Emotion Regulation Strategies in Daily Life: Examining Contextual Variability in the Process of Emotion Regulation

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Statement of Authorship and Sources

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

No parts of this thesis have been submitted towards the award of any other degree or diploma in any other tertiary institution.

No other person's work has been used without due acknowledgment in the main text of the thesis.

All research procedures reported in the thesis received the approval of the relevant Ethics/Safety Committees.

I received suggestions on copy editing from James Dixon, who is professionally accredited by the Institute of Professional Editors Limited, and generally acted on his advice.

Signed...   Date.......................................

Statement of Appreciation

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I would like to also thank my wife, Maria, for her constant support and encouragement, and all three of my children for their love and motivating influence throughout my studies.

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Abstract

Contemporary theories of emotional well-being emphasize context as being inextricably linked to the process of emotion regulation. Empirical studies of these processes have generally relied upon single-occasion measurement approaches, but such methods are limited in their capacity to uncover regulatory processes that are inherently contextual and dynamic and that unfold over discrete time-periods. In this thesis, I address this gap using a daily process approach in three empirical studies to examine contextual variability in the usefulness of three popular emotion regulation strategies: mindfulness, cognitive reappraisal, and emotion suppression.

In Study 1, I establish a daily process approach as relevant to studying emotion regulation, providing evidence for the notion, central to contextual approaches to emotion regulation that the utility of regulatory strategies depends on the person using the strategy. The study examines within-day and spillover (lagged) effects, providing evidence of the relationship between regulatory strategies and daily well-being within days and from one day to the next. This study explores the issue of directionality of effects and the possibility of reciprocal relations between daily strategy use and affect. Finally, this study uncovers age as an important moderator of the effect of one strategy—cognitive reappraisal—on the experience of daily negative affect.

Study 2 examines contextual variability in emotion regulation at a macro level of environmental context, testing a hypothesis that the utility of the three regulatory strategies depends on how much people using the strategies experience psychological need satisfaction in their lives. The hypothesis is supported for one strategy: cognitive reappraisal. Cognitive reappraisal is associated with daily benefits to well-being for those not experiencing need satisfaction, and reductions in daily well-being for those using the strategy while getting their

needs met. Further, this interaction is mostly explained by the need for relatedness, indicating a special relationship between the strategy and people's social world.

Study 3 examines the role of daily positive and negative events in the process of emotion regulation in a more proximal (micro) context. Specifically, it examines daily event "context" effects using a series of multilevel moderation models. Two reliable context effects were found. First, cognitive reappraisal was found to be related to *decreased* negative affect on days with more negative performance events, and *increased* negative affect when used on days with less negative performance events. Secondly, emotion suppression was associated with *decreases* in positive affect, but only on days in which there were more frequent positive social events. Several more tentative interactions are reported to inform future research possibilities.

Results and future research directions, including practical considerations, are discussed in relation to prominent theories of well-being and current contextual theories of emotion regulation. Overall, this thesis provides evidence in support of a contextual approach to emotion regulation and validates a daily process approach in studying the contexts that influence this important human process.

Chapter 1: Introduction and Overview

Darwin (1890) described the emotions of humans as the most expressive and complex of all animals' emotions. Emotions and their regulation are ubiquitous in the experience of daily life. While there are undoubtedly benefits to a life colored by emotions and "feelings", problems in the *healthy* regulation of emotions appear also to be fundamental to human suffering. Emotion regulation problems are increasingly thought to be central to the etiology, maintenance, or both of most if not all psychological problems, including mood disorders (Ehring, Tuschen-Caffier, Schnülle, Fischer, & Gross, 2010), anxiety disorders (Amstadter, 2008), eating disorders (Harrison, Sullivan, Tchanturia, & Treasure, 2010), impulse-control disorders (Williams, Grisham, Erskine, & Cassedy, 2012), suicidal behavior (Pisani et al., 2013), self-harm behavior (Mikolajczak, Petrides, & Hurry, 2009), criminal behavior (Roberton, Daffern, & Bucks, 2012), personality disorders (Linehan, 1993), and even psychosis-spectrum disorders (Henry, Rendell, Green, McDonald, & O'Donnell, 2008). Further, the development of healthy means of regulating emotions appears to be a key determinant of child and adolescent well-being (Cicchetti, Ackerman, & Izard, 1995).

Given the relevance of emotion regulation (ER) processes across a large range of problems, and the social and economic challenges presented by the current high prevalence rates of mental ill-health reported in Western countries (Kessler et al., 2009), research interest pertaining to ER processes has enjoyed exponential growth over the past decade (Figure 1.1).
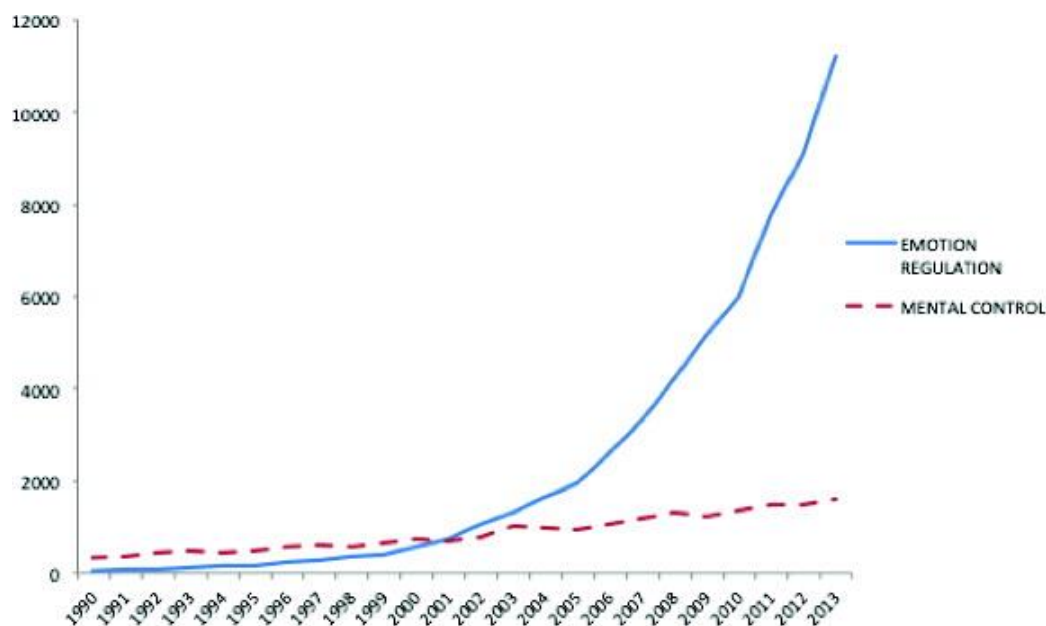
Figure 1.1. Number of publications containing the exact phrase "emotion regulation" versus "mental control" in *Google Scholar* each year from 1990 to 2013

Source: Taken with permission from J. J. Gross, "Emotion regulation: Current status and future prospects", *Psychological Inquiry*, 2015, *26*(1), p. 2. Copyright 2015 by Taylor & Francis.

Despite this growth in interest, it has become apparent that scientific progress in understanding the process of ER has been seriously limited by two related issues. First, ER research to date has been dominated by the standard methodological approaches (experiments, trait surveys) frequently employed in empirical psychology (Nezlek, 2007; Aldao, 2013). While those approaches have uncovered many insights into the nature of ER processes as psychological traits, they have been unable to advance our knowledge of ER processes as they are experienced in people's lives. ER is a dynamic and contextual process in which multiple determinants and influences unfold over time (Gross, 2015). It has been argued that the time has come for the field of ER to move beyond single-occasion measurement approaches and to embrace approaches more suited to examining regulatory processes in daily life (Aldao & Nolen-Hoeksema, 2012).

My current research aims broadly to examine ER and its contextual influences in the daily life of individuals using an ecological momentary assessment approach, with daily

diary data collection and multilevel data analyses. This thesis consists of three empirical

studies that are bookended by a general literature review and a discussion.

Chapter 2 introduces and links together the two central theoretical frameworks

(Gross, 2015; Aldao, 2013) that have guided the three empirical studies of the thesis

(chapters 4–6). Chapter 3 presents information on the methodology and design that is not

already detailed in each individual study and provides an overview of the methodological

approach employed. In Chapter 4, I present the first empirical article of the thesis: a study of

three ER strategies in daily life (cognitive reappraisal, emotion suppression, mindfulness).

The article has been accepted for publication in the peer-reviewed journal *Cognitive

Behaviour Therapy* (Brockman, Ciarrochi, Parker & Kashdan, 2017). Study 1 (Chapter 4)

aimed to answer the following research questions:

1.   What is the degree of convergence between mean daily and trait measures of ER and

        well-being?

2.   What is the unique contribution of three ER strategies (mindfulness, cognitive

        reappraisal, emotion suppression) to the prediction of daily well-being?

3.   Does the utility of the three ER strategies vary significantly among individuals?

4.   What trait demographic variables moderate the strategy–affect link?

5.   What is the relationship between the use of regulatory strategies and next-day affect

        experiences?

6.   What is the directionality of the interrelationships between ER strategies and daily

        affect? Do regulatory strategies predict next-day affect, vice versa, or both?

        In Chapter 5, I test a hypothesis that the usefulness of the three strategies would

depend on the degree to which people experienced need satisfaction in their lives. This study

is currently under review at the peer-reviewed journal *Emotion.* Study 2 (Chapter 5) aimed to

answer the following research questions:

1.   What is the relationship between the use of daily regulatory strategies (mindfulness, cognitive reappraisal, emotion suppression) and the satisfaction of a person's needs for autonomy, competence, and relatedness?

2.   Is the relationship between the use of daily regulatory strategies and emotional well-being (positive and negative affect) dependent upon a person's need satisfaction? I hypothesized that the relationship between the use of daily strategies and the experience of daily positive and negative affect would be greater among people experiencing unmet psychological needs and lower for those with satisfied psychological needs.

In Chapter 6, I explore the role of context at a more micro level, examining the role of daily positive and negative events in the process of ER. This study is currently being prepared for submission to the peer-reviewed journal *Cognitive Research and Therapy.* Study 2 (Chapter 6) aimed to answer the following research questions:

1.   What is the relationship between the frequency of positive and negative events, ER strategy use, and positive and negative affect as they are experienced in daily life?

2.   What is the relative contribution of strategy use and daily events to the experience of daily positive and negative affect? I hypothesized that both should be important. Strategies and daily events should all significantly predict unique variance in daily positive and negative affect.

3.   Do positive and negative events moderate the impact of ER strategies in daily life? Is the strength of the relationship between the use of ER strategies and affect dependent upon the extent to which the person is having a good day (with many positive events) or a bad day (with many negative events)?

Chapter 7 concludes the thesis with a general discussion and implications for future research.

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Chapter 2: Literature Review

In this chapter, I first review the literature on Gross's (1998; 2002) *process model of emotion regulation*, placing it within the broader context of emotion research. Second, I outline emerging theory and research emphasizing the importance of context to the process of ER. Third, I outline the potential benefits of studying ER using ecological momentary assessment methodologies, and the research to date that has used those methods to uncover "contextual variability" in everyday ER processes. Last, I give an overview of important directions for future research into studies of ER in daily life.

A Functional Approach to Emotions

> We will only recall the well-known evolutionary principle that when a certain power has once been fixed in an animal by virtue of its utility in presence of certain features of the environment, it may turn out to be useful in presence of other features of the environment that had originally nothing to do with either producing or preserving it. A nervous tendency to discharge being once there, all sorts of unforeseen things may pull the trigger and let loose the effects. That among these things should be conventionalities of man's contriving is a matter of no psychological consequence whatever.
>
> —William James (1884, p. 195)

Many modern approaches to emotion and ER take a functional view of emotions, in which emotions ultimately serve to help people adapt to a constantly changing environment (Keltner & Gross, 1999; Lazarus, 1991; Greenberg & Paivio, 1997). A core assumption of functional accounts is that emotions ultimately serve some *adaptive* role for the organism if viewed from a historical and even evolutionary perspective (Keltner & Gross, 1999). Plutchik (1980), argued on the basis of Darwin's concept of natural selection that every feature of each existing species, including its emotions, must have ultimate survival value in

evolutionary terms. William James, in his early scientific analyses of emotions (1884), took a functional view of emotions, arguing emotions to be *adaptive* physiological response-tendencies that can be triggered by situations that are evolutionarily significant. This notion of a response-tendency continues to inform modern accounts of emotion (Frijda, 2007; Lazarus, 1991; Gross & Munoz, 1995), which view emotions as being an important adaptive response brought forth by current *situational* triggers or events. Levenson (1994) defined emotions as "short-lived psychological-physiological phenomena that represent efficient modes of adaptation to changing environmental demands". This functional view of emotions, while not universally accepted, informs most modern approaches to emotion research (Keltner & Gross, 1999) and clinical psychology practice (for example, Thoma & McKay, 2014; Hayes, Strosahl, & Wilson, 1999).

In making his argument for a functional approach to emotion, Gross (1998, 1999) argued that emotions can serve several practical adaptive functions, including facilitating decision-making and learning, preparing rapid motor responses, informing social interactions, and providing information about the match between a person's goals and their current environment. While Gross takes a functional approach to emotions, that does not mean that emotions are always adaptive. Emotions always carry some adaptive information about the environment in relation to a person's activated goals, but the ultimate adaptiveness of an emotional response will depend upon the context in which it is activated (Gross, 2015). For example, while an employee's anger over poor work conditions (a situational trigger) may carry adaptive information about a mismatch between the current context and the employee's goals, overt behavioral expressions of that anger may turn out to be ultimately maladaptive if acted upon.

