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Preference for Regret, Disappointment, Elation, and Surprise Related to Appraisal Patterns and Core Affects

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Abstract

Västfjäll, D., & Gärling, T. Preference for regret, disappointment, elation and surprise related to appraisal patterns and core affects. Göteborg Psychological Reports, 2002, 32, No. 5. A study is reported in which 176 participants assigned to four groups were asked to recall emotion episodes of regret, disappointment, elation, and surprise, to rate the recalled emotions on the core-affect dimensions of valence and activation, to rate their preference for the recalled emotions, and to assess the recalled emotions on several appraisal dimensions. The results showed (1) that except for disappointment and regret, the core affect dimensions differentiated between the recalled emotions; (2) that the recalled emotions had unique appraisal patterns; and (3) that preference for the recalled emotions was related to valence and activation. The discussion focuses on the implications of the results for theories of decision making assuming that anticipated emotions play important roles for preference and choice.

Key words: Affect, emotion, preference, decision making, appraisal

A focus in current decision research is decision makers' anticipation of future emotions when making decisions and how they take them into account (Gilbert et al., 1998; Loewenstein, 1996; Loewenstein & Schkade, 1999: Loewenstein et al., 2001). Through mental simulation of possible emotional reactions to outcomes, the anticipated affective consequences may in addition to utility influence choice (Zeelenberg et al., 1998, 2000). A prerequisite to anticipate future emotional reactions is perhaps that they have already been experienced in the past, and further, that they are possible to retrieve from memory (Loewenstein, 1996). In a similar vein Kahneman, Wakker, and Sarin (1997) made a distinction between experienced, remem- bered, and predicted utility. Utility can in their view be equated with affective experiences of pleasure-displeasure or comfort-discomfort (Fredrickson, 2000). Experienced utility is the affect experienced at the moment of making a decision or knowing the outcome of an uncertain choice, while

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remembered utility is the memory of previously experienced affect associated with decision outcomes. The prediction of future utility or the anticipation of affect is guided by memories of previous experiences, that is, by remembered utility.

A recurrent discussion in emotion psychology is if emotions are best described and measured as dimensions or categories (Ekman, 1993; Russell & Feldman Barrett, 1999). In the literature on decision making both dimensional and categorical views are advocated and both approaches appears to have their respective merits (Desteno et al., 2000; Hockey et al., 2000). For, instance Learner and Keltner (2000) showed that the specific emotions anger and fear had different effects on risk perception, while other research have found that a general positive-negative dimension may predict judgment and choice (Isen, 2000). The present research is an attempt to integrate these two views by investigating how recollections of discrete or specific emotions can be described and predicted by dimensional measures. Central to this research is the assumption that people like certain affective states (elation, pleasure, or comfort) and dislikes others (regret, disappointment, displeasure, or discomfort). In this view decision making involves attending to or moving towards pleasurable states (maximizing positive affective reactions) and avoiding or moving away from aversive states (minimizing negative affective reactions). In this paper we are concerned with the fundamental question of how people's likes and dislikes of memories of discrete or specific emotions are related to the characteristics of these emotions. We describe an experiment where participants are asked to recall and rate affective reactions and preferences for affective reactions to four emotions, regret, disappointment, elation, and surprise, that have been commonly studied in relation to decision making.

*Emotions in Decision Making*

Janis and Mann (1977) discussed the effect of experienced negative emotions on decision making and later Loomes and Sugden (1982, 1986) and Bell (1982, 1985) formalized theories of risky choice entailing the anticipation of regret and disappointment. Starting with this pioneering research, the influence of anticipated and post-decisional regret and disappointment have been extensively studied (Baron, 1992; Conolly, Ordonez, & Coughlan, 1997; Gilovich & Medvec, 1995; Landman, 1987, 1993; Ritov & Baron, 1990; Ritov, 1996; van Dijk & van der Pligt, 1997; Zeelenberg, 1999; Zeelenberg et al., 1998).

Regret and disappointment are seen as separate emotions with different effects on decision making (Zeelenberg et al., 1998, 2000). Both are experienced in relation to an unfavorable or undesirable outcome. Regret is experienced when a chosen option turns out to be worse than the non-chosen option, while disappointment arises when the outcome is worse than expected (van Dijk, Zeelenberg, & van der Pligt, 1999; Zeelenberg et al., 2000).

People not only take into account regret and disappointment when making choices. For instance, Mellers, Schwartz, and Ritov (1999; Mellers, Schwartz, Ho,
& Ritov, 1997) investigated the anticipation and experience of elation¹. In decision affect theory (Mellers et al., 1999), it is assumed that people become elated or rejoiced when receiving a positive outcome (winning a monetary gamble) and disappointed or regretful when facing a negative outcome (loosing a monetary gamble). Moreover, the experience of affect is influenced by unexpected outcomes, that is, when outcomes are surprising (Kahneman & Miller, 1986). In this view, surprise is the result of an unexpected (low probability) win or loss, and thus amplifies the elation associated with a positive outcome or regret/disappointment associated with a negative outcome. In addition, van Dijk and van der Pligt (1997) found that the effect of unexpectedness was stronger for negative than for positive outcomes. Moreover, elation/rejoicing and disappointment/regret are assumed to be taken into account in decisions, whereas surprise is related to the experience of an outcome. The four emotions regret, disappointment, elation, and surprise² are thus those that have received most attention in decision research. It is therefore important to ask how these emotions differ in their antecedent conditions and experiential components.

