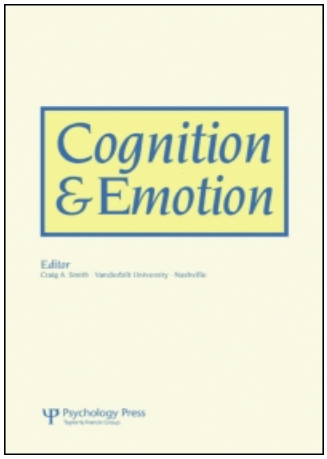
This article was downloaded by:[Universiteit Gent]
On: 29 August 2007
Access Details: [subscription number 769791685]
Publisher: Psychology Press
Informa Ltd Registered in England and Wales Registered Number: 1072954
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



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

Can cognitive methods be used to study the unique aspect of emotion: An appraisal theorist's answer

Online Publication Date: 01 September 2007
To cite this Article: Moors, Agnes (2007) 'Can cognitive methods be used to study the unique aspect of emotion: An appraisal theorist's answer', Cognition & Emotion, 21:6, 1238 - 1269
To link to this article: DOI: 10.1080/02699930701438061
URL: http://dx.doi.org/10.1080/02699930701438061

PLEASE SCROLL DOWN FOR ARTICLE

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

This article maybe 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.

© Taylor and Francis 2007

COGNITION AND EMOTION
2007, 21 (6), 1238–1269

Psychology Press
Taylor & Francis Group

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Can cognitive methods be used to study the unique aspect of emotion: An appraisal theorist's answer

Agnes Moors
Ghent University, Ghent, Belgium

I address the questions of whether cognitive methods are suited to the study of emotion, and whether they are suited to the study of the unique aspect of emotion. Based on a definition of cognitive processes as those that mediate between variable input–output relations by means of representations, and the observation that the relation between stimuli and emotions is often variable, I argue that cognition is often involved in emotion and that cognitive methods are suited to study them. I further propose that the unique feature of emotion has to do with the content of the representations involved in the transition from stimulus input to emotion. Emotions are elicited when stimuli contain information about the satisfaction status of goals (i.e., when they are goal relevant). Given that cognitive methods are fit to study any representation-mediated process regardless of their content, they can a fortiori be used to study a process that operates on representations with goal-relevant content. I compare this process to processes that have no or a different relation to goals, including the process that deals with purely valenced information.

Are cognitive methods suited to the study of emotion? And, if so, do they capture the unique aspect of emotion? I address these two questions in the first and second parts of the paper. If a cognitive method is understood as one that is suited or at least designed to investigate cognitive processes, the answer to the first question, whether cognitive methods can be used to investigate emotion, depends on whether cognitive processes are involved in emotion. Therefore, in the first part of the paper, I examine various views about the role of cognition in emotion. Special attention will be given to an analysis of the definitions of cognition employed in these views. The answer to the second question, whether cognitive methods can be used to study the

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

Agnes Moors is a postdoctoral researcher at the Fund for Scientific Research (Flanders, Belgium).

The author is grateful to Jan De Houwer and Adriaan Spruyt for valuable discussions and comments on an earlier draft of the paper.

© 2007 Psychology Press, an imprint of the Taylor & Francis Group, an Informa business
www.psypress.com/cogemotion DOI: 10.1080/02699930701438061

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

unique aspect of emotion, depends on what the unique aspect is. In the second part of the paper, therefore, I examine various proposals about the unique aspect of emotion and I defend a proposal based on appraisal theory. According to this proposal, the unique aspect of emotion is that it is caused by a process that monitors the satisfaction status of goals. In a third part of the paper I delineate this process from processes that have a different or no relation to goals including the process that is concerned with pure valence. In the final part of the paper, I examine whether there are ways to examine the motivational hypothesis empirically.

CAN COGNITIVE METHODS BE USED TO STUDY EMOTION?

Theorists who do not assign a (major) role to cognitive processes in emotion should not expect much use from cognitive methods (e.g., Izard, 1994; Tomkins, 1984). Among those that do assign a role to cognitive processes in emotion, some equate emotion with cognition (e.g., Nussbaum, 1990; Solomon, 1984), whereas others hold that cognition is part of emotion but does not overlap entirely with it. Most contemporary emotion theories are componential in that they view emotion as a compound of action tendency, bodily responses, and emotional experience. Cognition is often held to be part of the experience component (Scherer, 1993). Several brands of componential theory also assume that cognitive processes are involved in the causation of emotion. Network theorists (e.g., Lang, 1985; Leventhal, 1984; Teasdale, 1999) propose that emotions are caused by a process that activates the memory representations of prior emotions. Appraisal theorists (e.g., Frijda, 1986; Lazarus, 1991; Scherer, 1994) propose that emotions are caused by a process that deals with the implications of an event for the person's well-being. The debate about the role of cognition in emotion has often centred on the question of whether cognition is a cause of emotion. In the following sections, I discuss a few arguments against and in favour of cognitive causation of emotion. These arguments cannot be properly understood or compared without understanding the definition of cognition employed (cf. Leventhal & Scherer, 1987; Scherer, 1993). I therefore dedicate some space to exploring various usages of the term cognition.

What is cognition?

Consultation of the literature teaches us that cognition is a contrastive notion: It derives its meaning from the category with which it is contrasted. Various traditions have envisaged different types of non-cognition. I discuss two broad accounts of cognition and three narrow ones (see Table 1 for a schematic overview). After that, I zoom in on the term "cognitive method".

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

TABLE 1
Taxonomy of definitions for cognitive processes. For each definition, it is indicated what the criterion for inclusion is, and it is specified which processes belong to the category of cognitive processes and which belong to the category of non-cognitive processes

Accounts	*Criterion for inclusion in terms of*	*Cognitive process*	*Non-cognitive process*
Broad accounts			
(1) Topological account	- anatomical location	internal (=inside the brain)	external (=outside the brain)
(2) Mentalist account	- presence of representations	internal (=mental)	external (=physical/ behavioural)
Narrow accounts			
(1) Family of accounts		part of the brain/the mental	part of the brain/the mental (=subcognition)
1st Functional account	- functions (i.e., what the process does, the relation between input and output)	e.g., processes that transform the input	processes that preserve the input
Condition account	- conditions	e.g., nonautomatic in sense of conscious or controlled	automatic in sense of unconscious or uncontrolled
Mechanism account	- mechanisms	e.g., rule based	associative
Code account	- representational format/code	e.g., conceptual	nonconceptual
Neuroanatomical account	- neuroanatomical structures	e.g., cortical	subcortical
(2) 2nd Functional account	- functions	processes producing cognitive output = information unrelated to emotion (e.g., colour, location, gender, size, letter case, grammatical category, semantic category)	processes producing emotional output = (a) emotions (e.g., anger, fear, sadness, joy) (b) information related to emotion (e.g., valence)
(3) Intentional account	- presence of Intentionality	Intentional part of the mental	phenomenal part of the mental

Broad accounts

Proponents of broad accounts have equated cognition with internal processes contrasting them with external ones such as those going on in the body. According to a first broad account, the category of internal processes is equated with everything that goes on in the brain, including the physical

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

aspects. The contrasting category in this case is peripheral (but not central) physical processes and overt behaviour. I dub this account the topological account: cognition is a matter of location; it is what is inside the brain.

According to a second broad account, internal processes are equated with mental processes and delineated from all physical ones (including central physical ones) and overt behaviour (cf. Green, 1996). This "mentalist" view was endorsed by the originators of cognitive psychology (Miller, 1962; Neisser, 1967). They reacted against the then-dominant S–R view of psychological explanation by inserting intermediate variables between stimulus and response (S–O–R). Positive formulations of this view present cognitive processes as ones that are mediated by representations (e.g., Miller, Galanter, & Pribram, 1960).

Representation is a functional notion. It is something we need in order to explain certain types of input–output relations. Representations are required in cases in which the relation between input and output is not fixed (Bermudéz, 1995; Fodor, 1986). In cases in which the same stimulus always leads to the same response, there is no need for mediating representations. An input–output relation can be variable in different ways. First, repeated encounters with the same stimulus can lead to a change in response—e.g., faster; more positive (cf. mere exposure); less intense (cf. habituation); more intense (cf. sensitisation). Second, the same stimulus can lead to a change in response due to (repeated) co-occurrence with other stimuli (cf. classical and evaluative conditioning). Third, the same stimulus can lead to different responses depending on varying internal states such as motivation (e.g., food is approached when a person is hungry, but avoided when he/she is satiated). In the first two cases, a representation of the stimulus must be something that can be used on more than one occasion; it must be stored in long-term memory. In the first case, the stimulus representation must also be able to alter its quantitative parameters (e.g., activation strength, distinctiveness, and stability in time; Cleeremans & Jiménez, 2002) resulting in increased or diminished accessibility. Increased accessibility may explain faster and even more positive responses (Mandler, Nakamura, & Shebo-Van Zandt, 1987). In the second case, the stimulus representation must also be able to be associated with other representations. In the third case, stimulus representations must be able to be integrated with other representations (e.g., goal representations) to produce new representations or new behavioural output. In the third case, pre-existing long-term memory representations are not a must. A representation may be newly built, but it must be something that can be held in short-term memory long enough to become integrated with other pre-existing representations (e.g., of goals) or other newly built ones.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Narrow accounts