Appraisal Theories of Emotion

Appraisal theories of emotion also contribute to modern approaches to emotion research (Lazarus, 1991; Frijda, 2007), including ER research (Gross, 2015). Appraisal theories view emotions as "emotional episodes" unfolding over a discrete period of time and involving changes in a number of related physiological components (Moors, Ellsworth, Scherer, & Frijda, 2013). Appraisal theories see emotions as representing adaptive responses to the current environment that reflect appraisals of environmental conditions in relation to the organism's well-being. These models must therefore include an appraisal component involving some evaluation of the environment and the person–environment interaction (Lazarus, 1991), but also tend to include motivational, physiological, behavioral, and subjective feelings components (Moors et al., 2013). From this perspective, appraisals of the environment–person fit must be informed by some notion of the organism's "concerns", which include constructs such as needs, attachments, values, goals, and beliefs (Frijda, 1988; 2007).

James Gross's Process Model of Emotion Regulation

James Gross's *process model of emotion regulation* (1998, 2002) first builds on a "modal model" of emotion generation. Gross proposes that emotions unfold over time in a multicomponent process in which:

(a)   a situation occurs (either external environmental events or internal private events, such as thoughts)

(b)   that is then attended to, which gives rise to

(c)   an appraisal of the situation's relevance to the person's goals or "concerns" (Frijda, 2007; Lazarus, 1991), which then results in

(d)   an emotional response characterized by changes in behavior and bodily sensations (see Figure 2.1).

Panel A

Situation   Attention   Appraisal   Response

Panel B

Appraisal

Attention   Response

Situation

Panel C

Cycle 3   Attention   Appraisal

Appraisal   Response

Cycle 2   Attention   Situation

Appraisal

Attention   Response

Cycle 1   Situation   Time

Situation
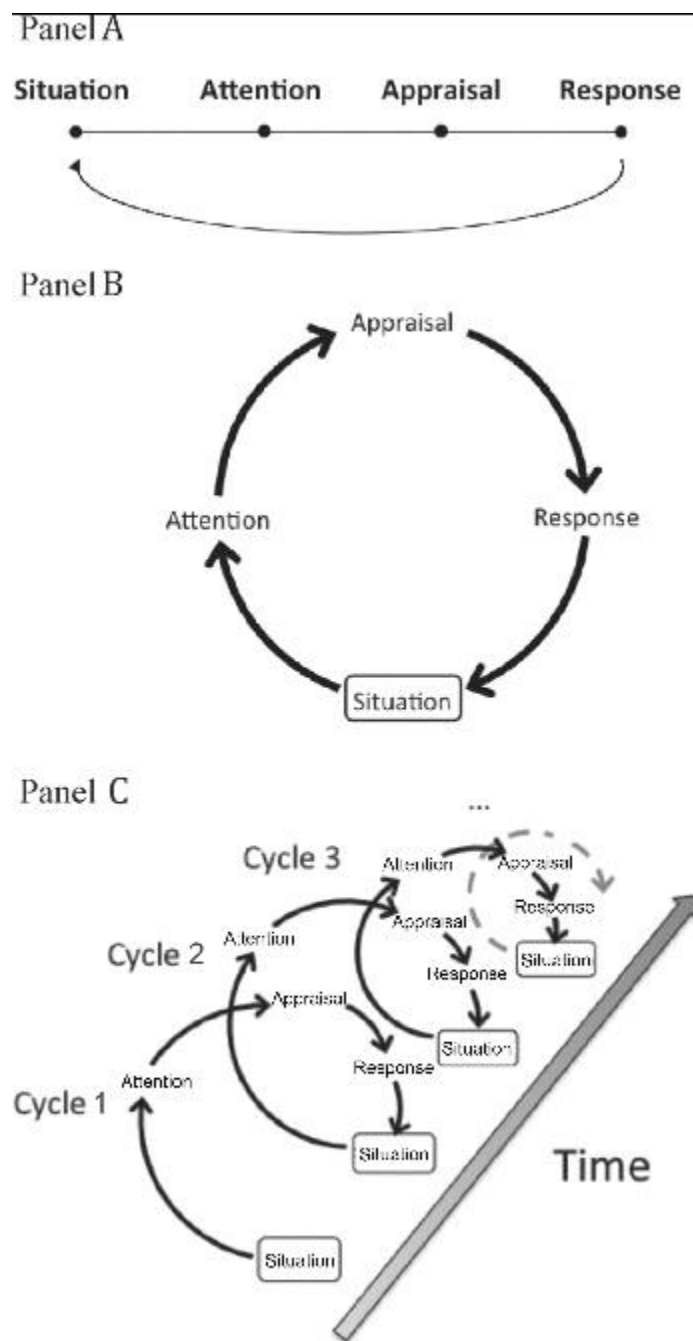
Figure 2.1. James Gross's modal model of emotion

Source: Taken with permission from J. J. Gross, "Emotion regulation: Current status and future prospects", *Psychological Inquiry*, 2015, *26*(1), p. 2. Copyright 2015 by Taylor & Francis.

According the model, emotional responses may then interact with the environment via

a feedback loop from response to situation, leading to changes in the situation that produced

the initial response, potentially triggering a new emotional response.

Gross (2015) suggests that this process can generate emotional responses that are

either useful or harmful depending upon the context of the activation. He notes that

emotional responses tend to be helpful when they guide appropriate sensory processing, decision-making and action in a given context. Further, emotions may become harmful when they are the wrong intensity (such as extreme guilt over a minor interpersonal infraction), duration (experiencing that guilt for a period of years), frequency (experiencing guilty feelings several times a day), or type in a given situation (experiencing happiness instead of grief at a funeral). For Gross (2015), emotional responses that are themselves appraised as harmful to a person's activated goals may lead to attempts by the person to regulate them using ER strategies. The model suggests that regulatory strategies may be called upon to regulate or "modulate" emotional responses (both negative and positive) at varying points in the emotion-generation sequence, giving shape to its final experience (see the top of Figure 2.2). Strategies applied after the full activation of the emotional response are termed *response*-focused strategies, while those employed before full activation are termed *antecedent*-focused strategies. This process of emotion generation and regulation has been called the process model of ER (Gross, 1998; 2002).
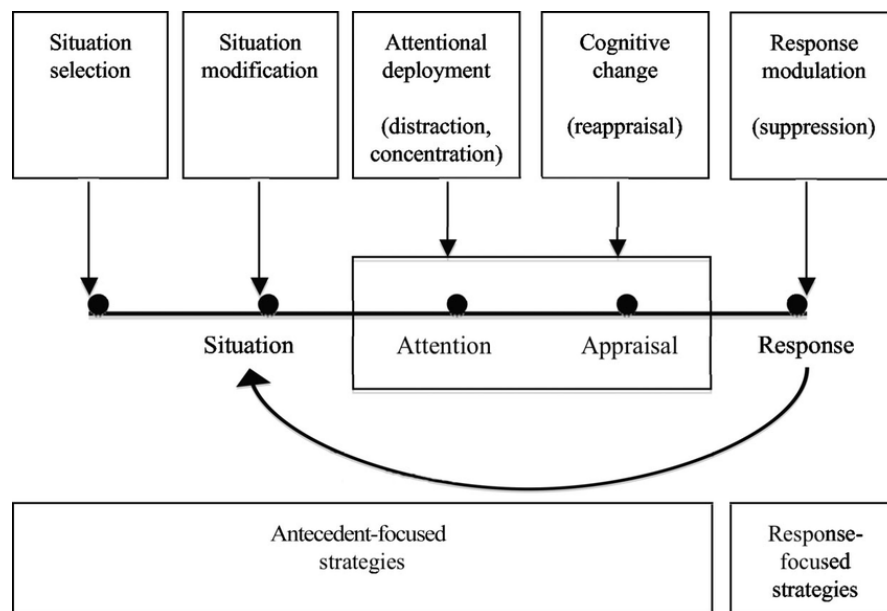
Figure 2.2. James Gross's process model of emotion regulation

Source: Gross (1998; 2002). Taken from T.L. Webb, E. Miles, & P. Sheeran, "Dealing with feeling: a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation", *Psychological Bulletin*, 2012, 138(4), p. 775. Copyright 2012 by American Psychological Association.

A multitude of ER strategies have been proposed based on this model, including emotion suppression, cognitive reappraisal, mindfulness, acceptance, avoidance, rumination, and worry (Gross, 1999; Arch & Landy, 2015). Thus, many clinical constructs thought to be involved in the maintenance of clinical problems and disorders can be understood within this framework as maladaptive attempts at ER. According to the model, strategies can be divided into those that are antecedent-focused (situation selection, situation modification, attentional deployment, cognitive change) and deployed before the complete activation of the emotional response, and those that are response-focused (response modulation / affective suppression) and deployed once the emotional activation has occurred.

Specific strategies have generally been argued to be either adaptive or maladaptive based upon their direct effects on cognition, behavior, and emotional distress, as well as on their relationships to indices of psychopathology (Gross, 2002; Aldao, Nolen-Hoeksema, & Schweizer, 2010). These assertions are generally well supported in the empirical literature (Aldao & Nolen-Hoeksema, 2012). The two strategies that have been most widely researched are cognitive reappraisal and emotion suppression. Gross, Richards, and John (2006) have explicitly studied ER by thoroughly examining just those two strategies as exemplars of antecedent- and response-focused strategies, respectively. Cognitive reappraisal is an example of an antecedent-focused strategy, defined as a type of perspective change involving interpreting a potentially emotive situation in a way that changes its emotional impact *before* the activation has fully occurred (Gross et al., 2006). As an example, consider a situation in which someone is called into their supervisor's office for a meeting in the afternoon. Initially, the person may start to wonder whether the meeting may be something threatening; however, before a full emotional response occurs, they reappraise the situation as most likely benign, preventing the full activation of an emotional response. Emotion suppression is a response-focused strategy that involves active attempts to inhibit the expression of emotionally

consistent behavior (Gross & Levenson, 1993). For example, a person who feels angry (the response) about a partner going away on a trip may appear unfazed when saying goodbye (inhibition of the response).

Previous research has indicated that reappraising one's emotions, compared to using no strategy and compared to using response-focused strategies such as emotion suppression, is related to a better profile of well-being. Across a range of emotional experiences (disgust, anger, and so on), reappraisal works to dampen the intensity of emotions in triggering contexts, doing so without significant physiological expense (Gross, 2001; Mauss, Cook, Cheng, & Gross, 2007). These studies suggest that people who make more frequent use of reappraisal tend to experience more positive and less negative emotions and demonstrate superior interpersonal functioning in self- and peer-reports (Gross & John, 2003). In contrast, the opposite profile has emerged from studies of emotion suppression, which have generally found that, while emotion suppression is successful at regulating emotionally expressive behavior, it does not provide relief from the subjective experience of negative affect, and comes with a substantial cost to cognition, physiology, and relationship functioning (Gross et al., 2006). These findings have led to the general conceptualization of reappraisal as representing an adaptive form of regulation and emotion suppression as representing a maladaptive strategy. These notions support many popular models of psychotherapy, including cognitive behavior therapy (Beck, 1979), acceptance and commitment therapy (Hayes, Luoma, Bond, Masuda, & Lillis, 2006), and dialectical behavior therapy (Linehan, 1993).

The Centrality of Goals and Values in the Process of Emotion Regulation

Gross (2015) argues that a central feature of ER is "the activation of a goal to influence the emotion trajectory". Goals guide ER through a process of valuation of the emotion in relation to the person's goals in each situation, activating action tendencies

(behaviors) relevant to the evaluation in a given context (Gross, 2015). One can imagine someone with a difficult boss becoming intensely angry and thinking something like: "I need to control my anger here or else I might lose my job." Conversely, someone being assaulted in the street may appraise their activating anger as energizing and useful for their assumed goal of self-protection and thus may make no attempt to down-regulate. For Gross, the regulation of emotional responses does not occur in a vacuum but within an evaluation of the emotion-in-context. While defined differently from different perspectives, the element of goals or "concerns"—those things an individual "cares about" most in life—is central to many theoretical and practical accounts of emotional well-being. This includes Frijda's theory of "concerns" in emotion (2007), self-determination theory (Ryan & Deci, 2017), acceptance and commitment therapy (Hayes et al., 1999), motivational interviewing (Miller & Rollnick, 2012), and schema therapy (Young, Klosko, & Weishaar, 2003).