Appraisal Patterns

It has been shown that emotions are elicited and differentiated on the basis of dimensions or criteria of personal significance and meaning of an object or situation (Scherer, 1999, 2001). Such appraisal criteria or dimensions include pleasantness (how pleasant is the situation?), novelty or attentional activity (how new or familiar is the situation?), goal significance (how relevant is the situation?), outcome uncertainty or unexpectedness (how well is the situation understood?), urgency or effort (how much mental effort is required?), control potential or situational control (can the situation be controlled?), coping potential or agency (who is responsible?), and value relevance or legitimacy (is it fair?) (Frijda, 1988; Frijda, Kuipers, & ter Shure, 1989; Lazarus, 1991, 2001; Roseman, 1991, 2001; Roseman, Spindel, & Jose, 1990; Roseman, Antoniou, & Jose, 1996; Roseman, Wiest, & Swartz, 1994; Scherer, 1997, 1999, 2001; Smith, 1989; Smith & Ellsworth, 1985, 1987).

In a study of appraisals related to negative emotions, van Dijk, van der Pligt, and Zeelenberg (1998) found differences between regret and disappointment on six of eight appraisal dimensions. Regret was associated with self-responsibility and control potential, whereas disappointment was associated with unexpectedness, legitimacy, valence, and circumstances agency. Zeelenberg et al. (1998) asked participants to recall an experience where they either experienced regret or disappointment, and to rate this experience on the five dimensions feelings, action tendencies, actions, thoughts, and motivational goals (Roseman et al., 1994). The results showed that regret was associated with thoughts of know-

¹ Both Bell (1982) and Loomes and Sugden (1982) included positive emotions such as rejoicing or elation in their early formulations of regret and disappointment theories. For a more recent integrative model, see Inman, Dyer, and Jia (1997).

² Surprise is not treated as a specific emotion in decision affect theory (Mellers et al., 1997) but rather as a weight for low probability outcomes.
ing better, a desire to undo the event, a desire to correct one's mistake, and a de-
sire to kick oneself. Disappointment was related to feelings of being powerless, a
desire to do nothing, and a desire to get away from the situation. In a later study,
van Dijk and Zeelenberg (in press) found that outcome-related disappointment
(ORD) differed from person-related disappointment (PRD) on appraisal dimen-
sions of control potential (higher ratings of self control for ORD), legitimacy
(higher ratings of perceiving oneself as morally right for PRD), problem source
(higher ratings of the event revealing something about the basic nature of some-
one or something for PRD), and other-person agency (higher ratings of other per-
son causing the event for PRD). In conclusion, even though regret and disap-
pointment are both negative emotions associated with counterfactual com-
parisons of outcomes, they differ in appraisal patterns and in experiential compo-
nents.

The appraisal patterns related to the two positive emotions elation (or the
related emotions joy/rejoicing/happiness) and surprise have also been investi-
gated. Scherer (1997) found that joy is associated with low unexpectedness, un-
pleasantness, goal hindrance, and external causation. Smith and Ellsworth
(1985) demonstrated that happiness is associated with an extremely pleasant
state, very little effort, a high level of certainty about the situation, and a desire
to pay attention. Moreover, happiness was associated with medium levels of self-
responsibility and control. Roseman et al. (1996) suggested that joy is circum-
stance-caused and related to certain positive or appetitive outcomes. Frijda et al.
(1989) found that joy and happiness were related to pleasantness, familiarity,
approach tendencies, and certainty. Surprise on the other hand is more ambigu-
ous. Some research assumes that surprise is a valence-neutral state (Roseman et
al., 1996; Scherer, 1997). Yet, Smith and Ellsworth (1985) found that surprise
was pleasant, sharing appraisal properties with positive emotions such as happi-
ness. Further, surprise was associated with low levels of effort, uncertainty about
the situation, and an attribution of human agency (caused by others). On the
other hand, Frijda et al. (1993) showed that surprise is not related to an ap-
praisal of uncertainty of the situation (Roseman, 2001) but of unexpectedness of a
stimulus, novelty, and unfamiliarity (Roseman et al., 1996). Following this,
Roseman et al. (1996) hypothesized that surprise is circumstance-caused, related
to an unexpected event, and can be both positive (motive-consistent) and negative
(motive-inconsistent). Moreover, Roseman et al. (1996) argued that surprise is
the result of a single appraisal of unexpectedness, whereas the other emotions
discussed here result from combinations of appraisals.

Table 1 summarizes the appraisal patterns related to the four emotions. As
may be seen, regret is assumed to be associated with low pleasantness (or un-
pleasantness), low attention (a desire to get away from the feeling), high self-
control, low other-/circumstance-control, high goal hindrance, low certainty, low
legitimacy (unfair), high responsibility, and high effort. The appraisal pattern for
disappointment is similar except that self-control is low and other-control is high.
Moreover, responsibility is low (not responsible). It is important to note that for
self- and other-control, different predictions concerning appraisal patterns may
be made if one distinguish between outcome-related disappointment (ORD) and
person-related disappointment (PRD) (van Dijk & Zeelenberg, in press). Also for
legitimacy, van Dijk and Zeelenberg found that ORD and PRD differed signifi-
cantly if legitimacy was measured as perceiving oneself as morally wrong or right. However, the present research conceptualized legitimacy as perceiving the event as unfair-fair why low legitimacy (unfair) is the expected appraisal for both ORD and PRD. Valence-neutral surprise is associated with medium pleasantness (neutral), medium attention, low self- and medium other-control, high circumstance-control, medium goal hindrance, low certainty (high unexpectedness), and medium effort (Ortony, Clore, & Collins, 1988; Roseman et al., 1996). Finally, elation is associated with high pleasantness, high attention, medium self-/other-/circumstance-control, low goal hindrance, medium responsibility, high certainty and legitimacy, and low effort (Scherer, 1999).

