The Role of Affect Regulation in Health Behavior Change

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Abstract

Objective: This research explores the relationship between affect regulation and health behavior change through two studies. Study 1 tested whether difficulties with affect regulation are associated with lower health-related behavioral intentions. Study 2 introduces the Calibrate and Qualify Model to examine the role of cognitive reappraisal in predicting health-related intentions and behavior. We posit that reappraisal could impact health behaviors either by shaping the favorability of health-related attitudes, norms, and perceived behavioral control, thereby increasing intentions and subsequently behavior (Calibrate Route), or by serving as a moderator, such that healthful cognitions better predict intentions and behavior at high levels of cognitive reappraisal (Qualify Route). *Methods*: Study 1 was a cross-sectional study of 15 health behaviors (N = 319) that measured Reasoned Action Approach (RAA) variables and Difficulties in Emotion Regulation. Study 2 was a 3-month longitudinal study (N = 807) of 8 health-related behaviors that tested the Calibrate and Qualify Model predictions using measures of cognitive reappraisal, RAA variables, and habit. *Results*: Difficulties in Emotion Regulation, and limited access to affect regulation strategies in particular, predicted intentions to perform health behaviors (Study 1). Findings from Study 2 supported the Calibrate Route: Cognitive reappraisal predicted intentions, and the reappraisal-intention relation was mediated by RAA variables. Supporting the Qualify Route, we observed a three-way interaction between habit, reappraisal, and intention, indicating that cognitive reappraisal combined with strong intentions attenuated the influence of habit on behavior. *Conclusions*: Our research suggests that affect regulation is an important consideration for predicting and understanding health behaviors.

Keywords: Affect regulation, behavior change, health, cognitive reappraisal

Public Significance: This research demonstrates the significance of affect regulation for health behavior change. Whereas difficulties with affect regulation are associated with lower intentions and performance of health behaviors, cognitive reappraisal is related to improvements in these

outcomes. Cognitive reappraisal enhances intentional control of behavior and attenuates the influence of habit.

The Role of Affect Regulation in Health Behavior Change

Behavioral decisions are influenced by both instrumentality beliefs (e.g., exercising is good for health, over-indulging in cake is not) and the emotions (e.g., enjoyment) we expect to feel (*anticipated affect;* Fishbein & Ajzen, 2010). Baumeister et al. (2007) proposed that feelings from prior behavioral performances (*experienced affect*) inform anticipated affect, in turn motivating behavior. People can modulate anticipated affect—and thus influence health behaviors—through *affect regulation* (i.e., modifying how we experience and react to emotions; Gross, 2007). Affect regulation has been studied for stress, relationships, and psychological well-being (Amat, 2005; Gross et al., 2019; Niven et al, 2012). However, research on the role of affect regulation in health behaviors is limited (DeSteno, 2013). Some initial work shows that people with affect regulation difficulties tend to exhibit maladaptive behaviors: risky sexual behavior (Cashwell et al., 2017), substance abuse (Zareban, 2017), and disordered eating (Buckholdt et al., 2015). These studies imply that effective affect regulation strategies such as cognitive reappraisal (Webb, Miles, & Sheeran, 2002) could hold promise for health behavior change.

Affective Processes in Health Behavior Change

Affective processes have traditionally received little attention in health behavior change research. Prominent theories like the Social Cognitive Theory (Bandura, 1986), Health Belief Model (Rosenstock, 1974), and Theory of Planned Behavior (Ajzen, 1991) emphasize the role of cognitive processes in shaping behavior, but neglect affective ones (Conner, 2013). Recently, interest has grown in how *affective attitudes*—"evaluations of the target behavior based on the aggregation of anticipated affective responses" (Williams et al., 2018, p. 10)—influence

behavior. The Reasoned Action Approach (RAA; Fishbein & Ajzen, 2010) extends the TPB to distinguish affective and cognitive attitudes in modelling intentions and behavior. Affective attitudes better predict intentions than cognitive attitudes across multiple health behaviors (Lawton et al, 2009), and predict behavior when controlling for intention and perceived behavioral control (PBC; Conner et al., 2015). Changes in affective, but not cognitive, attitudes are also associated with behavior both six and ten years later (Conner & Norman, 2021). These studies suggest the potential significance of regulating one's affective states for health behaviors.

Affect Regulation and Health Behavior Change

Gratz and Roemer (2004) define affect regulation difficulties via six facets: nonacceptance of emotional responses, difficulties engaging in goal pursuit in the face of negative emotions, difficulty controlling impulses in the face of negative emotions, lack of emotional awareness, limited access to emotion regulation strategies, and lack of knowledge about the emotions being experienced. These facets are measured by the Difficulties in Emotion Regulation Scale (DERS) and predict engagement in risky behaviors such as self-harm, dangerous driving, unhealthy eating, inadequate physical activity, and poor medication adherence (Seibokaite et al., 2017; Singh & Singh, 2023). Both overall DERS and subscale scores are used to predict behavior outcomes. Gratz and Roemer (2004) observed that the *limited access to affect regulation strategies* subscale was highly correlated with affect regulation measures such as the Generalized Expectancy for Negative Mood Regulation Scale (Catanzaro & Mearns, 1990); the strategies subscale is also linked to lower health status (Saxena et al., 2011).

