer, K. R. (2001). Vocal correlates of appraisal processes. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion* (pp. 271–284). New York: Oxford University Press.

Kaiser, S., & Wehrle, T. (2001). Facial expressions as indicators of appraisal processes. In K. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion*. Oxford, UK: Oxford University Press.

Kunst-Wilson, W. R., & Zajonc, R. B. (1980). Affective discrimination of stimuli that cannot be recognized. *Science*, *207*, 557–558.

Lang, P. J. (1985). The cognitive psychophysiology of fear and anxiety. In A. H. Tuma & J. D. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 131–170). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Lang, P. J. (1994). The motivational organization of emotion: Affect–reflex connections. In S. H. M. Van Goozen, N. E. Van de Poll, & J. A. Sergeant (Eds.), *Emotions: Essays on emotion theory* (pp. 61–92). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York: McGraw-Hill.

Lazarus, R. S. (1982). Thoughts on the relations between emotion and cognition. *American Psychologist*, *37*, 1019–1024.

Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.

Levenson, R. W. (1992). Autonomic nervous system differences among emotions. *Psychological Science*, *3*, 23–27.

Levenson, R. W., Ekman, P., & Friesen, W. V. (1990). Voluntary facial action generates emotion-specific autonomic nervous system activity. *Psychophysiology*, *27*, 363–384.

Leventhal, H. (1980). Toward a comprehensive theory of emotion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 13, pp. 139–197). New York: Academic Press.

Leventhal, H. (1984). A perceptual-motor theory of emotion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 17, pp. 117–182). New York: Academic Press.

Leventhal, H., & Scherer, K. R. (1987). The relationship of emotion to cognition: A functional approach to a semantic controversy. *Cognition and Emotion*, *1*, 3–28.

Lewis, M. D. (2005). Bridging emotion theory and neurobiology through dynamic system modeling. *Behavioral and Brain Sciences*, *28*, 169–194.

Lyons, W. (1980). *Emotion*. Cambridge, MA: Cambridge University Press.

Marr, D. (Ed.). (1982). *Vision: A computational investigation into the human representation and processing of visual information*. New York: Freeman.

Martin, I., & Levey, A. B. (1978). Evaluative conditioning. *Advances in Behaviour Research and Therapy*, *1*, 57–102.

Moors, A. (2007). Can cognitive methods be used to study the unique aspect of emotion: An appraisal theorist's answer. *Cognition and Emotion*, *21*, 1238–1269.

Moors, A. (2008). *Automatic constructive appraisal as a candidate cause of emotion*. Manuscript submitted for publication.

Moors, A., & De Houwer, J. (2006a). Automaticity: A theoretical and conceptual analysis. *Psychological Bulletin*, *132*, 297–326.

Moors, A., & De Houwer, J. (2006b). Problems with dividing the realm of cognitive processes. *Psychological Inquiry*, *17*, 199–204.

Nagel, T. (1974). What is it like to be a bat? *Philosophical Review*, *83*, 435–450.

Niedenthal, P. M., Krauth-Gruber, S., & Ric, F. (2006). *Psychology of emotion: Interpersonal, experiential, and cognitive approaches*. New York: Psychology Press.

Nisbet, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*, 231–259.

Nussbaum, M. (1990). *Love's knowledge*. Oxford, UK: Oxford University Press.

Oatley, K., & Johnson-Laird, P. N. (1987). Towards a cognitive theory of emotions. *Cognition and Emotion*, *1*, 29–50.

Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review*, *108*, 483–826.

Ortony, A., Clore, G. L., & Collins, A. (1988). *The cognitive structure of emotions*. Cambridge, UK: Cambridge University Press.

Ortony, A., & Turner, T. J. (1990). What's basic about basic emotions? *Psychological Review*, *97*, 315–331.

Panksepp, J. (1982). Toward a general psychobiological theory of emotions. *Behavioral and Brain Sciences*, *5*, 407–467.

Panksepp, J. (1998). *Affective neuroscience: The foundations of human and animal emotions*. New York: Oxford University Press.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Panksepp, J. (2000). Emotions as natural kinds within the mammalian brain. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed., pp. 137–156). New York: Guilford Press.

Parkinson, B., & Manstead, A. S. R. (1992). Appraisal as a cause of emotion. In M. S. Clark (Ed.), *Review of personality and social psychology* (Vol. 13, pp. 122–149). Newbury Park, CA: Sage.

Parrott, G. W. (2007). Components and the definition of emotion. *Social Science Information*, *46*, 419–423.

Pecchinenda, A. (2001). The psychophysiology of appraisals. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion: Theory, Methods, Research* (pp. 301–318). Oxford, UK: Oxford University Press.

Pleyers, G., Corneille, O., Luminet, O., & Yzerbyt, V. (2007). Aware and (dis)liking: Item-based analyses reveal that valence acquisition via evaluative conditioning emerges only when there is contingency awareness. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*, 130–144.

Power, M., & Dalgleish, T. (2007). *Cognition and emotion: From order to disorder* (2nd ed.). Hove, UK: Psychology Press.

Prinz, J. J. (2004). *Gut reactions: A perceptual theory of emotion*. Oxford, UK: Oxford University Press.

Reisenzein, R. (1983). The Schachter theory of emotion: Two decades later. *Psychological Bulletin*, *94*, 239–264.

Reisenzein, R. (2001). Appraisal processes conceptualized from a schema-theoretic perspective: Contributions to a process analysis of emotions. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion* (pp. 187–201). New York: Oxford University Press.