Table 1

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Regret</th>
<th>Disappointment</th>
<th>Surprise</th>
<th>Elation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasantness</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Attention</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Self-control</td>
<td>high</td>
<td>low&lt;sup&gt;a&lt;/sup&gt;</td>
<td>low</td>
<td>medium</td>
</tr>
<tr>
<td>Other control</td>
<td>low</td>
<td>high&lt;sup&gt;b&lt;/sup&gt;</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>Circumstance/</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>medium</td>
</tr>
<tr>
<td>Responsibility</td>
<td>high</td>
<td>low</td>
<td>low</td>
<td>medium</td>
</tr>
<tr>
<td>Goal hindrance</td>
<td>high</td>
<td>high</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>Certain</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Legitimacy</td>
<td>low</td>
<td>low&lt;sup&gt;c&lt;/sup&gt;</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Effort</td>
<td>high</td>
<td>high</td>
<td>medium</td>
<td>low</td>
</tr>
</tbody>
</table>

<sup>a</sup> Medium for outcome-related disappointment (ORD) and low for person-related disappointment (PRD) (van Dijk & Zeelenberg, in press)

<sup>b</sup> Medium for ORD and high for PRD

<sup>c</sup> Medium-high for both ORD and PRD if framed as morally wrong or right. However, the present research conceptualized legitimacy as perceiving the event as unfair-fair why low legitimacy (unfair) is the expected appraisal for both ORD and PRD.

In conclusion, the appraisal patterns related to the four emotions regret, disappointment, surprise, and elation are supposed to reveal the antecedents and circumstances under which they are elicited. The emotions can also be described with respect to their component core affects or experiences (Feldman-Barrett & Russell, 1998; Russell & Feldman-Barrett, 1999).

Core Affect

Russell and Feldman-Barrett (1999) made a distinction between core affects and prototypical emotion episodes. Core affect refers to cognitively accessible elements that are present in any type of emotion. Core affects need not be directed at a specific object and are therefore linked to current mood (Frijda, 1994),
although also elements of emotional reactions, or anticipated emotional reactions. In contrast, a prototypical emotion episode is an experienced or anticipated chain of events (e.g., Lazarus, 1991) consisting of antecedents, appraisals, and physiological, affective, cognitive, and behavioral responses. Prototypical emotion episodes always have a referent and are commonly assumed to constitute a finite discrete set that can be enumerated and described (Ortony, Collins, & Clore, 1988). They have been called basic, full-blown, or discrete emotions (e.g., Baggozzi, Gopinath, & Nyer, 1999; Ekman, 1993; Frijda, 1988; Russell & Feldman Barrett, 1999).

Core affect is assumed to be represented by a circumplex structure with two main axes identified as valence or pleasantness-unpleasantness and activation or arousal (Russell 1980). The valence dimension may be interpreted as reflecting the degree of affect that provides information about current well-being (Russell & Feldman Barrett, 1999). It is clearly fundamental in human experience. Other terms have frequently been used to refer to the same thing: pleasure-displeasure, good-bad mood, pleasure-pain, approach-avoidance, positive-negative, or hedonic tone (Kahneman, Diener, & Schwarz, 1999; Larsen & Diener, 1992; Russell & Feldman Barrett, 1999). Activation refers to the subjective experience of energy or mobilization (Reizenzein, 1994; Russell & Feldman Barrett, 1999). It ranges from deactivation (still or quiet) over a neutral state to high activation (activated or aroused). The activation dimension is also referred to as arousal, energy, activity, or tension (Thayer, 1989).

It is possible to conceptualize discrete emotions with reference to degrees of valence and activation (Feldman Barrett, 1998). Previous research has hypothesized that elation is a combination of high activation and high pleasantness, and that surprise is a high activation and neutral valence affect state (Feldman-Barrett & Russell, 1998). However, whether regret and disappointment differ in core affects is a yet unanswered question. It is possible that regret and disappointment may be characterized by similar valence and activation qualities but differ in appraisal determinants.

The Present Study

The present study assumes that people's preference for the emotional reaction to an outcome (not the outcome itself) influences decision making. For instance, in the process of making a choice between buying product A or product B, people may "inspect" their anticipated feelings about each of the options, and find that both alternatives would result in feelings of enjoyment. The process that differentiates and guide choice (I buy A because I like it more) would be a preference over one emotion over the other. This account of emotion is similar to the feeling-as-information approach to emotion and judgment. For example, Schwarz and Clore (1983) and Pham (1998) suggested that decision maker's inspect their experienced feelings in relation to mental representations of outcomes when evaluating different future prospects. Positive feelings lead to favorable evaluations and negative feelings to unfavorable evaluations.