People's use of effective versus ineffective strategies is a central focus of the affect regulation literature. The process model of emotion regulation identifies two major strategies: cognitive reappraisal and suppression (Gross, 2002). It is well established that *suppression*

(preventing the behavioral expression of emotion) is an ineffective regulation strategy whereas reappraisal is highly effective (e.g., Webb, Miles, & Sheeran, 2012). C*ognitive reappraisal* "involves construing a potentially emotion-eliciting situation in a way that changes its emotional impact" and is measured using the reappraisal subscale of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003, p. 349). Leventhal's (1992) Common Sense Mode, proposed that cognitive reappraisal influences behavioral responses to health threats. The utility of reappraisal has been demonstrated for health behaviors. For instance, increased use of reappraisal is linked to lower rates of adolescent alcohol abuse (Laghi et al., 2019) and reduced likelihood of cigarette smoking (Faulkner et al., 2022). The existing literature thus offers important initial insights concerning the relationship between affect regulation and health behaviors. However, the underlying mechanisms of *how* affect regulation influences health behaviors remain unexplored.

The Calibrate and Qualify Model

We propose the *Calibrate and Qualify Model* to specify two pathways (see Figure 1) through which affect regulation influences health behaviors via RAA variables–cognitive and affective attitudes, injunctive and descriptive norms, PBC—and intentions. First, affect regulation can shape favorability of health-related attitudes, norms, and PBC (*Calibrate Route)*. Negative affect increases likelihood of health-risk behaviors (e.g. unhealthy eating, smoking, drinking alcohol), likely due to beliefs that these behaviors will help one feel better (Kassel et al., 2003; Schotte et al., 1990; Ostafin & Brooks, 2011; Tice et al., 2001). The use of poor regulation strategies leads to overestimation of the positive affect that accrues from substance use (Buabang et al., 2023), whereas use of reappraisal lowers expectations that substances would lead to improved mood (Fucito et al., 2010). Thus, the capacity to downregulate anticipated positive affect from unhealthy behaviors, and upregulate anticipated positive affect from healthy

behaviors, should promote healthful intentions and behaviors through increasing the favorability of health-related attitudes. The same reasoning suggests that reappraisal could enable people to better calibrate social influences on health behaviors (norms) and to regulate their confidence about, or the perceived ease of, engaging in health behaviors (PBC).

Second, affect regulation could moderate associations between cognitions and intention, and intentions and behavior (*Qualify Route*). Cognitive reappraisal alters emotional experiences by regulating the person's emotional response (Gross, 2002). Thus, it seems feasible that affect regulation could reduce the consistency between intentions and affective attitudes, but increase the predictive validity of cognitive attitudes, norms, and PBC. Affect regulation also has implications for intentional versus habitual control of behaviors. Koole et al. (2023) proposed that people who are more capable at affect regulation are more likely to succeed at intention realization because they are better able to flexibly switch between automatic behavioral tendencies and intentions. Affect regulation can also attenuate the impact of automatic influences on behavior (Hofmann et al., 2008), which suggests that use of cognitive reappraisal could not merely augment action control by intentions but also reduce habitual control of health behaviors. In sum, there are theoretical grounds for hypothesizing that people who are better at regulating their affect (i.e., exhibit less difficulty in regulating affect and greater use of cognitive reappraisal) could better translate healthful cognitions into intentions and healthful intentions into behavior, and rely less on habits in guiding future behavior.

The Present Research

We explore the role of affect regulation in healthful intentions and behavior through two studies. Study 1 uses a cross-sectional design to examine how affect regulation difficulties predict 15 health behavioral intentions. We hypothesize that difficulties in affect regulation will

be linked to lower intentions. Study 2 uses a longitudinal design to test the Calibrate and Qualify Model by examining how cognitive reappraisal predicts eight health-related behavioral intentions and behavioral performance over three months. In both studies, we measure and control for RAA variables—affective and cognitive attitudes, descriptive and injunctive norms, and PBC—that are known to predict health behaviors (see McEachan et al., 2016, for review).

Study 1: Difficulties in Emotion Regulation and Intentions to Perform 15 Health Behaviors

Study 1 examines the relationship between affect regulation difficulties and multiple health-related behavioral intentions. Previous research offered suggestive evidence in relation to a small number of health-risk behaviors (Seibokaite et al., 2017; Singh & Singh, 2023) but tests are needed for health-protective behaviors and to establish generality. Accordingly, Study 1 uses a cross-sectional design to test whether people who have difficulties regulating their affect—as measured by the DERS—exhibit lower intentions to perform 15 health-related behaviors.