Proponents of more narrow accounts of cognition reserve the term for a restricted part of the brain or a restricted part of the mental. In a first family of narrow accounts, cognitive processes are delineated from what one might call subcognitive processes. Researchers have proposed various criteria to mark the distinction between cognitive and subcognitive. The criteria used are best understood when they are placed within a levels-of-analysis framework (e.g., Marr, 1982). This framework rests on the idea that one process can be described at three levels of analysis. The first level is the functional level. At this level, a process is described as a relation between the contents of its input and output; it tells what the process does. For example, the process of evaluation links a stimulus (i.e., the input) to a positive or negative valence (i.e., the output). At this level can also be situated the conditions under which the process operates (in addition to the stimulus input). Examples of conditions are that the stimulus input is conscious, that the person has the intention to evaluate the stimulus, that the person's attention is focused on the stimulus input, and that there is ample time. The second level is the formal level. At this level, a process is described in terms of the mechanisms that translate input into output (i.e., what is in the black box). Examples of mechanisms are associative processes and rule-based ones (Sloman, 1996). This level also articulates the representational format (i.e., codes) of inputs and outputs. Examples of codes are conceptual (verbal-like) and non-conceptual (image-like) codes. The third level is the implementational level. This level is concerned with the physical realisation of a process in the brain. On this level may be specified neuroanatomic details of the process, such as the brain structures or circuits involved.

Criteria to separate cognitive from subcognitive processes have been formulated in functional terms (e.g., cognitive processes transform rather than preserve input, Duncan & Barrett, 2007 this issue; Scherer, 1993[1]), in terms of the conditions under which they operate (e.g., cognitive processes are conscious, Baars, 1986; cognitive processes are under organismic control, Prinz, 2004; cognitive processes are goal dependent, Lavender & Hommel, 2007 this issue), in terms of mechanisms (e.g., cognitive processes are rule-based rather than associative), in terms of representational format (e.g., cognitive processes operate on conceptual rather than non-conceptual

[1] This functional account and the broad representation-mediated account discussed above are both concerned with change and variation. Whereas the former considers change within a single encounter with the stimulus (the output is different from the input), the latter considers change over the course of several actual or possible encounters with the stimulus (the input–output relation at time t_1 is different from that at time t_2, or it is different from one context to another).

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

codes, Armon-Jones, 1989), and in neuroscientific terms (e.g., cognitive processes are cortical rather than subcortical, e.g., Murphy & Zajonc, 1993).

According to a second narrow account, cognitive processes are ones that produce a cognitive output. Used as a predicate to output, the term cognitive is contrasted with the term emotional. Cognitive output is information that is not related to emotion, so-called "cold" information. Classic examples are colour, location, semantic category membership (e.g., profession, animal, tool), and identity. Emotional output includes emotions (e.g., anger) as well as information related to emotions (e.g., valence). This account is similar to the functional variant of the first narrow account in that cognitive processes are delineated from non-cognitive ones on functional grounds (the distinction is a matter of the content of inputs and/or outputs). It differs from it, however, in that the contrasting class here does not consist of subcognitive processes but of processes with an emotional output. This second functional account of cognition is very popular among experimental researchers concerned with the role of cognition in emotion (e.g., Bargh, 1997; Klauer & Musch, 2002; Murphy & Zajonc, 1993; see below).

A third narrow account of cognition can be found in philosophy of mind. There, the term has been coined to refer to the Intentional[2] part of the mental and has been contrasted with the phenomenal part (Green, 1996). I call this the Intentional account. An Intentional state is one that is about or directed toward something. It is a state that has an object. Examples are thinking, believing, and desiring. A being can be directed toward something by forming a representation of it. Cognitive processes have therefore been equated—here also—with representation-mediated processes. Phenomenal states or qualia belong to the part of the mental that cannot be captured in representations (but see Crane, 1998, and Tye, 2003, for a representationalist view of qualia) and therefore cannot be objectified. They refer to states or qualities that are entirely subjective such as what it is like to experience red colour or pain.

Cognitive method

A cognitive *method* is one that is suited or at least designed to measure cognitive processes. The meaning of the term cognitive method is thus parasitic on the meaning of the term cognitive process. For example, on the topological account of cognition, cognitive methods are those suited to investigate internal processes, not peripheral physical ones. On the

[2] I capitalise *Intentional* in philosophical use, but not *intentional* in ordinary use, following Searle (1983).

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

mentalist account, cognitive methods are those suited to study representation-mediated processes. Some of these methods focus on the *content* of the representations (i.e., the functional level of process description), whereas others focus on the *mechanisms* or on the *format of the representations* (i.e., formal level of process description). For example, most research conducted by appraisal theorists examines what kind of information must be minimally or typically processed before specific emotions such as anger and fear can be produced. This research focuses on the *content* of the representations that form the inputs and outputs of emotion-eliciting processes (e.g., Scherer, 1997). A handful of appraisal theorists have begun to investigate the *mechanisms* and the *format of the representations* involved in emotion elicitation using experimental techniques (e.g., Moors, De Houwer, & Eelen, 2004; Smith & Kirby, 2001). According to more narrow accounts of cognition, cognitive methods are those suited to investigate conscious or controlled processes, rule-based ones, neocortical ones, or processes with a cold output. On the Intentional account of cognition, cognitive methods are those fit to study the objectifiable part of the mental (Green, 1996).

Conclusion

Several of the accounts discussed converge on the idea that cognitive processes are ones that are mediated by representations, whether this feature serves to shield them from non-mental (i.e., physical and behavioural, cf. mentalist view) processes or, more narrowly, from the phenomenal part of the mental (cf. Intentional view). Other narrow views are more restrictive in that they take cognitive processes to be those that are mediated by representations with a specific format (e.g., conceptual), those with specific functional (e.g., producing cold output) or formal (e.g., rule-based) properties, and those that occur under specific conditions (e.g., under organismic control). I side with the broad representation-mediated view because I find the distinction between processes generating fixed vs. variable input–output relations useful. As explained above, the notion of representation is key to understanding this distinction (Bermudéz, 1995). Moreover, I do not want to restrict the definition further because I think there is nothing in the functional notion of representation that compels us to say that representations must be conceptual or propositional. Different types of input–output variability require representations with different functional properties: some must be capable of quantitative change, others of becoming associated with other representations, and still others of becoming integrated with other representations (cf. above). In principle, none of these properties demand representations of a specific format or

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

with a specific content and none of them require specific operating conditions.[3]

I now turn to a discussion of some experimental arguments adduced against and in favour of the idea that cognitive processes are involved in emotion, and more in particular, in the causation of emotion. The aim is not to give an exhaustive literature review but to show that the issue has not been settled in favour of either view yet. Another aim is to examine the definitions of cognition used in this kind of research and to situate them within the taxonomy of definitions presented above.

Arguments against cognitive causation of emotion

In this section I discuss four types of arguments against cognitive causation of emotion as well as some counterarguments. A first type of observations seeks support for the claim that in some cases the processing of valence precedes that of cognitive features. Given that valence processing is often considered a first step in the development of an emotion, the claim is that in some cases the start of the emotion process is not caused by cognition. A second type of observation purports to show that emotions can be caused directly by physical stimulation. A third argument is neuroanatomical evidence for the direct causation of emotion by simple stimuli. A fourth type of argument is dissociation data obtained with experimental and neuroanatomical techniques. These are aimed at showing that different mechanisms are responsible for the processing of cognitive vs. emotional information, and hence that cognition is not likely to cause emotions.

Valence comes first

Murphy and Zajonc (1993) reported that the influence of the valence of primes on preferences for neutral targets came about at shorter exposure times than did the influence of cognitive features of the primes such as symmetry, size, and gender. They concluded that valence is processed prior to cognitive features. However, there is evidence that the order in which different aspects of the stimulus material come to *influence* other processes does not necessarily reflect the order in which they were *processed* (Marcel,

[3] Note that this idea challenges the widespread view that integration of representations demands representations of a propositional format (e.g., Bermudéz, 1995) and cannot take place under conditions of automaticity. It may be so that different types of input–output variability (functional process level) demand different mechanisms (formal process level): some must only be capable of handling a single input and suffice with a simple associative process, whereas others must be capable of integrating a double (or multiple) input and require a complex associative process or a rule-based one (Moors, 2006). In any case, all three types of formal processes (simple associative, complex associative, and rule based) are representation mediated and count as cognitive on my use of the term.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

1983). It is thus possible that cognitive features were processed simultaneously or even before valence but that their influence on the target responses was slower. Of importance, the account of cognition employed here corresponds to the second functional account discussed above. Cognitive processes are defined as those producing a cognitive output and contrasted to those producing an emotional output. It should be mentioned that Murphy and Zajonc (1993, p. 738) considered valence to be an emotional output in the sense that it is related to emotion, but they did not consider it to be a full-blown emotion.