If the two dimensions of valence (v) and activation (a) describe the affective component of anticipated and experienced emotion, this raises the question of
how preference for emotional reactions (p) is related to these dimensions? Mehrabian and Russell (1974; see also Feldman-Barrett, 1996; Mehrabian, Wihardja, & Ljunggren, 1996; Kluger, Lewinsohn, & Aiello, 1994; Russell and Mehrabian, 1978) who studied affect-eliciting qualities of environments hypothesized that an approach tendency or preference is directly related to valence. In agreement with this, Russell and Mehrabian (1978) and Mehrabian et al. (1996) found that the major determinant of preference is the valence dimension. However, valence was not the only determinant. Assuming that preference is an inverted U-shaped function of activation, Mehrabian & Russell (1974) proposed the pleasure-arousal hypothesis. According to this hypothesis, people prefer moderate levels of activation to low or high levels. Moreover, the two independent dimensions of valence and activation interact so that preference for pleasant states increases with increasing levels of activation, while preference for unpleasant states decreases with increasing activation (Russell and Mehrabian, 1978). The pleasure-arousal hypothesis thus consists of three separate propositions: (1) valence is linearly related to preference; (2) preference is related to activation in the form of an inverted U; and (3) valence and pleasantness interacts so that for pleasant states high activation is preferred whereas for unpleasant states low activation is preferred.

Västjäll, Gärling and Kleiner (2001; 2002) found that the pleasure-arousal hypothesis accounted for participant's preference for their current (naturally occurring or induced) mood as well as experienced and anticipated emotional reactions. The present study aims at extending these findings to discrete emotional reactions. More specifically, one aim of the present study is thus to investigate how the core affect dimensions of valence and activation differentiate between remembered regret, disappointment, elation, and surprise. This information will add to the understanding of the nature of these emotions in addition to what is known about their appraisal patterns. Little is in fact currently known about the core affect structure of discrete or prototypical emotions (Remington, Fabrigar, & Visser, 2000).

A second aim is to investigate whether the pleasure-arousal hypothesis accounts for preference for specific emotions. If it does, this would contribute to the hypothesis' generality. A third aim is to test if cognitive emotion appraisals can predict preference better than, or equally well as, core affect dimensions. It is conceivable that measurement of appraisals help understanding the antecedents of anticipated emotional reactions to decision outcomes but that they do not predict preferences for these emotional reactions.

Different groups of participants were asked to recall an event when they either experienced regret, disappointment, elation, or surprise, and to rate how

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3 There are several reasons why remembered emotions were studied rather than anticipated emotions. First of all we wanted to extend our previous findings on preference for experienced and anticipated emotions to remembered emotions. Second, recall of emotional events is a standard procedure in appraisal research when studying specific emotions. Finally, by definition, it may be difficult to fully anticipate all facets of specific emotions why we considered remembered emotions to be a good approximation of anticipated emotions. In line with Kahneman et al. (1997), we argue that memories of emotion (remembered utility) is a central component of cognitive anticipations of future emotions (anticipated utility).
they felt on scales of valence and activation as well as to rate their preference for this reaction. Appraisal scales were also administered.

Method

Participants

Participants were 176 undergraduates, 82 men and 94 women, at Göteborg and Chalmers Universities. They participated on a voluntary basis. Their mean age was 24.7 years with a SD of 3.7 (range from 18 to 42 years).

Measures

The affect measure consisted of two bipolar scales that each was defined by three adjective pairs found in previous research (Västfjäll et al., 2002) to tap valence and activation, respectively. The adjective pairs defining the activation scale were sleepy-awake, dull-peppy, and passive-active, and those defining the valence scale displeased-pleased, sad-glad, and depressed-happy. An additional scale was included to measure preference for the emotional reaction. This scale was defined by the adjectives attractive, likeable, and “preferred relative to a neutral state” (Västfjäll et al., 2001). Beneath each set of adjectives typed on a single page, two endpoints and a middle point defined by the numbers 10, 50, and 90 were typed in boxes from left to right. In between there were two open boxes. Participants were asked to let the three adjective pairs define each scale and to write an appropriate number in the open boxes (11 to 49 or 51 to 89) or to cross one of the boxes. They made ratings on the preference scale by indicating a number between 10 (not at all) to 90 (very much).

The cognitive appraisal scale developed by Smith and Ellsworth (1985, 1987) was employed after translation into Swedish. This scale was chosen since it has been shown to differentiate between a large number of emotions and include appraisal dimensions proposed by different authors (Lazarus, 2001, Scherer, 2001; Roseman, 2001). The scale comprises eight theoretical dimensions: (1) Pleasantness (how pleasant the situation is); (2) Effort (amount of physical and/or mental effort needed in the situation); (3) Attentional activity/novelty (the degree of desire to attend to or shut out the situation); (4) Control (who or what is perceived as controlling the situation, self, other, or circumstances); (5) Certainty (the degree of understanding or certainty of what is happening in the situation); (6) Goal-path obstacle/goal relevance (the degree to which obstacles or problems are present in the situation); (7) Legitimacy (the extent to which the situation is perceived as being fair or unfair); (8) Responsibility (the degree of responsibility for the situation). Each dimension is measured by two items, with the exception of the control and certainty dimensions that are measured by three items. Ratings were obtained on 11-point scales. Four different random orders of the scales were used.

