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# The multiplicity of emotions: A framework of emotional functions in decision making

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## Abstract

A four-fold classification of emotions with respect to their functions in decision making is proposed. It is argued that emotions are not homogenous concerning their role in decision making, but that four distinct functions can be distinguished concerning emotional phenomena. One function is to provide information about pleasure and pain for preference construction, a second function is to enable rapid choices under time pressure, a third function is to focus attention on relevant aspects of a decision problem, and a fourth function is to generate commitment concerning morally and socially significant decisions. The pertinent literature on the relationship between emotion and decision making is reviewed, and it is concluded that most approaches fit into the proposed framework. We argue that a precise conceptualization of emotional phenomena is required to advance our understanding of the complex role of emotions in decision making.

Keywords: emotion, affect, decision making.

## 1 Introduction

In this paper, we address the question of how to conceptualize emotions concerning their role in decision making. The study of emotions in the context of decision making, beginning more than twenty years ago (Baron, 1992; Bell, 1982; Elster, 1985; Frank, 1988; Loomes & Sugden, 1982; Pfister & Böhm, 1992; Toda, 1980), has received increasing attention over the past decade (Loewenstein & Lerner, 2003; Mellers, 2000; Naqvi, Shiv, & Bechara, 2006; Peters, 2006). There is, however, little consensus in the literature on what is actually meant by emotion or affect. This paper tries to contribute to a more precise and useful conceptualization of emotion concerning the emotion-decision making relationship.

First, we briefly sketch two approaches with a similar objective, the classification of emotions by Loewenstein and Lerner (2003), and the functional typology proposed by Peters (2006). We will then discuss some common assumptions about emotions which we believe have confused the understanding of the role of emotion in de-

cision making. In particular, we argue that emotion(s) should not be construed as a homogenous category, that the positive-negative valence dimension is not the most important aspect of emotions in decision making, and that emotions do not imply irrationality.

We argue that it is more useful to think of emotional phenomena as implementing specific mechanisms to account for different functions that arise in decision making. Four functions are proposed which are conceptually independent, though empirically correlated. The four-fold classification of functions which we propose includes information, speed, relevance, and commitment as the basic aspects.

## 2 Related work

### 2.1 The Loewenstein-Lerner classification

Loewenstein and Lerner (2003) construe emotions according to their place along the time course of a decision process, beginning with a deliberation phase leading to a choice, then implementing the choice, and, eventually, experiencing the outcomes. They distinguish between anticipated emotions and immediate emotions, with imme-

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mediate emotions further classified into incidental and anticipatory emotions. *Anticipated* emotions are beliefs about one's future emotional states that might ensue when the outcomes are obtained. *Immediate* emotions, in contrast, are actually experienced when making a decision, thereby exerting an effect on the mental processes involved in making a choice; for similar distinctions see Kahneman (2000). Immediate emotions come in two variants, either as *incidental* emotions caused by factors which are not related to the decision problem at hand, and as *anticipatory* or *integral* emotions, which are caused by the decision problem itself.

There is ample evidence that these kinds of emotion frequently do influence the judgments and choices people make. Lerner and Keltner (2000) demonstrated the effects of incidental fear and anger on risk judgments. The influence of immediate anticipatory emotions in intertemporal choice has been examined by Loewenstein (1996). The importance of anticipated emotions such as anticipated regret and disappointment in decision making has been demonstrated by Zeelenberg, van Dijk, Manstead, and van der Pligt (2000).

## 2.2 Peters' functional roles of affect

Peters (2006) recently proposed a classification of the roles that affect plays in decision making. Affect is loosely defined as experienced feelings about a stimulus, either integral or incidental (Peters, Västfjäll, Gärling, & Slovic, 2006). Four roles are identified: First, affect plays a role as *information*, especially via the affect-as-information mechanism (Schwarz & Clore, 1988). These feelings, possibly misattributed to the stimulus, act as good-versus-bad information to guide choices, according to the affect heuristic proposed by Slovic, Finucane, Peters, and MacGregor (2002). The second role played by affect is as a *spotlight*, focusing the decision maker's attention on certain kinds of new information and making certain kinds of knowledge more accessible for further information processing. This role is reminiscent of mood-congruent memory as studied by Bower (1991). Third, affect operates as a *motivator*, influencing approach-avoidance tendencies as well as efforts to process information (Frijda, 1986; Zeelenberg & Pieters, 2006; Zeelenberg, Nelissen, Breugelmans, & Pieters, this issue). Finally, a fourth role of affect is to serve as a *common currency* in judgments and decisions (Cabanac, 1992). Just as money does for goods, affect provides a common currency for experiences. Following Cabanac (1992), Peters claims that affective reactions enable people to compare disparate events and complex arguments on a common underlying dimension.

The Peters approach is similar in some respects to our proposal. We will point out commonalities and dif-

ferences concerning the Peters taxonomy as we present our four-fold classification of emotional mechanisms, and take it up again in the discussion section.

## 3 Contentious issues in emotion research

Before presenting a framework of emotional phenomena in decision making based on functional considerations, we briefly discuss a number of common assumptions which, as we argue, have hindered a consensual conceptualization of the emotion-decision making relationship. Though our framework does not logically depend on these points, we consider it helpful to clarify these contentious issues in advance.