Method

Participants

We recruited a total of 332 participants from Amazon Mechanical Turk (https://www.mturk.com). Thirteen participants were excluded for failing an attention check, leaving a final sample of 319 participants (54.26% Female, M_{age} = 34.99 years, SD_{age} = 11.75 years). Most of the participants identified as White or Caucasian (73.87%), 8.93% as Hispanic or Latino, 8.11% as Black or African American, 7.81% as Asian, and 1.28% other or mixed ethnicities. Approximately 7% of the sample had an annual household income less than $10,000, 52% had an income between $10,000 and $49,999, 32% had an income between $50,000 to $99,999, and 9% had an income greater than or equal to $100,000. All participants provided

informed consent and were compensated $2.00 for completing the study. The research was approved by the University of North Carolina at Chapel Hill's Institutional Review Board.

Procedure

Participants completed a questionnaire measuring their beliefs (e.g., attitudes and norms) about 15 health-related behaviors (i.e., physical activity, low-fat diet, eating fruits and vegetables, use of sunscreen, floss teeth, drinking 4 or more cups of coffee each day, using illegal drugs, taking multivitamins, exceeding speed limit when driving, drinking more than recommended daily limits of alcohol, smoking cigarettes, snacking between meals, attending annual dental checkups, weighing oneself each week, and taking prescribed medicine). These behaviors were informed by the UK government's targets for health (UK Department of Health, 2004) and behaviors previously examined in the health behavior change literature (Lawton et al., 2009). Participants also reported their intention to engage in these behaviors and completed the DERS (Gratz & Roemer, 2004). At the end of the survey, they answered demographic questions.

Measures

Affective attitude was measured with two items (e.g., "How pleasant or unpleasant would engaging in each of the behaviors below be for you?"; *1 = pleasant* to *5 = unpleasant)*, mean r = 0.77. *Cognitive attitude* was measured with two items (e.g., "How harmful or beneficial would engaging in each of the behaviors below be for you?"; *1 = harmful* to *5 = beneficial*), mean r = 0.61. Participants also reported behavior-specific subjective norms (i.e., "Most people who are important to me think that I should [engage in this behavior]"; *1 = definitely yes* to *5 = definitely no*) and descriptive norms (i.e., "How many of the people who are important to you perform these behaviors themselves?"; *1 = None* to *7 = All*). *Intentions* were measured on a two-item scale (e.g., "I intend to [engage in this behavior]"; *1 = definitely yes* to *5 = definitely no*), mean r

= 0.75. Difficulties in emotion regulation was operationalized with the Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004), and we calculated a sum score for the overall scale and the six individual subscales. All items were measured on a five-point Likert Scale (*1 = almost always* to *5 = almost never*): *clarity* (e.g., "I have difficulty making sense out of my feelings"), *nonacceptance* (e.g., "When I'm upset, I feel guilty for feeling that way"), *goals* (e.g., "When I'm upset, I have difficulty concentrating"), *impulse* (e.g., "When I'm upset, I lose control over my behaviors"), *awareness* (e.g., "I am attentive to my feelings"), and *strategies* (e.g., "When I'm upset, I believe that there is nothing I can do to make myself feel better").

Analysis

The data was characterized by a two-level structure with attitudes, norms, and behavioral intention at Level 1 and participants' overall DERS and subscale scores at Level 2. Level 1 (within-subjects) predictors were group-mean centered; Level 2 (between-subjects) predictors were grand-mean centered. Multilevel models were conducted using the *lme4* package in R (Bates et al., 2015), and assessed patterns across behaviors. Behavioral intention was regressed on both Level 1 and Level 2 variables.

Results

Multilevel models tested the impact of DERS and RAA variables on behavioral intention. Overall difficulties in emotion regulation were negatively associated with intentions (b = -0.004, SE = 0.01, $p < .01$). Because DERS subscales show differential patterns of relations to outcomes (Gratz & Roemer, 2004), we entered subscale scores and RAA variables in a second model to determine which subscales drove the effect. Table S1 in the Supplemental Materials shows the correlations between the variables. Affective attitudes (b = 0.46, SE = 0.01, $p < 0.001$), cognitive attitudes (b = 0.27, SE = 0.01, $p < 0.001$), descriptive norms (b = 0.25, SE = 0.01, $p < 0.001$),

descriptive norms (b = 0.25, SE = 0.01, p < 0.001), and injunctive norms (b = 0.13, SE = 0.01, p < 0.001) significantly predicted intentions (see Table 2). Only the *strategies* subscale met conventional statistical significance (b = -0.03, SE = 0.01, p < .01), indicating that limited access to regulation strategies reduces behavioral intentions, even controlling for RAA variables.

Discussion

Findings from Study 1 showed that that difficulties in affect regulation—limited access to regulation strategies in particular—predicted weaker intentions to perform a range of health-related behaviors. This is consistent with the existing literature that affect regulation difficulties tend to be associated with unhealthy behaviors (Cashwell et al., 2017; Buckholdt et al., 2015; Seibokaite et al., 2017; Zareban, 2017). The implication is that greater use of effective strategies for regulating affect should positively relate to intentions and behavior. However, as behavior was not measured in this cross-sectional study, a longitudinal study of multiple behaviors that traces how effective affect regulation strategies influence intention and behavior remains to be undertaken. Another limitation of Study 1 is that PBC was not measured due to a coding error, and this limitation is addressed in our second study. To capture reflexive as well as reflective influences on behavior, Study 2 also includes a measure of habit.