Procedure
Participants were recruited in classes and were given a booklet containing all the scales to be checked. An approximately equal number of participants were assigned to four groups who were asked to recall either a regret, disappointment, elation, or surprise emotion episode. Before being asked to recall the episode, they performed ratings of their current mood on the valence and activation scales as well as rated their preference for their current mood. The intention was to familiarize the participants with the scales. They needed a few minutes to complete this task. Next, the procedure used by Smith and Ellsworth (1985) and Zeelenberg et al. (1998) was introduced. The participants were asked to think of an event when they had experienced intense regret (disappointment, elation, or surprise) and to recall as much as possible of the experience. They were encouraged to concretely think through the event step by step, and to recall its important characteristics and how they reacted emotionally. As a manipulation check, at the same time as they tried to recall the event, the participants were requested to write down the core characteristics of the event on a blank page in the booklet in as much detail that a friend would understand how they felt. After the participants had recorded the event, they turned to the next page and rated how they felt in that situation as well as how much they preferred feeling this way. Participants were finally requested to rate how they experienced the recalled event on the appraisal scales appearing on the following page in the booklet.

The data were collected on eight different occasions at different times of the day with between 10 and 40 participants each time. A session took about 15 minutes. After it was finished, written debriefing information was distributed.

Results

Emotion Episodes Related to Core Affect Dimensions

Figure 1 displays individual as well as mean ratings of valence and activation for regret, disappointment, elation, and surprise. It can be seen that at least partially the activation and valence dimensions differentiate between the emotions. Elation is high on both valence and activation, surprise high on activation but neutral on valence, and disappointment and elation low on valence and medium activation. This was substantiated by significant effects in one-way analyses of variance (ANOVAs) on the activation and valence ratings, $F(3, 173) = 22.15, p<.01$, and $F(3, 176) = 200.86, p<.01$, respectively. In Tukey post hoc tests at $p=.05$, all pairwise mean differences were significant on activation, as well as on valence, except for the difference between regret and disappointment.

The results for surprise were examined further since previous research (e.g., Smith & Ellsworth, 1985) has suggested that it may either be positively valenced or neutral (Roseman et al., 1996; Scherer, 1997). For this reason the group who rated surprise was split in three, negative surprise (n=15), neutral surprise (n=13), and positive surprise (n=16) (Figure 1). Reanalyzing data with positive, neutral, and negative surprise instead of only surprise yielded again highly significant differences between the emotions, $F(5, 171) = 14.91, p<.001$ (activation), and $F(5, 171) = 466.33, p<.01$ (valence). Tukey post-hoc tests showed at $p=.05$ that on valence negative, neutral, and positive surprise were significantly
different from each other. Further, neutral and negative surprise were significantly different from elation, regret, and disappointment whereas positive surprise did not differ significantly from elation. On activation the difference between negative, neutral, and positive surprise was not significant. Positive surprise was significantly different from regret and disappointment, whereas negative surprise and neutral surprise was significantly different from elation.

Figure 1. Ratings of valence plotted against ratings of activation. (Filled symbols denote group means).
Emotion Episodes Related to Appraisal Patterns

The appraisal ratings were first submitted to a principal component analysis. Nine factors with eigen values larger than 1.0 accounted for 77% of the total variance. The varimax rotated factor loadings indicated that seven of these factors corresponded to Smith and Ellsworth's (1985) appraisal dimensions Pleas- antness, Effort, Attentional Activity/Novelty, Responsibility, Certainty, Goal- Path Obstacle/Goal Relevance, and Legitimacy. The hypothesized Control dimension was split on the eighth and ninth factor with the self/other items loaded on the eight factor and the circumstance or no control item loaded on the ninth factor.

Based on the results of the principal component analysis, nine appraisal indices corresponding to the factors were constructed by summing the ratings on the designated scales. Each scale rating was given a unit weight and scales with negative loadings were reversed before being summed. Means of the nine appraisal indices are given in Table 2 for each emotion.

Table 2
Mean appraisal indices for regret, disappointment, surprise, and elation.

<table>
<thead>
<tr>
<th>Appraisal dimension</th>
<th>Regret</th>
<th>Surprise&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Disappointment, Elation</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>0</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pleasant</td>
<td>2.04</td>
<td>6.88</td>
<td>6.33</td>
<td>10.31</td>
<td>2.65</td>
</tr>
<tr>
<td>Attention</td>
<td>4.21</td>
<td>7.53</td>
<td>6.92</td>
<td>8.86</td>
<td>6.26</td>
</tr>
<tr>
<td>No Control</td>
<td>3.52</td>
<td>5.65</td>
<td>6.25</td>
<td>5.11</td>
<td>5.84</td>
</tr>
<tr>
<td>S/O Control&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.75</td>
<td>-2.58</td>
<td>-1.29</td>
<td>-3.19</td>
<td>-2.92</td>
</tr>
<tr>
<td>Certainty</td>
<td>3.81</td>
<td>2.50</td>
<td>2.79</td>
<td>2.58</td>
<td>2.11</td>
</tr>
<tr>
<td>Goal</td>
<td>6.58</td>
<td>4.81</td>
<td>5.12</td>
<td>3.16</td>
<td>6.81</td>
</tr>
<tr>
<td>Legitimacy&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.25</td>
<td>0.93</td>
<td>0.38</td>
<td>2.66</td>
<td>-0.96</td>
</tr>
<tr>
<td>Responsibility&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2.57</td>
<td>-2.70</td>
<td>-1.30</td>
<td>-3.86</td>
<td>-2.46</td>
</tr>
<tr>
<td>Effort</td>
<td>8.37</td>
<td>5.55</td>
<td>6.05</td>
<td>4.66</td>
<td>6.35</td>
</tr>
</tbody>
</table>

<sup>a</sup>In addition to ANOVAs on the total group who rated surprise (denoted mean surprise), additional analyses were performed splitting the group in three, neutral (0) (n=13), positive (+) (n=16), and negative (-) (n=15). The F ratios in parentheses refer to the ANOVAs including neutral, positive, and negative surprise with the other emotions. Dfs are 3 and 173 and 4 and 172, respectively.
<sup>b</sup>Increase for self control.
<sup>c</sup>Increase for fairness.
<sup>d</sup>Increase for responsibility.

