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Moving beyond categorization to understand affective influences on real world health decisions

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Abstract

This paper provides an overview of affect and health decision-making research, with a focus on identifying gaps, opportunities, and challenges to guide future research. We begin by defining common categorical distinctions of affective processes that influence health decisions: integral (i.e., related to the decision) and incidental (i.e., normatively unrelated to the decision) influences, and current (experienced in the moment) and anticipated (“cognitive representations” of future affect) affect. We then summarize key discoveries within the most common categories of affective influences on health decision making: current integral affect, current incidental affect, and anticipated integral affect. Finally, we highlight research gaps, challenges, and opportunities for future directions for research aimed at translating affective and decision science theory to improve our understanding of, and ability to intervene upon, health decision making.

1 | INTRODUCTION

Health-related behaviors are guided by several structural, environmental, social, and individual factors (Fisher et al., 2002; Ford, Zhao, Tsai, & Li, 2011; Khaw et al., 2008; Klein et al., 2014). Affective processes can underlie and/or moderate the influence of each of these factors (Ferrer, Green, & Barrett, 2015; Ferrer, Klein, Lerner, Reyna, & Keltner, 2016; Magnan, Shorey Fennell, & Brady, 2017). This paper begins by defining the affective experiences most examined within affect and health decision-making research. We then summarize key discoveries, synthesizing theoretical frameworks and discussing overlap among these, and identify theoretical and empirical research gaps. Finally, we highlight several future directions and opportunities for overcoming challenges that have hindered the translation of conceptual breakthroughs to applied health decision-making contexts.

We use “decisions” and “decision making” broadly, subsuming single-event and habitual decisions (including behavioral initiation and maintenance). We use “affective states” and “affect” as umbrella terms, referring to a variety of affectively laden psychological states, including discrete emotions (i.e., relatively fleeting states with a distinct cause—to which they may be correctly or incorrectly attributed—such as anger, fear, and happiness); mood (a more diffuse, free-floating state that is generally positive or negative); and stress (negative

affective and physiological arousal arising from a threat; Barrett, 2012; Lerner & Keltner, 2000, 2001; Lerner, Li, Valdesolo, & Kassam, 2015; Williams & Evans, 2014).¹ We also consider how individuals regulate their own and others' affect and attempt to attenuate (or amplify) affective influences on decisions (DeSteno, Gross, & Kubzansky, 2013; Ferrer, Green, & Barrett, 2015).

Affective influences are often categorized as integral versus incidental to a health decision, depending on whether the affect is normatively related to the decision (i.e., integral), versus normatively unrelated but influential nonetheless (i.e., incidental; Loewenstein & Lerner, 2003). For example, fear about the side effects of cancer treatment is integral to treatment decisions, whereas fear about an upcoming plane ride is incidental to a cancer treatment decision, but may, in some circumstances, influence the treatment decision nonetheless. Affective influences on health decisions are often further categorized as current (i.e., is experienced at the time of the decision, including anticipatory affect that is experienced in the present in anticipation of a future stimulus) versus anticipated (i.e., a "cognitive representation" of affect expected the future rather than experienced in the present; Conner, McEachan, Taylor, O'Hara, & Lawton, 2015; Loewenstein, Weber, Hsee, & Welch, 2001). For example, contemplating whether one will be diagnosed with cancer in the future can evoke currently experienced anticipatory worry, whereas expecting to feel upset over a diagnosis in the future is anticipated affect because worry is not experienced in the present, but is expected to be experienced in the future.