Study 2: Reappraisal, Intentions, and Longitudinal Analysis of Eight Health Behaviors

Study 2 is a longitudinal analysis that assesses cognitions, intentions, habits, and behavioral performance for eight health behaviors across a three-month period. Study 1 showed that lack of access to affect regulation strategies negatively impacted intentions. Thus, in Study 2, we examine whether cognitive reappraisal—a particularly effective regulation strategy (Webb et al., 2012)—promotes health-related intentions and behaviors. We evaluate the predictive validity of reappraisal in relation to well-established predictors of behavior: the RAA and habit.

Whereas the RAA characterizes the reasoned processes underlying behavior, habit theory concerns automatic processes that shape action (Ersche et al., 2016; Wood et al., 2012). Assessing reappraisal alongside RAA variables and habit enables us to determine if reappraisal predicts intentions and behavior over and above these factors. The Calibrate and Qualify Model is used as a lens to explore the mechanisms by which reappraisal influences these outcomes.

Method

Participants

We recruited 908 UK participants via Prolific Academic (https://www.prolific.com), an online survey platform that generates high-quality data (Douglas et al., 2023). Participants who failed one of the two attention checks were excluded from the analyses, yielding a final sample of 807 participants (68.5% Female, M_{age} = 33.75, SD_{age} = 9.37). The majority (94.3%) of the sample was Caucasian, 2.11% was African, 2.73% was Latino/Hispanic, 5.20% was Asian, 2.85% was Mixed Race, and 4.09% other ethnicities. This study was part of a larger project concerning the relationship between cognitions and health behaviors, and the moderating role of individual differences (e.g., conscientiousness, self-control, regulatory focus, rational versus experiential thinking); only items relevant to the present research are described below. The research approved by the University of Leeds Research Ethics Committee (#17-0230) and all participants provided informed consent.

Procedure

Study 2 was a longitudinal study with two time-points spaced three months apart. At Time 1, participants answered questions about their habits and cognitions in relation to eight health behaviors, and their current performance of those behaviors (i.e., physical activity, flossing, eating fruits and vegetables, eating low-fat diet, avoid snacking, avoid drinking more

than recommended weekly limit of alcohol, avoid continuous sitting, and avoid eating more than two portions of red meat per week). In the Time 1 questionnaire, participants first answered demographic questions (e.g., age, gender, ethnicity, and income). They then responded to five-point response scale questions that measured behavior-specific cognitions (i.e., RAA variables), habit, and intention. Participants also reported their use of cognitive reappraisal in daily life. The rest of the survey contained items pertaining to conscientiousness, self-control, health regulatory focus, and rational versus experiential thinking. Only variables relevant to the current research question are reported in this paper. The research was exploratory and unfunded; the full survey is available upon request. Three months later, at Time 2, participants reported their engagement in the behaviors over the past three months. Participants received £7.80 for completing the entire study.

Measures

Affective attitude was measured with two items (e.g., "Eating a low-fat diet each week over the next three months would be…"; *1 = not enjoyable/unpleasant* to *5 = enjoyable/pleasant*, mean r = 0.85). *Cognitive attitude* was measured with two items (e.g., "Eating a low-fat diet each week over the next three months would be…"; *1 = worthwhile/important – pointless/unimportant,* mean r = 0.74*)*. *Descriptive norms* (i.e., "Most people important to me think that … eat a low-fat diet each week over the next three months"; *1 = I should to 5 = I should not*) and *injunctive norms* (i.e., "I think most people who are important to me will eat a low-fat diet each week over the next three months"; *1* = strongly disagree to *5 = strongly agree*) were measured with single items. *Perceived behavioral control (PBC)* was measured with two items corresponding to self-efficacy (i.e., "If it were entirely up to me, I am confident that I could eat a low-fat diet each week over the next three months"; *1 = strongly*

disagree to *5 = strongly agree*) and perceived control (i.e., "How much control do you believe you have over eating a low-fat diet each week over the next three months"; *1 = no control* to *5 = complete control*), r = 0.40. *Habit* was measured by two items (Wood, Quinn, & Kashy, 2002) and calculated by multiplying performance frequency (e.g., "I eat a low-fat diet each week,") by context stability ("Is eating a low-fat diet each week something that you would do at the same times and in the same places each time?"; *1 = definitely no* to *5 = definitely yes*). *Intention* was also measured on a two-item scale (e.g., "I intend to eat a low-fat diet each week over the next three months"; *1 = strongly disagree* to *5 = strongly agree*), r = 0.84. *Reappraisal* was measured using the six-item reappraisal subscale of the ERQ (e.g., "When I want to feel more positive emotion, I change the way I'm thinking about the situation," "When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm"; *1 = strongly disagree* to *7 = strongly agree*), $\alpha = 0.89$ that has been widely used and extensively validated (e.g., Preece et al., 1999). Finally, at Time 2, *behavioral performance* was measured using a three-item scale for each behavior (e.g., "How frequently did you eat a low-fat diet each week over the past three months?"; *1 = never* to *5 = always*), mean $\alpha = 0.96$.