### 3.1 The influence-on metaphor

Both Peters (2006) and Loewenstein and Lerner (2003), and, arguably, a vast majority of other researchers in the field of decision making, adhere to what we call the *influence-on metaphor*. Emotions - or affect, or feelings - are portrayed as external forces influencing an otherwise non-emotional process. It is assumed that the domain of emotion is qualitatively different and functionally separate from the domain of cognition. Decision making is then seen as an essentially cognitive process, which does not necessarily entail emotions. Emotions may have an influence *on* decision making, but decision making *per se* might as well proceed without emotion. This is the premise of traditional approaches of behavioral decision making (Slovic, Lichtenstein, & Fischhoff, 1988), but is also reflected in current dual-system theories (Kahneman, 2003; Sloman, 1996; for a critical discussion see Price & Norman, this issue).

This antagonism of emotion and decision making is commonly accompanied by further dichotomies: Irrational emotions disturb rational cognitions, intuitive feelings outsmart deliberate thinking, and hot affect overwhelms cold logic.

We believe that the influence-on metaphor is misleading in several respects. In particular, we argue (1) that the class of emotional phenomena does not form a homogeneous category, but breaks down into qualitatively different categories, (2) that many emotions are not unambiguously mapped onto a simple positive-negative valence dimension, and (3) that emotional mechanisms are ubiquitous in decision making and do not constitute an external irrational force which interrupts an allegedly non-emotional rational process. In the following, each of these claims will be discussed briefly.

### 3.2 Is emotion a homogenous category?

Most researchers would agree with the common intuition that the variety of particular emotions – such as anger, joy, or envy – are all instances of a general category called emotion (Charland, 2002). The hypothesis is that all individual emotions share a few essential characteristics, which permit to subsume particular emotions under a single category of a more abstract type. The emotion category is perceived as referring to something *real and natural*, and is not to be taken as an arbitrary conceptual construction.

The view of emotion as a homogenous category has been discussed under the caption of emotion as a *natural kind*. A natural kind can be defined as exhibiting a so-called homeostatic property cluster, that is, an interrelated set of properties causing a dynamic but stable condition, which allows reliable inductions and generalizations (Boyd, 1999; Griffiths, 2004). The notion of an affect program as proposed by Panksepp (2000) or Ekman (1999) is consistent with that view. Neuroscientists claim to have identified particular areas of the brain which are in charge of emotional processes, whereas other parts are in charge of cognitive processes (Panksepp, 2000; LeDoux, 1996).

However, the conception of emotion as a natural kind has come under severe critique, mainly from a philosophical perspective (Griffiths, 1997, 2004). Following Griffiths (1997), the main counter-arguments are: (i) There is no cluster of properties, which is common to all instances of the emotion category, and which allows for lawlike generalizations; (ii) most generalizations are based on similarity by analogy, but not on homology, that is, not on a common evolutionary origin. Griffiths argues that no general regularities, physiological, neurological, or behavioral, can be reliably identified that are common to and essential for all emotions.

Along similar lines, the status of particular emotions such as anger and sadness as natural kinds has been questioned by Barrett (2006a). Barrett (2006a) summarizes a vast array of evidence disconfirming the view that particular emotions exhibit unique response patterns (physiological, facial, behavioral, etc.). Furthermore, Barrett (2006a) argues that empirical evidence supporting the claim of a unique causal mechanism, for example, particular neural circuitry in the brain for particular emotions, is far from being consistent.

We endorse the view that emotion is not a homogenous category. Emotion is a word used in the vernacular to refer to loosely related phenomena. The conceptual confusion to be observed in the literature about definitions of emotion manifests that fact. Ever since William James, there have been doubts if all emotions are to be treated in the same way: "I shall limit myself ... to what

may be called the coarser emotions, grief, fear, rage, love, in which every one recognizes a strong organic reverberation, and afterwards speak of the subtler emotions, or of those whose organic reverberation is less obvious and strong" (James, 1890/1952, p. 743).

### 3.3 Positive and negative emotions

Another assumption shared by the vast majority of researchers is the idea that all emotions are naturally classified as either positive or negative. More precisely, it is assumed that all emotional states can be mapped onto a one-dimensional scale of valence, characterized by contrasting labels such as positive versus negative, pleasurable versus painful, or helpful versus harmful (Barrett, 2006b; Russell, 2003). This assumption of one-dimensional scalability corresponds to the economic notion of utility, which takes for granted that choice reveals an underlying one-dimensional utility scale. In a parallel manner, research on hedonic feelings and happiness postulates a general dimension of pleasant versus unpleasant feelings on which all experiences can be evaluated (Cabanac, 1992). Empirically, however, this view just does not hold, and ample evidence demonstrates that human preferences do not conform to simple scalability (Lichtenstein & Slovic, 2006; Tversky & Thaler, 1990).

Such an unambiguous classification of all emotional states as positive or negative, though one of the most unanimous beliefs, may be impossible. Following Solomon and Stone (2002), we agree with the view that for many emotions a unique mapping as positive or negative is impossible. There are multiple meanings of this underlying dimension, and Solomon and Stone (2002) point out that good/bad, pleasurable/painful, useful/useless and similar contrasts have different origins and different meanings, and actually represent qualitatively different dimensions. What is good or beneficial need not be pleasurable, and what is harmful might nevertheless be satisfying.

Furthermore, many emotions constitute complex appraisals, consisting of mixtures of pleasurable and unpleasurable aspects. Taking anger as an example, the emotion's object (another person) may be judged as hostile, the situational context as undesirable, but the arousal (e.g., feeling strong) may be experienced as pleasurable, and the consequences of expressing one's anger (putting the other person in his place) may be quite enjoyable. The pleasurable and the painful, the positive and the negative are not exclusive in emotional experiences; ambivalence might be the norm and not the exception.