To investigate the appraisal patterns for each of the emotions, one-way ANOVAs were performed on each appraisal index. An additional second analysis was performed where surprise was split in negative, neutral, and positive. As may be seen in Table 2, all appraisal indices discriminated between the emotions in both analyses. Tukey post-hoc tests at p=.05 were computed for each pairwise mean difference on each appraisal index. The emotions denoted by symbols in Table 3 were significantly larger than the column emotions. As may be seen, all pairs of emotions differed reliably on at least one appraisal dimension. Table 3 shows that regret was associated with significantly higher scores on the otherself control and responsibility indices than the other emotions. Regret was also
related to significantly higher scores on the effort and goal indices than mean/positive surprise and elation. Similarly, disappointment received significantly higher scores than mean/positive/negative surprise on the other-self control and responsibility indices. Moreover, disappointment also received higher scores than all other emotions on the goal index with the exception of negative surprise. Disappointment was associated with significantly more effort than mean surprise, positive surprise, and elation. Mean surprise was associated with significantly higher scores on pleasantness, attention, and no control indices than regret and disappointment. Elation received a significantly higher score on the legitimacy dimension than all other emotions and higher scores on the pleasantness and attention indices than regret and disappointment. Elation had also significantly higher scores than mean surprise on the other-self control, responsibility, certain, and legitimacy indices.

Table 3
*Summary of Tukey post hoc tests (p=.05) showing on which appraisal dimensions regret, disappointment, surprise, and elation differ.*

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Regret (R)</th>
<th>Disappointment (D)</th>
<th>Surprise (S)</th>
<th>Elation (E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasantness</td>
<td>S, S0, S+, E</td>
<td>S, S0, S+, E</td>
<td>S0</td>
<td>S, S0, S+, E</td>
</tr>
<tr>
<td>Attention</td>
<td>S, S0, S+, S-, E</td>
<td>S, S0, S+, S-, E</td>
<td>S+, E</td>
<td>S+, E</td>
</tr>
<tr>
<td>No Control</td>
<td>S, S0, S+, S-</td>
<td>S, S0, S+, S-</td>
<td>S+</td>
<td>S+</td>
</tr>
<tr>
<td>Other/Self Control</td>
<td>R</td>
<td>R, D, E</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Responsibility</td>
<td>R</td>
<td>R, D, E</td>
<td>R, D, E</td>
<td>R, D, E</td>
</tr>
<tr>
<td>Goal</td>
<td>D</td>
<td>R, D, S-</td>
<td>R, D, S-</td>
<td>R, D, S-</td>
</tr>
<tr>
<td>Certainty</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Legitimacy</td>
<td>E, S+</td>
<td>E, S+, S0, R</td>
<td>E, S+</td>
<td>E, S+</td>
</tr>
<tr>
<td>Effort</td>
<td>R, D</td>
<td>R, D, S-</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

*Symbols in the table indicate that the denoted emotion was significantly larger on the appraisal index than was the column emotion.

*S denotes mean surprise (total group), S0 the group (n=13) who rated surprise neutral on valence, S+ the group (n=16) who rated surprise high on valence, and S- the group (n=15) who rated surprise low on valence.*

In the analyses in which surprise was split in negative, neutral, and positive surprise, it was found that neutral and positive surprise were significantly higher than regret and disappointment on the pleasant, no-control, and attention indices. Neutral and positive surprise were also significantly higher than negative surprise, and positive surprise was significantly higher than neutral surprise.

*The disappointment data was divided in outcome-related (ORD) and person-related disappointment (PRD) as described in van Dijk and Zeelenberg (in press). On the basis of coding of participants written descriptions it was found that 16 participants recalled PRD events and 28 participants ORD events. Independent t-tests on appraisal ratings yielded significant differences (p<.05) between ORD and PRD for the self-other control appraisal with higher self-control ratings for ORD (M=0.41) than for PRD (M=1.58), and for the responsibility appraisal with higher responsibility ratings for ORD (M=0.39) than for PRD (M=1.64). No other systematic differences were obtained on the remaining seven appraisal dimensions.*
on the pleasantness index. Positive surprise was associated with significantly larger scores on the legitimacy index than all other emotions. Negative surprise was significantly higher than neutral and positive surprise on the goal index and significantly higher than positive surprise on the effort index.

Preference for Emotion Episodes

Suggesting that there were differences in preference for the emotion episodes, an one-way ANOVA on the preference ratings yielded a highly significant effect, $F(3, 173) = 146.67, p < .001$. Tukey post-hoc tests at $p = .05$ showed that all pairwise mean differences between regret ($M = 14.0$), disappointment ($M = 17.2$), elation ($M = 87.8$), and surprise ($M = 53.3$) were significant with the exception of the difference between regret and disappointment. In a second analysis in which surprise was split in negative, neutral, and positive, a highly significant effect, $F(5, 171) = 356.24, p < .001$, was again obtained. Tukey post-hoc tests showed that all the mean differences were significant except the difference between regret and disappointment and between positive surprise ($M = 84.2$) and elation$. Negative surprise ($M = 25.3$) and neutral surprise ($M = 49.7$) were reliably more preferred than regret and disappointment.