Analysis

The data was characterized by a two-level structure with attitudes, norms, PBC, habit, and behavioral intentions at Level 1 and cognitive reappraisal at Level 2. Level 1 (within-subjects) predictors were group-mean centered. Level 2 (between-subjects) predictors were grand-mean centered. We conducted two multilevel models using the *lme4* package in R (Bates et al., 2015), assessing patterns across behaviors. Behavioral intention, the outcome of the first model, was regressed on RAA variables, habit, and reappraisal. Behavioral performance at follow-up, the outcome of the second model, was regressed on RAA variables, habit, and

behavioral intentions at baseline (which was group-mean centered for this analysis). We tested the Calibrate Route of the Calibrate and Qualify Model through mediation: RAA variables were tested as mediators of the reappraisal-intention and reappraisal-behavior relationships using the *lavaan* package. The Qualify Route was examined through moderation: two-way interaction terms between RAA variables and reappraisal were included in the model as predictors of intention and behavior. Significant interactions were decomposed via simple slopes analyses.

Results

Direct Relationships Between Predictors, Intention, and Behavior

Bivariate relationships between reappraisal, RAA variables, habit, intent, and behavior were explored in a correlation matrix (see Table S2 in Supplemental Materials). We fitted two multilevel models. In the model for intentions, reappraisal significantly predicted intentions above and beyond RAA variables (b = 0.20, SE = 0.02, $p < 0.001$). Greater use of cognitive reappraisal was associated with higher intentions to engage in health behaviors. All RAA variables—except cognitive attitudes—and habit positively predicted intentions (see Table 2).

The second model was fitted with behavior at Time 2 as the outcome. Again, reappraisal had a significant direct effect on behavior (b = 0.12, SE = 0.02, $p < 0.001$) — greater use of reappraisal was associated with increased performance of health behaviors at follow-up. Baseline intentions also predicted performance (b = 0.14, SE = 0.01, $p < 0.001$). Descriptive norms (b = 0.12, SE = 0.01), injunctive norms (b = 0.04, SE = 0.01), PBC (b = 0.07, SE = 0.02) and habit (b = 0.08, SE = 0.02) each positively predicted behavior. Affective attitudes and cognitive attitudes did not predict behavior, p = 0.12 and p = 0.20, respectively.

Calibrating Intentions: Reappraisal-Cognition-Intention Relations

As reappraisal directly predicted intentions, we followed up with parallel mediation analyses test whether RAA variables mediate the reappraisal-intention relationship. Results revealed the relationship was mediated by affective attitudes ($b = 0.05$, SE = 0.005, $p < 0.001$), descriptive norms ($b = 0.008$, SE = 0.002, $p < 0.001$), injunctive norms ($b = 0.003$, SE = 0.001, $p = 0.02$), PBC ($b = 0.063$, SE = 0.006, $p < 0.001$), and habit ($b = 0.07$, SE = 0.009, $p < 0.001$). Cognitive attitudes did not emerge as a significant mediator, $p = 0.08$. These findings support the Calibrate Route: RAA cognitions mediated the relationship between reappraisal and intention.

Qualifying Intentions: Moderation of Cognition-Intention Relations

Table 1 shows the regression coefficients of predictors and cross-level moderations. We did not find that reappraisal qualifies the relationship between cognitions and health intentions. Cross-level interactions for reappraisal and affective attitudes ($b < .001$, $p = 0.77$), cognitive attitudes ($b = 0.02$, $p = 0.28$), descriptive norms ($b < .001$, $p = 0.84$), injunctive norms ($b < .001$, $p = 0.87$), PBC ($b < .001$, $p = 0.74$), and habit ($b < .001$, $p = 0.56$) were not significant.

Calibrating Health Behaviors: Reappraisal – Cognition – Behavior Relations

Parallel mediation analyses indicated that behavioral intentions significantly mediated the reappraisal-behavior relation ($b = 0.02$, SE = 0.004, $p < 0.001$). Significant mediation effects were also found for affective attitudes ($b = 0.006$, SE = 0.002, $p = 0.01$), descriptive norms ($b = 0.012$, SE = 0.003, $p < 0.001$), injunctive norms ($b = 0.004$, SE = 0.002, $p = 0.01$), PBC ($b = 0.005$, $SE = 0.007$, $p = 0.04$), and habit ($b = 0.007$, SE = 0.002, $p = 0.003$). Cognitive attitudes was not a significant mediator, $p = 0.654$. These findings support the Calibrate Route: cognitions mediate the relationship between reappraisal and behavior.