Complex emotions are contextual states of mind, and depending on context might be positive or negative or both. Fear, commonly qualified as a negative emotion, is experienced as positive and joyful in the movies when the

context of a factual threat is stripped away. The notorious 'Schadenfreude' (gloating) represents a complex mixture of positive (subjective feeling) and negative (moral implications) facets, and might be painful or enjoyable depending on the context and attentional focus.

To be sure, we hold that some type of implicit or explicit appraisal is at the core of emotional states, representing an evaluation of the relationship between the self and the situation. For some emotions, this evaluation can be reduced to a simple dimension of pleasure and pain, as we will discuss shortly. For others, however, we endorse the argument of Solomon and Stone (2002), that it is impossible to reduce the qualitatively complex and multidimensional appraisals to a simple valence dimension.

With respect to decision making, this implies that substituting utility with valence does not solve the question of the emotion-decision making relationship; there is more to the function of emotions than supplying a location on the valence dimension. More than two-hundred years ago, already, Bernoulli (1954/1738) and Bentham (1948/1789) interpreted utility not as a formal measure, but as the subjective sensation of objective value, for example, as the pleasure associated with receiving some amount of money. By maximizing utilities, decision makers might in fact maximize pleasure and minimize pain (Mellers, 2000). However, to assign more utility, that is, more pleasure, to more money, might not be an emotional process at all, and to the extent that emotions are involved, the one-dimensional mapping might soon break down.

### 3.4 Emotion and rationality

A further common view is that decision making is a rational mental process without emotion, and that emotions disrupt and jeopardize the rational process. In decision research, rationality is mostly understood as formal consistency, that is, conforming to the laws of probability and the axioms of utility theory. If people behave rationally in that sense, they will make optimal choices. Emotions, then, can only interrupt and impede the process of achieving an optimal decision.

However, evidence is accumulating that this conception might be false (Bechara & Damasio, 2005; Bechara, Damasio, Tranel, & Damasio, 1997). Without emotional involvement, decision making might not even be possible or might be far from optimal (Damasio, 1994). Furthermore, evidence from neuropsychological studies suggests that at the level of brain structure and functioning, a clear-cut topological distinction between cognition and emotion might not be feasible (Phelps, 2006). Hence, the opposition of irrational emotion and rational cognition turns out to be dubious on behavioral and neuro-

anatomical grounds.

We agree with that view and believe that the issue of rationality should be based on the validity of emotional evaluations rather than on formal coherence. If our emotional appraisals are appropriate, that is, if we fear what objectively is to be feared, and if we hopefully anticipate what will actually make us happy, then these emotions might be called rational. Ample evidence demonstrates, unfortunately, that people are not exceptionally good in making appropriate judgments about what makes them happy (Gilbert, 2006; Hsee & Hastie, 2006). Emotions, thus, may be appropriate, hence rational, or inappropriate, hence irrational.

We view emotions not as threats to rationality. The rationality of decision making might actually depend on people's capacity to form appropriate emotions (de Sousa, 1987). Again, the influence-on metaphor is misleading here, assuming a detrimental influence of irrational forces on an otherwise rational process.

The influence-on metaphor, we suppose, partly results from these assumptions: Homogeneity of emotions, unique valence, and opposition to rationality. If it is accepted that emotion is not a homogenous category, and that valence cannot serve as a unifying aspect of emotion, it follows that emotional phenomena should be classified in a more heterogeneous way. Thus, we ask what functional requirements need to be solved in decision making, and propose to classify emotional mechanisms along these functions. It will turn out that what is usually conceptualized as simply 'emotional' actually consists of four separate kinds of emotional mechanisms.

## 4 A four-function framework of emotional mechanisms in decision making

The functional approach takes as its starting point potential requirements of decision tasks, and potential attempts to meet these requirements by instantiating particular emotional mechanisms. At present, we identify four functional requirements.

First, any decision requires some kind of information, and with respect to individual decisions which are made to promote the well-being of the decision maker, this information needs to be personally relevant. Hence, the first requirement and function is to *provide information* which is useful for evaluation; consequently, we suggest that a particular class of emotions serves that purpose.

Second, decisions in real life are an integral part of the flow of human activities, and thus subject to many situational constraints. One of the most significant constraints is time and time pressure. Making decisions requires to



Table 1: Emotional functions in decision making.

Function	Emotion type	Prototypes	Mechanisms
information	reducible emotions	joy, (dis)liking	integration, trade-offs
speed	affect-programs, drives	fear, disgust, sexual lust	stimulus-specific response
relevance	complex discrete emotions	regret, disappointment, envy	selective attention, appraisal
commitment	moral sentiments	guilt, love, anger	social coordination, perseverance

choose and act within a temporal window of opportunity, ranging from seconds to years. We suggest that a second function, hence a second kind of emotional mechanism, is concerned with *speed*, enabling the decision maker to make rapid decisions under time constraints.

Third, when making a decision, the decision maker selects a subset of particular aspects of the situation under consideration, which consists, in principle, of an uncountable number of aspects. This selection is controlled by *relevance*, and we propose that a third function, hence a third kind of mechanisms, is to direct the decision maker's attention to relevant aspects of the situation. What is relevant depends on how the situation is appraised.