While the process model of ER specifies the interplay between situational events, strategies, and emotional responses, the model gives little detail of the processes that govern the selection and use of the various ER strategies. While the concept of "activated goals" is central to the model, it pays little attention to how this goal process is activated and how and why particular strategies are employed. It is one thing to say that goals drive ER, but what goals and why? How do people choose between competing goals in ER? To start to answer those questions, Gross (2013; 2015) recently extended his process model of ER by adding detail on a process of *valuation* that he proposes underpins ER. First, emotions are generated out of situational contexts (the world) when such contexts represent a mismatch in relation to one or more valuation systems. While Gross is largely silent on what the valuation systems specifically consist of, he is of the view that humans most likely have evolved multiple valuation systems that serve as inputs into the emotion generation process. He also mentions by way of example that there may be separate valuation systems for "staying healthy" and

"connecting with people". Gross further details that these systems can activate simultaneously in ways that can be harmonious (such as exercising with a friend) or in ways that can conflict (such as a friend encouraging drug taking). For Gross (2015), this initial evaluation process informing emotion generation is termed "first-level valuation". Next, potential and actual activations of emotion are also subjected to a process of valuation. Gross calls this "second-level valuation"; that is, emotions are constantly being judged in terms of what may be "good" or "bad" for the person, given their competing goals and values. Gross argues that the goals and corresponding regulatory responses that activate are those that "win out" in a kind of summation of what is most important for the person overall, given the situation and any competing goals or values that may have activated. The addition of the process of valuation to the process model has been termed the "extended process model of emotion regulation" (Gross 2013; 2015). While the specification of this process outlines *how* a person's activated values and goals interact with ER strategies, no detail is given on *what* people tend to value or "care about".

Basic Psychological Needs as a Framework for Understanding the Nature of Evaluative Inputs

While Gross's process model of ER focuses on regulatory strategies as a key determinant of well-being, it gives little detail on specifically what motivates people. What do people care about and why? Self-determination theory (SDT) is a comprehensive model of human motivation and well-being that supports the central importance of basic psychological need satisfaction as the basis of well-being. Specifically, SDT places the satisfaction or thwarting of the basic psychological needs for relatedness (or belonging), competence, and autonomy as central to human well-being and development (Deci & Ryan, 2000). From an SDT perspective, well-being occurs to the degree that a person's social context supports versus impairs the satisfaction of basic psychological needs. Conversely, "ill-being"—a

blanket term for psychological states characterized by high levels of emotional distress and vulnerability and low levels of positive affect and vitality—results from social contexts that are unsupportive or thwarting of basic need satisfaction (Vansteenkiste & Ryan, 2013). SDT posits that, to experience optimal levels of well-being, people need to feel a sense of *relatedness* to other people and groups, believe they are *competent* navigators of their internal and external environments, *and* need to experience *autonomy* or self-determination in relation to the way they act within their life context (Deci & Ryan, 2017).

Vansteenkiste and Ryan (2013) theorize that the activation of negative affect resulting from the individual experiencing thwarted needs in their life context can lead to the use of "maladaptive coping mechanisms" in an attempt to soothe the negative emotional states activated by unhelpful social contexts. SDT thus describes a process in which emotional vulnerability occurs as a result of people being unable to satisfy their basic psychological needs, and in which individuals are motivated to cope or soothe themselves using behavioral regulatory strategies. This is largely consistent with the literature on ER, which similarly describes a process in which people make active attempts to change their emotions, the related responses, or both, to react appropriately to cues in the environment using ER "strategies" (Gross, 1998).

A key difference between ER theory and SDT is that ER theory views internal strategies as the key driver to well-being, whereas SDT views need satisfaction in the *external environment* as the key driver (Ryan & Deci, 2017). There is clear evidence that need satisfaction is in part a result of supportive environments. For example, Gagné (2003) conducted two studies investigating the individual and environmental predictors of need satisfaction and prosocial behavior and found that levels of reported parental autonomy support in one's social context predicted increases in the satisfaction of all three basic psychological needs. Furthermore, need satisfaction fully mediated the relationship between

the reported level of parental autonomy support and prosocial behavior. Similarly, La

Guardia and colleagues (La Guardia, Ryan, Couchman, & Deci, 2000) found robust

associations between the attachment security that participants experienced in current

relationships and the satisfaction of all three basic psychological needs. Van den Broeck,

Vansteenkiste, De Witte, Soenens, and Lens (2010) found similar results when studying the

link between environmental supports and need satisfaction in the workplace. Specifically,

they found that the environmental job resources of task autonomy, skill use, and social

support predicted corresponding increases in the satisfaction of basic psychological needs of

belonging, competence, and autonomy.

Given that the process model of ER fails to address the specific motivational inputs in

its valuation systems, I believe that the theory and research underpinning SDT may be

informative about the types of inputs that are likely to be of central importance to well-being.

Specifically, the degree to which a person's needs for relatedness, competence, and

autonomy are satisfied in their life context is likely to interact with the process of ER via the

valuation system. Thus far, no studies have brought these two literatures together.

The Importance of Context in the Process of Emotion Regulation

Despite the clear role afforded to context in Gross's process model, early empirical

work has focused on the utility of two strategies: emotion suppression and cognitive

reappraisal. This has led to the general notion that some strategies (such as cognitive

reappraisal and mindfulness) have "adaptive" well-being profiles and others have

"maladaptive" well-being profiles. There has been a growing interest within the ER literature

on the role of context in the ER process. The idea of this more contextually nuanced position

is that the effective implementation of ER may be affected by contextual demands, and that,

although some strategies have been purported to be either adaptive or maladaptive in general,

the adaptiveness of any strategy is ultimately influenced by the context in which it is

deployed. From this position, strategies may be considered adaptive only when implemented in the appropriate context (Aldao et al., 2010; Aldao & Nolen-Hoeksema, 2012), consistent with the activated goals of the individual (Gross, 2015). It has been argued that the "general profile" approach to studying ER strategies is limited because it fails to account for the inherently contextual nature of ER processes (Aldao, 2013). Werner and Gross (2010) argue that regulatory strategies may present as maladaptive via several pathways, including when

(a)   they are not effective (that is, they do not modify the emotional experience as desired)

(b)   they have not been properly developed

(c)   they have short-term benefits that are outweighed by long-term costs to the individual and their goals

(d)   they are poorly implemented, in an inflexible, context-insensitive way.

Flexibility in ER has been defined as the capacity to notice and adjust to various situational demands, shifting between cognitive or behavioral responses when particular strategies might compromise personal or social functioning (Kashdan & Rottenberg, 2010). Others have similarly defined flexibility as the ability to switch ER strategies to match situational demands in order to maximize adaptation (Bonanno & Burton, 2013).

The impact of context on the usefulness of ER strategies is being increasingly acknowledged and studied (Gross et al., 2006), but empirical examination of this issue remains in its infancy (Aldao, 2013). However, the issue is not new to the wider literature on emotions and well-being. Theoretical (Folkman, 1984; Lazarus, 1993) and empirical (Todrank & Somer, 2002) literature on the construct of "coping" has long suggested that contextual influences are central to the effectiveness of various *coping* strategies. Lazarus (1993), in summarizing the coping literature to that date, argued that using the standard trait-focused one-off assessment approach to measurement in coping research was proving extremely limiting, leading to stagnation in that research area. He stated (p. 243):

What I am arguing, in effect, is not an extreme contextualism in the study of coping but an effort to examine contextually influenced as well as stable relationships between a person and the environments, which that person pays attention to and chooses, where possible, or must deal with where there is no possibility of choice. I believe we must try to place process measures of coping within the larger framework of a person's life and way of relating to the world … To study coping over time and across diverse sources of stress in the same persons in sufficient numbers to address both its process and trait aspects, and to do this with the appreciation of the whole person, calls for complex, long-term research designs.

Research into the role of contextual influences on ER appears to be experiencing similar limitations as commonly used research paradigms struggle to capture the impact of context (situational demands) (Gross et al., 2006; Aldao, 2013). Several more recent studies of ER have attempted to overcome these limitations using novel paradigms designed to capture some of the impact of context. Gross and colleagues (2006) indicated that, although much was known about the consequences of antecedent- versus response-focused strategies from a trait measurement approach, little was known about ER in daily life. Gross et al. (2006) outlined a three-pronged approach to investigating ER in daily life, suggesting:

(a)   more qualitative research, in which respondents are asked for a greater depth of information about contextual influences

(b)   modified survey methods that retrospectively ask respondents about how they tended to respond to a series of contexts, or to contexts that have occurred over the past two weeks

(c)   between-group studies of emotion-induction experiments in which participants are exposed to emotion-eliciting situations in an experimental setting and their use of

various strategies, the effectiveness of those strategies and any contextual influences
are observed.

One study (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004) has attempted to
investigate whether contextual influences may affect the usefulness of emotion suppression.
The study involved 101 undergraduate university students studying in New York directly
after the 2001 terrorist attacks. Subjects' ability to both augment and suppress expressions of
affect was measured, and each subject's capacity to *both* suppress and express was
conceptualized as a measure of expressive *flexibility*. The study found that people who were
better able to *both* enhance and suppress emotional responses tended to evidence less
emotional disturbance by the end of their second year of university. Those results support the
view that the capacity to suppress emotions is related to well-being, as long as that capacity
occurs in the context of a corresponding capacity to enhance emotional expression. This is
consistent with the view that flexibility in the use of any ER strategy is of key importance to
longer term well-being, above and beyond the general usefulness of any individual strategy,
and that the usefulness of such strategies is likely to be context dependent. Thus, having the
capacity to express emotions in some contexts and suppress them in others appears to be an
important feature of successful ER, regardless of the finding that emotion suppression in
general is associated with poor outcomes. Despite the interesting and thought-provoking
nature of this finding, the trait measurement approach used means that the specific contextual
influences governing the usefulness of emotion suppression were not investigated.

Another recent study (Troy, Shallcross, & Mauss, 2013) reported similar contextual
influences governing the impact of reappraisal as an ER strategy. That study hypothesized
that reappraisal could be more useful in situations that are uncontrollable (when people have
little control over the situation), and problematic when applied in situations where stressors
can be controlled (when the person has some control over the situation). To investigate this,

Troy et al. measured reappraisal ability, recent life stressor severity, perceived controllability, and depressive symptoms among 170 participants who had reported experiencing a stressful life event during the preceding eight weeks. The researchers found that, for subjects with high stressor uncontrollability, stronger reappraisal capacity was related to lower levels of depression following a stressful life event. In contrast, for people experiencing more controllable stressors, greater reappraisal capacity was associated with *increased* depressive symptoms. The authors suggest that the results support conceptualizations of ER in which regulatory strategies are not adaptive or maladaptive *per se*; rather, their utility is dependent upon context (Troy et al., 2013).

Aldao and Nolen-Hoeksema (2012) attempted to investigate the impact of flexibility in strategy selection on indices of well-being. In that study, retrospective reports of emotion-eliciting situations (contexts) were used to overcome the problems with a pure trait-based approach. It was found that flexibility was a predictor of well-being in its own right for adaptive strategies (for example, reappraisal and problem solving), but not for maladaptive strategies (such as emotion suppression and self-criticism). The researchers noted that, although their research paradigm was a step in the right direction, it was limited insofar as it remained reliant upon retrospective self-reporting, which has been shown to be correlated with a range of reporting biases and to have low correlation with concurrent reports. They therefore called for future studies to employ more favorable methodologies, including ecological momentary assessment and daily diary data collection, to replicate their findings and to investigate whether there are discrepancies between results based on state-level versus trait-level methodologies (Aldao & Nolen-Hoeksema, 2012).

The assumption that certain ER strategies are globally maladaptive or adaptive has thus been challenged by recent theory and empirical data suggesting the importance of context and flexibility in determining the impact of the various strategies. However, the

studies reviewed here so far are also indicative of the current limitations in the research

methodologies that have been largely utilized in the ER literature to date.

Aldao's Framework for the Systematic Study of Contextual Factors in Emotion

Regulation

Given the central significance of context to the process of ER, Aldao (2013) suggests

that future research should focus on "capturing context" and use methodologies that are well

positioned to capture "contextual variability" in the process of ER. Aldao defines context in a

broad way as including "all of the circumstances that surround a given process" and proposes

a guiding framework in which context is made up of an interaction between four possible

elements:

(a)   Aspects of the organism carrying out the strategy. This includes trait demographics

         (e.g. gender and age), personality traits (e.g. neuroticism, psychopathology status),

         and state processes within the person (e.g. thoughts, emotional states).

(b)   The emotion-eliciting stimuli in the environmental context (environmental

         antecedents). These may represent proximal environmental stimuli (e.g. a romantic

         interaction), or more distal environmental conditions (e.g. level of social support).

(c)   The selection and implementation of strategies. For example, are there meaningful

         differences in the use of a strategy (i.e. reappraisal used for avoidance vs acceptance)?

         Does combining certain strategies yield benefits in some contexts?

(d)   The types of outcomes that are relevant. This will include some analyses of time

         frame (e.g. short-term versus long-term consequences), as well as type of outcome

         considered relevant (e.g. discrete emotions vs broad measures of affect; positive vs

         negative).

         This model of contextual influences is shown in Figure 2.3.