Emotions caused directly by physical stimuli

Another type of experimental study was taken to demonstrate a direct effect (unmediated by cognitive processing) of physical stimuli on emotions and preferences. For example, Strack, Martin, and Stepper (1988) showed that participants evaluated cartoons more positively when they took on a smiling face (due to the instruction to hold a pen between their teeth) than when they took on a serious face (due to the instruction to hold a pen between their lips). Critics, however, demonstrated that facial expressions do not cause but rather intensify relevant emotions (Clore, Storbeck, Robinson, & Centerbar, 2005; Tamir, Robinson, Clore, Martin, & Whitaker, 2004). Another example is data suggesting that drugs can directly cause emotions. Here also, it is difficult to establish that drugs cause rather than intensify emotions or that when they actually do cause emotions, they do so directly, bypassing cognition. Drugs may enhance the perceptual salience of certain stimuli so that they are more easily interpreted as threatening or satisfying.

Neuroanatomical data for the direct causation of emotion

Many researchers have taken LeDoux's (1989) subcortical route to the amygdala (which is said to be the locus of stimulus evaluation) as evidence that evaluation can occur without cognitive mediation. Because of the direct connections between the amygdala and motor centres, the subcortical route even leads to emotional responses (particularly fear responses) without cognitive mediation. Critics do not exactly deny the existence of the subcortical route to stimulus evaluation and emotional responses, but they contend that it is rarely used (Storbeck, Robinson, & McCourt, 2006). The use of the subcortical route to fear responses seems to be limited to simple stimuli (light) that were previously associated with negative stimuli (shocks) in a non-differential conditioning procedure (LeDoux, Romanski, & Xagoraris, 1989). In the experimental studies that are typically adduced as supporting the evaluation-without-cognition hypothesis (cf. the studies of Murphy & Zajonc, 1993), the stimuli presented are more complex (words,

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

pictures of faces or objects). These stimuli require identification via cortical structures (e.g., area IT) before they can be evaluated (Storbeck et al., 2006).

The debate in this neuroanatomical research is characterised by the use of three accounts of cognition. First, there is the second functional account, according to which cognitive processes are those with a cognitive output (such as semantic categories and identity) that are contrasted to those with an emotional output (such as valence and fear responses; e.g., Storbeck et al., 2006). Second, there is the neuroanatomical account, which equates cognitive with cortical and subcognitive with subcortical. It should be noted that authors often assume strong overlap between the second functional account and the neuroanatomical account: Cognitive functions such as categorisation and identification are often thought to take place in cortical brain areas (but see Crosson, 1992, for the role of subcortical areas in cognitive functions). Finally, there is the first functional account, which defines cognition as computation or transformation (i.e., the first functional account, cf. Table 1). Scherer (1993, p. 12) opted for this possibility and LeDoux (1989, p. 271) imagined it when he wrote that "the processes involved in stimulus evaluation could, if one chose, be called cognitive processes. The meaning of the stimulus is not given in physical characteristics but instead is determined by computations performed by the brain. As computation is the benchmark of the cognitive, the computation of affective significance could be considered a cognitive process". Separating between these different definitions of cognition is useful because asking whether cognitive functions such as categorisation and identification take place prior to evaluation (cf. the second functional account) is not the same thing as asking whether evaluation is itself cognition (cf. the first functional account).

Dissociation data

Experimental dissociation studies are set up to show that processes producing valenced versus cognitive (or non-valenced) output obey to different rules and hence that they are of a different nature (Bargh, 1997; Klauer & Musch, 2002; Zajonc, 1980). It is reasoned that if processes with valenced output obey different rules than processes with cognitive output, the former must be non-cognitive. Bargh (1997) reported a failure to find priming effects for potency and activity,[4] contrasting this with the fact that priming effects for valence are robust. Klauer and Musch (2002), however, pointed out that the strength of this argument depends in part on null-findings and on the comparability of the stimuli used as valenced and non-valenced material.

[4] Potency and activity are non-valenced features but they are not unrelated to emotion.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Further, several investigators reported that, contrary to semantic priming effects, affective priming effects became more likely or stronger when conscious or strategic aspects were eliminated from the task (Bargh, 1997; Murphy & Zajonc, 1993). However, Clore et al. (2005) argued that conscious input generally leads to stronger emotions than unconscious input. The observation that priming effects are sometimes weaker with conscious input can be explained by the fact that conscious input makes the purpose of the experiment more transparent. As a result, participants may no longer experience their feelings as reactions to the targets and deny them.

Finally, Klauer and Musch (2002) reported a series of studies (Experiments 4 to 8) showing priming effects for valence when the task consisted in matching primes and targets with regard to a cognitive feature such as location, colour, letter case, and grammatical category. They failed to observe priming effects for any of these other features when the task consisted of matching prime and target with regard to valence. They concluded that valence is the only feature that is processed independent of the goal to do so (see also Eder, Hommel, & De Houwer, 2007 this issue). Even in the Klauer and Musch experiments, however, there may have been characteristics of the procedure that favour the occurrence of a priming effect for valence over the occurrence of a priming effect for the non-valenced features. For instance, it could be argued that the "yes" and "no" responses that participants give on the basis of the match between primes and targets have an intrinsic positive and negative valence. This element may have enhanced the salience of valence relative to the other, non-valenced features. An imbalance in salience of one feature relative to others may induce in participants the goal to process this feature and this goal may be necessary to engage in the processing of this feature (see also Lavender & Hommel, 2007 this issue). A handful of observations are in line with this argument. Duscherer, Holender, and Molenaar (in press) reported that the affective Simon effect disappeared when trials with valenced stimuli were embedded in a large set of trials with neutral stimuli. These results suggest that in a standard affective Simon task (and perhaps also affective priming task) the salience of stimulus valence encourages participants to intentionally evaluate the stimuli. Storbeck and Robinson (2004; see also Storbeck & Clore, 2007 this issue) obtained semantic but not affective priming effects (even in the evaluation task) when the stimulus material varied systematically with regard to valence as well as with regard to a non-valenced feature (semantic category: religion vs. texture). They only obtained an affective priming effect when words were chosen from one semantic category (e.g., religion) and when an evaluation task was administered. The authors argued that valence is just part of the semantic meaning of a stimulus and that it only serves as the basis for categorisation when no other, more salient, feature is available.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Taken together, the dissociation data described above present a mixed picture. Some researchers believe that the dissociations they obtained reflect systematic differences between processes with valenced and those with cognitive output. Others have argued that the dissociations that are sometimes observed are due to confounding factors that have nothing to do with valence per se, such as characteristics of the procedure (instructions, stimulus set) that enhance the salience of valence relative to that of other features. Even if one maintains that the data do reflect systematic differences between processes with valenced and those with cognitive output, these differences only concern the conditions (e.g., conscious stimulus input, the goal to engage in the process) under which these processes can take place. They do not show differences in the mechanisms involved. I argued elsewhere (Moors & De Houwer, 2006b) that conditions and mechanisms must be kept separate and that conditions do not reliably inform us about mechanisms.

Dissociations between processes with emotion-related output and those with cognitive output are also suggested by data coming from neuroanatomical studies. Damage to certain neural structures causes impairment in processes with emotional output, but leaves processes with cognitive output intact. For example, LaBar, LeDoux, Spencer, and Phelps (1995) showed that subjects with lesions to the medial temporal lobe (including the amygdala) showed impaired fear conditioning as measured by skin conductance responses (emotional output), but no impairment of awareness of the CS–US relation (cognitive output). Neuroanatomical dissociations of this kind more convincingly argue that processes with emotional versus cognitive output have different underlying mechanisms. However, several authors have argued on logical grounds that neuroanatomical dissociation data, even double dissociations, are not proof of different underlying mechanisms or modular architecture (Dunn & Kirsner, 2003). Moreover, recent neuroanatomic studies seem to increasingly challenge the idea of specialised brain structures for cognition versus emotion (e.g., Duncan & Barrett, 2007 this issue; Storbeck & Clore, 2007 this issue).

In summary, behavioural dissociation studies at best reveal differences or similarities regarding the conditions under which processes with valenced versus cognitive output occur. Conditions, however, do not inform us about the mechanisms involved. Neuroanatomical dissociation studies seem more persuasive in demonstrating that different mechanisms underlie processes with cognitive versus emotional output, but they have recently been under fire.

As with the previous arguments against the cognitive causation of emotion hypothesis, the guiding account of cognition seems to be the second functional one. Cognitive processes are defined as those that have a cognitive output and contrasted with those that have an emotional output.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

There is little overlap between this functional account of cognition and the broad representation-mediated account of cognition that I adopt in the present paper. There is no reason to suspect that processes with a cognitive output are representation-mediated and those with an emotional output are not. Even if future research shows that different mechanisms are responsible for delivering cognitive versus emotional output, both mechanisms can still be representation-mediated and hence cognitive within my use of the term.

Arguments in favour of cognitive causation of emotion

In the previous sections, I listed a number of arguments against cognitive causation of emotion. These arguments were followed by counterarguments that questioned the validity of them. Some but not all of these counter-arguments can themselves be considered arguments in favour of cognitive causation of emotion, at least according to the functional definition of cognition often employed in that type of research. On the broad definition of cognition that I proposed, however, to answer the question whether cognitive processes are involved in emotion elicitation, one should consult research concerning the degree of flexibility in emotion elicitation. Saying that cognition is a cause of emotion amounts to saying that emotions are not invariably produced by a fixed set of stimuli and that representations must intervene. Empirical research does show that emotional responses are flexible. Habituation and sensitisation effects illustrate that emotional responses to stimuli can diminish or increase as a result of repeated exposure to these stimuli (Rose & Rankin, 2001). Fear-conditioning research shows that fear to initially neutral stimuli comes and goes as a consequence of prior presentation with other fear-eliciting stimuli or safety signals (Hamm & Vaitl, 1996). Appraisal research tells us that emotions vary as a function of the relevance of the stimulus for goals or concerns (Scherer, 1997).