Finally, a fourth requirement of decision making is to adhere to decisions once made, that is, to implement decisions in the long run. Most people show *commitment* in particularly complex decision situations, which, as we will demonstrate below, are mainly concerned with social and moral decisions. Hence, the fourth kind of mechanism will generate commitment in social decision making.

In sum, information, speed, relevance, and commitment are four requirements when making decisions, and distinct types of emotional mechanisms serve to meet these requirements. In the following sections, we will elaborate on each function (Table 1).

#### 4.1 The information function: Pleasures and pains

The information function of emotion has been acknowledged by many researchers, albeit under different frameworks and with varying emphasis (Clare, Gasper, & Garvin, 2001; Mellers, 2000; Peters, 2006; Schwarz & Clare, 1988; Slovic, Finucane, Peters, & McGregor, 2002). The information involved is information which is useful for evaluation and preference construction, that is, for making a decision.

For example, in Schwarz and Clare's (1988) affect-as-information framework, affective states such as positive or negative mood are assumed to provide informa-

tion about evaluative judgments, for example, about one's life satisfaction. This is particularly prominent when the mood state cannot be attributed to an unrelated causal event.

In contrast to the affect-as-information framework, which focusses mainly on incidental affect, decision affect theory as advanced by Mellers (2000) is based on integral emotion, that is, feelings of pleasure or displeasure that originate directly from the choice consequences under consideration. Decision affect theory assumes that decision makers compute a weighted sum of anticipated pleasures which they believe to obtain from outcomes of risky choices, and then choose the option they believe to yield the greatest amount of potential pleasure. Using pleasure as a substitute for utility, anticipated pleasure informs about the utility of a consequence, and ultimately about the expected utility of a choice option. This interpretation of utility as pleasure is in line with the conception of Bernoulli (1954/1738), which has been revived in a number of modifications of the Subjective-Expected-Utility model (Elster & Loewenstein, 1992; Kahneman & Tversky, 1979).

The affect-heuristic, proposed by Slovic et al. (2002), is a related approach, though it is somewhat equivocal with respect to the issue of incidental or integral affect. The affect-heuristic - a quick and simplified process of evaluating a risky option by relying on one's immediate feelings of liking or disliking - refers to affect elicited by the options under consideration, but the affective reaction might as well be caused by undetected intrusions from unrelated events or memories.

In any case, emotion or affect as understood by these theories is essential in providing the decision maker with *evaluative information* about the target, be it attributed correctly or incorrectly to the target itself. The most important feature of that process is its one-dimensionality: Whatever the origin and whatever its qualitative specifics, the multitude of affective states is projected onto one single dimension of pleasure and pain. In theoretical terms, this is the valence dimension, commonly assumed to be bipolar, and assumed to constitute a core characteristic of an emotional experience (Barrett, 2006b).

To the extent to which decision options can be mapped onto the pleasure dimension, this provides a simple mechanism of making a choice by integration and maximization. Most models imply an implicit weighing process, for example, weighing the pleasures of future outcomes by degree of delay and by probability of occurrence.

In economic regret and disappointment models, expected utility is modified by integrating deviations from non-obtained but hoped-for outcomes into the overall utility equation. For example, the basic utility of an outcome might be enriched by a function of the difference between the obtained outcome and the expected outcome, or by a function of the difference between the obtained outcome and a missed outcome (Bell, 1982; Loomes & Sugden, 1982). Many similar models have been proposed that try to overcome the limits of traditional expected utility models (Wu, Zhang, & Gonzales, 2004). However, empirical evidence supporting these approaches is mixed, at best.

We suppose that the limits of pleasure-as-utility models are demarcated by the one-dimensionality of the assumed emotional experience. To the extent that emotional experiences can be mapped unambiguously onto the pleasure-displeasure scale without loss of meaning, they can serve as informative signals for the decision maker: We call these emotions *reducible emotions*. Reducible emotions are emotions which are essentially carriers of valence without representing a complex appraisal of the situation, and are hence easily reducible onto a scale of pleasure and pain. Examples are joy (or distress), liking (or disliking), and attraction (or repulsion). It is only a subset of emotional states that are characterized by a unique valence, and that do not imply more complex appraisals (Ortony, Clore, & Collins, 1988; Solomon & Stone, 2002; Zajonc, 2000).

When making a choice, reducible emotions are mentally represented as beliefs about the decision's consequences, not as momentary feelings. When pondering the question whether you should rather choose a risky gamble with the risk of losing amount  $X$ , otherwise winning  $Y$ , or a safe option gaining  $Z$  (with  $X < Z < Y$ ), you are consulting your beliefs about the expected pleasures of winning  $Y$ , and the expected pains of losing  $X$ , respectively. From memory or from imagination you infer how you might feel, but you do not necessarily feel it at that moment. More generally, these beliefs provide orientation concerning a preferential problem. Reducible emotions with respect to preferences can be considered as a special case of the general class of orientation feelings (Norman, Price, & Duff, 2006; Price & Norman, this issue).

To orient one's choices towards the amount of pleasure provided applies to personal decision making, that is, when individual preferences are concerned. This should

not be extended to organizational decision making, since an aggregated unit such as a firm surely does not maximize pleasure, it rather maximizes profit.

As discussed above, many emotions cannot be characterized unequivocally as positive or negative (Solomon & Stone, 2002). Hence, information about valence is a specific property restricted to only a few emotional states. Peters' (2006) notion of information is related to our conceptualization, but extends the information function to all emotions, and also includes incidental sources of affect.