Aldao (2013) outlines how any of these aspects can be included in models, controlled for, or combined in ways that will shed light on the contextual influences governing ER processes. For example, much of what we do know from studies of ER processes comes from studies of relatively healthy populations of university students. Results of these studies help us to understand ER processes 'in the context of' this relatively healthy psychopathology status. However, comparing these results with results from populations with psychopathology (e.g. depression), enable us to understand the role of ER processes 'in the context' of depression. Note also that context can be modelled in more and more levels of complexity and specificity by modelling *interactions* between different facets of context. For example, adding state anger as an outcome to the above model would mean that you are investigating ER processes 'in the context of' depressed individuals, on the expression of state anger. The results may be quite different compared to an outcome of state sadness, for example. Thus, modelling interactions between different facets of context may be as important as any one facet being investigated. In all, using this model, the possibilities for combining (or holding constant) different facets and dimensions of context are endless, mirroring perhaps to some degree, the endless complexity of human experience.
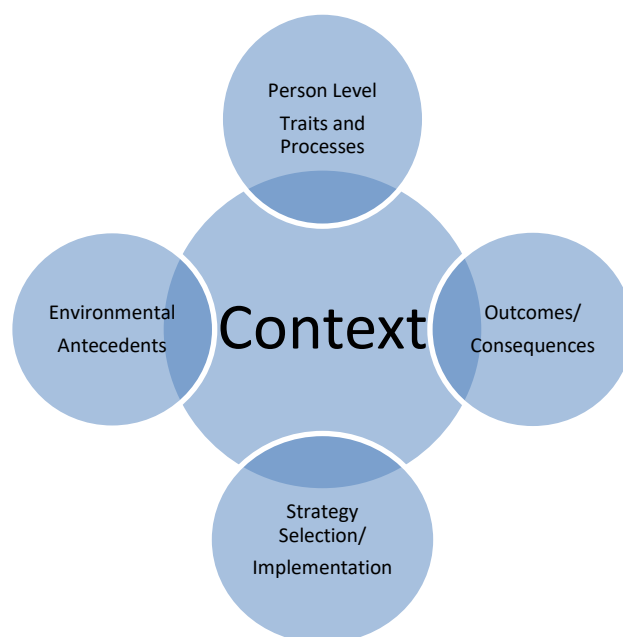
Figure 2.3. A pictorial description of Aldao's framework for the systematic study of contextual factors in emotion regulation

It must be noted that, from this position, context is defined more broadly as encompassing aspects that go beyond the physical environment. While some models of emotion describe context relatively narrowly to environmental antecedents in an environment-person transaction (Lazarus, 1991), Aldao's broader definition is more consistent with recent 'interactionist' approaches to studying personality that focus on the interaction between traits, states, situations, and behaviors (e.g. Mischel & Shoda, 1995; Nezlek, 2007). This broader definition is also consistent with modern contextual-behavioral science approaches, which define context pragmatically as the variable stream of events exerting an organizing influence on behavior (Hayes & Ciarrochi, 2015; Hayes, Villatte, Levin, & Hildebrandt, 2011; Hayes, Strosahl, & Wilson, 1999). Within this tradition, "behavior" is also defined broadly as anything the organism "does", including overt behavior such as "avoiding relationships" and covert behavior such as "ruminating".

Ecological momentary assessment (EMA) approaches, including diary studies, have been touted as being particularly promising in studying the process of ER as it unfolds, as the dynamic relationships between the four aspects of context noted above (such as person-level variables, antecedents and consequences) can be modeled in a way that maximizes ecological validity and captures the impact of significant moderating variables (Aldao, 2013; Adlao & Nolen-Hoeksema, 2012).

The Promise of Ecological Momentary Assessment in Emotion Regulation Research

Since at least 1968 (Mischel, 1968) debate has ensued in the field of personality psychology as to the utility of two competing approaches. Before this time, the predominant approach to the study of personality was to conceive of personality in terms of relatively stable behavioral dispositions, or a *trait* approach. Mischel (1968) noted that from this

position, behavior is generally determined by broad dispositions that manifest themselves stably more or less independently of any stimulus conditions. Further, from this position, any variability observed within each person on a particular dimension is viewed as error variance, and problematic, and as such should be averaged out for best approximation of a 'true score' of the underlying trait dimension (Mischel & Shoda, 1995). However, such pure trait-focused approaches have for some time now been shown to be limited. For example, a long line of research now exists demonstrating that people show relatively small levels of cross-situational consistency in their behavior, (Mischel, 1968; Epstein, 1979; Mischel & Shoda, 1995). Micshel (1968) argued that pure trait focused approaches to personality were largely invalid because they did not account for situational features, which tended to have far more influence on behavior than trait features. Since this time, interactionist approaches have become increasingly popular, and can be characterized as the study of the dynamic interplay between states, traits, situations and behaviors (Mischel & Shoda, 1998; Nezlek, 2007). In studying ER using EMA methods, the current thesis takes an interactionist approach to studying personality, assuming that measures at the trait, and state (or daily) level are likely to on occasion, yield differing results, and that combining such measures within the same multi-level models, is likely to be fruitful in advancing our understanding of the drivers of daily life in individuals (Nezlek, 2007).

EMA methods are a group of related data-gathering methods that include experience sampling, ambulatory assessments, and daily diary studies. In EMA studies, data is collected from individuals in their real-world contexts as much as possible, which leads to increased *ecological* validity of research findings (Shiffman, Stone, & Hufford, 2008). These assessments are *momentary*, in that they concentrate on either the current state a person is experiencing or states that they have recently experienced, minimizing the possibility of biases in retrospective recall. In addition to these benefits, well-being researchers have

become increasingly interested in EMA approaches to measurement over the past 20 years

because they offer a method of capturing state variables in addition to trait variables. This is

important in the current climate of personality research, which is increasingly focused on the

impact of variables at the state level rather than simply at the trait level because of the

limitations of a purely trait approach (Nezlek, 2007). It is becoming clearer that many

findings of trait level research do not hold across contexts, and findings found at the trait

level do not always hold when these variables are investigated in daily life (Nezlek, 2007).

This fact calls into question the validity of scientific claims made solely on the basis of trait

measurement. In EMA studies, subjects do not merely provide an assessment from one

moment in time (cross-sectional) but complete multiple assessments, providing information

about how their experiences vary over time and across situations (Shiffman et al., 2008). This

allows for a more in-depth examination of the dynamic and complex processes that are

certainly involved in most psychological phenomena (Smyth & Stone, 2003). EMA methods

can thus be argued to remedy many of the limitations of the traditional, trait-focused

approaches to the measurement and study of ER, providing better opportunities to model the

complexity of variables involved in human well-being.

      Collecting data using EMA methods produces data that are nested (multiple

observations are collected for a given individual) and require specialized statistical

approaches, called *multilevel modeling*, for analyses (see, for example, Nezlek, 2007) to

examine the data appropriately. This results in researchers gaining access to a more dynamic

range of research questions that were historically not available with traditional measurement

approaches. Shiffman and colleagues (2008) outlined four classes of research technique

commonly employed using EMA data collection:

(a)   using aggregated state data to derive trait measures

(b)   analyzing within-subject trends over time

(c)   examining contextual associations

(d)   examining temporal sequences.

It is argued that EMA methods and the research questions available with an EMA approach are well placed to investigate the role of contextual factors involved in ER. I now discuss these categories of research technique.

Using Aggregated State Data to Derive Trait Measures

Because of the limitations and biases involved in trait measurement, some researchers have taken to aggregating daily state measures to derive a more accurate measure of trait variables (for example, Fleeson, 2001). In this approach, the contextual, temporal, and within-person nature of the data is neglected and the data is simply aggregated. While this approach does not take full advantage of the depth and complexity of EMA data, some have used it as an improved trait measure where traits are the subject of interest (Fleeson, 2001). This kind of aggregation can also be used in intervention studies in which the mean levels of states at two or more time points are aggregated so as to compare mean change across time points. Beyond this, however, aggregation also opens up the possibility of specifying trait variables that may be impossible to measure in one-off assessment through the aggregation of the "variability" or "stability" of a measured state. This is usually done by calculating a measure of the standard deviation of a given state variable over the course of multiple observations. This approach was recently exemplified in a daily diary study of emotion differentiation and drinking habits (Kashdan, Ferssizidis, Collins, & Muraven, 2010), which calculated negative emotion differentiation (the degree to which a person tends to describe their feelings in distinct, nuanced ways) by calculating the intra-class correlation of six negative affect descriptors for each participant over the course of 21 days. The researchers then used this newly derived trait variable—emotion differentiation—to test a moderation model and found that emotion differentiation indeed had a buffering effect on the relationship

between the intensity of daily negative affect and increases in drinking behavior. The novelty

of this approach was in being able to gain access to trait-level data patterns that were not

easily obtainable through traditional data assessment methods. Although the aggregation

approach does not in itself take advantage of the complex, temporal, and contextual nature of

EMA data collection, aggregated variables can then be used in further research questions that

do so.

Analyzing Within-Subject Trends over Time

In this approach, within-person variation over time becomes the focus and is treated

as an independent variable. This is sometimes called investigating the "natural history" of a

phenomenon of interest (Shiffman et al., 2008). This is of key importance to understanding

the role of context, as one of the first questions the contextual therapist asks is "When is this

behavior more (and less) likely to occur?" EMA methods are particularly well suited to

investigating the temporal dynamics because subjects are reporting their daily experiences

over weeks or even months. This can open up a raft of possible contextual questions, such as:

How does the variable of interest fluctuate at different times of the day? Does it behave

differently on some days compared to others (for example, weekdays versus weekends)? Has

it shown certain growth patterns over the time course of the study? (Bolger, Davis, & Rafaeli,

2003).

An example of how this kind of analysis can improve our understanding of well-being

comes from the literature on positive psychotic symptoms, which boasts a surprisingly

extensive EMA literature. One early EMA study investigating the daily experiences of people

suffering schizophrenia (Delespaul & van Os, 2002) found that, contrary to previous studies

that used trait assessment methodology, visual hallucinations occurred more frequently in

daily life than auditory hallucinations among such people. This is a good example of a

finding from an EMA study that contradicted previous studies, which had relied upon a

traditional trait approach to measurement. Thus, this kind of study allows for a closer examination of the phenomenon of interest as it occurs in daily life, providing an opportunity for more precise models of human functioning to be determined. This type of question often forms the basis of an EMA study, setting the scene for the addition of more complex questions about the way these variables relate to other (contextual) variables.

Examining Contextual Associations

EMA studies that examine contextual associations are perhaps the most obvious candidates for improving research into ER. These studies are generally cross-sectional but are within-person, in that they are interested in the relationship between variables in specific "moments in time" or days within people. Using this methodology, the researcher is able to analyze the relationships among the many kinds of variables that ER researchers are interested in when trying to model and implement change, including the dynamic "in the moment" interplay between traits, emotional states, situations, and behaviors (Nezlek, 2007). The data analytic methods used for these studies are more complicated than, but are based upon, basic correlation and regression analyses often used in trait studies, with which many researchers will already be familiar. The kinds of questions one can ask are thus similar: What is the relationship between two daily variables? What is the relationship between a trait variable and various state variables? These questions may sound simple enough, but when we consider that the interplay of these analyses can be any combination of trait, emotion state, behavior, and situational variables "in the moment", we can see how the methodology allows the researcher to get closer to the variables that may be maintaining problems that can be interpreted with a behavior analytic framework. In many ways, this approach to collecting data corresponds to the type of information collected on a traditional thought record form, as is used in many therapy traditions for assessment and to build patients' awareness of the factors involved in their problems.

The power of this approach, however, lies in its ability to uncover contextual effects by examining trait and state moderator and mediator effects. This moves the question on from "What are the correlates or predictors of these important variables?" to "What variables influence the relationship between these two variables?" This is as close to a definition of context as one can hope to get using these methods. Kashdan and Nezlek (2012) demonstrated this in a daily diary study of 87 people, who provided 1,239 reports of their daily spiritual and emotional experiences. The authors found that higher daily levels of spirituality were related to increased meaning in life, positive emotions, and self-esteem (within-day effects). Furthermore, the relationship between daily spirituality and both self-esteem and positive emotions was fully mediated by a person's meaning in life. Kashdan and Nezlek also found that this effect was higher for those who were higher in trait spirituality. Here, the contextual influence of meaning in life and spirituality were uncovered in terms of their impact on daily well-being. As can be seen, by capturing these moments in time and understanding contextual associations, the influences that govern these experiences can be more thoroughly examined and understood.

Examining Temporal Sequences

Extending the methodologies described above, and capitalizing on the longitudinal nature of the data collection, temporal sequences can be built into the analyses in order to examine the effect of these daily variables on each other over different periods. This methodology can closely mirror the antecedent–response framework inherent in the ER framework and so is clearly relevant to an ER approach to well-being. For example, in one of the EMA studies described above (Delespaul & van Os, 2002), participants were prompted 10 times per day for their experiences, allowing for time sequencing to be modeled to predict later outcomes. Using this methodology, the authors found that hallucinatory experiences were not associated with any contextual triggers measured *before* the experience

(antecedents), but were moderated by *later* coping behaviors of maximum engagement (keeping busy) or maximum disengagement (complete withdrawal/avoidance). This uncovered the likely short-term contingencies that hallucinatory experiences were functioning under, in which certain behaviors were resulting in symptom relief in the short term, while others were ineffectual. Here it can be seen that the momentary collection of data allows the researcher to understand the discrete chaining of momentary experiences as they occur over time, closely paralleling the way therapists may be interested in the contingencies that shape target behaviors. This exemplifies how findings from EMA studies can provide increased ecological validity.