Rimé, B., Philippot, P., & Cisamolo, D. (1990). Social schemata of peripheral changes in emotion. *Journal of Personality and Social Psychology*, *59*, 38–49.

Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin*, *128*, 934–960.

Roseman, I. J. (1991). Appraisal determinants of discrete emotions. *Cognition and Emotion*, *5*, 161–200.

Roseman, I. J., Antoniou, A. A., & José, P. E. (1996). Appraisal determinants of emotions: Constructing a more accurate and comprehensive theory. *Cognition and Emotion*, *10*(3), 241–277.

Roseman, I. J., & Smith, C. A. (2001). Appraisal theory: Overview, assumptions, varieties, controversies. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion* (pp. 3–34). New York: Oxford University Press.

Russell, J. A. (1994). Is there universal recognition of emotion from facial expression? A review of the cross-cultural studies. *Psychological Bulletin*, *115*, 102–141.

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*, 145–172.

Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes; and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, *76*, 805–819.

Scarantino, A. (in press) Insights and blindspots of the cognitivist theory of emotions. *British Journal for the Philosophy of Science.*

Schachter, S. (1964). The interaction of cognitive and physiological determinants of emotional state. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 1, pp. 49–80). New York: Academic Press.

Schachter, S., & Singer, J. (1962). Cognitive, social, and physiological determinants of emotional state. *Psychological Review*, *69*, 379–399.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Scherer, K. R. (1984). On the nature and function of emotions: A component process approach. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 293–317). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Scherer, K. R. (1988). Criteria for emotion-antecedent appraisal: A review. In V. Hamilton, G. H. Bower, & N. H. Frijda (Eds.), *Cognitive perspectives on emotion and motivation* (pp. 89–126). Dordrecht, The Netherlands: Kluwer.

Scherer, K. R. (1993a). Neuroscience projections to current debates in emotion psychology. *Cognition and Emotion*, *7*, 1–41.

Scherer, K. R. (1993b). Studying the emotion-antecedent appraisal process: An expert system approach. *Cognition and Emotion*, *7*, 325–355.

Scherer, K. R. (1994). Toward a concept of "modal emotions". In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 25–31). Oxford, UK: Oxford University Press.

Scherer, K. R. (1997). Profiles of emotion-antecedent appraisals: Testing theoretical predictions across cultures. *Cognition and Emotion*, *11*, 113–150.

Scherer, K. R. (1999). Appraisal theory. In T. Dalgleish & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 637–661). Chichester, UK: Wiley.

Scherer, K. R. (2000). Emotions as episodes of subsystem synchronization driven by nonlinear appraisal processes. In M. D. Lewis & I. Granic (Eds.), *Emotion, development, and self-organization: Dynamic systems approaches to emotional development* (pp. 70–99). Cambridge, UK: Cambridge University Press.

Scherer, K. R. (2001). Appraisal considered as a process of multilevel sequential checking. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion* (pp. 92–120). New York: Oxford University Press.

Scherer, K. R. (2004). Feelings integrate the central representation of appraisal-driven response organization in emotion. In A. S. R. Manstead, N. H. Frijda, & A. H. Fischer (Eds.), *Feelings and emotions: The Amsterdam symposium* (pp. 136–157). Cambridge, UK: Cambridge University Press.

Scherer, K. R. (2005). What are emotions? And how can they be measured? *Social Science Information*, *44*, 695–729.

Scherer, K. R., & Peper, M. (2001). Psychological theories of emotion and neuropsychological research. In F. Boller & J. Grafman (Eds.), *Handbook of neuropsychology* (Vol. 5, pp. 17–48). Amsterdam: Elsevier.

Searle, J. R. (1983). *Intentionality: An essay in the philosophy of mind*. Cambridge, UK: Cambridge University Press.

Shanks, D. R., & Dickinson, A. (1990). Contingency awareness in evaluative conditioning: A comment on Baeyens, Eelen, and Van den Bergh. *Cognition and Emotion*, *4*, 19–30.

Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, *48*, 813–838.

Smith, C. A., & Kirby, L. D. (2000). Consequences require antecedents: Towards a process model of emotion elicitation. In J. P. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (pp. 83–106). Cambridge, UK: Cambridge University Press.

Smith, C. A., & Kirby, L. D. (2001). Toward delivering on the promise of appraisal theory. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion* (pp. 121–138). New York: Oxford University Press.

Smith, C. A., & Lazarus, R. S. (1993). Appraisal components, core relational themes, and the emotions. *Cognition and Emotion*, *7*, 233–269.

Smith, E. R., & Neumann, R. (2005). Emotion processes considered from the perspective of dual process models. In P. Niedenthal, L. Feldman-Barrett, & P. Winkielman (Eds.), *The unconscious in emotion* (pp. 287–311). New York: Guilford Press.

Solomon, R. C. (1976). *The passions: Emotions and the meaning of life*. New York: Doubleday.

Downloaded By: [University of Gent] At: 10:20 13 May 2009

Teasdale, J. D. (1999). Multi-level theories of cognition–emotion relations. In T. Dalgleish & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 665–682). Chichester, UK: Wiley.

Tomkins, S. S. (1962). *Affect, imagery, consciousness: Vol. 1: The positive affects*. New York: Springer.

van Reekum, C. M., & Scherer, K. R. (1997). Levels of processing in emotion-antecedent appraisal. In G. Matthews (Ed.), *Cognitive science perspectives on personality and emotion* (pp. 259–300). Amsterdam: Elsevier Science.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, *3*, 151–175.

Downloaded By: [University of Gent] At: 10:20 13 May 2009