

# Emotion and Decision Making

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## Abstract

A revolution in the science of emotion has emerged in the last few decades, with the potential to create a paradigm shift in thinking about decision theories. The research reveals that emotions constitute powerful, pervasive, and predictable drivers of decision making. Across different domains, important regularities appear in the mechanisms through which emotions influence judgments and choices. The present paper organizes and analyzes what has been learned from the past 35 years of work on emotion and decision making. It also proposes an integrated model of decision making that accounts for both traditional (rational-choice theory) inputs and emotional inputs, synthesizing scientific findings to date.

## Keywords

affect, mood, appraisal tendency, judgment, choice, behavioral economics

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Hence, in order to have anything like a complete theory of human rationality, we have to understand what role emotion plays in it.

-- Herbert Simon, 1983, *Reason in Human Affairs*, p. 29

## I. INTRODUCTION

Nobel Laureate Herbert Simon ([1967](#), [1983](#)) launched a revolution in decision theory when he introduced bounded rationality, a concept that would require refining existing models of rational choice to include cognitive and situational constraints. But as the quote above reveals, Simon knew his theory would be incomplete until the role of emotion was specified, thus presaging the crucial role contemporary science has begun to give emotion in decision research. Across disciplines ranging from philosophy ([Solomon 1993](#)) to neuroscience ([e.g., Phelps et al in press](#)), an increasingly vibrant quest to identify the effects of emotion on judgment and decision making (JDM) is in progress.

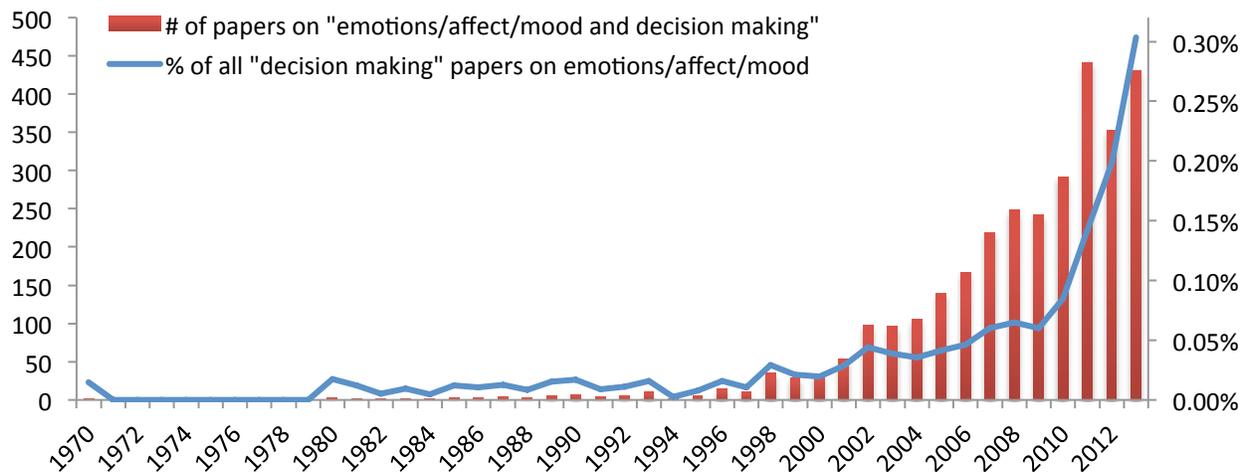
Such vibrancy was not always apparent. In economics, the historically dominant discipline for research on decision theory, the role of emotion in decision making rarely appeared for most of the 20<sup>th</sup> century, despite featuring prominently in influential 18<sup>th</sup> and 19<sup>th</sup> century economic treatises ([for review, see Loewenstein & Lerner 2003](#)). The case was similar in psychology for most of the 20<sup>th</sup> century. Even behavioral decision researchers' critiques of economics' rational decision models focused primarily on understanding cognitive processes. Moreover, research examining emotion in *all* fields of psychology remained scant ([for review, see Keltner & Lerner 2010](#)). The online **Supplemental Text** for this article examines the curious history of scientific attention to emotion. The supplement also includes primers on the respective fields of (a) emotion and (b) judgment and decision making.

The present paper examines theories and evidence from the nascent field of emotion and decision-making, ranging from approximately 1970 until the present. It emphasizes studies in the

behavioral sciences, especially psychology, as opposed to studies in neuroscience, which are comprehensively reviewed in the *Annual Review of Neuroscience* ([see Phelps et al in press](#)).

In recent years, the field has grown rapidly; yearly scholarly papers on emotion and decision making doubled from 2004 to 2007 and again from 2007 to 2011, and increased by an order of magnitude as a percentage of all scholarly publications on “decision making” (already a quickly growing field) from 2001 to 2013.

**Figure 1.** Number of scholarly publications from 1970 to 2013 that refer to “emotion(s)/affect/mood and decision making” (in red bars) and percentage of all scholarly publications referring to “decision making” that this represents.



Indeed, many psychological scientists now assume that emotions are the dominant driver of most meaningful decisions in life (e.g., [Ekman 2007](#), [Frijda 1988](#), [Gilbert 2006](#), [Keltner & Lerner 2010](#), [Keltner et al 2014](#), [Lazarus 1991](#), [Loewenstein et al 2001](#), [Scherer & Ekman 1984](#)). Decisions serve as the conduit through which emotions guide everyday attempts at avoiding negative feelings (e.g., guilt, fear, regret) and increasing positive feelings (e.g., pride, happiness, love), even when we lack awareness of these processes (for reviews, see [Keltner & Lerner 2010](#), [Loewenstein & Lerner 2003](#)). And once the outcomes of our decisions materialize, we often feel

new emotions (e.g., elation, surprise, and regret, [Coughlan & Connolly 2001](#), [Mellers 2000](#), [Zeelenberg et al 1998](#)). Put succinctly, emotion and decision making go hand in hand.

## **Objectives and Approach**

This paper provides organizational structure to and critical analysis of research on emotion and JDM. Due to strict space and citation-count limits as well as the unusually long (three-decade) span of material to be covered, we had to be selective. When multiple studies represented reliable scientific discoveries, for example, we necessarily restricted ourselves to one or two key studies. We also gave preference to studies that contribute to theoretical development over studies that stand alone as interesting phenomena.

## **II. EMOTIONAL IMPACT ON JUDGMENT AND DECISION MAKING: EIGHT MAJOR THEMES**

In surveying research on emotion and decision making, eight major themes of scientific inquiry emerged. Consistent with the fact that the field is in its infancy, these themes typically: (a) vary in the amount of research conducted, (b) contain few competing theories, (c) include few definitive conclusions, (d) display relative homogeneity in methodology, and (e) examine fundamental questions about the nature of emotion and decision making rather than refinements about known phenomena. Nonetheless, the themes reveal rapid progress in mapping the psychology of emotion and decision making. Collectively, they elucidate one overarching conclusion: emotions powerfully, predictably, and pervasively influence decision making.

### **Theme 1: Integral emotions influence decision making**

It is useful when surveying the field to identify distinct types of emotion. We start with emotions arising from the judgment or choice at hand (i.e., *integral emotion*), a type of emotion that strongly and routinely shapes decision making ([Damasio 1994](#), [Greene & Haidt 2002](#)). For

example, a person who feels anxious about the potential outcome of a risky choice may choose a safer option rather than a potentially more lucrative option. A person who feels grateful to a school s/he attended may decide to donate a large sum to that school even though it limits personal spending. Such effects of integral emotions operate at conscious and non-conscious levels.