Empirical Literature Examining Emotion Regulation Strategies in Daily Life

Recent research into ER using EMA methods is indeed starting to shed more light on the contextual nuances of ER, as suggested by Aldao's (2013) model of context in ER. Nezlek & Kuppens (2008) provided an initial study into the relationships between daily cognitive reappraisal and emotion suppression, and daily emotional experiences and adjustment, among undergraduate college students. They found that, in general, and consistent with the trait literature to date, cognitive reappraisal had beneficial effects on affect, self-esteem, and adjustment, whereas the converse relationship was found for emotion suppression. However, while the negative effects of daily emotion suppression were found for both daily positive and negative affect, the relationship between cognitive reappraisal and daily reported affect was found to be more complex. Looking at its links with reported daily levels of positive and negative affect only, daily cognitive reappraisal was found to be significantly related only to increases in positive affect, with no significant relationship with daily negative affect. This is a somewhat surprising result, given the many empirical studies to date demonstrating cognitive restructuring to be related to decreases in negative emotions, but it is a result that is wholly possible given the different measurement approach

implemented. That is, relationships found at the trait level do not necessarily hold at the state

or daily level (Nezlek, 2007).

A more recent study further examined ER in daily life in two cohorts of university

students who were prompted to self-report their emotional experiences via a designated

palmtop computer 10 times per day over seven days (Brans, Koval, Verduyn, Lim, &

Kuppens, 2013). The study found that cognitive reappraisal:

(a)   was the least used strategy of the six strategies measured (the others were rumination,

          suppression, distraction, social sharing, and reflection)

(b)   was not related to daily negative affect in either cohort

(c)   was only marginally related to increased positive affect in one of the two cohorts.

One of the other major findings of the study was that, while three of the strategies

were linked to increases in negative affect (rumination, suppression, and sharing), no strategy

was associated with decreases in daily negative affect.

The results of the Nezlek and Brans et al. EMA studies indicate that, while some

strategies appear to be associated with poorer ER (suppression, rumination, and sharing)

when measured in the context of daily life, no strategy appeared to be related to decreased

negative affect.

A recently published experience-sampling study of 25 people with diagnoses of

psychotic disorder compared the strategies of "experiential acceptance" and cognitive

reappraisal as predictors of emotional well-being and functioning in daily life (Vilardaga,

Hayes, Atkins, Bresee, & Kambiz, 2013). Using a one-item measure of acceptance on a six-

point scale ("I simply noticed my feelings and continued with what I was doing"), this study

found that acceptance was significantly related to increased positive affect and decreased

negative affect, while habitual cognitive restructuring was not found to be similarly related to

negative or positive affect.

Haines and colleagues (2016) found that habitual reappraisal was not associated with general emotional benefits in daily life. Rather, they found that daily reappraisal was beneficial only when employed in situations that were perceived as "uncontrollable", as opposed to "controllable". I interpret this as evidence that one source of contextual variability may indeed be environmental antecedents (Aldao, 2013). Thus far, however, no studies have used EMA to explore the effects of specific environmental contexts on the usefulness of specific ER strategies.

While the studies to date have started to shed light on ER as it is employed in daily life, it can be argued that we have as yet only scratched the surface. Although they are a good start, so far none of the studies has fully capitalized on the contextual nature of the EMA data collected, focusing almost solely on within-day relationships between variables. A more comprehensive approach would involve modelling the dynamic interplay between situations, states, traits, and behaviors, across time in line with recent 'interactionist' approaches to the study of personality (e.g. Nezlek, 2007). Several possibilities for such a program of research are now considered.

Future Research Directions: Using Ecological Momentary Assessment and Related Methods to Study Emotion Regulation

I have so far argued that EMA and related methods are well positioned to examine ER processes because they are sensitive to the dynamic contextual interplay between within-person variables and traits. Capitalizing on the strengths of the EMA approach, and guided by the Aldao model of context in ER (2013), here I lay out an initial research agenda for those interested in studying ER using this methodology.

Comparing trait and state relationships

It is well known that relationships found at the trait level do not necessarily hold at the state or daily level (Nezlek, 2007). An example of this already exists in ER research. Two

early studies of ER in daily life have converged to find that daily use of cognitive reappraisal is not related to the daily experience of negative affect (Nezlek & Kuppens, 2008; Brans et al., 2013). This is despite there being a reliable correlation between reappraisal and decreased negative affect, as reported in the trait measurement literature (Aldao et al., 2010). An important initial outcome of a daily process approach to ER would be an examination of the relationships between daily regulatory strategies and indices of well-being. Do relationships established at the trait level hold at the daily level?

Expanding our knowledge to a range of daily regulatory strategies

The daily ER studies by Nezlek and Kuppens and Brans et al. also found emotion suppression to be associated with a maladaptive profile of regulation in daily life (more negative and less positive affect), consistent with the trait literature. However, little is known about ER strategies that might be beneficial in regulating negative affect in daily life. Studies of daily process need to examine strategies other than reappraisal and suppression, particularly strategies that hold promise for being useful in the regulation of negative affect (for example, mindfulness; Arch & Landy, 2015).

Examining emotion regulation across time

A key feature of ER is that it unfolds over discrete periods of time. Many approaches to ER are unable to model ER processes in this way, potentially missing out on important nuances in how ER works over time. Future studies of daily ER should capitalize on EMA methods, which can model variables interacting across days or occasions. It is important not only to understand ER processes within a given day, but also to understand the relationships between ER strategies and well-being from one day to the next. Using the dynamic nature of the data, this can be extended further to test a *reciprocal influences model* of ER (for example, Seaton, Parker, Marsh, Craven, & Yeung, 2014). Do ER strategies predict changes in affect, or vice versa, or both?

Examining contextual variability in the utility of emotion regulation strategies

The Aldao (2013) model of contextual influences in ER provides a framework to explore contextual influences on the process of ER. This would largely involve testing moderation models using potential contextual variables (such as personality traits and situational features) as moderators (see Figure 2.1). What is the impact of a range of contextual variables on the link between daily ER strategies and well-being? This will start to uncover more specific knowledge about the contexts in which attempts to regulate are useful, as opposed to potentially harmful, and may have implications for clinical models of intervention.

Modeling the impact of regulatory flexibility

Recent theory and research suggest that flexibility in strategy selection and implementation should be a key determinant of well-being, beyond the contribution of any particular strategy (Kashdan & Rottenberg, 2010). The idea here is that being able to implement strategies flexibly depending on context is more likely to result in a strategy–situation fit. While daily measures of regulatory flexibility do not yet exist, it is possible to construct such measures using aggregation (for example, Kashdan et al., 2010). Does *flexibility* in the daily use of emotion suppression, reappraisal, and mindful acceptance contribute unique variance to the prediction of well-being, above the effects of any one strategy?

Conclusion

Gross's process model of ER has contributed much to our understanding of the impact of a range of regulatory strategies on the experience of emotions (for example, Gross, 1998; Aldao et al., 2010), but has not focused on explaining the contextual factors that influence the process of ER. The methodological approaches used to date in ER research have tended to rely on single-occasion measurement and thus struggle to provide more

nuanced understandings of ER processes as they are experienced. EMA and related methods

are well positioned to uncover insights into the contextual variability governing ER

processes.

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Chapter 3: Methodology and Design

Comprehensive methodological information is provided within each individual study in this thesis. This chapter provides:

(a)   additional information and context on the use of a secondary dataset for the three studies

(b)   an overview of the methodological approach.

Description of Data

The three studies in this thesis (chapters 4–6) use a large intensive longitudinal dataset, "Social Interaction and Personality", which provides data on the daily life of college students enrolled at George Mason University, USA. I was given access to this dataset for the three studies in this PhD thesis by data owner Professor Todd Kashdan (associate supervisor). The general aim of collecting this intensive data was to understand the nuances of both sexuality and emotion regulation in daily life. Several research questions were set up in advance for this 21-day study. This included a deep analysis of how sexuality operates in daily life compared to global questionnaires, the nature of anger from a qualitative and quantitative perspective, and what can be learned about the generation, construction, and regulation of emotions to determine resiliency and vulnerability factors. Data were collected from 187 university students over 21 consecutive days after their completion of an initial trait data packet. The final sample had a mean age of 23.9 years (range 17–63) and an ethnic composition of 53.1% Caucasian, 11.7% Latino/Hispanic, 11.2% Asian, 7.1% African-American, 1.6% Middle Eastern, 1.1% Native American, and 6.5% other. The 187 participants provided 3,852 days of data at an average of 20.59 days per person, demonstrating a high rate of compliance. Interestingly, it was reported by the data owner (T.K.) that a large number of people in the sample continued to make diary entries despite the study officially ending. This resulted in more data than 187×21 days should afford. For the

purposes of the current study, data entries beyond 21 days were excluded from analyses. As

this was a daily diary study with days nested within individuals, level 1 (daily) variables are

linked to level 2 (trait) variables by ID. There are more than 700 variables in the overall

dataset, reported across 21 days. Several studies have been published from this data set

before the completion of this thesis (Kashdan, et al., 2011; Pond et al., 2012; Kashdan et al.,

2014; Kashdan, Goodman, Mallard, & DeWall, 2016; Kashdan, Goodman, Stiksma, Milius,

& McKnight, 2017; Young, Machell, Kashdan, & Westwater, 2018). Most of these studies

focus on sexual experiences and well-being, and do not bear any direct relevance to the

current thesis which focuses on emotion regulation strategies in daily life. However, two of

these studies (Pond et al., 2012; Kashdan, Goodman, Mallard, & DeWall, 2016) bear direct

relevance to models of emotion regulation, and are discussed in Chapter 7 (Discussion and

Conclusions) in light of the results found in the studies of this thesis.

Secondary Data Analysis

The studies in this thesis rely mainly on the use of secondary data. The use of

secondary data has a long history in the social sciences but has only started to be embraced

relatively recently in the discipline of psychology (Trzesniewski, Donnellan, & Lucas, 2011).

Secondary data analysis provides opportunities for furthering areas of research through the

replication, re-analysis and reinterpretation of existing data. This gives researchers

opportunities to test emerging ideas, theories, models, and hypotheses without the burden and

expense of collecting new data (Johnston, 2014). Further, the use of existing databases to

answer important research questions avoids the unnecessary duplication of data collection

and the waste of resources and ensures that particular topics or populations are not over-

researched (Tripathy, 2013).

However, the use of secondary data has both advantages and disadvantages that must

be understood by researchers implementing this approach. The advantages are clear. The

most significant advantage is that the data have already been collected, potentially saving a great deal of time, energy and resources in designing and implementing data collection (Trzesniewski et al., 2011). Furthermore, the data available in archives tend to be more numerous and of a higher quality than those that could be collected by an individual researcher. Therefore, developing the skills required to analyze large and high-quality datasets is an efficient means of making valuable contributions to an area of research.

Nevertheless, secondary data analyses most often involve a cost to benefit trade-off between the obvious benefits of the approach and any limitations involved. The major limitation is that the researcher is not involved in the data collection. This means that the data were most often not collected with the researcher's particular goals and framework in mind, making for a less than ideal approach. For example, the data might not use the most relevant or up-to-date measures for the researcher's area of interest. This was an issue that I encountered in Study 2 of this thesis (Chapter 5). While I had strong theoretical reasons to explore need satisfaction as a moderator of the utility of ER, an ideal approach would have been to implement a measure of need satisfaction *and* need thwarting. There are theoretical reasons that suggest one may get different results from delineating the effect of needs in this way. However, this dataset, despite its strengths, used only a measure of need satisfaction but no index of thwarting. There were thus several instances in which a trade-off was struck in order to advance interesting research questions. Notwithstanding some of these issues, overall, the dataset was a very good match for the aims of the thesis. The inherent time-series nature of the daily diary data, along with the large number of variables recorded at the trait and daily levels, gave a multitude of options for studying contextual variability in ER processes using multilevel modeling.

Ecological Momentary Assessment Methodology

Ecological momentary assessment (EMA) approaches are a group of related data collection methods that include ambulatory assessment, experience sampling, and daily diary methods. These approaches have a long history of use in psychology and well-being research (Kanner, Coyne, Schaefer, & Lazarus, 1981; Larson, & Csikszentmihalyi, 1983). The core feature of these approaches is that data are collected from individuals in their natural surroundings as they go about their daily lives, resulting in the increased *ecological* validity of research findings (Shiffman, Stone, & Hufford, 2008). As discussed in Chapter 2, ER has two features that make it difficult to research with traditional measurement approaches. First, emotional responses and subsequent regulation unfold across moments of time (Gross, 2015). Second, ER is a contextual process, so understanding the dynamics of ER processes involves assessing and modeling contextual variability and, if possible, across moments of time. EMA data collection approaches appear to be a good fit for ER research in which subjects provide multiple assessments of how their experiences vary over time and between situations (Shiffman et al., 2008).

Multilevel Modeling Approach

Collecting data using EMA methods produces data that are nested, as multiple observations are collected from a given individual, and require specialized statistical approaches, called *multilevel modeling*, for analyses (for example, Nezlek, 2007). While multilevel modeling is essentially based on simple regression models, its key strength is that it can provide analyses of nested data structures without violating the assumption of independence. This is a key feature of data collected using EMA methods, as data collected from one day to the next tend to be highly correlated. In this thesis, I follow the approach outlined by Nezlek (2007) for modeling the interplay between personality traits, states, situations, and behaviors. Two main features of this approach make it ideal for the purposes

of researching contextual variability in ER processes. First, the relationship between two daily variables (for example, reappraisal and negative affect) can be modeled in terms of how they vary as a function of a third "moderating" or "mediating" variable, uncovering contextual variability. Second, these relationships can be modeled across time from one occasion to the next, providing insight into the dynamic nature of ER processes. The specific analytical approach differs slightly among the three studies, as discussed in detail in chapters 4, 5, and 6.