Much of the research on emotion and health decision making falls into one of three category combinations: current integral, current incidental, and anticipated integral. Sometimes, these distinctions are explicit, whereas in applied work, distinctions may be more implicit. For example, fear appeals may not be explicitly labeled as aimed to evoke discrete integral affect (i.e., fear), but that is indeed what they (attempt to) do (Witte & Allen, 2000). Other research targets current disgust integral to colorectal cancer screening (Kiviniemi, Jandorf, & Erwin, 2014); current positive emotions integral to eating fruits and vegetables (Walsh & Kiviniemi, 2014); current stress (Emond et al., 2016) or negative mood (Werthmann et al., 2014) that is incidental to eating decisions but influences them nonetheless; or anticipated regret integral to the future consequences of a cancer screening decision (O'Carroll, Chambers, Brownlee, Libby, & Steele, 2015). Such categorization is ubiquitous (see Magnan et al., 2017) and pragmatic in that it allows for systematic examination of various affective influences on health decisions. However, categorization may oversimplify the overlap and interplay among different affective states in the real world, a point that we return to later. Here, we organize our review by these traditional categorical combinations, not to advocate for their continued proliferation, but for the purpose of reflecting the organization of the extant literature.

¹Although phenomena such as affective attitudes (Conner, Rhodes, Morris, McEachan, & Lawton, 2011; Conner, Godin, Sheeran, & Germain, 2013; Conner et al., 2015; Lawton, Conner, & McEachan, 2009) are sometimes construed as affective influences, we consider these to be outside the scope of this review because they are largely operationalized as relatively automatic pleasant or unpleasant associations with a behavior, rather than more elaborated current affective experiences or cognitive representations of future affective experiences.

2 | LITERATURE REVIEW

2.1 | Current integral affect

Current integral affect is, arguably, the most common category of research on affect and health decisions. Sometimes, current integral affect is operationalized based on the valence (i.e., positive or negative): How does associating positive emotions with condoms influence their use (Ellis, Homish, Parks, Collins, & Kiviniemi, 2015)? How does associating negative emotions with colonoscopy screening increase uptake (Kiviniemi et al., 2014)? Other times, the operationalization centers on specific, discrete emotions: How does fear about breast cancer affect screening decisions (Consedine, Magai, Krivoshekova, Ryzewicz, & Neugut, 2004)?

Theory suggests that current integral affect—especially negatively valenced affect—should influence health-related judgments and decisions because it provides important information (Clare, Gasper, & Garvin, 2001; Peters, Lipkus, & Diefenbach, 2006; Schwarz, 2011). For example, people tend to inflate their susceptibility to health threats when the consequences are dreadful or uncontrollable because such consequences elicit negative affect (Slovic, Finucane, Peters, & MacGregor, 2004). Affect can also signal the value of behaviors themselves. For example, positive emotions linked with behaviors serve as information about these behaviors, increasing likelihood of participation (Ellis, Rajagopal, & Kiviniemi, 2018; Karlsson, 2012; Kiviniemi, 2018; Kiviniemi & Duangdao, 2009; Van Cappellen, Rice, Catalano, & Fredrickson, 2018). Indeed, creating positive affective associations by linking condom use or healthy foods to positive words and images results in healthier behavior (Ellis, Homish, et al., 2015; Walsh & Kiviniemi, 2014).

Although these examples focus on affective valence, sometimes, discrete emotions have distinct effects despite being similarly valenced (Frijda, Kuipers, & ter Schure, 1989; Keltner & Gross, 1999). Some frameworks posit that specific emotions are associated with cognitive appraisals (Lazarus, 1991; Smith & Ellsworth, 1985) and trigger action tendencies (Carver, 2006; Frijda, 1986), which facilitate predictable behavioral patterns (Lerner & Keltner, 2000, 2001; Lerner et al., 2015). For example, fear is low in certainty and control, associated with threat-related appraisals, and results in risk-reducing action tendencies. Conversely, anger is high in certainty and control and associated with transgression-related appraisal that results in aggressive or risky actions to rectify the transgression. Sadness and disgust are also negative emotions that can have opposing action tendencies, where sadness motivates reward seeking to change circumstances and mitigate loss, whereas disgust motivates disposal or avoidance.