To investigate the relationship between preference and the core affect dimensions of valence and activation, a multiple regression analysis was performed with the preference ratings as dependent variable and the valence and activation ratings as independent variables. This analysis was performed on all individual ratings to ensure sufficient variation. As Table 4 shows, in a multiple linear regression analysis the beta coefficient was significant only for the valence scale. When the terms associated with the interaction between valence and activation ($V \times A$) and the quadratic component associated with activation ($A^2$) were entered, the explained variance slightly increased and all beta coefficients reached significance. In Figure 2 the preference ratings are plotted against preferences derived from the least-squares fitted model $P = 0.68V - 0.11A^2 + 0.28VA$. As may be seen, no systematic deviation can be observed.

Although a very high proportion of variance in the preference ratings was accounted for by the fitted model, it is still possible that the appraisal indices are equally or more strongly related to preference. Therefore, another multiple regression analysis was run with the appraisal indices as independent variables. However, as may be seen in Table 4, only the pleasantness and attention indices reached significance and the explained variance is marginally lower. In a final step still another multiple regression analysis was conducted with the independent variables the valence ratings, the squared activation ratings, the product of the valence and activation ratings, and the appraisal indices (except the pleasant index which correlated .95 with the valence ratings). Whereas the beta weights for the valence and activation components remained significant, no beta weight for any of the appraisal indices was significant.

$^6$ Dividing the disappointment data into ORD and PRD yielded no significant differences for valence (Ms 59.7 vs. 63.0), activation (Ms 15.9 vs. 18.1), or preference (Ms 14.1 vs. 21.2) for PRD and ORD respectively.
Table 4
*Multiple regression analyses of preference for remembered emotional reactions related to core affect and appraisal dimensions* for the four emotions regret, disappointment, surprise, and elation.

<table>
<thead>
<tr>
<th>Model</th>
<th>$\beta$</th>
<th>$R^2_{adj}$</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Affect Dimensions</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Restricted model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valence (V)</td>
<td>.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activation (A)</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Full model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A^2$</td>
<td>$-1.11$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VxA</td>
<td>.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appraisal Dimensions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Restricted model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pleasantness</td>
<td>.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td>.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ControlNo</td>
<td>-.02</td>
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</tr>
<tr>
<td>ControlSelf/Others</td>
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<tr>
<td>Certainty</td>
<td>.01</td>
<td></td>
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<tr>
<td>Goal hindrance</td>
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<td></td>
</tr>
<tr>
<td>Legitimacy</td>
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<td></td>
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<tr>
<td>Responsiblity</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Full model</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>.72</td>
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<td></td>
</tr>
<tr>
<td>$A^2$</td>
<td>$-1.12$</td>
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<tr>
<td>VxA</td>
<td>.24</td>
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<tr>
<td>Attention</td>
<td>.06</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ControlNo</td>
<td>-.02</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>ControlSelf-o</td>
<td>.03</td>
<td></td>
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<tr>
<td>Certainty</td>
<td>.02</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Goal hindrance</td>
<td>-.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legitimacy</td>
<td>-.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*All variables are standardized. Beta values in italics are significant for $p<.05$. 
Figure 2. Observed preference plotted against model-derived preference.

Discussion

The present research aimed at investigating dimensional representations of discrete emotional reactions and their relation to preference for emotions. Consistent with the implication of the pleasure-arousal hypothesis, preference for the emotions was related to both valence and activation (Russell & Mehrabian, 1978). Further, as previous research has shown for current mood, experienced emotional reactions, and anticipated emotional reactions, support was also obtained for the specific form of the pleasure-arousal hypothesis with preference proportional to valence and related to activation through an inverted U-shaped function with a maximum increasing with valence (Västfjäll et al., 2001, 2002). In line with previous research, the valence dimension did account for the main proportion of the variance (Russell & Mehrabian, 1978). In the present study, even though including activation as a determinant of preference improved the explained variance significantly, only an increase of 4% was observed. In other studies, activation and the activation by valence interaction typically account for 20–40 percent of the explained variance (Västfjäll et al., 2001; Mehrabian & Russell, 1974; Russell & Mehrabian, 1978). The observation that the inclusion of activation in the present study only slightly increased the fit is most likely due to a ceiling effect (valence alone accounted for 90% of the variance) caused by the choice of target emotions.
Other studies have demonstrated that the structure of the affect space and the intercorrelation between valence, activation and preference is dependent on the selection of stimuli or sampling of target emotions (Mehrabian & Russell, 1974). As may be noted in Figure 1, the two-dimensional space is not completely covered, most notably very few ratings are found in the low activation/pleasant quadrant. This may in part also explain why activation was attenuated in the regression analyses. Nevertheless, the present research and findings reviewed above suggest that preference for affect cannot simply be equated with the valence dimension or a good-bad dimension (Kahneman, 1999).

Consequently, the present findings suggest that affective reactions should be measured by at least two dimensions (Russell, 1980; Fabrigar et al., 2000). Mellers et al. (1997, 1999) suggested that affective reactions to decision outcomes are captured by a continua stretching from disappointment to elation. Such a uni-dimensional view of emotions, however, confounds activation and valence. Elation is a high activation pleasant state when translated into core affect dimensions. Furthermore, our results indicate that disappointment is not the bipolar counterpart of elation. In the present study, disappointment is the combination of high unpleasantness and moderate activation, whereas disappointment as conceptualized by Mellers et al. (1999) would be high unpleasantness and low activation. A uni-dimensional view of emotions thus cannot easily accommodate differential antecedents and effects of valence and activation (Västfjäll & Gärling, in press).