To answer the question whether cognition is a *necessary* cause of emotion, one should look for cases in which an emotion is not caused by cognition. This comes down to finding stimuli that invariably lead to the same emotional response. The observation that rats' fearful responses to a cat's odour do not habituate or cannot be modified in another way (Zangrossi & File, 1994) would count as an example of emotion without cognition on the broad representation-mediated definition of cognition employed here (McNaughton, 1997). It remains to be seen whether such stimuli also exist for humans. I argued that to judge the usefulness of cognitive methods for the study of emotion, one must ascertain that cognition is involved in emotion or its causation. It may not be necessary, however, to ascertain that cognition is always involved in emotion or its causation. If not all emotions are caused by cognition, cognitive methods can still be used to study those emotions that are.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Until now I have discussed the problem that most research dedicated to the cognitive causation of emotion contrasts processes with cognitive output to those with emotional output and that this research does not inform us about whether processes with an emotional output are representation-mediated and hence cognitive within my use of the term. Another problem has to do with the fact that processes with emotional output are often restricted to those with valenced output. Earlier, I distinguished between two types of output that can be labelled emotional: genuine emotions (e.g., anger) and information related to emotions (e.g., valence). I believe that it is the first type of emotional output, the genuine emotions, that matter to emotion research. Many investigators consider the assessment of valence to be the first and most important step in the development of genuine emotions. They therefore consider research concerning processes with valenced output to be relevant for emotion research. In the next section, I defend the position that the assessment of valence independent of the person's goals may have no actual emotion-eliciting power (Lazarus, 1991). In other words, valence can be totally disconnected from emotions. Thus, I propose shifting the focus of processes with valenced output to ones with emotions as output (see below).

To sum up, research dedicated to the cognitive causation of emotion is characterised by several elements: First, most research is guided by the narrow functional definition of cognitive processes as those with cognitive output (e.g., colour, size, location, non-valenced semantic meaning) and these are contrasted to processes with emotional output (e.g., emotions, valence). Second, much research contrasts processes with cognitive output to those with *valenced* output instead of those with *emotions* as output. Third, much research centres on the question whether or not there exist cases in which emotions are not caused by cognition. To decide whether cognitive methods can be used to study emotion or its causation, one should focus instead on whether there exist instances of emotions that involve cognition or that are caused by cognitive processes. On the basis of the account of cognition adopted in the present paper, emotions are caused by cognitive processes when they are mediated by representations. A useful guide to assessing whether a process is representation-mediated is to see whether the relation between input and output is flexible. The available evidence (coming from habituation studies, classical conditioning research, and appraisal research) suggests that there is a fair amount of flexibility in the causation of emotion. I therefore believe that cognitive methods can be used to study it. The next section deals with the second question, which is to know whether cognitive methods can also be used to study the *unique* aspect of emotion.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

CAN COGNITIVE METHODS BE USED TO STUDY THE UNIQUE ASPECT OF EMOTION?

For theorists who assume partial overlap among cognition and emotion, cognitive methods can be used to study the overlapping parts. One may object that by studying the cognitive part of emotion, researchers miss out on the non-cognitive part, the part that is unique to emotion. Theorists have identified different constructs as the unique non-cognitive part of emotion. Some authors have chosen action or other bodily responses (e.g., Dolan, 2002), whereas others have stressed the phenomenal (as opposed to Intentional) aspect of emotional experience (e.g., Oatley & Johnson-Laird, 1987). I agree that the aspects of body and phenomenal experience can be considered non-cognitive (at least according to certain definitions of the term cognition) and that they cannot be studied with cognitive methods. Physical processes cannot be studied with methods developed to study mental processes, and phenomenal aspects of experience cannot be studied with methods aimed at studying the Intentional aspect of experience. I disagree, however, that physical and phenomenal aspects are unique to emotions. Emotion is not the only phenomenon that has a physical component. Consider intentional action as another example of such a phenomenon. Phenomenal quality is not exclusive to emotions either. Perceptions (e.g., seeing red or green colours), bodily sensations (e.g., feeling physical pain), and even thoughts (e.g., thinking of the concept circle) are all infused with phenomenal quality.

Several theorists have proposed that the unique aspect of emotion has to do, not with the presence of one or another component of emotion (bodily responses, emotional experience), but rather with the causes of emotion. Among the theorists who agree that both cognitive outputs and emotions are caused by representations, some posit that the format of the representations differs in the two cases. Leventhal (1984) argued that nonconceptual (i.e., image-like), but not conceptual (verbal-like) representations have emotion-eliciting power. This view was shared by Teasdale (1999; see also Barnard, Duke, Byrne, & Davidson, 2007 this issue) who equated nonconceptual representations with memories *of* emotions and conceptual representations with memories *about* emotions. This proposal raises two problems. First, it remains obscure why nonconceptual representations would be more likely to elicit emotions than conceptual ones (Frijda & Zeelenberg, 2001). According to Leventhal (1984) this is because the abstractions of conceptual representations are often based on the most salient features of an emotion episode and tend to leave out familiar cues and context information, which are crucial for the actual elicitation of emotions. Frijda (1988) suggested that it may have to do with the fact that nonconceptual representations have a higher degree of reality or vividness than conceptual ones. The second

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

problem is that nonconceptual representations are not unique to emotions. For instance, perceptual representations of objects are considered nonconceptual but they do not necessarily elicit emotions.

Other theorists have argued that it is not the format, but the content of the representations that marks the difference between processes with cognitive output and those with emotions as output. According to Lang (1985), only representations that contain response information can elicit emotions. Recent research on embodied cognition, however, suggests that representations or schemata containing motor information are not unique to emotions. This research is guided by the thesis that most if not all of our representations contain motor information and that action and perception share the same representations. For example, Spivey, Tyler, Richardson, and Young (2000) showed that activation of the concept skyscraper influenced eye-movements, suggesting that representations of neutral concepts may in fact include motor information.

Another content proposal comes from appraisal theory and other belief–desire theories of emotion. These theories have suggested that any and only information about the satisfaction status of goals or concerns, that is, stimuli appraised as goal relevant, are capable of eliciting emotions (Buck, 1988; Frijda, 1986, 1988, 1994; Lazarus, 1991; Oatley & Johnson-Laird, 1987; Ortony, Clore, & Collins, 1988; Reisenzein, 2006; Roseman, 1984; Scherer, 1994; Smith & Lazarus, 1993). Emotion-related information that is not goal relevant is emotionally inert. Information about components of emotion, such as bodily responses and action tendencies are not capable of eliciting emotions unless they are themselves appraised as relevant for a goal. For example, a stimulus signalling a pending mismatch with one's goal for safety may elicit fear, and the consequent trembling of one's body may itself constitute a mismatch with one's goal of making a good impression and elicit shame. Further, a mismatch with an expected state will not provoke an emotion, unless the expected state is also desired, or unless being able to predict the outcome of events in general is desired. Finally, a stimulus with positive or negative valence (e.g., the word "dumb") will not lead to an emotion unless and until it is appraised as affecting one's goals (e.g., when your boss calls you dumb and your self-esteem is threatened). Lazarus (1991) defended a similar point when he wrote that intrinsic valence, without referring to motives, is incapable of eliciting real emotions. He asserted that the inherent pleasantness or unpleasantness of a stimulus should be considered pure knowledge, which requires additional evaluation in light of goals before resulting in an emotion.

Appraisal theory distinguishes between an appraisal of goal relevance and an appraisal of goal congruence (Lazarus, 1991). Goal relevance refers to whether or not (or the extent to which) a stimulus conveys information about the satisfaction status of goals and determines whether or not an emotion

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

will occur (or the intensity of the emotion that will occur). Goal congruence refers to the kind of information that is conveyed by the stimulus (whether the stimulus matches or mismatches with the goal) and determines the kind of emotion (positive or negative) that will occur. In the present paper, I do not make separate predictions for the appraisals of goal relevance and goal congruence. On the assumption that emotion always has intensity and quality, it may be difficult to separate them.

In summary, the components of bodily responses and phenomenal experience can be considered non-cognitive aspects on some accounts of cognition, but they are not unique to emotion. Uniqueness is also problematic for the nonconceptual format and response-related content of representations that some believe to be crucial for emotion elicitation. Of the candidate constructs discussed, only the goal-relevant content of emotion-antecedent representations seems unique to emotions. This construct faces another problem, however, which it shares with the constructs of non-conceptual format and response-related content of representations. They are all features of representations and therefore do not fall outside the realm of the cognitive. This may pose a problem for emotion theorists who wish to avoid equating emotion with cognition. One solution may be to say that the cause of emotion can be equated with cognition but that emotions themselves may still include non-cognitive components.