Some research has found that discrete emotions are associated with health decisions in accordance with these cognitive appraisals and action tendencies. For example, fear of health threats can motivate risk-reducing behaviors when individuals believe they can effectively mitigate risk (Witte & Allen, 2000). Worry about health consequences, with appraisals and action tendencies similar to fear, also predicts risk-reducing behavior (Cameron & Reeve, 2006; Ferrer & Klein, 2015; Hay, Buckley, & Ostroff, 2005; Hay, McCaul, & Magnan, 2006; Janssen, Waters, van Osch, Lechner, & de Vries, 2014; Kiviniemi & Ellis, 2014; Sheeran, Harris, & Epton, 2014). For example, encouraging smokers to worry about their behavior

contributes to motivation to quit smoking (Magnan, Köblitz, Zielke, & McCaul, 2009). Priming unhealthy foods with disgust can motivate avoidance of these foods, facilitating healthier eating behavior (Legget, Cornier, Rojas, Lawful, & Tregellas, 2015). Current integral emotion can also be a barrier to healthy behaviors, in ways consistent with appraisals and action tendencies; for example, fear about cancer is associated with avoidance of cancer-related information, ostensibly because of withdrawal-related tendencies (Vrinten et al., 2018). Similarly, disgust about colorectal cancer screening has been linked to non-adherence with screening guidelines (Kiviniemi et al., 2014).

2.2 | Current incidental affect

Research on affect and health decisions commonly focuses on current “integral” affect because it has a known source, is directly and normatively relevant to health decisions, and is more intuitively targeted by health behavior change interventions. However, accumulating research suggests that current “incidental” affect can have carryover effects on health risk perceptions (Ferrer, Klein, & Graff, 2017; Waters, 2008) and decisions (Ferrer, Klein, et al., 2016) that are similar to those of integral affect.

Research on current incidental affect has most commonly focused on valence and in particular, negative mood and stress as facilitators of unhealthy behaviors including smoking, overeating, and alcohol consumption (Addicott, Gray, & Todd, 2009; Bulik, 2002; Ellis, Orom, Giovino, & Kiviniemi, 2015; Kelly, Masterman, & Young, 2011; Kiviniemi, Orom, & Giovino, 2010; Loxton, Dawe, & Cahill, 2011; Schnohr, Kristensen, Prescott, & Scharling, 2005). For example, stress and negative affect increase smoking and overeating (Emond et al., 2016; Paxton, Valois, Watkins, Huebner, & Drane, 2007; Werthmann et al., 2014). Positive mood, on the other hand, can facilitate healthier behaviors like physical activity (Emerson, Dunsiger, & Williams, 2018).

As with current integral affect, some research suggests the importance of moving beyond valence. Theory suggests that the effects of an emotion’s appraisals and action tendencies can go beyond the emotion-eliciting situation (Han, Lerner, & Keltner, 2007; Lerner & Keltner, 2000, 2001; Lerner et al., 2015), perhaps because these tendencies remain activated even after the emotional experience has ceased (Andrade & Ariely, 2009) and/or because the emotion’s source is misattributed (Forgas, 1995, 1998; Murphy & Zajonc, 1993). Thus, for example, although disgust about fecal matter may motivate individuals to avoid disgust-inducing behaviors such as colorectal cancer screening (Kiviniemi et al., 2014), such disgust could also carry over to unrelated decisions such as eating behavior (see Chan, Van Boven, Andrade, & Ariely, 2014 for an example of incidental disgust influencing eating). Incidental sadness, associated with reward seeking tendencies, can motivate unhealthy eating behavior (Garg & Lerner, 2013), whereas incidental fear may motivate actions that mitigate risk for obesity (Persky, Ferrer, & Klein, 2016a). Those experiencing incidental fear may also visually avoid health information, compared to those experiencing incidental anger (Ferrer, Stanley, et al., 2016).

However, sometimes, current incidental emotion influences behavior in ways that are not fully anticipated by existing theories. For example, under certain threatening circumstances, individuals experiencing incidental anger may actually engage in more “avoidant” behaviors.