*Integral emotion as beneficial guide.* Although a negative view of emotion's role in reason has dominated much of Western thought ([Keltner & Lerner 2010](#)), a few philosophers pioneered the idea that integral emotion could be a beneficial guide. David Hume ([1738/1978, p. 415](#)), for example, argued that the dominant predisposition toward viewing emotion as secondary to reason is entirely backward: "Reason is, and ought only to be, the slave of the passions, and can never pretend to any other office than to serve and obey them." Following this view, anger, for example, provides the motivation to respond to injustice ([Solomon 1993](#)), and anticipation of regret provides a reason to avoid excessive risk-taking ([Loomes & Sugden 1982](#)).

Compelling scientific evidence for this view comes from emotionally impaired patients who have sustained injuries to the ventromedial prefrontal cortex (vmPFC), a key area of the brain for integrating emotion and cognition. Studies find that such neurological impairments reduce both patients' ability to feel emotion and the optimality of their decisions in ways that cannot be explained by simple cognitive changes ([Bechara et al 1999](#), [Damasio 1994](#)). Participants with vmPFC injuries repeatedly select a riskier financial option over a safer one, even to the point of bankruptcy—despite their cognitive understanding of the sub-optimality of their choices. Physiological measures of galvanic skin response suggest that this behavior is due to these participants not experiencing the emotional signals—"somatic markers"—that lead normal decision makers to have a reasonable fear of high risks.

*Integral emotion as bias.* Despite arising from the judgment or decision at hand, integral emotions can also degrade decision making. For example, one may feel afraid to fly and decide to drive instead, even though base rates for death by driving are much higher than base rates for death by flying the equivalent mileage ([Gigerenzer 2004](#)). Integral emotions can be remarkably influential even in the presence of cognitive information that would suggest alternative courses of action ([for review, see Loewenstein 1996](#)). Once integral emotions attach themselves to decision targets, they become difficult to detach ([Rozin et al 1986](#)). Prior reviews have described myriad ways in which integral emotion inputs to decision making, especially perceptually vivid ones, can override otherwise rational courses of action ([Loewenstein et al 2001](#)).

## **Theme 2: Incidental emotions influence decision making**

Researchers have found that *incidental* emotions pervasively carry over from one situation to the next, affecting decisions that should, from a normative perspective, be unrelated to that emotion (for selective reviews, [Han et al 2007](#), [Keltner & Lerner 2010](#), [Lerner & Keltner 2000](#), [Lerner & Tiedens 2006](#), [Loewenstein & Lerner 2003](#), [Pham 2007](#), [Vohs et al 2007](#), [Yates 2007](#)), a process called the carryover of incidental emotion ([Bodenhausen 1993](#), [Loewenstein & Lerner 2003](#)). For example, incidental anger triggered in one situation automatically elicits a motive to blame individuals in other situations even though the targets of such anger have nothing to do with the source of the anger ([Quigley & Tedeschi 1996](#)). Moreover, carryover of incidental emotions typically occurs without awareness.

*Incidental emotion as bias.* Psychological models have begun to elucidate the mechanisms through which the carryover effect occurs as well as the moderators that amplify or attenuate the effect. Early studies of carryover either implicitly or explicitly took a valence-based approach, dividing emotions into positive and negative categories, and positing that emotions of

the same valence would have similar effects: people in good moods would make optimistic judgments, and people in bad moods would make pessimistic judgments (for reviews, see [Han et al 2007](#), [Keltner & Lerner 2010](#), [Loewenstein & Lerner 2003](#)).

Using a valence-grounded approach, Johnson and Tversky ([1983](#)) conducted the first empirical demonstration of incidental affect's influence upon risk perception. Participants read newspaper stories designed to induce positive or negative affect and then estimated fatality frequencies for various potential causes of death (e.g., heart disease). As compared to participants who read positive stories, participants who read negative stories offered pessimistic estimates of fatalities. Surprisingly, the influence of mood on judgment did not depend on the similarity between the content of stories and the content of subsequent judgments. Rather, the mood itself generally affected all judgments.

Research in economics has recently begun to study incidental emotion carryover at the macro level. For example, based on the assumption that people are happier on sunny days, economists found a positive correlation between the amount of sunshine on a given day and stock market performance across 26 countries ([Hirshleifer & Shumway 2003](#), [Kamstra et al 2003](#)). In contrast, stock market returns declined when a country's soccer team was eliminated from the World Cup ([Edmans et al 2007](#)). These studies make a promising connection between micro-level and macro-level phenomena that should increase in precision as promising new methods emerge for measuring public mood and emotion (e.g. [Bollen et al 2011](#)), as well as individual subjective experiences across time and situations ([Barrett & Barrett 2001](#), [Stayman & Aaker 1993](#)), within psychology.

*Moderating factors.* The field is just starting to identify moderating factors for carryover of incidental emotion. One promising line of work is Forgas's ([1995](#)) Affect Infusion Model,

which elaborates on the circumstances under which affect—integral and/or incidental— influences social judgment. The model predicts that the degree of affect infusion into judgments varies along a processing continuum, such that affect is most likely to influence judgment in complex and unanticipated situations.

Another promising line is the emerging hypothesis by Yip and Côté (2013), which predicts that individuals with high emotional intelligence can correctly identify which events caused their emotions and, therefore, can screen out the potential impact of incidental emotion. In one study, individuals high in emotion-understanding ability showed less impact of incidental anxiety on risk estimates when informed about the incidental source of their anxiety. Although solid evidence supports both of these emerging approaches to mapping moderators, the field needs much more attention to moderators in order to understand how emotion and decision making processes occur in the varied private and public settings in which decisions are made.

### **Theme 3: Beyond valence: Specific emotions influence decision making**

Most early literature on emotion and JDM implicitly or explicitly took a valence-based approach, but such models cannot account for all influences of affect upon judgment and choice. Though parsimonious, valence models sacrifice specificity by overlooking evidence that emotions of the same valence differ in essential ways. For example, emotions of the same valence, such as anger and sadness, are associated with different antecedent appraisals (Smith & Ellsworth 1985); depths of processing (Bodenhausen et al 1994b); brain hemispheric activation (Harmon-Jones & Sigelman 2001); facial expressions (Ekman 2007); autonomic responses (Levenson et al 1990); and central nervous system activity (Phelps et al in press). At least as far back as 1998, an *Annual Review of Psychology* on JDM noted the insufficiency of valence and arousal in predicting JDM outcomes: “Even a two-dimensional model seems inadequate for

describing emotional experiences. Anger, sadness, and disgust are all forms of negative affect, and arousal does not capture all of the differences among them...A more detailed approach is required to understand relationships between emotions and decisions ([Mellers et al 1998](#), p. [454](#)).”

In an effort to increase the predictive power and precision of JDM models of emotion, Lerner and Keltner ([2000](#), [2001](#)) proposed examining multi-dimensional discrete emotions with the Appraisal-Tendency Framework (ATF). The ATF systematically links the appraisal processes associated with specific emotions to different judgment and choice outcomes. The general approach predicts that emotions of the same valence (such as fear and anger) can exert distinct influences on choices and judgments, while emotions of the opposite valence (such as anger and happiness) can exert similar influences.