Qualifying Health Behaviors: Moderation of Cognition-Behavior Relations

There was a significant cross-level interaction between reappraisal and injunctive norms for behavior ($b = 0.03$, $SE = 0.01$, $p < 0.01$). Simple slopes analyses showed that injunctive norms did not predict behavior at low levels of reappraisal ($b = 0.01$, SE = 0.02, $p = 0.51$). However, when reappraisal levels were high, injunctive norms positively predicted behavioral engagement ($b = 0.08$, $SE = 0.02$, $p < 0.001$). This indicates that reappraisal qualifies the relationship between injunctive norms and health behaviors; greater use of reappraisal increases the relationship strength between injunctive norms and behavior. All other two-way interactions were not significant. Regression coefficients and the cross-level interaction are shown in Table 2.

We also explored how reappraisal interacts with intentions and habit to shape behavior. Reappraisal, intentions, and habit were included in a model to predict behavior. The results did not yield the expected two-way interactions. However, the three-way interaction between reappraisal, intentions, and habit was significant ($b = -0.01$, SE = 0.01, $p = 0.04$) (see Table 3). Simple slopes analyses showed that greater use of reappraisal combined with strong intentions to act attenuates the impact of habit on behavior ($b = 0.06$, SE = 0.03, $p < 0.03$) compared to lower use of reappraisal and weak intentions ($b = 0.11$, SE = 0.03, $p < 0.001$) (see Figure 2).

Discussion

Study 2 evaluated the longitudinal influence of reappraisal on health intentions and behavior. Reappraisal was positively associated with both outcomes. Results also supported the Calibrate and Qualify Model. Via the Calibrate Route, reappraisal shaped behavior-specific affective attitudes, descriptive norms, injunctive norms, and PBC. Those who engaged more in reappraisal were more likely to believe that performing the behavior would have positive affective consequences, perceive more performance of the behavior in their social network, perceive greater social pressure to act, and perceive more behavioral control. This leads to

stronger intentions and increased performance. Via the Qualify Route, reappraisal moderated the relationship between injunctive norms and behavior: behavior was more strongly aligned with social pressure to act at higher levels of reappraisal. Importantly, reappraisal altered intentional versus habitual control of health behaviors. Greater reappraisal attenuated the impact of habit on the intention-behavior relationship, enabling people to regulate habitual influence.

General Discussion

This research explored the link between affect regulation and health behavior change. Study 1 showed that difficulties in affect regulation predicted lower intentions to perform 15 health-related behaviors, above and beyond RAA variables. This supports evidence that poor affect regulation is associated with maladaptive health behaviors (Cashwell et al., 2017; Buckholdt et al., 2015; Seibokaite et al., 2017). Additionally, this relationship was driven by limited access to regulation strategies; people who lacked means to regulate affect had lower intentions to perform health behaviors. These findings pointed to the potential significance of affect regulation strategies in promoting health-related intentions and behavior.

Accordingly, Study 2 investigated the role of cognitive reappraisal in predicting intentions and behavior over three months using the Calibrate and Qualify Model. Results showed that greater use of reappraisal predicted intentions and behavior at follow-up. We then explored two pathways through which reappraisal could impact these outcomes. Through the Calibrate Route, reappraisal influences intentions and behavior by positively shaping behavior-specific cognitions. Through the Qualify Route, reappraisal strengthens the relationship between injunctive norms and behavior, and modifies the influence of habits versus intentions in predicting future behavior.

We observed that habitual control of health behaviors is not inevitable. When people both strongly intend to act and use cognitive reappraisal to regulate affect, the influence of habit diminishes. This finding is important because relatively little research has identified factors that serve to reduce habitual control—and enhance intentional control—of behavior (Sheeran & Conner, 2019). Koole et al. (2023) offered a useful theoretical analysis of this issue that distinguishes between three modes of action control: automatic (characterized by habits energized by positive affect), *static* (characterized by analytical thinking, intention maintenance, and inhibition of positive affect), and *dynamic* (characterized by flexible switching between automatic and static modes). According to Koole et al. (2023, p. 10), "a person who is capable of self-regulating positive affect can flexibly switch between intuitive [automatic] behavior control and intention memory [controlled behavior]." The present findings appear to be consistent with this analysis. Reappraisal enables individuals to downregulate negative affect and upregulate positive affect (Gross, 2002). This ability to dynamically modulate affect allows people to adjust their affective state based on situational demands, such as increasing positive affect to enact non-habitual behaviors (Koole & Kuhl, 2007). Furthermore, reappraisal facilitates conscious deliberation (e.g., analytical thinking), and thus can override automatic habitual responses.