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Chapter 4: Emotion Regulation Strategies in Daily life:

Mindfulness, Cognitive Reappraisal and Emotion Suppression

Abstract

Most empirical studies of emotion regulation (ER) have relied upon the use of retrospective trait measures, and have not examined the link between daily regulatory strategies and everyday emotional well-being. We used a daily diary methodology with multilevel modeling data analyses ($n = 187$) to examine the influence of three ER strategies (mindfulness, cognitive reappraisal, and emotion suppression) on the experience of daily negative and positive affect. Our results suggested that daily mindfulness was associated with lower negative and higher positive affect, whereas the converse pattern was found for daily emotion suppression: cognitive reappraisal was related to daily positive, but not negative affect. When daily mindfulness, suppression and reappraisal were included in the same models, these strategies predicted unique variance in emotional well-being. Random slope analyses revealed substantial variability in the utility of these strategies. Additional analyses revealed that age moderates the effect of cognitive reappraisal on daily negative affect: higher use of appraisal was associated with more negative affect for adolescents (aged 17 to 19) but became associated with less negative affect with increasing age. We interpret these results in line with a contextual view of ER in which no strategy is inherently "good" or "bad".

Introduction

Difficulties in healthy ER are increasingly viewed as a trans-diagnostic process underlying a range of clinical problems (Ellard, Fairholme, Boisseau, Farchione, & Barlow, 2010). Research on ER has also been shown to have high clinical relevance, providing empirical and theoretical support for many modern approaches to psychological therapy (Kring & Sloan, 2009). ER is the process by which people actively modulate their feelings, their response to their feelings, or the conditions that elicit emotions to respond effectively to environmental demands (Gross, 1998). Specific regulatory strategies have commonly been proposed to have either "adaptive" or "maladaptive" profiles because of their known relationships to affective, behavioral, and cognitive outcomes, as well as on their relationships to poor mental health outcomes (Gross, 1998; Gross & John, 2003; Gross, 2015).

Despite the apparent significance of ER strategies to emotional well-being, there has been limited research into the role of ER in the daily life of individuals and the distinctive contribution of the various strategies to daily emotional well-being. Empirical studies into ER have almost entirely relied upon cross-sectional and experimental research designs (Gross & John, 2003), using a "trait" approach to measurement where people contribute data from one time-point. This approach is a valid means of examining ER as a trait; however, other approaches are needed to uncover the nature of ER as it unfolds in daily life (Gross & John, 2003). This is because results measured at the trait level are often independent from those measured at the "state" or "within-person" level (Brose, Voelkle, Lövdén, Lindenberger, & Schmiedek, 2015; Kashdan & Nezlek, 2012). The present study examined the relative contributions of three of the most common ER strategies in basic research and therapy (mindfulness, cognitive reappraisal, and emotion suppression) on daily emotional well-being.

Each of these three ER strategies, and why they are likely to be of profound importance to everyday emotional experiences, are discussed. Cognitive reappraisal has been proposed to be an antecedent-focused strategy, defined as a form of perspective shift involving interpreting a potentially triggering emotive situation in a way that modifies its full affective impact before full activation has occurred (Gross & John, 2003). A great deal of research has contrasted reappraisal with suppression. Emotion suppression is a response-focused strategy that involves the active inhibiting of emotionally expressive behavior (Gross & Levenson, 1993).

Various studies have revealed that reappraising, relative to no strategy and relative to response-focused strategies such as suppression, is related to benefits in emotional well-being. Across a range of emotion-inducing contexts, reappraisal has been argued to effectively decrease negative affect, and to do so without significant physiological expense, meaning there appear to be little to no negative side effects of the strategy (Gross, 2002; Mauss, Cook, Cheng, & Gross, 2007). Past studies suggest that people who frequently make use of reappraising tend to experience more positive emotions and less negative emotions and show better interpersonal functioning in both self- and peer-reports (Gross & John, 2003).

A different profile has emerged from studies of emotion suppression. Researchers have found that emotion suppression is an effective means of dampening emotionally expressive behavior, but does not provide subjective relief to negative affect experiences. Further, the strategy comes with a substantial cost to cognition, physiology, and relationship functioning (Gross, 2002). These findings have led to the general conceptualization of cognitive reappraisal as being an "adaptive" regulatory strategy and emotion suppression as being a "maladaptive" form of regulation (Gross & John, 2003).

Mindfulness has been proposed as an alternative or complement to the more traditional response-focused strategy of cognitive reappraisal. Mindfulness has been defined

as "paying attention in a particular way: on purpose, in the present moment, and non-

judgmentally" (Kabat-Zinn, 1994, p. 4). This definition characterizes mindfulness as being

made up of:

(a)   an *awareness* component where one's attention is being purposely harnessed towards

         the present moment

(b)   an *accepting* stance towards this experience characterized by an attitude of curiosity

         and openness (Bishop, 2002).

         Placed within an ER framework, it has been hypothesized that mindfulness could

facilitate a healthy engagement with and expression of emotions, guarding against problems

associated with both the under-engagement (for example, alexithymia) and over-engagement

of emotions (for example, emotion dysregulation) (Chambers, Gullone, & Allen, 2009).

Chambers, Gullone, and Allen (2009) argue that mindfulness is a strategy antithetical to the

putatively problematic strategy of emotion suppression, a view shared by proponents of more

recent behavioral and cognitive therapy approaches such as acceptance and commitment

therapy (Hayes, Strosahl, & Wilson, 1999).While cognitive reappraisal is largely concerned

with changing the negative *content* of cognitions to regulate emotions, mindfulness has been

proposed to focus on a person's capacity to *relate* differently to those cognitions and

emotional experiences (Chambers et al., 2009).

Are there Regulation Strategies that are Inherently Good or Bad?

         There has been a growing interest recently in the idea that ER strategies may not be

inherently good or bad for emotional well-being. Rather, their value may depend on the

person using them and the situation in which they are used (Kashdan & Rottenberg, 2010).

From this contextual perspective, strategies are not considered universally adaptive or

maladaptive (Aldao, 2013).

Research is starting to support a contextual view of ER. One study aimed to investigate whether contextual influences may be involved in the usefulness of emotion suppression (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004). The study involved 101 university students in New York directly after the 2001 terror attacks. Participants' capacity to both increase and suppress the expression of their feelings in the months following the attacks was measured, and was conceptualized as a measure of "expressive flexibility". This study found that people who were better able to *both* enhance and suppress the expression of emotion reported better emotional well-being by the end of the second year of study. These results suggest that the capacity to suppress emotions may be related to benefits to emotional well-being, as long as this capacity occurs in the context of a corresponding capacity to enhance emotional expression.

A more recent study has reported similar contextual influences governing the usefulness of cognitive reappraisal (Troy, Shallcross, & Mauss, 2013). This study hypothesized reappraisal to be more adaptive when stressors were perceived to be more uncontrollable (when the person had little control over the situation), but problematic when stressors were perceived to be controllable (when the person had some control over the situation). To investigate this, Troy and colleagues (2013) measured recent life stressor severity, cognitive reappraisal skill, the perceived "controllability" of stressors, and depressive symptoms amongst 170 participants who had reported experiencing a stressful life event during the previous eight weeks. Results indicated that, for subjects with high perceived stressor "uncontrollability", greater cognitive reappraisal skill was related to decreased depressive symptoms following a stressful life event. In contrast, for participants with stressors perceived to be more controllable, greater cognitive reappraisal skill was associated with *more* depressive symptoms. The authors interpreted these results as

supportive of a contextual approach to ER in which particular regulatory strategies are not adaptive or maladaptive *per se*; rather, their utility is dependent upon context.

In another recent study, Aldao and Nolen-Hoeksema (2012) investigated the impact of regulatory strategy selection on indices of emotional well-being. In this study, retrospective reports of emotion-eliciting situations were used to overcome some of the problems associated with a pure trait-based approach, and to start to understand some of the contextual influences governing ER. This study found that flexibility was a predictor of emotional well-being in its own right for putatively adaptive strategies (for example, reappraisal and problem solving), but not for maladaptive strategies (such as emotion suppression and self-criticism). The researchers noted that, although a step in the right direction, their research paradigm had some major limitations as it remained reliant upon retrospective reports, which have been demonstrated to be impacted by a range of reporting biases, and in some studies, to poorly correlate with concurrent reports. They thus called for future studies to employ more favorable methodologies, such as ecological momentary assessment (EMA) and daily diary data collection, to replicate their findings and investigate whether there are discrepancies between results based on state-level versus trait-level methodologies (Aldao & Nolen-Hoeksema, 2012).

Research such as this has led to a refining of the original *process* model of ER to include a more contextual view of ER. Gross (2015, p. 17) acknowledges that some strategies appear to have a more adaptive or maladaptive profile in general (for example, cognitive reappraisal vs. emotion suppression), yet the adaptiveness of a given strategy will ultimately depend on "the person, the situation, and the goals that person has in that situation". Gross (2015) thus argues that an important area of future investigation is to examine how the adaptive value of regulatory strategies is influenced by personality and contextual variables.

Emotion Regulation as a Daily Process

Only recently have researchers started to investigate ER in daily life (Kashdan &
Steger, 2006; Nezlek and Kuppens, 2008). Upon examining the relationship of the strategies
of daily cognitive reappraisal and emotion suppression with daily events and reactions to
them in clinical and non-clinical populations, researchers found cognitive reappraisal to have
beneficial effects on affect, self-esteem, and adjustment, with the converse effects for
emotion suppression (Blalock, Kashdan, & Farmer, 2016; Nezlek & Kuppens, 2008). In non-
clinical samples, the adverse effects of daily emotion suppression were found for both daily
positive and negative affect, but the relationship between cognitive reappraisal and daily
reported affect was more complex. Looking at its links with reported daily level of positive
and negative affect only, daily cognitive reappraisal was only found to be significantly
related to increases in positive affect, with no significant relationship with daily negative
affect (Nezlek & Kuppens, 2008). This is a somewhat surprising result, given the many
empirical studies to date demonstrating reappraisal to be related to decreases in negative
emotions, but is wholly possible, given the different measurement approaches implemented.
That is, relationships found at the trait level do not necessarily hold at the state or daily level
(Nezlek, 2007).

A more recent study further examined ER in daily life in two cohorts of university
students who were prompted to report on their emotional experiences via a designated
palmtop device 10 times per day over seven days (Brans, Verduyn, Lim, & Kuppens, 2013).
This study found that:

(a)   cognitive reappraisal was the least used strategy of the six strategies measured (the
        study also included rumination, suppression, distraction, social sharing, and
        reflection)

(b)   cognitive reappraisal was not related to daily negative affect in either cohort, and was

             only marginally related to increased positive affect in one of the two cohorts.

        One of the other major findings of this study was that, whilst three of the strategies

were linked to increases in negative affect (rumination, suppression, and sharing), no

strategies were associated with decreases in daily negative affect.

        The results of these two daily process studies indicate that some strategies appear to

be associated with poorer ER (suppression, rumination, and sharing), when measured in daily

life; no strategies appeared to be related to *decreases* in negative affect.

        One study has explored the role of daily mindfulness in daily ER whilst constructing a

state version of the Mindful Attention and Awareness Scale (MAAS) (Brown & Ryan, 2003).

This study found that state mindfulness was discriminable from trait mindfulness, and that

state mindfulness predicted unique variance in daily positive and negative affect above and

beyond the impact of trait mindfulness.

        A sampling of the existing body of work on ER in daily life suggests that how

emotions are managed in the moment offers unique explanatory power in understanding the

well-being and functioning of individuals. The goal of basic science is to predict what people

will experience and do in their everyday life, and daily diary studies offer insight into these

moments for the same person, in various situations, and over time.

The Present Research

        Past research into ER has overwhelmingly used either retrospective designs, analogue

designs or trait measures of ER with suboptimal ecological validity. The few studies that

have employed daily measures have focused on comparisons between reappraisal and

suppression, and not included the potential unique value that mindfulness could contribute to

understanding daily emotional well-being.

The present study had four overarching goals. First, we explored the degree of convergence between mean daily and trait measures of ER and well-being. In particular, we were interested in the crossover correlations between mean daily and trait measures of ER constructs, given their divergent measurement approaches.

Second, we examined the extent that daily measures of reappraisal, suppression, and mindfulness overlapped with each other and predicted unique variance in emotional well-being. We were particularly interested in the role of mindfulness as a beneficial ER strategy with regard to daily negative affect, given the paucity of data on the beneficial forms of ER on negative affect (Brans et al., 2013) and the promising results found in an earlier study validating a measure of state mindfulness (Brown & Ryan, 2003).

Third, we examined the extent that the utility of the three ER strategies varied between individuals. If the utility of a strategy depends on the interaction between an individual and their particular context, then we would expect that the link between a strategy's use and healthy emotional outcomes would depend on the individual using it. In contrast, if context makes little difference, we would expect strategies such as mindfulness and cognitive reappraisal to have the same benefit across subjects, and suppression to have the same negative effect across subjects. Demonstrating that the utility of ER strategies depends on the person is thus a prerequisite for a contextual approach to ER.

Finally, we were interested in the directionality of the effects of the three strategies on emotional well-being from one day to the next. A key assumption of the ER model is that strategies have an impact on levels of experienced affect. Rarely do empirical studies consider that levels of affect might impact regulation strategies.