The ATF rests on three broad assumptions: (a) that a discrete set of cognitive dimensions differentiates emotional experience (e.g., [Ellsworth & Smith 1988](#), [Lazarus 1991](#), [Ortony et al 1988](#), [Scherer 1999](#), [Smith & Ellsworth 1985](#)); (b) that emotions serve a coordination role, automatically triggering a set of concomitant responses (physiology, behavior, experience, and communication) that enable the individual to quickly deal with problems or opportunities (e.g., [Frijda 1988](#), [Levenson 1994](#), [Oatley & Jenkins 1992](#)); and (c) that emotions have motivational properties that depend on both an emotion’s intensity and its qualitative character. That is, specific emotions carry specific “action tendencies” (e.g., [Frijda 1986](#)), or implicit goals, that signal the most adaptive response. In this view, emotions save cognitive processing by triggering time-tested responses to universal experiences (such as loss, injustice, and threat) ([Levenson 1994](#), [Tooby & Cosmides 1990](#)). For example, anger triggers aggression, and fear triggers flight.

Lazarus (1991) has argued that each emotion is associated with a “core-relational,” or appraisal theme—the central relational harm or benefit that underlies each specific emotion.

The ATF points to a clear empirical strategy: Research should compare emotions that are highly differentiated in their appraisal themes on judgments and choices that relate to that appraisal theme (Lerner & Keltner 2000). Han and colleagues (2007) refer to this strategy as the “matching principle,” which we discuss further in the next section. By illuminating the cognitive and motivational processes associated with different emotions, the model provides a flexible yet specific framework for developing a host of testable hypotheses concerning affect and JDM.

*The appraisal-tendency hypothesis.* Put succinctly, *appraisal tendencies* are goal-directed processes through which emotions exert effects upon judgments and decisions until the emotion-eliciting problem is resolved (Lerner & Keltner 2000, Lerner & Keltner 2001). The ATF predicts that an emotion, once activated, can trigger a cognitive predisposition to assess future events in line with the central appraisal dimensions that triggered the emotion (for examples, see Table 1). Such appraisals become an implicit perceptual lens for interpreting subsequent situations. Just as emotions include action tendencies that predispose individuals to act in specific ways to meet environmental problems and opportunities (e.g. Frijda 1986), the ATF posits that emotions predispose individuals to appraise the environment in specific ways towards similar functional ends.

An early study consistent with the ATF examined the effects of anger and sadness upon causal attributions (Keltner et al 1993). Although both anger and sadness have negative valence, appraisals of individual control characterize anger, whereas appraisals of situational control characterize sadness. The authors predicted that these differences would drive attributions of responsibility for subsequent events. Consistent with this hypothesis, incidental anger increased

attributions of individual responsibility for life outcomes, whereas incidental sadness increased the tendency to perceive fate or situational circumstances as responsible for life outcomes.

In an explicit test of the ATF, Lerner and Keltner (2000) compared risk perceptions of fearful and angry people. Consistent with the ATF, dispositionally fearful people made pessimistic judgments of future events, whereas dispositionally angry people were optimistic. Subsequent experimental studies experimentally induced participants to feel incidental anger or fear and found identical results (Lerner & Keltner 2001). Importantly, participants' appraisals of certainty and control mediated the causal effects of fear and anger on optimism.

Findings consistent with the ATF in many other contexts have further supported this approach (for discussion, see Bagueux et al 2012, Cavanaugh et al 2007, Han et al 2007, Horberg et al 2011, Lerner & Tiedens 2006, Yates 2007). For example, one study challenged a valence-based tendency for people in positive moods to make positive judgments and vice versa for negative moods, finding differential effects of sadness and anger on judgments of likelihood, despite both emotions having negative valence (DeSteno et al 2000). DeSteno and colleagues have also shown several ways in which positive emotions predict behavior beyond the contributions of valence (Bartlett & DeSteno 2006, Williams & DeSteno 2008). For example, several studies show that specific positive emotions, such as gratitude and pride, have unique effects on helping behavior and task perseverance. Others have delineated the unique profiles of a variety of positive states in accordance with differences in their appraisal themes (Campos & Keltner in press, Valdesolo & Graham 2014).

#### **Theme 4: Emotions shape decisions via the content of thought**

Given that discrete emotions are grounded in cognitive appraisals (for review, see Keltner & Lerner 2010), the ATF helps identify the effects of specific emotions on judgment and choice,

breaking down emotions into cognitive dimensions that can be mapped onto the content of thought JDM processes. A number of these appraisal dimensions involve themes that have been central to JDM research: perceived likelihood of various events, economic valuation, and assignment of responsibility and causality.

Consider two illustrations of how emotions shape the content of thought via appraisal tendencies, drawn from Lerner and Keltner (2000). Table 1 compares two pairs of emotions of the same valence that are highly differentiated in their central appraisal themes on a judgment related to those appraisal themes. Each of these four emotions can be characterized in terms of the six emotion appraisal dimensions originally identified by Smith and Ellsworth (1985): certainty, pleasantness, attentional activity, anticipated effort, control, and others' responsibility. The ATF predicts that dimensions on which an emotion scores particularly low or high are likely to activate an appraisal tendency that influences JDM, even for incidental emotions. The penultimate row in the table lists appraisal tendencies for each emotion that follow from the dimensions on which the emotion is low or high.

For example, anger scores high on the dimensions of certainty, control, and others' responsibility, and low on pleasantness. These characteristics suggest that angry people will view negative events as predictably caused by, and under the control of, other individuals. In contrast, fear involves low certainty and a low sense of control, which are likely to produce a perception of negative events as unpredictable and situationally determined. These differences in appraisal tendencies are particularly relevant to risk perception, with fearful people tending to see greater risk and angry people tending to see less risk. As described above, correlational and experimental work support this idea (Lerner & Keltner 2000, Lerner & Keltner 2001). This last row illustrates the ATF "matching principle," introduced in the prior section. Specifically, a match between the

appraisal themes of a specific emotion and the particular domain of a judgment or decision predict the likelihood that a given emotion will influence a given judgment or decision.

Differences in appraisal dimensions of pride and surprise, meanwhile, suggest different effects on attributions of responsibility. Specifically, pride scores lower than surprise on the dimension of others' responsibility, whereas surprise scores low on certainty. These differences suggest that pride will produce an appraisal tendency to attribute favorable events to one's own efforts, whereas surprise will produce an appraisal tendency to see favorable events as unpredictable and outside one's own control. These differences are likely to be relevant to judgments of attribution, with pride increasing perceptions of one's own responsibility for positive events and surprise increasing perceptions of others' responsibility for positive events, even when the judgment is unrelated to the source of the pride or surprise. Once again, this last part illustrates the ATF "matching principle."

**Table 1.** Two illustrations of the Appraisal-Tendency Framework, originally developed by Lerner & Keltner (2000; 2001)

	<i>Illustration with negative emotions</i>		<i>Illustration with positive emotions</i>	
	<i>Anger</i>	<i>Fear</i>	<i>Pride</i>	<i>Surprise</i>
Certainty	High	Low	Medium	Low
Pleasantness	Low	Low	High	High
Attentional Activity	Medium	Medium	Medium	Medium
Anticipated Effort	Medium	High	Medium	Medium
Control	High	Low	Medium	Medium
Others' Responsibility	High	Medium	Low	High
Appraisal Tendency	Perceive negative events as predictable, under human control, & brought about by others	Perceive negative events as unpredictable & under situational control	Perceive positive events as brought about by self	Perceive positive events as unpredictable & brought about by others
	<i>Influence on risk perception</i>		<i>Influence on attribution</i>	
Influence on Relevant Outcome	Perceive low risk	Perceive high risk	Perceive self as responsible	Perceive others as responsible

\* *Certainty* is the degree to which future events seem predictable and comprehensible (high) vs. unpredictable and incomprehensible (low). *Pleasantness* is the degree to which one feels pleasure (high) vs. displeasure (low). *Attentional activity* is the degree to which something draws one's attention (high) vs. repels one's attention (low). *Control* is the degree to which events seem to be brought about by individual agency (high) vs. situational agency (low). *Anticipated effort* is the degree to which physical or mental exertion seems to be needed (high) vs. not needed (low). *Responsibility* is the degree to which someone or something other than oneself (high) vs. oneself (low) seems to be responsible. See Smith and Ellsworth (1985) for comprehensive descriptions of each dimension and each emotion's scale values along the dimensions.