In one virtual reality study, non-White participants who were angry created greater interpersonal distance between themselves and a White clinician than those who were fearful (Persky, Ferrer, & Klein, 2016b). Similarly, some research suggests that women may be less optimistic about risk perceptions when experiencing anger (Ferrer, Maclay, Litvak, & Lerner, 2017; Lerner, Gonzalez, Small, & Fischhoff, 2003), perhaps because women do not experience anger as high control and are therefore less likely to engage in risky behavior. These somewhat unexpected findings may be reflective of the complexity of both emotions and situations, which make it difficult to translate affective science frameworks to make straightforward predictions about real-world health decisions.

Indeed, emotions may evoke predictable effects only to the extent that they activate appraisal and action tendencies as expected and to the extent that those tendencies are focused on the situation or decision as expected. For example, although fear is expected to promote risk-mitigating action and anger to promote riskier action, many real-world decisions are ambiguous and involve complex tradeoffs in which all options carry some risk. One study found that fear can focus individuals on the health consequences of “inaction,” whereas anger can focus individuals on the health consequences of “action,” ostensibly because fear focuses individuals on the avoidance component, whereas anger on the action component (Ellis, Klein, Orehek, & Ferrer, 2018). Similarly, incidental fear may increase persuasiveness of messages about the risks of not engaging in a healthy behavior, whereas incidental anger may increase persuasiveness of messages about the benefits of engaging in a healthy behavior (Gerend & Maner, 2011; Persky et al., 2018). These examples underscore the importance of research examining individual and situational moderators of predicted associations of affect with health decisions.

Importantly, operationalizations of affect as integral or incidental should be more nuanced. Researchers often categorize affect as integral or incidental based on how they, themselves, would consider the decision, as opposed to carefully considering how others might weight various considerations. For example, some perspectives conceptualize stress and sadness as incidental to behavior like smoking and overeating because the stress or sadness was not elicited by cigarettes or food (Garg & Lerner, 2013). However, other perspectives consider these integral to the decision, in that hedonically pleasing (but unhealthy) behaviors serve as a (sometimes effective) means of emotion regulation (DeSteno et al., 2013; Ferrer, Taber, et al., 2015; O’Leary, Suri, & Gross, 2018). Indeed, some perspectives suggest that individuals labelled as “irrational” by behavior researchers may, in fact, be behaving in objectively rational ways when considering the hedonic or emotion regulatory goals they are pursuing (Kopetz & Orehek, 2015). Thus, among individuals for whom affect regulation goals are salient, stress and sadness are integral to a decision to smoke or overeat. Accordingly, research suggests that individuals who frequently engage in ineffective emotion regulation strategies (e.g., suppression) and infrequently leverage effective emotion regulation strategies (e.g., reappraisal) also engage in more unhealthy appetitive behaviors related to reward seeking (Danner, Evers, Stok, van Elburg, & de Ridder, 2012; Ellis, Prather, Grenen, & Ferrer, 2018; Ferrer, Green, Oh, Hennessy, & Dwyer, 2017; Vandewalle, Moens, Beyers, & Braet, 2016). Thus, it may be important to identify individual’s values, goals, and motives when determining whether affect is integral or incidental to a decision, as well as when

predictions about when integral and incidental affective influences would be similar or different.

2.3 | Anticipated integral affect

Health decisions are often made, in part, by considering future affective reactions to a decision and its potential consequences (Peters, Laham, Pachter, & Winship, 2014; Rhodes & Strain, 2008). A recent synthesis suggests that studies examining anticipated affect and health decisions may be even more prevalent than previously believed because research in more applied fields often examines these concepts but does not utilize affective/decision sciences terminology (Ellis et al., 2019). One recent meta-analysis suggests that anticipated emotions may be more predictive of behavior than are current emotions (Xu & Guo, 2018). Anticipated regret is generally one of the strongest predictors of health decisions (Brewer, DeFrank, & Gilkey, 2016; Sheeran et al., 2014). For example, one prospective study found that anticipated regret predicted intentions to quit smoking and completing a 24-hr quit attempt at follow-up (Janssen et al., 2014). Anticipated guilt can also facilitate healthier behaviors (Dillard & Nabi, 2006; Dillard & Peck, 2000; Giner-Sorolla, 2001).