Method

Participants

Data were collected from 187 college students (40 men, 133 women, 14 with missing

data) with a mean age of 23.9 years (SD = 9.06, range 17–63) and an ethnic composition of

53.1% Caucasian, 11.7% Latino/Hispanic, 11.2% Asian, 7.1% African-American, 1.6%

Middle Eastern, 1.1% Native American, and 6.5% other. The 187 participants provided 3,852

days of data at an average of 20.59 days per person (SD = 2.06).

Procedure

Participants were recruited through a web-based portal for students seeking to

participate in research, as well as flyers and online advertisements for a study on personality

and behavior. During the consent process, participants were informed that the purpose of the

study was to better understand people's experiences of emotions in daily life. Participants

completed a 1½ hour introductory session where they provided baseline data, including

demographic information and trait measures, and were trained in how to correctly complete

the daily online survey. Participants were then asked to complete this survey each day before

going to sleep over the next 21 days. Participants received weekly reminder emails

emphasizing the importance of compliance, confidentiality, and the time-and-date stamping

of online entries. After completing the study, subjects received research credit as a part of

their course unit, and raffle tickets into a draw to win one of ten $25 gift certificates.

Measures

Trait Emotion Regulation

Trait cognitive reappraisal and emotion suppression were measured using the full 10-

item Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ is intended to

evaluate individual differences in the habitual use of cognitive reappraisal and expressive

suppression as ER strategies. The 6-item trait cognitive reappraisal subscale has been shown

to have adequate internal consistency (0.79) and test–retest reliability (0.69) in undergraduate student samples (Gross & John, 2003). The cognitive reappraisal factor measures the tendency of people to engage in construing potentially emotion-eliciting situations in ways that change their emotional impact (Gross & John, 2003). The 4-item trait emotion suppression scale has been shown to have acceptable internal consistency (0.73) and test–retest reliability (0.69) in undergraduate student samples and measures the tendency of people to engage in active inhibiting of ongoing emotion-expressive behavior (Gross & John, 2003). The scale uses a 7-point Likert type scale from 1 (*Strongly disagree*) to 7 (*Strongly agree*), where higher scores indicate increased use of the regulatory strategy.

Trait mindfulness was assessed using the Langer Mindfulness Scale (LMS; Pirson, Langer, Bodner, & Zilcha-Mano, 2012). The LMS is a 21-item self-report measure of an individual's tendency to be mindful. Each item is assessed using a 7-point Likert type scale, ranging from 1 (*Strongly disagree*) through to 7 (*Strongly agree*), with higher LMS scores reflecting higher trait mindfulness. In a pooled sample of 952 undergraduate students and community members, Bodner and Langer (2001) report Cronbach's alpha for the LMS total mindfulness score to be 0.85.

Trait Positive and Negative Affect

Trait positive and negative affect was measured using the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988). The PANAS is a 20-item self-report scale that measures positive and negative mood states in relation to several time frames (for example, previous week, month). The current study used the PANAS items anchored to the statement: "Indicate to what extent you generally feel this way, that is, how you feel on the average." The *negative affect* scale consists of 10 adjectives describing negative emotions (for example, scared, upset), whilst the *positive affect* scale consists of 10 adjectives which describe positive emotions (for example, interested, proud). Participants rate the degree to

which they feel each emotion on a scale from 1 (*Very slightly or not at all*) to 5 (*Extremely*).

The PANAS has demonstrated good internal consistency, with Cronbach's alpha for both

scales reported to be between 0.87 and 0.88 (Watson, Clark, & Tellegen, 1988).

Daily Emotion Regulation

Daily emotion suppression was measured using a modified 3-item state measure

adapted from the 10-item ERQ (Gross & John, 2003): "I keep my emotions to myself" (item

2), "When I am feeling positive emotions, I am careful not to express them" (item 4), and

"When I am feeling negative emotions, I make sure not to express them" (item 9).

Participants were asked to indicate how frequently they had experienced each item that day

using a 7-point Likert type scale from 1 (*Strongly disagree*) to 7 (*Strongly agree*), where

higher scores indicate increased use of the regulatory strategy. The ERQ is designed to assess

individual differences in the habitual use of cognitive reappraisal and expressive suppression

as ER strategies. The 3-item state measure of emotion suppression represents a parsing down

from a 4-item state measure used in a previous study (Kashdan & Steger, 2006) which was

reported to have high reliability (0.97).

Daily cognitive reappraisal was measured using a modified 2-item state measure

adapted from items 1 and 3 of the ERQ. This included the following items: "When I want to

feel more positive emotion (such as joy or amusement), I change what I'm thinking about"

(item 1), and "When I want to feel less negative emotion (such as sadness or anger), I change

what I'm thinking about" (item 3). The cognitive reappraisal factor measures the tendency of

people to engage in construing potentially emotion-eliciting situations in ways that change

their emotional impact (Gross & John, 2003).The two items chosen were based upon a study

by Kashdan & Steger (2006), who reported high reliability (0.97) for the four-item state

measure of cognitive reappraisal.

The 5-item state MAAS (Brown & Ryan, 2003) assesses the short-term expression of a receptive state of mind in which attention, sensitively aware of what is occurring in the present moment, just observes what is taking place as it unfolds (Brown & Ryan, 2003). For the purposes of this study, a 3-item version of the state MAAS was used so as not to overburden respondents without any corresponding benefit in terms of validity or reliability (for example, Farmer & Kashdan, 2012). Two items drawn from the state MAAS used for the current study were (1) "I found myself preoccupied with the future or the past" and (2) "I found myself doing things without paying attention". A third item ("I accepted my feelings, thoughts, and bodily sensations without judging or trying to change them") was constructed and added so as to broaden our mindfulness measure to include an "acceptance" aspect emphasized by some mindfulness researchers (for example, Bishop, 2002). Participants were asked to indicate how frequently they had the experienced each item that day using a 6-point Likert type scale from 1 (*Almost always*) to 6 (*Almost never*), where high scores were reflective of increases in daily mindfulness. The original state MAAS has shown excellent psychometric properties (for example, reliability = 0.92; Brown & Ryan, 2003), and to be predictive of trait MAAS scores and both lower negative and higher positive daily affect independent of the trait MAAS (Brown & Ryan, 2003).

Daily Positive and Negative Affect

Daily positive and negative affect was measured by responses to four positively valanced adjectives (enthusiastic, happy, satisfied, and excited) and four negatively valanced adjectives (embarrassed, disappointed, anxious, and sad). Participants answered using a 7-point scale with endpoints 1 = "Did not feel this way at all" and 7 = "Felt this way very strongly". The daily negative (0.68) and positive affect (0.73) measures have been found to have adequate reliability in a previous diary study (Machell, Goodman, & Kashdan, 2015).

Analysis

We used multilevel modeling data analysis techniques to account for the nested structure of our data, with 3,852 days within 187 people. A multilevel modeling approach allowed us to test for individual variation in slopes using the "lme4" (Bates, Maechler, Bolker, & Walker, 2014) and "nlme" (Pinheiro, Bates, DebRoy, Sarkar, & R Core Team, 2016) packages of the statistical program "R" Version 3.1.3 (R Core Development Team, 2016). A control for autoregressive error structures was applied to all multilevel models, with the exception of the lagged (time contingent) models. Including this error structure did not substantively change any of the results of the multilevel models.

Results

Exploratory plots were examined across the repeated measures data, and a linear model was confirmed as adequately describing the trajectories. Where possible, all 21 time points were included in the analysis, although there were incomplete data in some cases. The average intra-class correlations (ICCs) for daily reappraisal, mindfulness, and suppression were 0.63 (95% CI = .58–.68), 0.49 (95% CI = .43–.54), and 0.57 (95% CI = 0.52–0.62), respectively, indicating an acceptable level of variability in the daily measures of ER. The ICCs for daily negative and positive affect were 0.33 (95% CI = 0.28–0.39), and 0.39 (95% CI = 0.33–0.44), suggesting that 67% and 61% of the variability in negative and positive affect was within-person. Means, standard deviations, reliabilities, and correlations between daily and trait ER and positive and negative affect are displayed in Table 4.1.

Relationship between Daily and Trait Measures

The associations between the average of a person's daily measures and their trait measures are displayed in Table 4.1. In general, larger correlations were observed between data collected at the same level; there was a general lack of association between measures collected at different levels (that is, daily versus trait). For example, mean daily negative

affect was found to be significantly related to trait negative affect (0.33, $P = <.001$); however, a person's mean level of daily positive affect was not significantly related to trait positive affect ($P = > .05$). No significant effects were found for crossover relations between mean daily and trait measures for any of the strategies. The results of these analyses are highlighted in the shaded area of Table 4.1.

Table 4.1. Means, standard deviations, reliabilities, and correlations between daily and trait emotion regulation and positive and negative affect

Measure (Scale range)	Mean (*SD*) α	1	2	3	4	5	6	7	8	9	10
1) Daily negative affect (1–7)	9.84 (4.77) 0.90	–	–0.36[c]	–0.01	–0.52[c]	.21[c]	.33[c]	–0.07	–0.08	0.02	0.03
2) Daily positive affect (1–7)	16.38 (5.84) 0.92		–	0.34[c]	0.20[a]	–0.17[a]	0.01	–0.03	0.05	–0.02	–0.05
3) Daily cognitive reappraisal (1–7)	7.40 (3.43) 0.97			–	–0.13	.32[c]	.16	–0.02	0.16	0.11	0.02
4) Daily mindfulness (1–7)	14.01 (3.49) 0.94				–	–0.30[c]	–0.28[c]	0.01	–0.01	–0.10	–0.08
5) Daily emotion suppression (1–7)	8.13 (4.04) 0.96					–	0.10	0.09	–0.02	0.15	0.16
6)) Trait negative affect (1–10)	18.92 (6.61) 0.85						–	–0.30[c]	–0.13	–0.14	0.17[a]
7) Trait positive affect (1–10)	34.35 (6.47) 0.85							–	0.36[c]	0.48[c]	–0.28[c]
8) Trait cognitive reappraisal (1–7)	28.36 (6.75) 0.84								–	0.46[c]	–0.03
9) Trait mindfulness (1–7)	106.91 (15.56) 0.87									–	–0.13
10) Trait emotion suppression (1–7)	12.84 (5.47) 0.81										–

a   Significance level $P < 0.05$.

b   Significance level $P < 0.01$.

c   Significance level $P < 0.001$.

Notes: Shaded area highlights correlations between trait and mean daily variables. Daily variables are averaged by person. Dark shading highlights correlations between average daily and trait measures of similar constructs. All daily variables in this table have been averaged by person. Reliabilities for the daily measures were calculated from the ICCs. The reliabilities for the trait measures represent Cronbach's alphas.

Within-Day Effects of Emotion Regulation Strategies

For the within-day effects we first examined the relationships between strategies. Multilevel regression analyses revealed daily reappraisal to predict higher levels of daily suppression ($\beta = -0.11$, t(3025) = –2.09, $P < 0.05$) and lower levels of daily mindfulness ($\beta = 0.23$, t(3043) = 4.26, $P < 0.001$). Daily mindfulness was found to be related to lower levels of daily emotion suppression ($\beta = -0.28$, t(3025) = –4.24, $P < 0.001$).

Next we compared a model in which the slopes for each daily strategy were random versus a model in which the slopes were fixed. Across all three strategies, chi-square difference tests indicated that the random slope models were significantly better fitting (see Table 4.2).

Table 4.2. Results of chi-square difference tests comparing random intercept and random slope models

Negative affect	Difference	DF	*P*-value
Mindfulness	26.99	2	< 0.0001
Reappraisal	75.69	2	< 0.0001
Suppression	30.88	2	< 0.0001
Positive affect	~	~	~
Mindfulness	37.83	2	< 0.0001
Reappraisal	86.92	2	< 0.0001
Suppression	33.64	2	< 0.0001

Table 4.3 indicates that the slopes for mindfulness and emotion suppression were significant ($P < 0.001$) for both daily negative and positive affect, demonstrating that, in general, within-person mindfulness was related to benefits to emotional well-being whilst emotion suppression was generally predictive of lower levels of emotional well-being. Similar results were found with the relationships between daily cognitive reappraisal and positive affect, with a significant positive relationship found as expected ($P <. 001$).

However, the slope for daily cognitive reappraisal was not significant for daily negative

affect, meaning the strategy was not generally associated with lower daily negative affect.

Table 4.3. Random slope and random intercept model statistics for daily emotion regulation on daily negative
and positive affect

Negative affect	B	SD	DF	B_{Low}	B_{High}
(Intercept)	9.814[a]	2.205[a]	3019	7.609	12.019
Mindfulness	–1.517[a]	0.896[a]	3019	–2.413	–0.621
~					
(Intercept)	10.163[a]	2.626[a]	3031	7.537	12.789
Reappraisal	–0.202	1.442[a]	3031	–1.644	1.240
~					
(Intercept)	10.002[a]	2.516[a]	3031	7.486	12.518
Suppression	1.027[a]	1.036[a]	3031	–0.009	2.063
Positive affect	~	~	~	~	~
(Intercept)	16.386[a]	3.408[a]	3023	12.978	19.794
Mindfulness	1.045[a]	1.295[a]	3023	–0.250	2.340
~					
(Intercept)	16.103[a]	3.125[a]	3034	12.978	19.228
Reappraisal	1.353[a]	1.780[a]	3034	–0.427	3.133
~					
(Intercept)	16.268[a]	3.388[a]	3034	12.88	19.656
Suppression	–0.795[a]	1.336[a]	3034	–2.131	.541

a   Significance level $P < 0.001$.
Notes: Slope ("influence") was shown to significantly vary by individual. B_{Low} = slope 1 SD below the average.
B_{High} = slope 1 SD above the average.