*Note:* Table adapted from Lerner, J.S., and Keltner, D, "Beyond valence: Toward a model of emotion-specific influences on judgment and choice," (2000), *Cognition and Emotion*, 14(4), Table 1, page 479, American Psychological Association, adapted with permission from the publisher.

An experiment conducted in the wake of the 9/11 terrorist attacks tested whether these patterns would scale up to the population level. A nationally representative sample of U.S. citizens read either a real news story (on the threat of anthrax) selected to elicit fear or a real news story (on celebrations of the attacks by some people in Arab countries) selected to elicit anger, and then were asked a series of questions about perceived risks and policy preferences ([Lerner et al 2003](#)). Participants induced with fear perceived greater risk in the world, whereas those induced with anger perceived lower risk, both for events related and unrelated to terrorism. Participants in the anger condition also supported harsher policies against suspected terrorists than did participants in the fear condition.

### **Theme 5: Emotions shape the depth of thought**

In addition to the content of thought, emotions also influence the depth of information processing related to decision making. As with other emotion research, early studies focused on effects of positive and negative mood ([Schwarz 1990](#), [Schwarz & Bless 1991](#)). If emotions serve an adaptive role by signaling when a situation demands additional attention, they hypothesized, then negative mood should signal threat and thus increase vigilant, systematic processing, and positive mood should signal a safe environment and lead to more heuristic processing. Indeed, numerous studies have shown that people in positive (negative) affective states were more (less) influenced by heuristic cues, such as the expertise, attractiveness, or likeability of the source, and the length rather than the quality of the message; they also relied more on stereotypes ([Bless et al 1996](#), [Bodenhausen et al 1994a](#)).

Note that systematic processing is not necessarily more desirable than automatic processing. Studies have shown that increased systematic processing from negative affect can aggravate anchoring effects due to increased focus on the anchor ([Bodenhausen et al 2000](#)).

Similarly, negative affect reduced the accuracy of thin-slice judgments of teacher effectiveness except when participants were under cognitive load, suggesting that the accuracy decrease for sad participants was caused by more deliberative processing ([Ambady & Gray 2002](#)). Finally, dysphoric people show excessive rumination ([Lyubomirsky & Nolen-Hoeksema 1995](#)).

Although this research shows clear influences of affect on processing depth, it has typically operationalized positive affect as happiness and negative affect as sadness. In one exception, Bodenhausen and colleagues ([1994b](#)) compared the effects of sadness and anger, both negatively valenced emotions. Relative to neutral or sad participants, angry participants showed greater reliance on stereotypic judgments and on heuristic cues, a result inconsistent with valence-based explanations but consistent with the affect-as-information view that anger carries positive information about one's own position ([Clore et al 2001](#)).

Tiedens and Linton ([2001](#)) suggested an alternative explanation for the difference between happiness and sadness in depth of processing: happiness involves appraisals of high certainty and sadness of low certainty. In a series of four studies, they showed that high-certainty emotions (e.g., happiness, anger, disgust) increased heuristic processing by increasing reliance on the source expertise of a persuasive message as opposed to its content, increasing usage of stereotypes, and decreasing attention to argument quality. Further, by manipulating certainty appraisals independently from emotion, they showed that certainty plays a causal role in determining whether people engage in heuristic or systematic processing.

Since Lerner and Tiedens ([2006](#)) introduced emotion effects on depth of thought into the ATF framework, studies have shown emotion influences on depth of processing across numerous domains. For example, Small and Lerner ([2008](#)) found that, relative to neutral-state participants, angry participants allocated less to welfare recipients, and sad participants allocated more. This

effect was eliminated under cognitive load, suggesting that allocations were predicted by differences in depth of processing between sad and angry participants.

### **Theme 6: Emotions shape decisions via goal activation**

It has been argued that emotions serve an adaptive coordination role, triggering a set of responses (physiology, behavior, experience, and communication) that enable individuals to deal quickly with encountered problems or opportunities ([for review, see Keltner et al 2014](#)). For example, in their investigation of action tendencies, Frijda and colleagues ([1989](#)) found that anger was associated with the desire to change the situation and “move against” another person or obstacle by fighting, harming, or conquering it. As one would expect, readiness to fight manifests not only experientially but also physiologically. For example, anger is associated with neural activation characteristics of approach motivation ([Harmon-Jones & Sigelman 2001](#)) and sometimes with changes in peripheral physiology that might prepare one to fight, such as increased blood flow to the hands ([Ekman & Davidson 1994](#)).

Emotion-specific action tendencies map onto appraisal themes. For example, given that anxiety is characterized by the appraisal theme of facing uncertain existential threats ([Lazarus 1991](#)), it accompanies the action tendency to reduce uncertainty ([Raghunathan & Pham 1999](#)). Sadness, by contrast, is characterized by the appraisal theme of experiencing irrevocable loss ([Lazarus 1991](#)) and thus accompanies the action tendency to change one’s circumstances, perhaps by seeking rewards ([Lerner et al 2004](#)). Consistent with this logic, a set of studies contrasted the effects of incidental anxiety and sadness on hypothetical gambling and job-selection decisions and found that sadness increased tendencies to favor high-risk, high-reward options, whereas anxiety increased tendencies to favor low-risk, low-reward options ([Raghunathan & Pham 1999](#)).

Lerner and colleagues (2004) followed a similar logic in a series of studies that tested the effects of incidental sadness and disgust on the *endowment effect* (Kahneman et al 1991), whereby sellers value goods more than buyers do, because sellers see the sale as a loss of ownership. The authors hypothesized that disgust, which revolves around the appraisal theme of being too close to a potentially contaminating object (Lazarus 1991), would evoke an implicit goal to expel current objects and avoid taking in anything new (Rozin et al 2008). Consistent with this hypothesis, experimentally-induced incidental disgust reduced selling prices among participants who owned the experimental object (an “expel” goal) and reduced buying prices among participants who did not (an “avoid taking anything in” goal). For sadness, associated with the appraisal themes of loss and misfortune, both selling old goods and buying new goods present opportunities to change one’s circumstances. Consistent with predictions, sadness reduced selling prices but increased buying prices. In sum, incidental disgust eliminated the endowment effect, whereas incidental sadness reversed it.

Han and colleagues (2012) further tested the effects of disgust on implicit goals in the context of the *status-quo bias*, a preference for keeping a current option over switching to another option (Samuelson & Zeckhauser 1988), and ruled out more general valence- or arousal-based disgust effects: A valence-based account would predict that any negative emotion should devalue all choice options, preserving status-quo bias (Forgas 2003). An arousal-based account would predict disgust to exacerbate status-quo bias by amplifying the dominant response option (Foster et al 1998). In contrast, an implicit goals-based account would predict disgust to trigger a goal of expelling the current option. Data supported this last interpretation: Given the choice between keeping one generic box of unspecified office supplies (the status quo) or switching to another generic box of similar but unspecified office supplies, disgust-state participants were

significantly more likely than neutral-state participants to switch. As is commonly the case with effects of incidental emotion, the effects of disgust on choices eluded participants' awareness.