I hypothesise along with appraisal theory that the representations mediating the relation between stimuli and emotions contain information that touches on goals or concerns. This information is the unique aspect of emotion. The question whether cognitive methods can be used to study the unique aspect of emotion can now be answered as follows. A process operating on representations is a cognitive process irrespective of the content of these representations. Thus, methods designed to study cognitive processes can also be used to study cognitive processes operating on goal-relevant information. In the next section, I consider the motivational hypothesis in further detail. The aim is to delineate the process that deals with goal-relevant information from processes that have no relation or a different relation with goals, such as processes that deal with stimuli that are valent but not goal relevant. I also formulate additional predictions regarding the conditions under which goal-relevant or goal (in)congruent information versus purely valenced information can be processed. In the final part of the section, I examine whether there are ways to investigate the motivational hypothesis as well as the additional predictions about conditions.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

OUTLINE OF THE MOTIVATIONAL HYPOTHESIS

Before refining the hypothesis that goal-relevant information reliably produces emotions, I clarify some theoretical choices and useful distinctions about the representation, activation, and implementation of goals.

The representation, activation, and implementation of goals

I side with Bargh's (1997) assumption that "goals ... do not exist in some mysterious ether but correspond to mental representations in much the same way as do attitudes and perceptual structures" (Bargh, 1997, p. 7). Goal representations, however, are said to have special dynamic qualities that are not shared by other kinds of representations. For instance, the activation of goal representations accumulates over time and persists in the face of obstacles (Bargh & Barndollar, 1996).

With regard to the content of goal representations, three distinctions are useful. A first distinction is between goals and intentions. Intentions are a subclass of goals. The content of a goal can be any state of affairs; the content of an intention must be an action or process (e.g., James, 1890). One can intend to cook an egg, but one cannot intend the egg to be cooked. An intention must also be carried out by the person who has it. One cannot intend someone else to cook the egg. I define an intentional action or process as one that is caused by the goal to engage in it, and an unintentional action or process as one that is not caused by the goal to engage in it (Moors & De Houwer, 2006a).

A second distinction is between central and peripheral goals (e.g., Frijda, 1986). Central goals define satisfaction conditions for basic needs such as safety, food, appreciation, and optimal physical and cognitive functioning. Peripheral goals are derived from central goals. The central goal for physical survival may induce a series of more peripheral goals that directly or indirectly serve the satisfaction of this goal,[5] such as the goals to earn money, to watch traffic lights, and to eat healthily. These goals may, in turn, trigger subgoals. Together, they form a hierarchical network.

A third useful distinction is between proximal goals and remote goals. These are not fixed categories of goals. The terms proximal and remote refer to the distance between a goal and the process (or action) under study. A goal is proximal when it is directly related to the process under study, meaning that the process figures in the content of the goal. Examples are the goal to engage in the process and the goal to stop or avoid the process.

[5] For one part, the satisfaction of a central goal is at the service of a central goal or another peripheral goal. For the other part, peripheral goals may lead a life of their own. For example, the goal to own a nice car may stem from the goal to be appreciated by others, but it may also become a purpose in itself (Frijda, 1986).

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

A remote goal is one that is not related, content-wise, to the process under study. The notions of proximal and remote goal are useful for explaining the difference between the concepts goal (in)dependent and (un)intentional (Moors & De Houwer, 2006a). A process that is caused by a goal is goal dependent. This goal may be either the proximal goal to engage in the process or another, remote goal. A remote goal may cause the process indirectly, via the proximal goal, or directly, circumventing the proximal goal. A process that is caused by the proximal goal to engage in it is intentional. A process that is directly caused by a remote goal is unintentional but goal dependent. Intentional processes are a subclass of goal-dependent processes (because intentions are a subclass of goals). A process that is not caused by a (proximal or remote) goal is goal independent. As an illustration of these notions, consider the process of evaluating primes in a priming task. The process is intentional when it is caused by the proximal goal to evaluate the primes, otherwise it is unintentional. The process is unintentional but goal dependent when it is directly caused by a remote goal, such as the goal to perform well on the task. Another scenario is that the remote goal to perform well on the task triggers the proximal goal to evaluate the primes, and that the latter goal causes the evaluation process. In this case the process is also intentional. The evaluation process is goal independent when there is not a proximal or a remote goal that causes it.

Another distinction has to do with the way in which goals are activated or chosen among a set of alternatives (i.e., the phase of goal setting; Gollwitzer, 1990). Bargh (1990; Bargh & Barndollar, 1996; Bargh & Gollwitzer, 1994) distinguished between chronic goals and temporary goals. Chronic goals are those that are frequently and enduringly activated in the past, whereas temporary goals are recently induced and their activation is typically short lived. In Bargh's (1990) automotive model, a goal that is repeatedly and enduringly chosen in a specific situation forms associations in memory with stimuli in these situations. These stimuli eventually become sufficient to activate the existing goal representation so that conscious choice of the goal can be circumvented and the goal drops out of consciousness. To activate a temporary goal, other conditions are required in addition to the stimulus, such as instructions or other task features. To illustrate the distinction, when the goal to be egalitarian is chronic, it can be activated upon the mere presentation of a picture of a minority group member (cf. Moskowitz, Gollwitzer, Wasel, & Schaal, 1999). When the goal to be egalitarian is not chronic, its temporary activation requires more than the picture alone. It may require the instruction to be egalitarian or more subtle ways of induction, such as a preceding unobtrusive priming phase (e.g., a scrambled sentence test with egalitarian words; Chartrand & Bargh, 1996). In the case

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

of instructions, the temporary goal is thought to be conscious; in the case of more subtle ways of induction, the goal may remain unconscious.

Once a goal is activated or chosen (phase of goal setting) it must still be translated into real action (phase of goal striving; Gollwitzer, 1990; Heckhausen, 1990/1991). The motivation literature has identified two factors that determine whether an intention will be implemented: strength of the intention and feasibility of the action or process. An intention must be strong enough in comparison to other intentions that are vying for implementation. Feasibility encompasses two subfactors: opportunity and skill. For example, to process a word for meaning, there must be a word (i.e., opportunity), and the person must know how to read (i.e., skill).

Processes can have two kinds of relations with goals

The previous paragraph described how goals to engage in actions or processes are translated into real actions and processes and in this way *serve the satisfaction* of these goals. Goals (of any kind) may also induce processes that serve to *monitor the satisfaction status* of these goals. The goal for survival may lead to a process that determines matches or mismatches with it. The core of the motivational hypothesis is that the output of this monitoring process is, structurally speaking, an emotion. One extra condition that is probably needed to speak of a full-blown (i.e., intense) emotion is that the goal at stake should be sufficiently *central*. Centrality is a relative notion. Some goals are more central than others and hence more likely to serve as the basis for emotions. For example, a mismatch with the goal to survive is more likely to elicit an emotion than a mismatch with the goal to perform a dull task.

According to the motivational hypothesis, processes that have emotions as output deal with goal-relevant information, whereas processes that have no emotions do not. I wish to clearly delineate the terms goal relevant, goal dependent, and goal related. Goal-relevant information is information about the satisfaction status of goals. A goal-dependent process is one that is caused by a goal. A process that does not deal with the satisfaction status of goals may still be caused by a goal. Thus, processes concerned with goal-relevant information and processes that are goal dependent are both goal related, but the type of relation differs.

The motivational hypothesis says that emotions are caused by stimuli that are appraised as goal relevant. It is important to note that goal relevance *as appraised* is not the same thing as *objective* goal relevance (Frijda, 1986, p. 330; Frijda & Zeelenberg, 2001). A goal-relevant stimulus does not lead to an emotion unless the person processes this goal relevance.

This raises the question of what kind of mechanism is required to assess goal relevance (and goal congruence). The most common proposal is a

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

mechanism that compares the incoming stimulus with a goal. The output of this comparison is a match or a mismatch. A match leads to a positive and a mismatch to a negative emotion. Positive and negative emotions may consist of different action tendencies depending on whether matches are potential, partial, or complete, and whether mismatches are revocable or irrevocable. A potential or a partial match leads to the tendency to increase contact with the stimulus (i.e., approach); a perfect match leads to the tendency to cease goal striving or the tendency to increase contact with other stimuli (that offer opportunity for the fulfilment of other goals). A revocable mismatch results in a tendency to turn it into a match (e.g., by means of fight or flight); an irrevocable mismatch results in the tendency to cease goal-striving. The actions resulting from the tendency to reduce the discrepancy between stimulus and goal (in case there is a potential or partial match or a revocable mismatch) may cause a change in the stimulus situation. The changed situation is fed back in the monitoring process and the feedback cycle is repeated until the discrepancy is solved (cf. TOTE model of Miller et al., 1960; also see Carver & Scheier, 1990; Case 4 in Figure 1). As suggested by several authors (Bargh, 1990; Moskowitz, 2001), goal representations need not have a conceptual format nor must they be consciously chosen or even consciously accessible to serve as a standard for comparison. A goal representation may be latent until a discrepant or matching stimulus awakens it. Often, a person is unaware of what is important to her/him until a strong emotional reaction tells her/him so (cf. Buck's, 1988, idea that emotion is a readout of motivational potential). As an alternative to a comparison mechanism, information about the satisfaction status of goals may, in principle, also be delivered by a mechanism of direct memory retrieval. It is not unthinkable that certain stimuli are tagged in memory as goal (ir)relevant or goal (in)congruent as a result of prior learning. Presentation of these stimuli may trigger activation of their associated goal-(ir)relevant or goal-(in)congruent meaning.