As with current emotion, sometimes, research examines the role of generally anticipated affect, rather than focusing on specific emotions. For example, anticipated devastation at receiving genomic testing results indicating increased risk for fatal disease is associated with avoidance of genomic testing result information (Ferrer, Taber, et al., 2015). Some studies examining anticipated integral emotion have also collapsed measures of discrete emotions by valence (Nelissen, de Vet, & Zeelenberg, 2011). For example, anticipated positive and negative emotions may be associated with motivation for physical activity (Dunton & Vaughan, 2008; Helfer, Elhai, & Geers, 2014).

Importantly, most work on anticipated affect has focused on affect that is integral to the decision, highlighting an important gap in our understanding of the dynamics of the influence of affect on decisions: The extent to which individuals think about or ignore anticipated future mood or emotions unrelated to a decision is largely unknown. As stated, sometimes, affect that is considered incidental to a decision by researchers is, in fact, integral to the decision from the perspective of the decision maker (Emond et al., 2016; Paxton et al., 2007; Werthmann et al., 2014). In the case of anticipated affect, expecting to feel affect that is ostensibly unrelated to the decision can, indeed, influence decisions at times because this seemingly unrelated affect is actually related to the decision. For example, anticipating joy at a child's wedding may be perceived by others as being unrelated to a cancer treatment decision, but for the individual, the experiences may be deeply intertwined if the consequences of a cancer treatment decision will extend life, albeit with severe side effects, thereby influencing the likelihood of experiencing the anticipated joy.

In some instances, researchers might overlook such seemingly unrelated anticipated affect, or might consider it to be incidental, as in the case where a cancer treatment decision aid focuses narrowly on the immediate consequences of the treatment decision without thinking about the broader consequences for other life events that might produce affective reactions. In other instances, decision makers themselves might overlook such incidental anticipated influences, such as when they are focused so narrowly on the consequence of a decision

al., 2015; Michie et al., 2005). Despite the prevalence of theories that examine one particular category of affective influence (e.g., current integral affect), we propose the need for a more holistic approach, where researchers would decide, in a particular context and for a particular question, where there is value in directly overlaying an existing framework onto a health decision-making phenomenon and when it is important to alter, adjust, or combine components of these frameworks, or even to develop new frameworks. This more holistic approach requires interrogation of when affective influences fall into neat categories in the real world versus when they co-occur, inform one another, and overlap, that is, an understanding of when they might “blend.”

3.1 | Blending discrete affective states

The way that we define, operationalize, and measure affective states and processes allows for isolation of specific mechanisms. However, it can also make it challenging to study the effects of the interrelated and complex affective states and processes that are more reflective of both the real world and our neural processes. For example, although research sometimes focuses on discrete emotions rather than similarly valenced affective states, this categorization might not reflect how affect is experienced or influences decisions in the real world. People may sometimes (but not always) subjectively “experience” their affect as a discrete emotion state, such as when we can label an experience as anger, fear, or disgust. However, neural processes underlying emotional experience are not discrete in the brain (Barrett, 2013, 2014), and little is known about when the subjective experience of affect versus neural processes influences decisions. Additionally, even the subjective experience or perception of categorized, discrete emotions can differ from person to person and within people depending on the situation. For example, although men and women endorse traditional anger similarly after anger-inducing stimuli (Kring, 2000), women may experience that anger as qualitatively different. Specifically, studies show that women are less likely to respond with aggression and risk seeking (Ferrer, Maclay, et al., 2017; Lerner et al., 2003), perhaps because they experience anger as lower control than do men and thus, perceive their actions as less capable of changing the situation.