Lerner and colleagues ([2013](#)) tested whether the effect of sadness on implicit goals would increase impatience in financial decisions, creating a myopic focus on obtaining money immediately instead of later, even if immediate rewards were much smaller than later awards. As predicted, relative to median neutral-state participants, median sad-state participants across studies accepted 13% to 34% less money immediately to avoid waiting 3 months for payment. Again, valence-based accounts cannot explain this effect: disgusted participants were just as patient as neutral participants.

The view that discrete emotions trigger discrete implicit goals is consistent with the "Feeling is for doing" model ([Zeelenberg et al 2008](#)), a theoretical framework asserting that the adaptive function of emotion is defined by the behaviors that specific states motivate. According to Zeelenberg and colleagues, these motivational orientations derive from the experiential qualities of such emotions, as opposed to, for example, the appraisal tendencies giving rise to their experience. Thus, the behavioral effects depend only on the perceived relevance of an emotion to a current goal, regardless of whether the emotion is integral or incidental to the decision at hand. Given that the ATF does not distinguish informational versus experiential pathways, an important agenda for future work is to develop more granular evidence of the mechanisms through which emotions activate implicit goals in judgment and choice. At present, the models appear to make similar predictions.

### **Theme 7: Emotions influence interpersonal decision making**

Emotions are inherently social ([for review, see Keltner & Lerner 2010](#)), and a full explanation of their adaptive utility requires an understanding of their reciprocal influence on

interaction partners. As an example of how complex such influences can be, people derive happiness merely from opportunities to help and give to others with no expectation of concrete gains ([Dunn et al 2008](#)). Indeed, prosociality is sometimes used instrumentally to manage one's mood, relieving sadness or distress ([Schaller & Cialdini 1988](#)).

*Emotions help optimally navigate social decisions.* Scholars have conceptualized emotions as communication systems that help people navigate and coordinate social interactions by providing information about others' motives and dispositions, ultimately allowing for the creation and maintenance of healthy and productive social relationships ([Keltner et al 2014](#), [Morris & Keltner 2000](#)). In the case of psychopathology (e.g., narcissism), emotions impede healthy and productive social relationships ([Kring 2008](#)).

Frank ([1988](#)) argues that the communicative function of emotions has played a crucial role in helping people solve important commitment problems raised by mixed motives. That is, whether we decide to pursue cooperative or competitive strategies with others depends on our beliefs about their intentions ([c.f. Singer & Fehr 2005](#)), information that is often inferred from their emotions ([Fessler 2007](#)). This approach has been particularly evident in the study of mixed-motive situations ([e.g., negotiation and bargaining; c.f. Van Kleef et al 2010](#)). For example, communicating gratitude triggers others' generosity ([Rind & Bordia 1995](#)) and ultimately helps an individual build social and economic capital ([DeSteno 2009](#)).

Research to date leads to the conclusion that emotion may serve at least three functions in interpersonal decision making: (a) helping individuals understand one another's emotions, beliefs, and intentions; (b) incentivizing or imposing a cost on others' behavior; and (c) evoking complementary, reciprocal, or shared emotions in others ([Keltner & Haidt 1999](#)). For example, expressions of anger prompt concessions from negotiation partners ([Van Kleef et al 2004a](#)) and

more cooperative strategies in bargaining games ([Van Dijk et al 2008](#)) because anger signals a desire for behavioral adjustment ([Fischer & Roseman 2007](#)). This effect is qualified by contextual variables, such as the motivation and ability of interaction partners to process emotional information ([Van Kleef et al 2004b](#)) as well as the morally charged nature of a negotiation ([Dehghani et al in press](#)). Multi-party negotiations show different effects; for example, communicated anger can lead to exclusion in these contexts ([Van Beest et al 2008](#)).

One study investigating this mechanism found that people seem to use others' emotional displays to make inferences about their appraisals and, subsequently, their mental states ([de Melo et al 2014](#)). Discrete supplication emotions (disappointment or worry) evoke higher concessions from negotiators as compared to similarly-valenced appeasement emotions (guilt or regret; [Van Kleef et al 2006](#)). As compared to anger, disappointment also engenders more cooperation: In the "give-some game" ([Wubben et al 2009](#)), two participants simultaneously decide how much money to give to the other participant or keep for themselves. Any money given is doubled and this procedure is repeated over 14 trials. After perceived failures of reciprocity, expressing disappointment communicates a forgiving nature and motivates greater cooperation, whereas expressing anger communicates a retaliatory nature and promotes escalation of defection.

Though interpersonal emotions can influence others' behavior by communicating information about an emoter's intentions, they can also change decisions and behavior as a function of the corresponding or complementary emotional states they evoke in others. Anger can elicit fear when communicated by those high in power ([or corresponding anger when communicated by those low in power; Lelieveld et al 2012](#)) and also a desire for retaliation ([Wang et al 2012](#)). Communicating disappointment with a proposal can evoke guilt in a bargaining partner and motivate reparative action ([Lelieveld et al 2013](#)).

Decision makers try to use the emotional communications of bargaining partners as sources of strategic information ([Andrade & Ho 2007](#)). Increasing knowledge of how emotion communication influences others' decisions also raises the possibility for the strategic *display* of emotional expression. The few studies investigating this possibility have produced mixed results: Though such strategies can prompt greater concessions ([Kopelman et al 2006](#)), inauthentic displays that are detected are met with increased demands and reduced trust ([Côté et al 2013](#)). The costs and benefits of intentionally deploying emotional expressions in such contexts will be an interesting area of future research. For example, initial work ([Elfenbein et al 2007](#), [Mueller & Curhan 2006](#)) suggests that emotionally intelligent individuals, for example, should be better able to elicit desired emotions from counterparts and, therefore, might use such skills to achieve desired outcomes.

*Emotion influences on group processes and perceptions of groups.* Research on group-level emotional processes is surprisingly scant, given that so many high-stakes decisions are made in groups and that the existing research reveals important effects. For example, research has found that, although team members tend to feel happy and to enjoy groups that have a shared sense of reality, such feelings are associated with groupthink—the destructive tendency to minimize conflict and maximize harmony and conformity ([Janis 1972](#)). Given that general positivity or negativity can spread through groups and influence performance outcomes (e.g., [Barsade 2002](#), [Hatfield et al 1993](#), [Totterdell 2000](#)), considerably more research in this area is needed, especially at the level of specific emotions.

**Theme 8: Unwanted effects of emotion on decision making can only sometimes be reduced**

Although emotion's influences on JDM are not always harmful and are sometimes even helpful, a number of strategies have examined ways to minimize the deleterious effects of

emotions on decision making. These strategies broadly take one of two forms: (a) minimizing the magnitude of the emotional response (e.g., through time delay, reappraisal, or inducing a counteracting emotional state), or (b) insulating the judgment or decision process from the emotion (e.g., by crowding out emotion, increasing awareness of misattribution, or modifying the choice architecture).