Until now, I have defended a strong version of the motivational hypothesis. According to this version, goal-relevant information is necessary for emotion elicitation. One could also defend a weak version, arguing that goal-relevant information is not strictly necessary to elicit emotions but, together with a host of background conditions, it is sufficient. The weak version leaves room for emotions that are not easily explained by making appeal to goal relevance, such as those elicited by music and films (but see Frijda, 1989).

The theoretical possibilities discussed can be summarised as follows (see Figure 1). A process can be: (a) unintentional (i.e., not caused by a proximal goal; Case 1); (b) chronically intentional (i.e., caused by a proximal goal that is chronic; Case 2); or (c) temporarily intentional (i.e., caused by a proximal goal that is temporary; Case 3). In all three cases the process may or may not

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

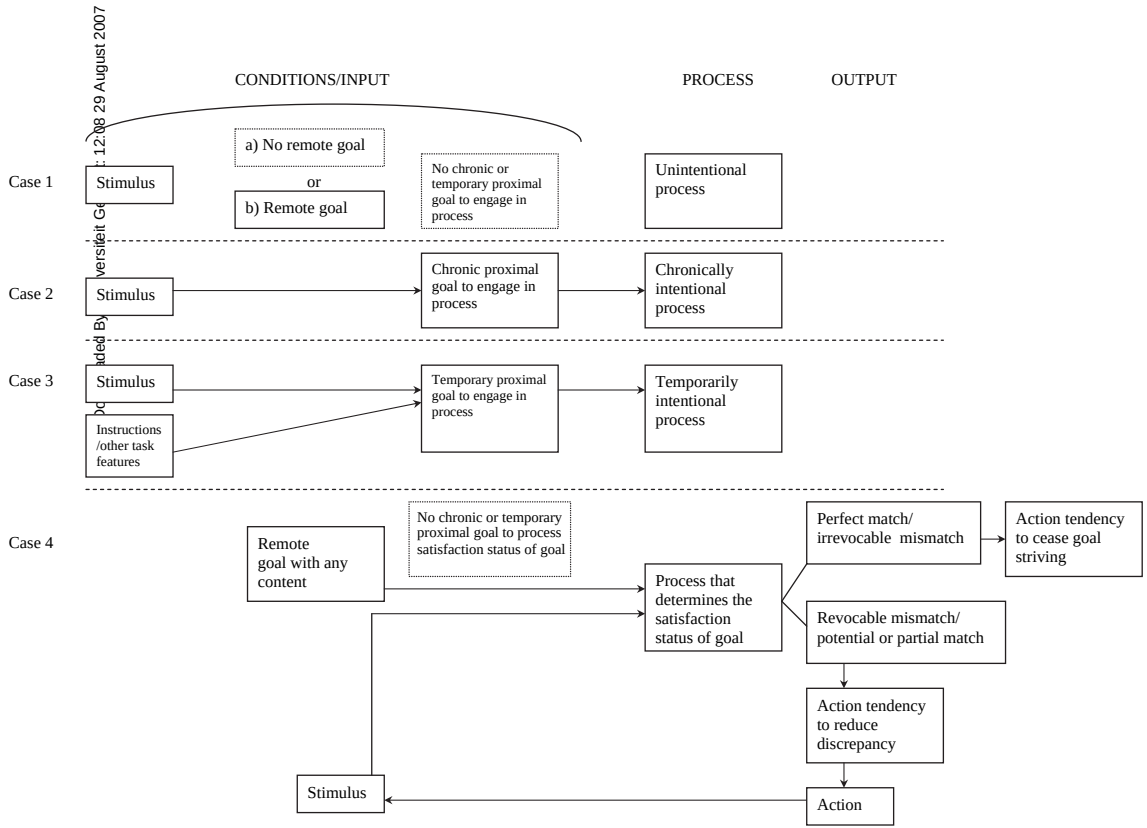


Figure 1. The motivational framework distinguishes between processes that are unrelated to goals (Case 1a); processes that serve the satisfaction of goals (unintentional goal-dependent ones [Case 1b], chronically intentional ones [Case 2], and temporarily intentional ones [Case 3]); and processes that monitor the satisfaction status of goals (Case 4).

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

(also/still) be caused by a remote goal, but the model is organised around the presence or absence of proximal goals. In addition to processes that directly *serve* the satisfaction of intentions (Cases 2 and 3), there is a process that *monitors* the satisfaction status of intentions and of other goals (Case 4). The core of the (strong version of the) motivational hypothesis is that only the process in Case 4 has emotions as output. An important implication is that valenced stimuli that are not appraised as goal relevant are not capable of eliciting emotions.

The motivational framework sketched above assumes that many processes and actions stem from goals. Most processes and actions do not occur in isolation but are embedded in chains of goals and subgoals. Although the framework does leave room for processes that are not caused by a proximal and/or remote goal, there may be very few cases of entirely goal-independent processes. When researchers argue that their effects are goal independent they often mean that these effects are independent of certain goals, such as the proximal goal to process the feature under study or other, more remote goals that are temporarily induced by features of the experimental procedure.

Conditions under which goal relevance versus valence can be processed

The process that monitors the satisfaction status of goals was presented as goal dependent. The goal to be loved leads to the process to verify whether one is actually loved. In addition, I hypothesise that this process is (or can be) unintentional. From a functionalist perspective, emotions have survival value. They are designed to mobilise the organism in response to the detection of (potential) matches or mismatches with goals. Emotions are most useful for survival when their occurrence is dependent on the least number of processing conditions. I therefore hypothesise that the process that causes emotions can be unintentional. Pursuing the survival argument, I further speculate that processes without survival value are typically intentional; they do not occur unless the person has the intention to engage in them. Several cognitive tasks, such as sorting stimuli in the binary categories of blue versus yellow, upper case versus lower case, and animal versus person, do not usually require priority and I hypothesise that people will not engage in them unless they have an intention to do so. In a similar vein, I hypothesise that valenced stimuli that are not goal relevant will not be sorted in the binary categories of positive versus negative unless people have the intention to do so. In short, I predict a dissociation between processes that have emotions as output and those that have valence as output: the former require no intention to occur, whereas the latter do. In addition, I predict no dissociation between processes that have valence as output and

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

those that have other binary categories as output: both require an intention to occur.

In the next sections, I examine whether there are ways to investigate the core of the motivational hypothesis that emotions are caused by stimuli that provide information about the satisfaction status of goals. I also examine the available empirical support in favour of and against the additional hypotheses that the process that determines the satisfaction status of goals can take place unintentionally, whereas processes that sort stimuli into binary categories (including the binary categories of positive vs. negative) do not.

EMPIRICAL INVESTIGATION OF THE MOTIVATIONAL HYPOTHESIS

Investigating the core assumption

To falsify the strong version of the motivational hypothesis that goal-relevant information is necessary for emotion elicitation entails demonstrating that valenced stimuli that do not provide information about the satisfaction status of goals can also elicit emotions. This enterprise is complicated by two difficulties. First, one has to choose a criterion that indicates the presence or absence of an emotion (dependent variable), and this criterion should be logically independent of the presence or absence of goal relevance (independent variable; Frijda & Zeelenberg, 2001). In other words, in addition to the hypothesised criterion of goal relevance, one has to find a second unique criterion (or set of criteria) to demarcate emotions from phenomena that are not emotions. The literature contains several proposals for criteria. Examples are that emotions: (1) are valenced states (this delineates them from surprise and interest; Ortony & Turner, 1990); (2) are short lived (this delineates them from moods); (3) have arousal (this delineates them from attitudes and preferences); (4) are action tendencies (this delineates them from actions; Frijda, 1986); (5) arise spontaneously (this delineates them from intentions; Frijda, 1986); and (6) have a specific formal object (Hacker, 2004) or core relational theme (Lazarus, 1991) such as danger (for fear), a demeaning offence against me and mine (for anger), and irrevocable loss (for sadness). The latter criterion delineates emotions from bodily sensations (e.g., hunger, pain). Most authors combine several of these criteria to delineate the class of emotions. Unfortunately, there is no consensus among authors. Thus, researchers have to make a choice and state it explicitly.

There is a second difficulty that one encounters when studying the emotion-evoking power of stimuli that have valence but no goal relevance. One has to find a way to operationalise valence in a pure way. This may turn

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

out to be a very tough nut to crack. Indeed, when stimuli are used with a positive or negative valence, one has no guarantee that participants will *not* link these stimuli to their goals, even if goals are not being manipulated. For example, the word "dumb" may have no emotion-evoking power as such, but it may actually make contact with a person's goals via imagination (e.g., she may imagine that someone calls her dumb so that her self-esteem is threatened) and in this way evoke an emotion. Because of this difficulty, direct testing of the strong version of the motivational hypothesis does not seem within immediate reach. It remains possible, however, to seek support for the weaker version of the motivational hypothesis. Despite the difficulty of discarding the goal relevance of a stimulus, it remains possible to manipulate the degree to which the stimulus is relevant for some goal, and assess whether this affects the intensity of the emotional response. Another possibility is to suddenly increase the goal relevance of some stimulus by inducing a new goal or by enhancing the centrality of an existing goal. The emotional consequences of both phases can then be compared.