Emotions can also be experienced as a combination of multiple discrete emotions (Allen, Machleit, & Marine, 1988; Ersner-Hershfield, Mikels, Sullivan, & Carstensen, 2008; Larsen & McGraw, 2011; Morris & McMullen, 1994; Myrick & Oliver, 2015). These blended states may reflect discrete emotions of similar valence, such as happiness and excitement or sadness and fear, or they may reflect ambivalent emotional states comprised of both positive and negative discrete emotions (e.g., excitement and fear). Ambivalence may be particularly relevant for uniquely complex and affectively laden health decisions (Ariely & Loewenstein, 2006; DeSteno et al., 2013; Ellis & Ferrer, 2018; Ferrer, Green, & Barrett, 2015; Ferrer, Padgett, & Ellis, 2016; Sheeran et al., 2018). For example, a cancer diagnosis may elicit fear, but also anger, sadness, guilt, and stress, and it may be common for individuals to rapidly fluctuate among these, or to experience them concurrently. As such, examining discrete emotions separately may not reflect the way that emotions are experienced in health decision making. Little is known about how these blended or rapidly shifting affective states combine or override one another to influence health decisions, underscoring the need to adapt existing, and develop novel, frameworks that accommodate blended affective states, as well

as to develop methodologies for targeting and measuring blended affective states. Moreover, work is needed to understand the mechanisms driving the effects of blended emotions, such as examining the appraisal and action tendencies of blended states themselves rather than considering the appraisal and action tendencies of two concurrently experienced emotions.

3.2 | Blending integral and incidental affect

Although integral and incidental affective states are treated as distinct phenomena (Bodenhausen, 1993; Loewenstein & Lerner, 2003), it is likely that there is overlap, co-influence, and blending of these categories as well. There have been calls to examine multiple types of affective influences simultaneously (Magnan et al., 2017); however, when studies examine more than one type of influence, they tend to treat them as independent, discrete, and additive (Ferrer, Taber, et al., 2015). Little attention has been paid to the fact that these discrete categories may not reflect how individuals perceive and respond to affect in the real world and that integral and incidental affective processes may blend and co-inform each other in non-additive ways. In addition to our earlier suggestion that emotion may be labeled incidental by a researcher but perceived as integral by the decision maker, it is also possible for incidental emotion to inform or become integral emotion. This may help explain why comparisons across studies of integral and incidental affect sometimes show similar levels of influence (Lerner et al., 2003; Lerner & Keltner, 2001). Research suggests that affect is commonly used as information (Forgas, 1995, 1998; Murphy & Zajonc, 1993), so in health decision making, incidental affect (e.g., about the weather and other unrelated events; Payne, Hall, Cameron, & Bishara, 2010; Schwarz & Clore, 1983) is likely to transfer to, and mark, health decisions, thereby rendering the affect integral.

Given the presumed similarity between integral and incidental influences and because targeting incidental emotion allows for more precision and experimental control (and thus more confident inferences about causality), researchers interested in the role of integral affect on health decisions sometimes experimentally target incidental affect and assume their effects are interchangeable (Ferrer, Stanley, et al., 2016; Persky et al., 2016a). However, preliminary evidence suggests that there are some instances in which individuals are able to weight these two influences as separate and discount incidental influences (De Hooze, Breugelmans, & Zeelenberg, 2008; Ferrer & Ellis, 2019). Thus, understanding when individuals are able to make the distinction between integral and incidental affect, and what factors determine the extent to which integral and incidental affect influence health decisions similarly, is particularly important. Assumptions about the interchangeability of integral and incidental affect may be unwarranted in contexts where, and among individuals for which, integral and incidental affect diverge in their influences on health decisions.

3.3 | Blending of current and anticipated affect

Similarly, although current and anticipated affect are treated as discrete categories, it is likely that these also blend. Indeed, anticipated affect is, by definition, a cognitive representation of a future affective state, and neuroscientific evidence suggests that neural processes underlying emotion are not separable from neural processes corresponding to “cognition” (Barrett, 2013, 2014). In practice, it seems likely that current and anticipated affect are not as separable as represented in the extant health decision-making literature.