*Solutions that seek to minimize the emotional response*

*Time delay.* In theory, the simplest strategy for minimizing emotional magnitude is to let time pass before making a decision. Emotions are short-lived ([Levenson 1994](#)). Facial expressions are fleeting ([Keltner et al 2003](#)), and physiological responses quickly fade (e.g., [Mauss et al 2005](#)). The extensive literature on affective forecasting has documented the surprising power of adaptation and rationalization to bring our emotional states back toward baseline even after traumatic events (c.f. [Wilson & Gilbert 2005](#)). In certain instances, perhaps rare ones, induced anger may cause immediate changes in participants' decisions, but show no such effects when the induction and decision are separated by a 10-minute delay ([Gneezy & Imas 2014](#)). Anyone who has ever observed a family member nurse a grudge for years may question the boundary conditions of time delay. In short, although it cannot be said that time heals all wounds, research in psychology has revealed that humans revert back to baseline states over time, an effect we typically underestimate ([Gilbert 2006](#), [Loewenstein 2000](#)).

That said, there is a reason why a strategy as simple as waiting is so rarely used. The reason: delay is fundamentally antithetical to the function of many emotional states, which motivate behavioral responses to immediate adaptive concerns. Few would disagree that taking a moment to decide how to react after discovering a spouse in the arms of another would be prudent. Fewer still would actually be capable of doing so. The immediate effects of emotional

states can render us “out of control” and incapable of waiting for a neutral state to return ([Loewenstein 1996](#)).

*Suppression.* Although suppression is often touted in the popular literature (e.g., “control your anger”), research indicates that it is often counterproductive, intensifying the very emotional state one had hoped to regulate ([Wenzlaff & Wegner 2000](#)). Attempting to avoid feeling an emotion will typically reduce one’s expressive behavior but have little or no impact on one’s subjective experience of the emotion ([Gross & Levenson 1993](#)). Indeed, physiological reactions to suppression are often mixed and frequently deleterious ([Gross 2002](#), [Gross & Levenson 1993](#)). Specifically, attempts at suppression are cognitively costly, impairing memory for details of what triggered the emotion ([Richards & Gross 1999](#)). This effect has important practical implications for how individuals might best respond to unexpected accidents that trigger intense emotion.

*Reappraisal.* Reframing the meaning of stimuli that led to an emotional response, i.e., reappraisal, has consistently emerged as a superior strategy for dissipating the emotional response ([Gross 2002](#)). Reappraisal includes such behaviors as reminding oneself “it’s just a test” after receiving a poor exam grade, adopting the mindset of a nurse or medical professional to minimize the emotional impact of viewing someone’s injury, or viewing a job layoff as an opportunity to pursue long-forgotten dreams ([Gross 1998](#), [Gross 2002](#)). In contrast to suppression, reappraisal not only reduces self-reported negative feelings in response to negative events but also mitigates physiological and neural responses to those events ([Jamieson et al 2012](#), [Ochsner et al 2002](#)). Those who employ strategic reappraisal typically have more positive emotional experiences ([Gross & John 2003](#)) and show fewer incidences of psychopathology ([Aldao et al 2010](#)).

As yet, we find few studies applying reappraisal techniques to emotion effects on JDM, but one path-breaking paper suggests that this area holds promise. Halperin and colleagues ([2012](#)) examined the responses of Israelis to the recent Palestinian bid for United Nations recognition. Participants who were randomly assigned to a reappraisal training condition (compared to a control condition) showed greater support for conciliatory policies and less support for aggressive policies toward Palestinians at planned assessments both 1 week and 5 months later.

The relative efficacy of suppression and reappraisal techniques derives from the content of thoughts about emotions (i.e., don't think about this, or think about this differently). A separate literature on mood repair suggests the possibility of another route to regulation: triggering other target emotional states that “cancel out” the original state.

*The “two-state solution” (inducing a counteracting emotional state).* Theoretically, one could counteract an unwanted decision effect by inducing another emotion—one that triggers opposing tendencies in JDM. Thus, the decision process would still involve bias, but the decision outcome would not. A provocative example of this approach examined the well-known phenomenon of excessively high financial discount rates, as described in the JDM primer. Whereas sadness is known to increase excessive discount rates (Lerner et al., 2013), gratitude has now been shown to reduce such rates, even below levels one would experience in a neutral state ([DeSteno et al 2014](#)). These results suggest the unusual possibility that inducing an incidental emotion (in this case, gratitude) may reduce an existing bias. Akin to ([Loewenstein et al 2012](#)), one might use one bias to counteract another.

*Solutions that seek to insulate the decision process from the emotion*

*Increasing cognitive effort through financial incentives.* Few studies have systematically tested ways to reduce the carryover of incidental emotion; results to date suggest that such reduction will be difficult. Increasing a decision maker's attention to the decision task by having real financial outcomes is often considered a good way to reduce bias, but this intuition does not seem to be effective. Incidental emotions routinely serve as perceptual lenses even when real financial rewards are at stake (e.g., [DeSteno et al 2014](#), [Lerner et al 2013](#), [Lerner et al 2004](#), [Loewenstein et al 2001](#)).

*Crowding out emotion.* Saturating the decision maker with cognitive facts about a particular decision domain and making the domain relevant might also seem like useful ways to diminish the carryover effect. Unfortunately, neither strategy appears promising. For example, although U.S. citizens paid close attention to matters of risk and safety in the wake of 9/11, incidental emotions induced shortly after the attacks shaped citizens' global perceptions of risk and their preferences for risky courses of action ([Lerner et al 2003](#)).

*Increasing awareness of misattribution.* Based on the idea that emotion-related appraisals are automatic ([Ekman 1992](#), [Lazarus 1991](#), [LeDoux 1996](#)), the "cognitive-awareness hypothesis" ([Han et al 2007](#)) posits that appraisal tendencies will be deactivated when decision makers become more cognitively aware of their decision-making process. Schwarz and Clore ([1983](#)) pioneered this approach, discovering in a seminal study that ambient weather effects on judgments of subjective well-being disappeared when people were reminded of the weather.

In a similar vein, Lerner and colleagues ([1998](#)) showed that inducing decision makers to monitor their judgment processes in a preemptively self-critical way, via the expectation that they would need to justify their decisions to an expert audience (i.e., accountability), reduced the impact of incidental anger on punishment decisions by leading people to focus on judgment-

relevant information and dismiss incidental affect as irrelevant to the judgment. Notably, the accountable decision makers did not feel any less anger than the non-accountable decision makers; they simply used better judgment cues.

It should be noted that these examples of deactivation of emotional carryover may be more the exception than the rule, as numerous factors can thwart cognitive awareness. First, people often lack the motivation to monitor their decision-making process. Moreover, even when people are motivated, attaining accurate awareness of their decision processes is a difficult task ([for review, see Wilson & Brekke 1994](#)). For example incidental disgust led participants to get rid of their possessions even when they were directly warned to avoid this carryover effect of disgust ([Han et al 2012](#)).

Stepping back to consider broader frameworks for organizing and understanding bias in JDM, the type of incidental emotion carryover observed appears most consistent with what Wilson and Brekke ([1994](#)) refer to as “mental contamination” and Arkes ([1991](#)) calls “association based errors”—processes wherein bias (e.g., incidental emotion carryover) arises because of mental processing that is unconscious or uncontrollable. These models suggest that the best strategy for reducing such biases would be to control one’s exposure to biasing information in the first place. This is a difficult task for the decision maker. Thus, debiasing may be more effectively accomplished by altering the structure of the choice context as we describe below.