This research contributes to the growing body of literature that investigates the role of affective processes in health behavior change. While it is recognized that affect can influence behavior, few studies have bridged the literatures on anticipated affect, health behavior change, and affect regulation (DeSteno, 2013; Sheeran et al., 2018). Our proposed Calibrate and Qualify Model offers a novel conceptual framework for understanding mechanisms through which affect regulation influences intentions and behavior. While the RAA highlights the importance of anticipated affect in determining health-related intentions and behavior, the model does not

address how affect regulation relates to behavioral outcomes. In the Calibrate and Qualify Model, we integrate affect regulation with the RAA to demonstrate that affect regulation shapes intentions and behavior through two pathways. The Calibrate Route involves the direct influence of affect regulation on behavior-specific cognitions, while the Qualify Route involves moderation of cognition-behavior relations by affect regulation. That affect regulation indirectly influences intentions and behavior through these pathways is consistent with research showing that affect directly impacts cognitions, but not behavior (Schwarz & Clore, 2007). Using affect regulation strategies could help people change the valence or influence of health cognitions, thereby promoting healthful intentions and behavior.

Our findings have important practical implications. Promoting affect regulation through strategies like reappraisal could foster health behavior change. One way to do so is encouraging people to form implementation intentions to use reappraisal to regulate affective responses to behavior (e.g., “If I feel anxious about exercising, then I will think about how exercising can improve my mood.”). Implementation intentions facilitate intention realization by specifying situational cues that trigger instrumental responses (Gollwitzer & Sheeran, 2006), and have proved effective in regulating affect (see Webb, Schweiger Gallo et al., 2012, for meta-analysis). Identifying affective responses situational cues and reappraisal as the instrumental response could help better regulate affect and enhance health-related intentions and behavior (Sheeran et al., 2018). Reappraisal interventions have been effective in reducing alcohol consumption (Rodriguez et al., 2019) and smoking and food cravings (Szasz et al., 2012; Yokum & Stice, 2013). These studies and our findings suggest that teaching affect regulation via reappraisal could help address affective processes that undermine health-related intentions and behavior.

Several limitations should be noted. First, this preliminary work relies on observational data. Experiments that manipulate reappraisal are necessary to complement these findings. Second, we used online convenience samples. Given that affect regulation strategy effectiveness varies across cultures (Ramzan & Amjad, 2017), future studies should recruit more diverse samples to test effects of reappraisal on intentions and behavior. Third, behavior was self-reported, which can be subject to social desirability and recall biases. Future studies should use objective measures of behavior (e.g., fitness trackers) for more valid measures of action. Finally, Study 2 focused only on reappraisal due to its proven effectiveness (Webb, Miles, & Sheeran, 2012). More research is needed to examine the effectiveness of other affect regulation strategies.

Despite these limitations, this work sets important foundations for future research and suggests new directions to explore. For instance, situation selection and modification are two affect regulation strategies that warrant investigation. Situation selection involves choosing situations based on anticipated affect (e.g., playing team sports with a friendship group). This strategy is especially effective for people who have difficulties with affect regulation (Webb et al., 2017), which as Study 1 showed, contributes to weaker health intentions and behavior. Meanwhile, situation modification involves altering the situation to change one's affective experience (Gross, 1998), such as modifying the situation to be more enjoyable (e.g., watching a movie while on the treadmill). Future research could thus consider how situation selection and modification relate to intentions and behavior. Future work should also expand the repertoire of health behaviors (e.g., smoking, cancer screening, and mental health maintenance) to evaluate the broader applicability of affect regulation strategies to health behavior change.

In summary, our research offers new evidence about the relationship between affect regulation and health behavior change. Although contemporary theories (e.g., Steven et al.,

2020) increasingly acknowledge the crucial role of affect—especially affective beliefs—in promoting behavior change, efforts at regulating affective responses to health actions have received little attention. We find that people who have difficulties with affect regulation have lower intentions to perform health behaviors, due to their limited access to regulation strategies. We also find that cognitive reappraisal is effective for bolstering intentions and behavior: Reappraisal calibrates cognitions towards health, enhances the influence of injunctive norms, and helps reduce habitual influence. These findings thus underscore the potential of affect regulation for health behavior change and signals the value of further research geared at realizing that potential.

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Table 1. Study 1 Multilevel regression of health-related intentions on Difficulties in Emotion Regulation Subscales (DERS) and Reasoned Action Approach variables

Predictors	***B***	***SE***	***p***
Intercept	*3.92*	*0.04*	*< .001*
DERS Awareness	-0.02	0.01	0.051
DERS Strategies	-0.03	0.01	0.003
DERS Clarity	0.01	0.01	0.376
DERS Goals	-0.02	0.01	0.105
DERS Nonacceptance	0.01	0.01	0.189
DERS Impulse	0.02	0.01	0.067
Affective attitudes	0.46	0.01	< .001
Cognitive attitudes	0.27	0.01	< .001
Descriptive norms	0.25	0.01	< .001
Injunctive norms	0.13	0.01	< .001

N of participants = 318, *N* of observations = 4,770

Note: The Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004) is a measure of affect regulation difficulties, and is comprised of six subscales: awareness, strategies, clarity, goals, nonacceptance, and impulse.