Indeed, people use their own current affective states to predict their future affective states and the affective states of others, including in medical contexts (Loewenstein, 2005). Moreover, guided imagery, narrative transportation, and emotional education processes work not just by helping people to cognitively anticipate their future selves, but also by helping them to currently experience their future selves' emotions (hopefully more accurately; Ellis, Elwyn, et al., 2018). However, despite these clear sources of blending and bleeding, current and anticipated affect are still treated as discrete phenomena within most of the affect and health decision-making literature.

3.4 | Constructing and testing “blending” emotion theories

Greater understanding of complex affective states is important for the translation of affective sciences to real-world contexts and interventions. Although this difficult task is beyond the scope of this paper, key areas requiring greater research include identifying individual- and situation-level factors that influence the extent to which different types and categories of affective experiences blend. To answer this question, it is critical to integrate knowledge across disciplines to develop new techniques to observe, measure, and manipulate types of affective influences that are actually experienced and influence health decisions. Moreover, because it may be impractical to induce or measure all of the various types of affective influences in any given decision-making context, it is important to identify which health decisions and contexts are most likely to activate particular blends of affect. To this end, it is necessary to develop hypotheses about what types of affective states influence health decisions, in what contexts, and whether the effects are favorable or unfavorable. Integrating these hypotheses into organizational frameworks may help guide empirical work. Iterative hypothesis testing using existing and novel methodologies can then help refine these frameworks.

Novel induction approaches might involve concurrently activating different types of affective influences and leveraging emerging methods and technologies to model affect the way it is experienced in the real world, such as multiphase optimization strategy (Collins, Murphy, & Strecher, 2007), ecological momentary assessment, (Shiffman, Stone, & Hufford, 2008) implicit measures (Payne, Cheng, Govorun, & Stewart, 2005), and nonverbal assessments of emotions and arousal (Atee, Hoti, Parsons, & Hughes, 2018; Herr, Bjoro, & Decker, 2006; Xu et al., 2018). New induction approaches might also involve inductions of blended affective states (rather than concurrently activated categories of affective states) and more precise measurement of such affective states. These inductions may be similar to those that are currently used to evoke “pure” categories of affect, since even traditional inductions often unintentionally evoke blended states. For example, a video induction intended to facilitate incidental current anger might induce a more blended anger–disgust state (Gross & Levenson, 1995). It is possible that standard induction videos could also facilitate mixed integral–incidental affect and mixed current–anticipated affect. Similarly, autobiographical inductions intended to induce current incidental anger might be facilitating a blended anger–fear state depending on how much power and control someone feels over the situation they describe (and its consequences). The current anger–fear also might facilitate anticipated anger–fear in the future, and the anger–fear may or may not actually be normatively incidental to the individual's decisions depending on the context and salient goals. Given

that these blended states are often evoked regardless of the experimenter's original intent, a more nuanced and precise measurement of concurrent and blended affective states might be the optimal means of enhancing our understanding of blended states and their influence on health decisions.

Similarly, we should think critically about whether our measurements are capturing what we think they are, which is particularly important given that many affective measures are developed ad hoc for a particular study, rather than extensively tested (Weidman, Steckler, & Tracy, 2017). It is also important to move beyond cross-sectional assessments of affect. For example, when we assess fear of cancer recurrence (but not a suite of affective influences, to include other emotions and mood, as well as fear of treatment side effects, and anticipated fear of potential outcomes, as well as how these unfold over time), can we conclude that fear of cancer recurrence underlies any associations we observe, or is it possible that other affective states that co-occur or blend with fear of cancer recurrence are driving the association? These types of questions are critical for a true understanding of how affect influences health decisions and to inform targeted interventions that would improve decision-making outcomes. Advancing the development of affective measures may contribute to tackling the current psychology replication crisis; part of the reason findings do not replicate may be that we are not fully modeling the complexity of affective processes or that our measures are not capturing what we intend to measure.