## 4.2 The speed function: Affect programs and somatic markers

Bechara, Damasio, Tranel and Damasio (1997) demonstrated, using the so-called Iowa Gambling Task, that anticipatory affective reactions, measured as changes in skin conductance responses, towards risky and disadvantageous stimuli precede in time conscious knowledge about the disadvantageous nature of the stimulus. The somatic-marker hypothesis (Bechara & Damasio, 2005; Damasio, 1994) maintains that these kinds of affective signals, originating in bodily states and acquired by learning from previous experiences, act as markers about the positivity or negativity of current experiences. Somatic markers operate automatically and obligatorily, influencing behavior even before a deliberate intention is generated.

Evidently, there is a class of bodily states that has the potential to guide behavior without cognitive control. This finding is not totally new. Being in a state of intense hunger or strong sexual arousal drives behavior in a certain direction. Loewenstein (1996; Loewenstein, Weber, Hsee, & Welch, 2001) has emphasized the role of visceral states in determining human choice and behavior. The force of the body is, not surprisingly, especially irresistible when basic drives or addictive desires are involved: An overwhelming craving for a drug or even for a chocolate bar resolves the choice for us, leaving only a minor role to our cognitive reflections concerning that choice (Baumeister & Vohs, 2003). The finding of an hyperbolic discount function in intertemporal choice might be partially accounted for by the increasing intensity of bodily states of deprivation when the object of one's cravings nears in temporal or physical proximity (Frederick, Loewenstein, & O'Donoghue, 2003).

Somatic markers, visceral states, and (quasi-)addictive cravings all show a common characteristic: They speed up behavior, in contrast to the slow machinery of deliberate choice. This can be viewed as adaptive from an evolutionary perspective. Observations from patients with a damage to the ventromedial prefrontal cortex, considered to be the brain structure which triggers relevant somatic markers, suggest that these patients not only tend to make

disadvantageous choices, but that it takes them a tremendous amount of time to reach a decision at all (Bechara & Damasio, 2005). These patients endlessly ponder the pros and cons of options, continually procrastinating a final resolution. They appear to be unable to make up their minds to execute the vital step from choosing to acting, exhibiting a lack of ability to cross the *Rubicon* gap from thinking to doing (Heckhausen, 1991). Generally speaking, all decisions are constrained by temporal limits, and any choice is, at some point in time, preceded by a choice to choose at all.

The function to speed up choices is especially obvious for a few affective states for which some authors have claimed that so-called affect programs (Panksepp, 2000; Tomkins, 1984) can be identified as specialized brain circuitries. Based on a meta-analysis of functional neuroimaging studies of emotions, Murphy, Nimmo-Smith and Lawrence (2003) conclude that partially separate neural systems can be identified for fear, disgust, and anger. These emotions also show a typical structural distinctiveness, with fear associated with the amygdala, disgust with the insula-operculum and the globus pallidus, and anger with the lateral orbitofrontal cortex. On the other hand, no particular brain areas can be cohesively ascribed to emotional activity in general, or to positive versus negative emotions. Though at present neuroimaging findings should be interpreted with caution, this suggests that fear, disgust, and anger might constitute a special kind of process, which is hard-wired in the brain, and which enables humans to act quickly without deliberation.

This makes sense also from an evolutionary perspective, assuming that a finite set of affect programs evolved, which are tied to stimuli that are exceptionally threatening, and associated with immediate withdrawal behavior. Interestingly, Murphy et al.'s (2003) meta-analysis provides some evidence for a discrete neural system for withdrawal, but not for approach, restricting the set of quick affective responses to behaviors that move the person out of a dangerous situation. Approach behavior might then be controlled by more deliberate functions, increasing the flexibility of approach behavior and enabling the exploration of genuinely new situations.

Not all fast decisions need to be mediated by affective responses. An experienced chess player is able to make rapid moves by simple pattern recognition. But these decisions are not vital for the chess player, whereas affect programs address concerns of vital importance for the organism, which is presumably why they have evolved in the first place. A mere cognitive response is easily controlled by deliberation, but an affect program claims control precedence, and enormous effort is needed to suppress the response, if this is possible at all.

The speed function plays no prominent role in Loewen-

stein and Lerner's (2003) approach. In the taxonomy of Peters (2006), it is implicit in the motivation function. However, the motivating function of emotions can take different forms. The direct link between affect and a particular behavior in affect programs supports rapid implementation of actions. This is, however, not the case for broad action tendencies (Frijda, 1986), referred to by Peters (2006). Action tendencies may or may not be enacted, and might even slow down behavior when contradicting tendencies paralyze each other.

### 4.3 The relevance function: Discrete emotions

Many emotional states are comprehensible only with reference to their cognitive content, examples are regret, envy, gloating, pride, guilt, shame, contempt, and many others. Note that this does not apply to simple pleasure or liking: An utterance such as "I like my spouse" is a legitimate statement without providing any knowledge about the spouse. In contrast, an assertion such as "I regret that I chose to marry X" needs a meaningful justification to be acceptable in normal conversation. According to appraisal theories, these emotions are the consequence of the particular way people construe the situation or the event (Ortony et al., 1988; Smith & Lazarus, 1993). If we are aware of the particular appraisals concerning dimensions such as valence, certainty, control, and responsibility, we can infer what emotion a person is experiencing. And, vice versa, knowing the particular emotion a person has with respect to an event provides us with a justified conjecture about how this person construes that event (Siemer & Reisenzein, 2007).