*Choice architecture.* All the strategies discussed so far are effortful and therefore unlikely to be broadly successful tactics for helping busy decision makers. By contrast, the burgeoning literature on choice architecture offers an alternative set of tactics that affects behaviors automatically without restricting choices ([Thaler & Sunstein 2008](#)). It does this by changing the

framing and structure of choices and environments in a way that relies on JDM's understanding of people's sometimes faulty decision processes to counteract more pernicious errors. For example, Thaler and Sunstein (2003) suggest that cafeterias should be organized so that the first foods consumers encounter are healthier options, thus increasing the chance that the combination of visceral hunger and mindless consumption does not derail their health goals.

The cafeteria example illustrates that one of the most powerful yet simple forms of choice architecture is setting good defaults. For example, setting a default to automatically enroll new employees in a 401(k) plan is highly effective at increasing saving rates (Madrian & Shea 2001). Setting good defaults is especially important when emotions such as happiness or anger reduce the depth of cognitive processing (Tiedens & Linton 2001). That is, when people rely on easily accessible cues and heuristic processing, a good default is especially likely to improve average decision quality.

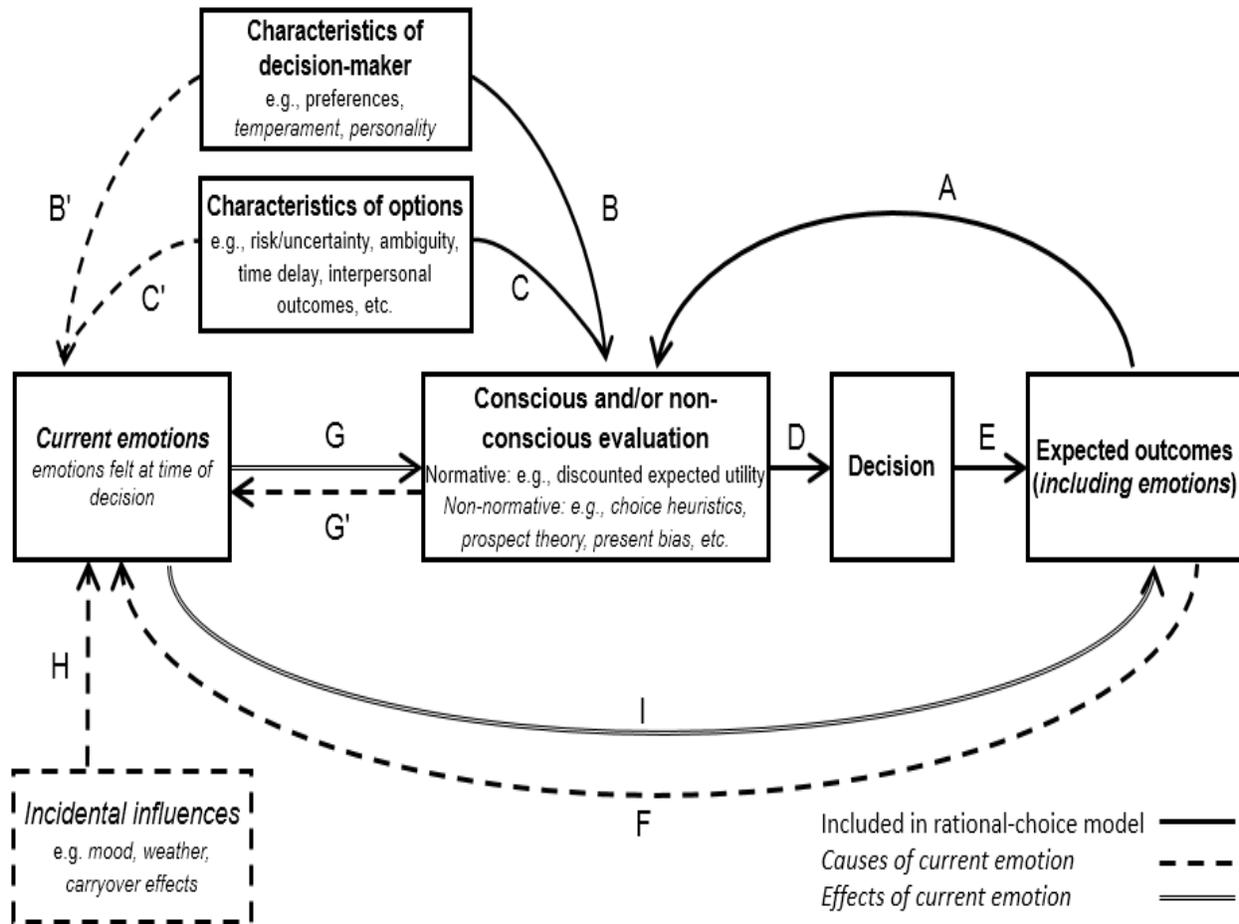
More heavy-handed choice architecture can also be utilized to help consumers delay their choices to reduce the influence of immediate emotion. For example, most U.S. states require a waiting period before individuals can buy guns, thereby reducing any immediate influences of temporary anger. Similarly, 21 U.S. states require couples to wait from 1 to 6 days to get married after receiving a marriage license.

By involving relatively unconscious influences, choice architecture provides a promising avenue for reducing the impact of unwanted emotions in a way that can actually benefit the general public. Yet, most choice architecture is designed with only cognitive decision-making processes in mind, overlooking emotion, and this omission may limit its effectiveness. The field would benefit by initiating research in the spirit of choice architecture that specifically targets unwanted emotional influences.

### III. GENERAL MODEL

Here we propose a model of decision making that attempts to account for both traditional (rational-choice) inputs and affective inputs, thus synthesizing the findings above. Specifically, we propose the *Affect Integrated Model of Decision-making* (AIMD; Figure 2), which draws inspiration from the risk-as-feelings model ([Loewenstein et al 2001, Figure 3, p. 270](#)) and Loewenstein and Lerner's ([2003, Figure 31.1, p. 621](#)) model of the determinants and consequences of emotions. For the purposes of this paper, the AIMD assumes that the decision maker faces a one-time choice between given options, without the possibility of seeking additional information or options. The model ends at the moment of decision and does not include actual (as opposed to expected) outcomes and feelings that occur as a result of the decision. Finally, although we include “visceral” influences that affect decision processes, we do not account for reflexive behavior, such as when one jumps back or freezes upon hearing an unexpected, loud blast. That is, our model attempts to explain conscious or non-conscious decision making, but not all human behavior.

**Figure 2.** Toward a general model of affective influences on decision making: The Affect Integrated Model of Decision-making (AIMD)



We begin by discussing the aspects this model shares with normative, rational-choice models of decision making such as expected utility and discounted utility theories (solid lines). Decision theory requires that the decision maker evaluate the options at hand by assessing the utility of each expected outcome for each option. These outcome utilities are combined with characteristics of the options, such as probabilities and time delays, and characteristics of the decision maker, such as risk aversion and time preferences. These factors are combined (lines A, B, and C) to form an overall evaluation of each option, and the best option is chosen (line D).

The AIMD adds emotions to this process in two ways. The first departure from rational-choice models is to allow for *constructed* rather than stable preferences ([Payne et al 1993](#), [Slovic](#)

[1995](#)), such that the utility for each decision outcome is judged by predicting one's emotional response to that outcome (line E). These predicted emotions still enter as rational inputs in the decision process (line A) and are evaluated much like utility, consistent with the concept of "somatic markers" ([Damasio 1994](#)).