New measurement techniques may involve developing more complex and longitudinal self-reporting instruments. Consider the earlier example: If it is hypothesized that incidental negative mood might combine with fear of cancer recurrence to influence a treatment decision, some combination of singular or blended inductions could be employed, and a questionnaire could assess different types of negative mood, fear of cancer recurrence, and combinations of these to see whether the inductions influence the decision in systematic ways. One could also assess whether the decision maker is consciously aware of the unique or combined influences of different emotions and possible mediating or underlying mechanisms (e.g., appraisal tendencies, such as perceptions of control) using self-reports. New measurement techniques may also involve integrating self-reports—or replacing them altogether—with physiological or observational measures. For example, research on pain assessment has made strides in coding pain expression to overcome difficulties in self-report (Atee et al., 2018; Herr et al., 2006; Xu et al., 2018), and affective research might leverage these techniques or combine them with existing facial coding techniques (Cohn, Ambadar, & Ekman, 2007) to augment self-reporting of current and anticipated integral and incidental affect. Combining these measurement approaches with inductions and using longitudinal assessments has promise for generating a more comprehensive understanding of the ways that various types of co-occurring and blended affect influence health decisions.

4 | CONCLUSION

Accumulating evidence suggests that affective processes are critical determinants of health decisions. The field has made tremendous strides in developing its own theories and translating work from marketing, decision science, and behavioral economics. However, important gaps remain in how we categorize, operationalize, and measure affective states to

be more consistent with people's real-world affective experiences and health decision-making situations. A more precise, accurate, and nuanced understanding of affect and health decisions will require the development of new paradigms that incorporate different types of influences and accommodate variability across diverse populations.

Appendix

TABLE A1

	Current		Anticipated	
	Emotion	Affect	Emotion	Affect
Integral	Does worry about lung cancer facilitate smoking cessation?	Does feeling positively about condoms increase their use?	Does anticipating fear of death decrease preference for palliative care in advance care plans?	Does anticipating devastation over potential consequences of vaccination decrease influenza vaccination?
	Does disgust about colorectal cancer screening attenuate screening uptake?	Does feeling negatively about needles decrease influenza vaccination?	Does anticipating regret over being diagnosed with late-stage cancer increase cancer screening behavior?	Does anticipating embarrassment over Pap testing decrease adherence to Pap testing recommendations?
Incidental	Does sadness over a breakup increase smoking behavior?	Does stress increase smoking?	Does anticipation of happiness with one's family in the future increase advance care planning?	Does anticipating a future positive mood facilitate unhealthy eating?
	Does anger over an argument with one's supervisor increase physical activity?	Does positive mood increase physical activity?	Does anticipation of sadness over losing a loved one in the future increase smoking behavior?	Does anticipating a future negative mood facilitate exercise?

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Rebecca Ferrer, Ph.D., is a Health Scientist/Program Director at the National Cancer Institute, Division of Cancer Control and Population Sciences, Behavioral Research Program, Basic Biobehavioral and Psychological Sciences Branch. Dr. Ferrer cultivates and manages a portfolio of grants related to affective and decision science, her own program of research centers on health-related judgment and decision making. She is particularly interested in examining how affective and social processes influence health-related risk perceptions, decision making, and behavior. This program of research reflects a multidisciplinary approach, drawing from the fields of decision science, social psychology, and health psychology. Her work has focused primarily on cancer prevention behaviors such as nutrition, physical activity, and cancer screening, as well as HIV preventive behaviors such as condom use. Dr. Ferrer earned her doctorate in social psychology from the University of Connecticut in 2009, with a certificate in quantitative methods. She also holds a bachelor's degree in decision science from Carnegie Mellon University. She completed a Post-Doctoral Cancer Research and Training Award Fellowship in the Office of the Associate Director in 2011.

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