The discrete emotions investigated were associated with specific appraisal profiles largely as expected (see Tables 1 and 3). Regret was found to be associated with unpleasantness, low attention, high self control and low other/circumstance control, high goal hindrance, medium certainty, medium legitimacy (neither fair nor unfair), high responsibility, and high effort. The appraisal pattern for disappointment was very similar except for lower scores on other-self control (other control), legitimacy (unfair), effort, and responsibility (not responsible), and a higher score on goal hindrance. The current results thus support the findings by van Dijk et al., (1998) showing that regret and disappointment are different in appraisal patterns. Elation was associated with high pleasantness, high attention, medium self/other/circumstance control, very low goal hindrance, fairness, high certainty, and low effort.

In contrast to the results reported by Smith and Ellsworth (1985), surprise was in the present study significantly different from elation. As may be seen in Figure 2, elation is the combination of high activation and high pleasantness, while mean surprise is the combination of high activation and moderate pleasantness. This finding is supported in earlier research where surprise has been considered to be neither inherently positive nor negative (Roseman et al., 1996; Scherer, 2001). The results showed that mean surprise was associated with medium pleasantness (neutral), high attention, low self control, high circumstance control, medium goal hindrance, low certainty (high unexpectedness), and medium effort. At an individual level, the current results however showed that some recalled events eliciting surprise were negative and some were positive although still high on activation. Moreover, negative and positive surprise differed in appraisal pattern. Positive surprise was higher on pleasantness, attention, legitimacy (fair), and lower on responsibility, goal hindrance, and effort. In addition,
positive surprise was different from elation on control (other control), certainty (uncertain), and responsibility (not responsible). Negative surprise differed from regret and disappointment on attention, control, responsibility, and effort, and from regret on goal hindrance.

In conclusion, the results indicate that recalled emotions are associated with distinct appraisal profiles. Russell and Feldman-Barret (1999) suggested that prototypical emotion episodes entail appraisals, bodily changes, cognitions, overt behavior, and core affect. To disentangle the structure of prototypical emotions, it is important to operationalize each of these processes. The four emotions examined in the present study are considered to represent prototypical emotion episodes (Ekman, 1993, Ortony, et al., 1988). However, the results suggest that preference for the four emotions are only related to the core affect dimensions of valence and activation. In a decision-making context, preference for affect may thus be determined by core affect, whereas antecedents of distinct affective states is likely to also be related to other components of emotion episodes (Lazarus, 1984; Zajonc, 1980, 1984).

In current research on emotional reactions to decision outcomes, regret and disappointment are conceptualized as two distinct emotions with different influences on decision making and different behavioral consequences (Zeelenberg, 1999; Zeelenberg et al., 2000). Although regret and disappointment differ in antecedent and eliciting conditions, the present study showed that core affect measures of valence and activation do not discriminate between them. Both regret and disappointment are combinations of unpleasantness and medium activation. Thus the present research shows that that a circumplex representation may fail to discriminate between specific emotions as has been observed for other discrete states such as anger and fear (Learner & Keltner, 2000). However, more importantly, as a consequence of their close position in the affect circumplex, regret and disappointment do not differ in preference. Given that people do not hold different preferences for regret and disappointment, how does preference for these emotions (and other affective states) influence choice? In the current research it is assumed that people make choices on the basis of their preference. Both regret and disappointment are negative emotions that people dislike and consequently will try to avoid. However, it is unlikely that people ever face choices between courses of action leading either to regret or disappointment. Thus, no inconsistency will exist.

Another possibility is that preference for anticipated affective reactions to decision outcomes is also influenced by the existence of several alternatives, pos-

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6 It should, however, be noted that the appraisal dimension pleasantness predicted preference in the absence of the valence dimension. Due to the high intercorrelation between valence and pleasantness the final regression equation only included the core affect dimensions. Other appraisal scales tapping pleasantness appraisals such as the Smith and Lazarus (1993) motivational congruence item may have independently contributed to the explained variation in preference ratings. In addition, “primary appraisals” may be mirror images of the core affect dimensions. For instance, Smith and Kirby (2001) suggested that motivational relevance and motivational congruence correspond to valence and activation, respectively. Motivational congruence is an appraisal of the extent to which the situation is in line with current goals, whereas motivational relevance is an appraisal of how important the situation is to the person. Similar to core affects, primary appraisals of motivation relevance and congruence are present in every emotional encounter (Smith & Kirby, 2001).
ibly leading to counterfactual comparisons. Idson, Liberman, and Higgins (2000) suggested that positive and negative goal attainments and regulatory focus might influence activation and thus indirectly affect preference. Regret and disappointment theory (Zeelenberg et al., 2000) assumes that the attractiveness of an alternative is altered by comparisons with other outcomes and consequently affect preference. Even though this research has focused on post-decisional affect, it is assumed that counterfactual comparisons also influence attractiveness of future outcomes (Boninger, Gleicher, & Stratham, 1994). In such cases, it is conceivable that measures of core affect no longer predict preference although the latter predicts choice, or that core affects predict preference but that preference does not predict choice. Appraisal patterns may in any case have a more prominent role. Future research therefore needs to investigate if appraisal patterns related to anticipated emotions predict choice over and above preferences for the alternatives while several choice alternatives are deliberated.

References