The second kind of emotion in the AIMD consists of current emotions that are felt at the time of decision making, which are entirely outside the scope of conventional rational-choice models. Dashed lines and italicized text depict five potential sources of current emotions. First, characteristics of the decision maker, such as chronic anxiety or depression, can lead to a baseline level of current emotion (line B'). Second, characteristics of the choice options can directly impact current feelings (line C'). For example, ambiguous information or uncertain probabilities can directly lead to anxiety, or time delays may lead to anger. Third, predicted emotions can have an anticipatory influence on current emotions (line F). For example, someone anticipating a painful shock may feel fear now. Fourth, contemplating the decision can directly cause frustration (line G'), particularly if the options are nearly equivalent or feature difficult, possibly even taboo, tradeoffs ([Luce et al 1997](#)). Finally, while the first four sources contribute to *integral* emotions, *incidental* emotions due to normatively unrelated factors, such as emotions arising from an unrelated event, the weather, or mood, can also carry over (line H).

As described in Section II, current emotions directly influence the evaluation of the outcomes (line G) by affecting what dimensions the decision maker focuses on, whether she uses heuristic or analytic processing, and what motivational goals are active—the three tenets of the ATF. These affective influences change how rational inputs are evaluated. For example, specific emotions may increase the weight put on certain dimensions (e.g., [Lerner & Keltner 2000](#), [Lerner & Keltner 2001](#)), reduce the number of dimensions considered (e.g., [Tiedens & Linton](#)

2001), distort probabilities ([Rottenstreich & Hsee 2001](#)), increase or decrease discount rates ([DeSteno et al 2014](#), [Lerner et al 2013](#)), and set different motivational goals ([Lerner et al 2004](#), [Raghunathan & Pham 1999](#)). Current emotions can also indirectly influence decision making (line I) by changing predicted utility for possible decision outcomes ([Loewenstein et al 2003](#)).

The following example illustrates the AIMD in action, although it is not an exhaustive account of the relationships among the model's links. Imagine that someone experiencing sadness due to the death of her dog is offered an intertemporal choice: she can receive \$50 now or \$100 in 1 month. As noted above, her decision could be affected by personal characteristics; for example, if she has a high discount rate, she would be less likely to choose the delayed amount (Line B). In accordance with the ATF, her sadness, though incidental to the decision (Line H), would increase her motivation to attain rewards immediately, even at the expense of longer-term gains (Line G). However, the anticipatory influences of expected positive outcomes might mitigate her sadness by triggering a positive feeling in the future, such as excitement over the prospect of receiving money either way (Line F). Conversely, current sadness might also temper such expectations, making both outcomes seem less rewarding (Line I). Finally, frustration about waiting for a time-delayed reward (Line C') and anxiety about the size of the discrepancy between the rewards (Line G') may further color her current emotions. The ultimate decision will be predicted by the combination of her sadness-modified discount rate, her monetary goals, and how she values the potential rewards (Line D).

#### IV. CONCLUSIONS

The psychological field of affective science, originally slow to develop, is undergoing a revolutionary phase that already has begun to impact theories of decision making ([Keltner &](#)

[Lerner 2010](#), [Loewenstein & Lerner 2003](#), [Loewenstein et al 2001](#)). Major conclusions from the past 35 years of research on emotion and decision making include:

(1) Emotions constitute powerful and predictable drivers of decision making. Across different types of decisions, important regularities appear in the underlying mechanisms through which emotions influence judgment and choice. Thus, emotion effects are neither random nor epiphenomenal.

(2) Emotion effects on JDM can take the form of integral or incidental influences, with incidental emotions often producing influences that are unwanted and non-conscious.

(3) Theories that generate predictions for specific emotions appear to provide more comprehensive accounts of JDM outcomes than do theories that generate predictions for positive versus negative moods.

(4) Although emotions may influence decisions through multiple mechanisms, considerable evidence reveals that effects occur via changes in (a) content of thought, (b) depth of thought, and (c) content of implicit goals—three mechanisms summarized within the Appraisal-Tendency Framework.

(5) Whether a specific emotion ultimately improves or degrades a specific judgment or decision depends on interactions among the cognitive and motivational mechanisms triggered by each emotion (as identified in conclusion 4) and the default mechanisms that drive any given judgment or decision.

(6) Emotions are not necessarily a form of heuristic “System 1” thought. Emotions are initially elicited rapidly and can trigger swift action, consistent with “System 1.” But once activated, some emotions (e.g., sadness) can trigger systematic “System 2” thought.

Distinguishing between the cognitive consequences of an emotion-elicitation phase and an emotion-persistence phase may be useful in linking to JDM theories.

(7) When emotional influences are unwanted, it is difficult to reduce their effects through effort alone. A few strategies have been suggested, some aimed at reducing the intensity of emotion, some at reducing the use of emotion as an input to decisions, and some at counteracting an emotion-based bias with a bias in the opposite direction. We suggest that less effortful strategies, particularly choice architecture, provide the most promising avenues here.

(8) The field of emotion and decision making is growing at an accelerating rate but is far from mature. Most sub-areas contain few competing theories, while other areas remain relatively unexplored with existing studies raising as many questions as they answer. The research pathways ahead therefore contain many fundamental questions about human behavior, all ripe for study.

(9) Despite the nascent state of research on emotion and decision making, the field has accumulated enough evidence to move toward a general model of affective influences on decision making. Here we proposed the *Affect Integrated Model of Decision-making* (AIMD), building on existing models and nesting rational choice models. We hope it provides a useful framework for organizing research in the future.

Inasmuch as emotions exert causal effects on the quality of our relationships ([Ekman 2007](#), [Keltner et al 2014](#)), sleep patterns (e.g., [Harvey 2008](#)), economic choices ([Lerner et al 2004](#), [Rick & Loewenstein 2008](#)), political and policy choices ([Lerner et al 2003](#), [Small & Lerner 2008](#)), creativity ([Fredrickson 2001](#)), physical ([Taylor 2011](#)) and mental health (e.g., [Kring 2010](#)), and overall wellbeing (e.g., [Ryff & Singer 1998](#)), the theories and effects reviewed

here represent key foundations for understanding not only human decision making but also much of human behavior as a whole.

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## **DEFINITIONS LIST**

**Affect:** unspecified feelings; the superordinate umbrella of constructs involving emotion, mood, and emotion-related traits

**Mood:** diffuse feeling that persists in duration without a necessary specific triggering target. Can be integral or incidental to the decision at hand.

**Emotion:** coordinated reactions to survival-relevant event, including cognitive and biological changes, facial and/or bodily expressions, subjective feelings, and action tendencies such as approach or withdrawal.

**Integral affect:** feelings arising from decision at hand, e.g., fear of losing money when deciding between investments. Normatively defensible input to JDM.

**Incidental affect:** feelings at the time of decision not normatively relevant for deciding, e.g., fear about giving a speech when deciding between investments.

**Cognitive appraisal:** cognitive “meaning-making” that leads to emotions, usually along dimensions of certainty, pleasantness, attentional activity, control, anticipated effort, and self-other responsibility

**Appraisal theme:** each emotion’s macro-level summary of specific harms/benefits that may arise in the environment, which influence specific course of action.

**Appraisal tendency:** From the ATF, a hypothesized mechanism through which emotions activate a cognitive and motivational predisposition to appraise future events according to appraisal dimensions that triggered the emotion (emotion-to-cognition).

**Bounded Rationality:** the idea that decision making deviates from rationality due to human limitations in cognition capability and willpower

**Bias:** Systematic deviation from rational JDM

**Intertemporal Choice:** Decisions involving tradeoffs among costs and benefits occurring at different times

**Discount Rate:** How much less future utility is worth relative to immediate utility

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