Emotional construals are idiosyncratic, representing the event from a subjective point of view. Yet, there is one invariant feature: All emotional construals focus on the fundamental relationship between the self and the event, that is, on the relevance a particular event has on a person's vital concerns and interests. We suggest that this is the characteristic function: To focus people's attention on the particular aspects of an event that are appraised as relevant. Once this focus is established, further emotions, or motivations, or actions concerning that relevant aspect may ensue.

Take as an example the event of a colleague who proudly brags about his paper which has just been accepted by the most prestigious journal. As a result of appraising that event you might feel envy, somebody else might, however, feel admiration. In either case, the very same event tells a quite different story about the relevant concerns of the two characters experiencing envy or admiration. This, in turn, entails different behaviors if a choice is involved (Böhm & Pfister, 2000, 2005; Zeelenberg et al., this issue).



In decision research, the two most extensively studied emotions that serve the relevance function are regret and disappointment (Connolly & Zeelenberg, 2002; Zeelenberg, van Dijk, Manstead, & van der Pligt, 2000). Regret and disappointment both result from counterfactual comparisons of what one has obtained with what one could have obtained, signalling that we have made a bad decision. Regret and disappointment draw people's attention to different potential causes of the bad outcomes, and trigger different behavioral tendencies (Zeelenberg et al., 2000). With respect to regret, one's own previous decision is highlighted as the relevant cause, and tendencies to undo one's decision and attempts to get a second chance will result. In contrast, with respect to disappointment, tendencies to get away from the situation and attempts to blame one's bad fortune will result.

Similarly, Böhm and Pfister (2000, 2005) have shown that in the domain of environmental risks people tend to appraise a risk either with respect to its consequences, or with respect to its moral implications, depending on how the risk is mentally represented. A consequentialist appraisal causes emotions such as fear or worry, which in turn trigger helpful behavior. In contrast, a moral appraisal causes emotions such as anger or indignation, triggering aggressive behaviors.

There are, of course, other processes that direct people's attention on specific features of the world, such as the startle response, or just the novelty of particular features. These mechanisms, however, yield no meaningful interpretation of the situation, they are, in a sense, neutral. To perceive an object as novel is neutral, but to perceive an action as regrettable is personally relevant.

What people consider relevant, guided by their emotions, depends on their very personal histories and motives. More important, emotional relevance does not necessarily imply good and wise judgment. To regret and grieve over consequences which cannot be undone and could not have possibly been foreseen, is clearly irrational. To ask for advice from other people might be a good strategy in these situations. For non-involved strangers, the decision problem under consideration is not personally relevant, and they might grasp the problem in a more comprehensive, more balanced way, and might possibly provide advice that improves our decisions (Yaniv, 2004).

The spotlight function of Peters (2006) closely parallels the relevance function. However, whereas Peters is more concerned with the valence of affect, which directs attention on either positive or negative aspects, we emphasize the particular semantics of emotions. For example, regret, interpreted as a negative emotion, not simply focuses attention on unpleasant aspects, it actually construes the situation as a regrettable one. This implies a focus on non-chosen alternatives, and comparisons of

outcomes obtained and not obtained, irrespective of them being positive or negative.

#### 4.4 The commitment function: Moral sentiments

We all have strong intuitions about what is morally right and what is wrong. The morally right choice, however, is frequently opposed to what is in our best self-interest, narrowly construed as the immediate maximization of material wealth. We might make a steeper career if we were ruthlessly competitive instead of collaborating with others, we might live a less stressful life if we lied and cheated from time to time, or we might end up with more money in our pockets if we invested in military stocks instead of contributing to *medecins sans frontieres*.

Why, then, do most people act morally most of the time? Frank (1988, 2004) argues that some emotional states mainly operate as commitment devices, leveraging moral choices and preventing people from pursuing hardnosed self-interest. From the point of view of self-interest, emotions such as guilt or shame are senseless. From a strict consequentialist and utilitarian perspective, they might even prevent optimal decisions (Baron, 1994). Ever since Adam Smith (1759), however, it is conceded that people are influenced by motives that go beyond, and contradict, pure self-interest, understood as a narrow focus on maximizing one's own material outcomes.

In the familiar prisoners' dilemma, pure self-interest dictates to choose the defective option, but with the consequence that both players are worse off than if they had chosen the cooperative option. In fact, people frequently choose the cooperative option, even when playing the game only once with a stranger, let alone when playing an iterated version with repeated interactions with the same player. People also contribute to public goods, and punish others who behave uncooperatively, even if that entails a cost (Gintis, Bowles, Boyd, & Fehr, 2005).

The problem with that kind of moral or altruistic decision is not to find out what the right choice is, but how to enact it and stick to it when confronted with opposing motives to pursue one's pure self-interest. To summarize Frank's basic argument by example (1988, 2004, 2006): Suppose you are the owner of a business and have the opportunity to open a satellite office elsewhere. Since you cannot directly survey the manager of the new office far away, he might cheat you. If he cheats, he obtains, say, \$ 1.500, and you lose \$ 500. If he is honest, both of you obtain \$ 1.000. Following pure self-interest, the manager will cheat. Knowing this, you will not open the new office, so that each of you obtains nothing. Now you and the manager are worse off, relative to what you would have obtained with the new office opened and an honest

manager running it. However, if the manager feels guilty when cheating, this feeling might incur a cost on cheating. Suppose the cost is as large as \$ 10,000, then cheating plus feeling guilt would amount to a loss of - \$ 8,500. Thus, the moral emotion of guilt causes the manager to be honest, for your benefit as well as his.