Investigating the additional assumptions concerning the conditions under which goal relevance versus valence can be processed

In the present section, I further consider the hypotheses that the satisfaction status of goals can be determined unintentionally, whereas processes that sort stimuli into binary categories require an intention. I first compare these new hypotheses with those that have guided previous dissociation research. Authors of previous dissociation studies have addressed the question whether processes with valenced versus cognitive output occur under the same (no-dissociation view) or under different conditions (dissociation view). Advocates of the dissociation view (Bargh, 1997; Zajonc, 1980) assume that processes with valenced output are unintentional and even entirely goal independent (Case 1) and that certain processes with cognitive output are steered by intentions, without specifying whether these intentions are chronic (Case 2) or temporary (Case 3). Advocates of the no-dissociation view (Clore et al., 2005; Storbeck & Robinson, 2004; Storbeck et al., 2006) assume that processes with valenced output are part of semantic encoding, without specifying whether both are unintentional or intentional in some variety of the term.

I propose an alternative account that is still consistent with the no-dissociation view. I first hypothesise that the (semantic) encoding of stimuli is either unintentional (Case 1) or chronically intentional (Case 2). I further propose that the processes underlying priming effects are binary categorisation processes. Priming for valence requires the categorisation of stimuli (both primes and targets) as positive or negative, whereas priming for

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

cognitive features (e.g., animacy, colour) requires categorisation in other binary categories (e.g., living vs. non-living, blue vs. yellow).[6] Target responses are relatively facilitated when prime and target are sorted in the same category, but relatively inhibited when they are sorted in different categories. Categorisation based on valence is just one type of binary categorisation. Crucially, binary categorisation of stimuli entails more than pure encoding; encoding can be a first step. For example, encoding of the word dog can be a first step in categorising it as an animal instead of a person or as a living creature instead of an object. Similarly, encoding of a blue square can be a first step in sorting it in the category of blue instead of yellow or in the category of squares instead of triangles. I hypothesise that binary categorisation of stimuli is temporarily intentional (Case 3). Sorting stimuli in one of two categories on the basis of valence or any other feature requires more than the mere presence of the stimulus; it requires a temporary intention that must be fuelled by an explicit instruction or a more subtle task feature (such as the nature of the target task or the characteristics of the stimulus set).

Empirical support for the idea that valence-based categorisation is (consciously or unconsciously) intentional is mixed. Studies in which task features are removed that might induce the (conscious or unconscious) intention to engage in valence-based categorisation show sometimes that affective priming (and Simon) effects disappear (De Houwer, Hermans, Rothermund, & Wentura, 2002; Duscherer et al., in press; Klauer & Musch, 2001, 2002; Klinger, Burton, & Pitts, 2000; Lavender & Hommel, 2007 this issue; Spruyt, Hermans, De Houwer, & Eelen, 2002; Spruyt, Hermans, Pandelaere, De Houwer, & Eelen, 2004) and sometimes that they remain intact (Bargh, Chaiken, Raymond, & Hymes, 1996; Hermans, De Houwer, & Eelen, 1994, Klauer & Musch, 2002). Although the latter results are inconsistent with the view proposed here, it could be argued that in none of these studies it can be completely ruled out that the nature of the target responses or the polarised valence of the stimuli (primes and/or targets) enhanced the salience of valence compared to that of other dimensions and induced the intention to engage in valence-based categorisation. It must be emphasised, however, that the proposed account is speculative and calls for extensive empirical testing.

Until now, there has been only limited empirical support for the hypothesis that the satisfaction status of goals can be determined unintentionally. Several studies with attentional bias tasks support the idea that goal relevance can be processed unintentionally (Moskowitz, 2002; Rothermund, 2003; Wentura, Rothermund, & Bak, 2000). Support for the idea that

[6] Priming experiments may, of course, require participants to sort features into more than two categories.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

goal congruence can be processed unintentionally is provided by studies conducted at our lab. Using variants of the sequential affective priming task, Moors, De Houwer, Hermans, and Eelen (2005) showed that primes that constituted a match or a mismatch with temporarily induced goals influenced responses to positive and negative target words. Several features of the procedures used supported the idea that these matches and mismatches were determined without the (conscious) intention to do so.

In summary, I have speculated that binary valence-based categorisation requires a conscious or unconscious temporary intention, whereas assessment of the satisfaction status of goals requires no intention. Empirical support in favour of these speculations is either mixed or limited. I see it as a major challenge for future dissociation studies to continue investigation of these speculations. Where most previous studies have focused on dissociations between processes concerned with valence versus non-valenced features, future studies should focus on dissociations between processes concerned with valence versus the satisfactions status of goals. Studies may focus on differences with respect to conditions and test the speculations presented above, or differences with respect to the types of mechanisms involved. Differences or similarities in conditions do not yield an insight in mechanisms but are valuable in their own right. In this way, the motivational framework provides directions for future research.

CONCLUSION

The present paper set out to answer the questions whether cognitive methods are suited to the study of emotion, and whether they are suited to study the unique aspect of emotion. Based on (a) the definition of a cognitive process as one that mediates between flexible input–output relations by means of representations, and (b) observations indicating a flexible relation between stimuli and emotions, I concluded that cognitive processes are involved in the elicitation of many emotions and hence that cognitive methods can be used to study them. I further proposed that the unique aspect of emotion has to do with the content of the representations involved in the process that elicits the emotion. More particularly, these representations contain information about the satisfaction status of central goals. Cognitive methods are fit to study this process, given that such methods work for any representation-mediated process, regardless of the content of the representations.

The core of the motivational hypothesis is that (only) processes that monitor the satisfaction status of goals can elicit emotions. I sketched a broader motivational framework in which this monitoring process was contrasted with processes that serve the direct satisfaction of goals and

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

intentions. I formulated the additional hypotheses that the satisfaction status of goals can be processed unintentionally, whereas processes that sort stimuli into binary categories (e.g., based on valence, colour, semantic category) cannot. These hypotheses were contrasted to the views guiding previous dissociation research. In most of this previous research, the focus was on dissociations between the processing of valence versus cognitive features. The current motivational hypothesis urges researchers to also study processes concerned with goal relevance or goal congruence. In conclusion, processes involved in the causation of emotion can be studied with cognitive methods and I believe they do have a special status, but researchers may have been looking for them in the wrong place.

REFERENCES

Armon-Jones (1989). *Varieties of affect*. Toronto, Canada: University of Toronto Press.

Baars, B. J. (1986). *The cognitive revolution in psychology*. New York: Guilford Press.

Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition* (Vol. 2, pp. 93–130). New York: Guilford Press.

Bargh, J. A. (1997). The automaticity of everyday life. In R. S. Wyer (Ed.), *Advances in social cognition* (Vol. 10, pp. 1–49). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

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.

Bargh, J. A., Chaiken, S., Raymond, P., & Hymes, C. (1996). The automatic evaluation effect: Unconditional automatic activation with a pronunciation task. *Journal of Experimental Social Psychology*, *32*, 104–128.

Bargh, J. A., & Gollwitzer, P. M. (1994). Environmental control of goal-directed action: Automatic and strategic contingencies between situations and behavior. In W. D. Spaulding (Ed.). *Nebraska Symposium on Motivation*, *41*, 71–124.

Barnard, P., Duke, D., Byrne, R., & Davidson, I. (2007). Differentiation in cognitive and emotional meanings: An evolutionary analysis. *Cognition and Emotion*, *21*, 1155–1183.

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

Buck, R. (1988). *Human motivation and emotion*. New York: Wiley.

Carver, C. S., & Scheier, M. F. (1990). Principles of self-regulation: Action and emotion. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 3–52). New York: Guilford Press.

Chartrand, T. L., & Bargh, J. A. (1996). Automatic activation of social information processing goals: Nonconscious priming reproduces effects of explicit conscious instructions. *Journal of Personality and Social Psychology*, *71*, 464–478.

Cleeremans, A., & Jiménez, L. (2002). Implicit learning and consciousness: A graded, dynamic perspective. In R. M. French & A. Cleeremans (Eds.), *Implicit learning and consciousness* (pp. 1–40). Hove, UK: Psychology Press.

Clore, G. L., Storbeck, J., Robinson, M. D., & Centerbar, D. (2005). Seven sins in the study of unconscious affect. In L. F. Barrett, P. Niedenthal, & P. Winkielman (Eds.), *Emotion: Conscious and unconscious* (pp. 384–408). New York: Guilford Press.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Crane, T. (1998). Intentionality as the mark of the mental. In A. O'Hear (Ed.), *Contemporary issues in philosophy of mind* (pp. 229–251). Cambridge, UK: Cambridge University Press.

Crosson, B. A. (1992). *Subcortical functions in language and memory*. New York: Guilford Press.

De Houwer, J., Hermans, D., Rothermund, K., & Wentura, D. (2002). Affective priming of semantic categorization responses. *Cognition and Emotion*, *16*, 643–666.