Table 2. Study 2 Multilevel regression of health behavior intention on predictor variables

Predictors	***B***	***SE***	***p***
		Intention	
Intercept	*3.22*	*0.03*	*< .001*
Reappraisal	0.20	0.02	< .001
Affective attitudes	0.23	0.04	< .001
Cognitive attitudes	0.03	0.04	.371
Descriptive norms	0.05	0.01	< .001
Injunctive norms	0.08	0.01	< .001
Perceived Behavioral Control	0.37	0.01	< .001
Habit	0.47	0.01	< .001
		Behavior	
Intercept	0.01	*0.02*	*< .001*
Reappraisal	0.12	0.02	< .001
Intention	0.14	0.01	< .001
Affective attitudes	0.02	0.04	0.117
Cognitive attitudes	0.04	0.03	0.195
Descriptive norms	0.12	0.01	< .001
Injunctive norms	0.04	0.01	< .001
Perceived Behavioral Control	0.07	0.02	< .001
Habit	0.08	0.02	< .001
Cross-level interactions			
Reappraisal × Injunctive norms	0.03	0.01	0.013

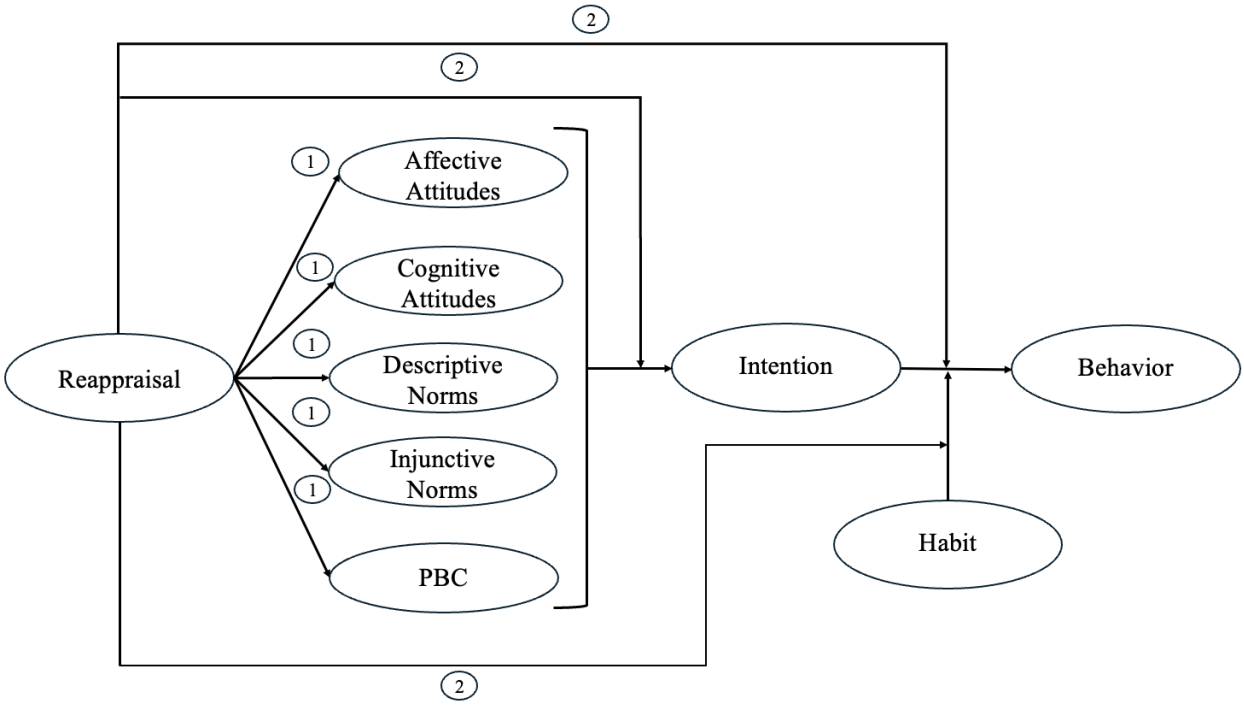
Note. For intention, *N* of participants = 793, *N* of observations = 6,328. For behavior, *N* of participants = 572, *N* of observations = 4,561

Table 3. Multilevel Regression of Behavior on Reappraisal, Intent, and Habit (Study 2)

Predictors	***B***	***SE***	***p***
Intercept	*0.02*	*0.02*	*0.426*
Reappraisal	0.13	0.02	< .001
Intention	0.19	0.01	< .001
Habit	0.12	0.02	< .001
Reappraisal × Intention	-0.01	0.01	0.695
Reappraisal × Habit	-0.01	0.01	0.372
Intention × Habit	-0.01	0.01	0.274
Reappraisal × Intention × Habit	-0.01	0.01	0.040

Note. N of participants = 574, *N* of observations = 4,592

Figure 1. Pathways in the Calibrate and Qualify Model



Notes. Pathway 1 represents the Calibrate Route, and Pathway 2 represents the Qualify Route.

Figure 2. Three-Way Interaction Between Reappraisal, Habit, and Intention in Predicting Behavior