Note that the generation of guilt, in that framework, is automatic and involuntary, though the decision which follows is a deliberate act. The story could go on: Suppose the manager, in a moment of moral blindness, cheats, and feels guilt as a consequence. To remove that nagging feeling, he silently returns the money, undoing his misdeed, again to his and your advantage.

Guilt, on that account, serves as the proximal cause of the manager's commitment to be honest. Being honest is not an abstract moral act, it is advantageous to both agents, and without that mechanism, everybody would be worse off. There is an important corollary to this account: The owner should somehow recognize managers who do not cheat. Obviously, to trust a manager who simply tells you that he is honest is not an advisable strategy. Moral sentiments, following Frank (1988), also provide a solution for the skeptical owner, since they generate observable signals such as blushing which indicate the likelihood that a person is honest.

This suggests that evolution has equipped humans with the capacity to produce reliable signals informing others that they are honest and trustworthy, which in turn leads to advantageous cooperation. These signals must be automatic and uncontrollable to be credible. On the other hand, they are not totally reliable, some cheaters survive and benefit, leading to an evolutionary stable equilibrium with a majority of trustworthy people and a minority of cheaters in coexistence (Frank, 1988).

As these examples demonstrate, moral sentiments are closely related to social relationships. Evidence from neurobiology suggests that moral judgments involve brain areas which are associated with cognitive as well as with social-emotional processing, forming a specialized neural circuitry activated when making moral judgments (Greene, Nystrom, Engell, Darley, & Cohen, 2004). Just as guilt and shame provide signals about trustworthiness, so do emotions such as sympathy and love signal social support and reciprocity. They indicate with whom it is beneficial and wise to form a bond, just as guilt and shame they serve also as commitment devices. The emotion of love, for example, helps you to be faithful to your partner, even when at times another person might be more alluring. In sum, moral sentiments such as guilt, shame, love, hate, or sympathy guide decisions in two ways: They support people to stick to long-term commitments, and they support decisions about whom to select for cooperation.

The field of game theory which is genuinely concerned

with strategic interaction and coordination, has, like behavioral decision research, increasingly focused on the study of emotional factors (Geanakoplos, Pearce, & Stacchetti, 1989; Rabin, 1993). In line with the assumptions of Frank (1988), Fehr and Gächter (2002) demonstrate that people cooperate with strangers in one-shot interactions even when it is costly for them, showing strong reciprocity (Gintis et al., 2005). Using a public good paradigm, they showed that a majority of participants was willing to punish violators who did not contribute and tried to get a free ride. Punishing, however, was costly for those who punished without delivering a balancing benefit. This constitutes a social dilemma in its own right: If everybody punishes the violators, then in the long run all are better off, assuming that violators learn from punishment; but the one who does not punish, while others do, will be even better off. Fehr and Gächter's (2002) findings suggest that this cooperative behavior is emotionally mediated by anger. Anger triggers behavior which from a pure self-interest perspective is costly for the individual.

Note that other kinds of anger, such as road rage (Joint, 1996), do not implement the commitment function. The word anger, thus, denotes quite different emotional phenomena: In the public good situation, anger is close to what might be called moral indignation, whereas in a traffic jam situation, anger is close to rage and fury.

The role of moral sentiments and the commitment function is not addressed by Peters' (2006) taxonomy, nor by Loewenstein and Lerner (2003). The particular role of commitment and moral emotions will be taken up in the discussion.

## 5 Discussion

We propose a new look on the relationship between emotion and decision making. Emotions do not merely influence an otherwise non-emotional process, as the influence-on metaphor holds, but are part of virtually any decision making process. Because, as we argue, emotion itself is not a homogeneous category, the emotional functions within decision making are multifaceted. Following functional considerations, we propose a four-fold classification on how emotional mechanisms shape decision making.

The information function provides evaluative information which feeds into preference construction. Emotional states such as joy or distress inform about the degree of (un)pleasantness of actions and consequences. They allow to map a diversity of experiences on a one-dimensional scale of pleasure and pain.

The speed function enables rapid choice and action under time pressure. Affect programs for fear and disgust

trigger immediate avoidance responses. These mechanisms are highly stimulus-specific and presumably have evolved under evolutionary selection pressure.

The relevance function focuses attention on particular aspects that are of potential relevance for the decision maker. A discrete emotion such as regret or envy constitutes a particular appraisal, which implies particular evaluations as well as particular action tendencies.

The commitment function enables social coordination by committing people to stick to decisions, even against their short-term self-interest. Guilt, for example, prevents defection in social dilemmas, and thus guides decision making in strategic choice situations.

We claim that there is no uniform influence of emotion or affect *per se* on decision making. In particular, the view of emotions as providing valenced evaluations, and substituting utility with valence, is just one of four qualitatively different mechanisms. Contextual requirements primarily determine which function dominates: Lack of information, time pressure, relevance ambiguity, or need of social coordination. Of course, no real decision situation is an uncontaminated instance of just one functional requirement. We might, simultaneously, be pressed by some affect program to escape, and at the same time be committed to continue a morally endorsed course of action.

The issue of rationality in decision making, thus, turns out to be one of appropriateness of emotions, not of formal consistency of preferences. Whenever several emotional functions generate antagonistic preferences, an intense state of ambivalence occurs. Ambivalence might be considered as an important cause that makes decisions difficult (Greenspan, 1980).