Dolan, R. J. (2002). Emotion, cognition, and behavior. *Science*, *298*, 1191–1194.

Duncan, S., & Barrett, L. F. (2007). Affect is a form of cognition: A neurobiological analysis. *Cognition and Emotion*, *21*, 1184–1211.

Dunn, J. C., & Kirsner, K. (2003). What can we infer from double dissociations? *Cortex*, *39*, 1–7.

Duscherer, K., Holender, D., & Molenaar, E. (in press). Revisiting the affective Simon effect. *Cognition and Emotion*.

Eder, A. B., Hommel, B., & De Houwer, J. (2007). How distinctive is affective porcessing? On the implications of using cognitive paradigms to study affect and emotion. *Cognition and Emotion*, *21*, 1137–1154.

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

Frijda, N. H. (1988). The laws of emotion. *American Psychologist*, *43*, 349–358.

Frijda, N. H. (1989). Aesthetic emotions and reality. *American Psychologist*, *44*, 1546–1547.

Frijda, N. H. (1994). Emotions require cognitions, even if simple ones. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 197–202). New York: Oxford University Press.

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.

Fodor, J. A. (1986). Why Paramecia don't have mental representations. *Midwest Studies in Philosophy*, *10*, 3–23.

Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 53–92). New York: Guilford Press.

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

Hacker, P. M. S. (2004). The conceptual framework for the investigation of emotions. *International Review of Psychiatry*, *16*, 199–208.

Hamm, A. O., & Vaitl, D. (1996). Affective learning: Awareness and aversion. *Psychophysiology*, *33*, 97–107.

Heckhausen, H. (1991). *Motivation and action* (P. K. Leppman, Trans.). Berlin, Germany: Springer-Verlag. (Original work published 1990)

Hermans, D., De Houwer, J., & Eelen, P. (1994). The affective priming effect: Automatic activation of evaluative information in memory. *Cognition and Emotion*, *8*, 515–533.

Izard, C. E. (1994). Cognition is one of four types of emotion-activating systems. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 203–207). New York: Oxford University Press.

James, W. (1890). *The principles of psychology*. New York: Holt, Rinehart, & Winston.

Klauer, K. C., & Musch, J. (2001). Does sunshine prime loyal? Affective priming in the naming task. *Quarterly Journal of Experimental Psychology*, *54*, 727–751.

Klauer, K. C., & Musch, J. (2002). Goal-dependent and goal-independent effects of irrelevant evaluations. *Personality and Social Psychology Bulletin*, *28*, 802–814.

Klinger, M. R., Burton, P. C., & Pitts, G. S. (2000). Mechanisms of unconscious priming: I. Response competition, not spreading activation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *26*, 441–455.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

LaBar, K. S., LeDoux, J. E., Spencer, D. D., & Phelps, E. A. (1995). Impaired fear conditioning following unilateral temporal lobectomy in humans. *The Journal of Neuroscience*, *15*, 6846–6855.

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.

Lavender, T., & Hommel, B. (2007). Affect and action: Towards an event-coding account. *Cognition and Emotion*, *21*, 1270–1296.

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

LeDoux, J. E. (1989). Cognitive–emotional interactions in the brain. *Cognition and Emotion*, *3*, 267–289.

LeDoux, J., Romanski, L., & Xagoraris, A. (1989). Indelibility of subcortical emotional memories. *Journal of Cognitive Neuroscience*, *1*, 238–243.

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

Mandler, G., Nakamura, Y., & Shebo-Van Zandt, B. J. (1987). Non-specific effects of exposure on stimuli that cannot be recognized. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *13*, 646–648.

Marcel, A. J. (1983). Conscious and unconscious perception: An approach to the relation between phenomenal experience and perceptual processes. *Cognitive Psychology*, *15*, 238–300.

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

McNaughton, N. (1997). Cognitive dysfunction resulting from hippocampal hyperactivity—A possible cause of anxiety disorder. *Pharmacology Biochemistry and Behavior*, *65*, 603–611.

Miller, G. A. (1962). *Psychology: The science of mental life*. Harmondsworth, UK: Penguin.

Miller, G. A., Galanter, E., & Pribram, K. (1960). *Plans and the structure of behavior*. New York: Holt.

Moors, A. (2006). Investigating the automaticity of constructive appraisals. *Proceedings of the 18th European Meeting on Cybernetics and Systems Research*. Vienna, Austria: Austrian Society for Cybernetic Studies.

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.

Moors, A., De Houwer, J., & Eelen, P. (2004). Automatic stimulus–goal comparisons: Support from motivational affective priming studies. *Cognition and Emotion*, *18*, 29–54.

Moors, A., De Houwer, J., Hermans, D., & Eelen, P. (2005). Unintentional processing of motivational valence. *Quarterly Journal of Experimental Psychology*, *58A*, 1043–1063.

Moskowitz, G. B. (2001). Preconscious control and compensatory cognition. In G. B. Moskowitz (Ed.), *Cognitive social psychology: The Princeton symposium on the legacy and future of social cognition* (pp. 333–358). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Moskowitz, G. B. (2002). Preconscious effects of temporary goals on attention. *Journal of Experimental Social Psychology*, *38*, 397–404.

Moskowitz, G. B., Gollwitzer, P. M., Wasel, W., & Schaal, B. (1999). Preconscious control of stereotype activation through chronic egalitarian goals. *Journal of Personality and Social Psychology*, *77*, 167–184.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Murphy, S. T., & Zajonc, R. B. (1993). Affect, cognition, and awareness: Affective priming with optimal and suboptimal stimulus exposures. *Journal of Personality and Social Psychology*, *64*, 723–739.

Neisser, U. (1967). *Cognitive psychology*. Englewood Cliffs, NJ: Prentice Hall.

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.

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

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

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

Reisenzein, R. (2006). Emotions as metarepresentational states of mind. In R. Trappl (Ed.), *Proceedings of the 18th European Meeting on Cybernetics and Systems Research*. Vienna, Austria: Austrian Society for Cybernetic Studies.

Rose, J. K., & Rankin, C. H. (2001). Analyses of habituation in Caenorhabditis elegans. *Learning & Memory*, *8*, 63–69.

Roseman, I. J. (1984). Cognitive determinants of emotions: A structural theory. In P. Shaver (Ed.), *Review of personality and social psychology* (Vol. 5, pp. 11–36). Beverly Hills, CA: Sage.

Rothermund, K. (2003). Automatic vigilance for task-related information: Perseverance after failure and inhibition after success. *Memory & Cognition*, *31*, 343–352.

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

Scherer, K. R. (1994). An emotion's occurrence depends on the relevance of an event to the organism's goal/need hierarchy. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 227–231). New York: Oxford University Press.

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

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

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, *119*, 3–22.

Smith, C. A., & Kirby, L. D. (2001). Toward delivering on the promise of appraisal theory. In K. R. Scherer, A. Schorr, & T. Johnstone, *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.

Solomon, R. (1984). *The passions: The myth and nature of human emotions*. New York: Doubleday.

Spivey, M., Tyler, M., Richardson, D., & Young, E. (2000). Eye movements during comprehension of spoken scene descriptions. *Proceedings of the 22nd Annual Conference of the Cognitive Science Society* (pp. 487–492). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Spruyt, A., Hermans, D., De Houwer, J., & Eelen, P. (2002). On the nature of the affective priming effect: Affective priming of naming responses. *Social Cognition*, *20*, 227–256.

Spruyt, A., Hermans, D., Pandelaere, M., De Houwer, J., & Eelen, P. (2004). On the replicability of the affective priming effect in the pronunciation task. *Experimental Psychology*, *51*, 109–115.

Downloaded By: [Universiteit Gent] At: 12:08 29 August 2007

Storbeck, J., & Clore, G. L. (2007). On the interdependence of cognition and emotion. *Cognition and Emotion*, *21*, 1212–1237.

Storbeck, J., & Robinson, M. D. (2004). Preferences and inferences in encoding visual objects: A systematic comparison of semantic and affective priming. *Personality and Social Psychology Bulletin*, *30*, 81–93.

Storbeck, J., Robinson, M. D., & McCourt, M. E. (2006). Semantic processing precedes affect retrieval: The neurological case for cognitive primacy in visual processing. *Review of General Psychology*, *10*, 41–55.

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*, 768–777.

Tamir, M., Robinson, M. D., Clore, G. L., Martin, L. L., & Whitaker, D. (2004). Are we puppets on a string? The contextual meaning of unconscious expressive cues. *Personality and Social Psychology Bulletin*, *30*, 237–249.

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. (1984). Affect theory. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 163–196). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Tye, M. (2003). A theory of phenomenal concepts. In O'Hear A. (Ed.), *Minds and persons* (pp. 91–106). Cambridge, UK: Cambridge University Press.

Wentura, D., Rothermund, K., & Bak, P. (2000). Automatic vigilance: The attention-grabbing power of approach and avoidance-related social information. *Journal of Personality and Social Psychology*, *78*, 1024–1037.

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

Zangrossi, H., & File, S. E. (1994). Habituation and generalization of phobic responses to cat odor. *Brain Research Bulletin*, *33*, 189–194.