The approach most akin to our proposal is the functional taxonomy of Peters (2006; Peters et al., 2006), and we will briefly discuss central similarities and emphasize differences. Though it seems that Peters (2006) is more concerned with affect in contrast to discrete emotional states, the terminology is somewhat unclear and we will neglect definitional issues for the moment.

The information function proposed by Peters (2006) is closely related to the affect-as-information theory (Schwarz & Clore, 1988). People use immediate and holistic affective responses as a substitute of deliberate reasoning (Kahneman, 2003); the affective substitute might be completely incidental. In contrast, the information function in our framework defines evaluative information as the essence of a preferential judgment. Reducible emotions actually generate the information necessary to compare different options; what they accomplish is the very process of projecting diverse experiences on a common pleasure-pain dimension.

Peters' (2006) spotlight metaphor, taken from theories on visual perception (Fernandez-Duque & Johnson,

1999), is somewhat related to the relevance function. The spotlight function posits that affect directs attention to particular kinds of information, just as selective attention directs visual search. The specific valence, positive or negative, determines the kind of information selected, which is a well-known effect (Bower, 1991). In contrast, the relevance function is about semantics, that is, how a situation is construed. To feel regret entails that attention is focused on alternative options one could have but has not chosen. Relevance is not restricted to valence, quite to the contrary, relevant emotions such as regret or pride focus attention on a meaningful configuration of options, outcomes, and their relationships.

To view affect as a motivator (Peters, 2006) for action has been a recurrent issue in emotion research (Frijda, 1986), and has recently been emphasized by Zeelenberg and Pieters (2006; Zeelenberg et al., this issue). We fully endorse this assumption, since it is of paramount importance in decision making. Beyond simple approach-avoidance behavior, action tendencies associated with discrete emotions trigger preferences for particular activities (Zeelenberg & Pieters, 2006). In our framework, the motivational function is implied by the speed function, by the relevance function, as well as by the commitment function, differing in the granularity of the action urged to implement.

Finally, the assumption of affect serving as a common currency as has been advocated by Cabanac (1992), parallels the information function and what we call reducible emotions. Cabanac (1992) showed that pleasure indeed serves as a common currency for different sensory experiences. We doubt, however, that the totality of experiences, including complex cognitions, can be collapsed onto one hedonic scale of simple affect (Peters, 2006). As Solomon and Stone (2002) argued, many emotions cannot be mapped uniquely onto the positive-negative dimension. Ambivalence, decision aversion and trade-off difficulties (Beattie & Barlas, 2001; Hanselmann & Tanner, this issue) indicate the ubiquity of different currencies with frequently unknown exchange rates.

In sum, we see several similarities with Peters' (2006) approach, and take this convergence as evidence of the need to develop theoretically clear and comprehensive accounts of the emotion-decision making relationship. We also think that our framework extends the common ideas in important ways. Peters' information, spotlight, and common currency functions all hinge on the existence of a one-dimensional valence scale. Affective substitution, affective selective attention, and the common currency proposal are all variants of one basic mechanism of valence ascription. This is captured in our notion of reducible emotions. The relevance and the commitment function, however, go beyond mere valence. Relevance entails preferences for highly particular actions, and com-

mitment entails actions in the social domain, which are concerned with issues of morality rather than with pleasure.

It is the commitment function in particular which has no counterpart in Peters' (2006) or in Loewenstein and Lerner's (2003) approach. The function of emotions in the social and moral domain goes far beyond valence. Increasing evidence shows that moral emotions serve as proximate causes when issues of ethical behavior, altruism, cooperation, personal autonomy and social responsibility are involved. Behavior such as altruistic punishment or long-term environmentally protective choices is best explained by the particular emotions involved (Böhm & Pfister, 2000, 2005; Gintis et al., 2005).

The framework proposed here emphasizes some lines of research which have been somewhat neglected. First, what people choose should vary as a function of the salient relevance emotion, even if valence is kept invariant. Preliminary confirming evidence has been provided by Lerner and Keltner (2000; Lerner & Tiedens, 2006). Further research should specify when decisions are primarily determined by particular emotions, implying specific behaviors (Zeelenberg et al., this issue).

Also, from experimental economics, there is accumulating evidence confirming the crucial importance of moral emotions in strategic interactions (Fehr & Gächter, 2002; Pillutla & Murnighan, 1996). Further research should supplement these one-shot experiments with longitudinal studies. One of our major claims is that the commitment function sustains long-term decisions; we would predict that the permanence and consistency of preferences and choices depends, in the long run, on the sustainability of appropriate emotions. The issue of emotion regulation as a prerequisite of preference management would be of central importance.

As mentioned above, the common currency metaphor of affect cannot explain why so many choices are hard, effortful, and why people often even prefer to avoid a choice. Ambivalence, we believe, is at the core of these difficulties. This is not to be confused with the notorious gut feeling versus reason conflict. Ambivalence denotes a conflict that arises when different emotional mechanisms exert incompatible influences on behavior. There has been some research around these issues (Beattie & Barlas, 2001; Luce, Payne, & Bettman, 2001), but no good account of ambivalent decision making exists so far. Although any organism, when making a choice, ultimately sets some kind of priority, this does not imply that the revealed priorities originate from a common hedonic dimension. The framework proposed in this paper is an attempt to provide a conceptual groundwork to investigate these issues, beyond the influence-on metaphor.

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