Given the significance of the random slopes model, we examined the variability of the

effect of each strategy on positive and negative affect. The right side of Table 4.3 (B_{Low} and

B_{High}) presents the slope plus or minus one standard deviation from the mean slope. These

results can be understood visually in figures 4.1 through 4.3. The effects of daily mindfulness

tended to vary from highly positive (for example, strong link with emotional well-being) to

only moderately positive (relatively weak link to emotional well-being). A similar but

opposite pattern was observed for emotion suppression. Thus, mindfulness was generally

associated with positive outcomes and emotion suppression with negative emotional

outcomes, but the strength of this effect varied significantly between people. However, as

seen in Figure 4.3, an interesting profile emerged for the effect between daily reappraisal and

negative affect such that among some people higher daily reappraisal was associated with

lower negative affect, whereas for others it was associated with *higher* negative affect.

We also found that reappraisal was generally associated with greater positive affect,

with a strong positive relationship observed for some people and a weak positive relationship

for others.

Random Intercept and Slope

Random Intercept and Slope
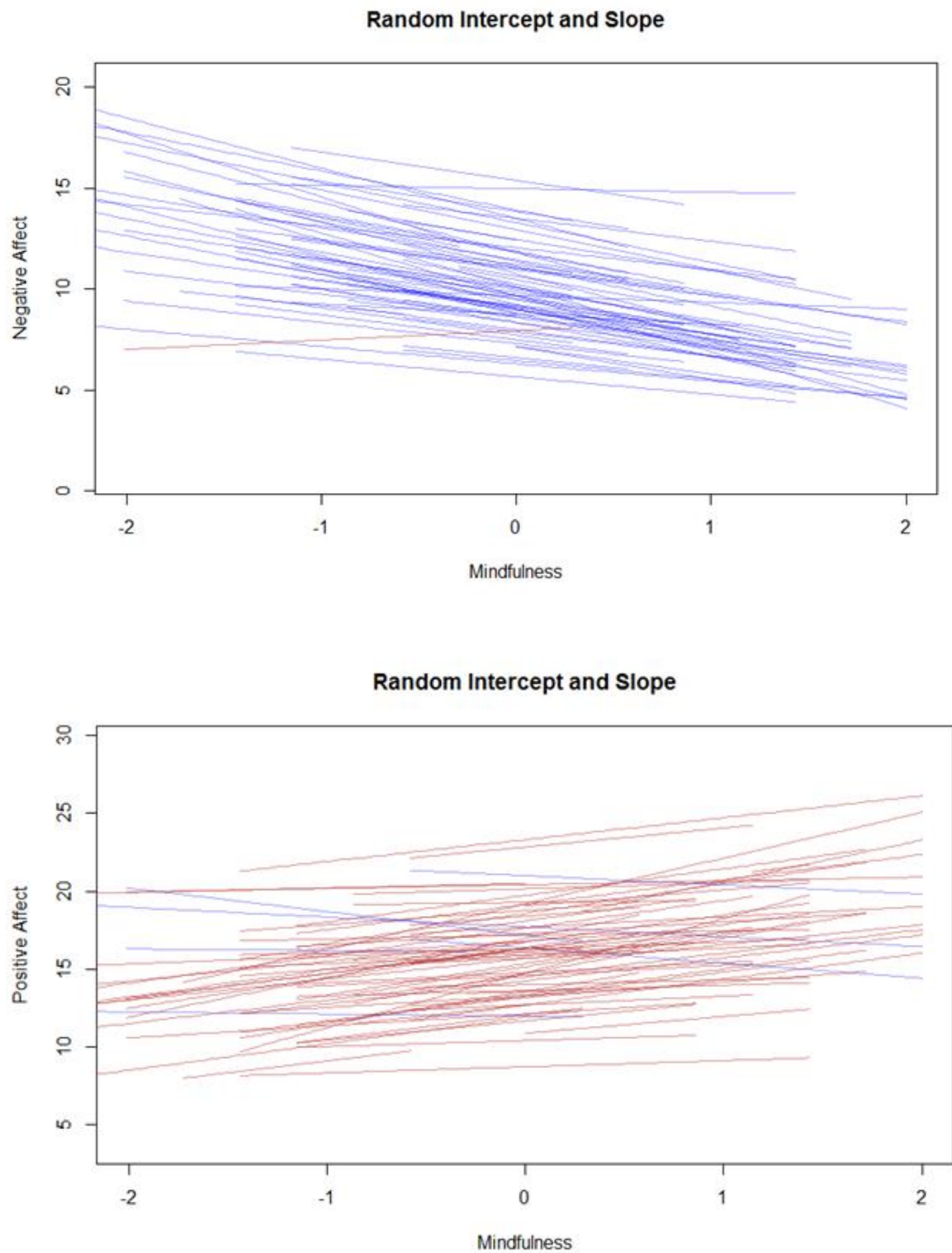
Figure 4.1. Random intercept and slope models for daily mindfulness on daily positive and negative affect

Random Intercept and Slope

Random Intercept and Slope
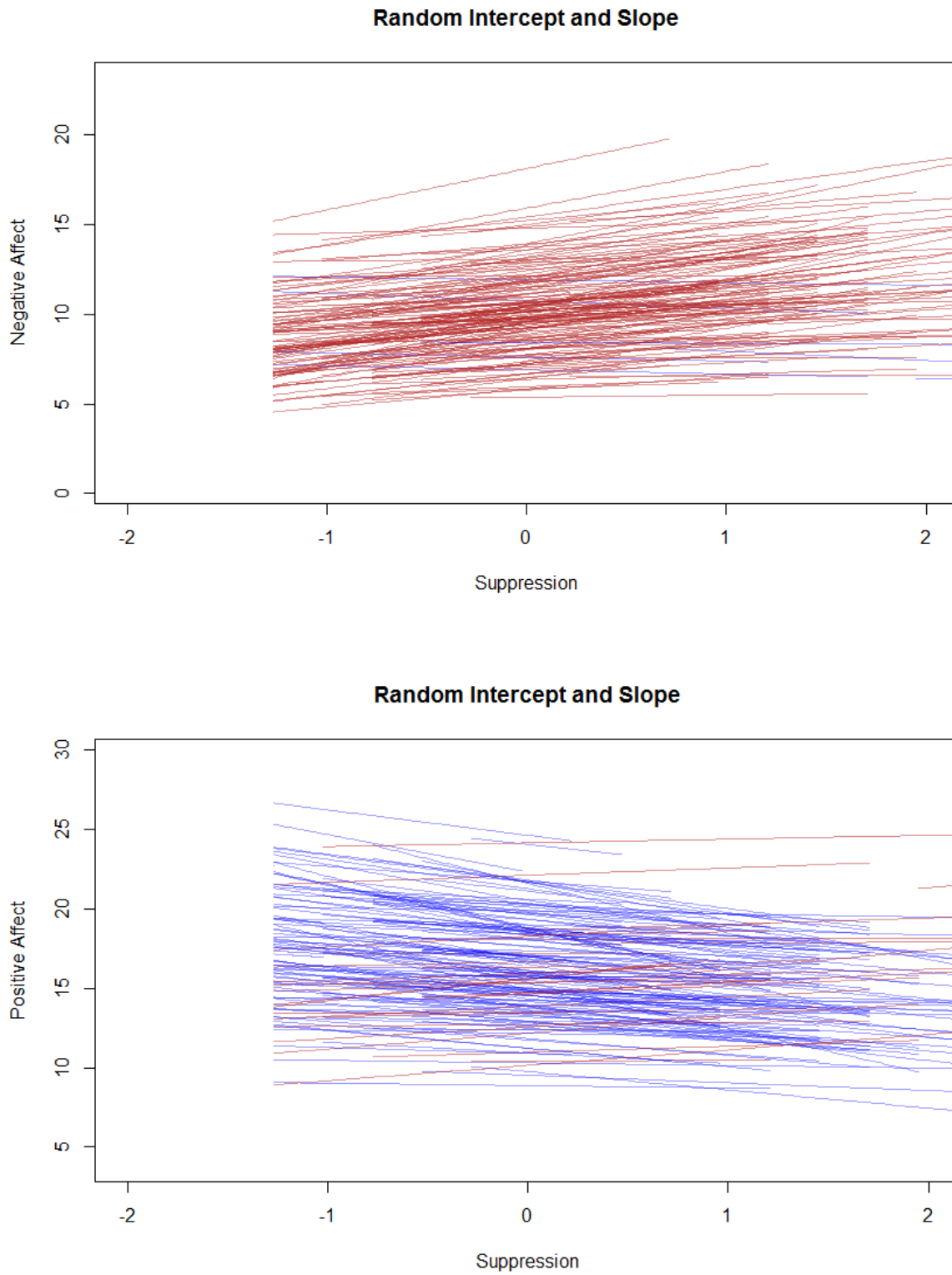
Figure 4.2. Random intercept and slope models for daily emotion suppression on daily positive and negative affect

Random Intercept and Slope

Random Intercept and Slope
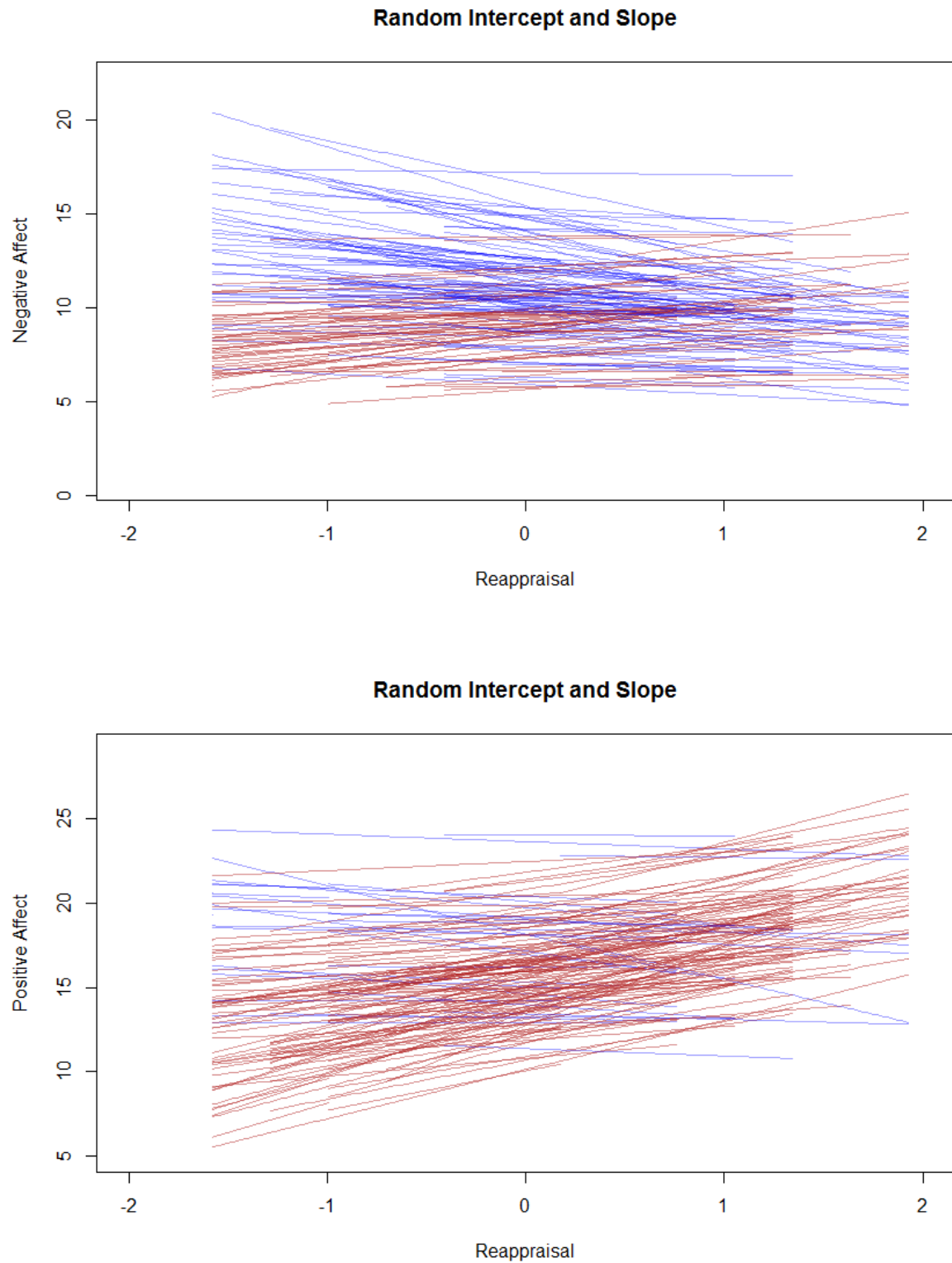
Figure 4.3. Random intercept and slope models for daily cognitive reappraisal on daily positive and negative affect

We next assessed the extent that the three strategies predicted unique variance in positive and negative affect. We conducted multilevel regression analyses that included all

three ER strategies as independent variables (predictors) at Level 1 (the within-person level),

with daily negative and positive affect as the dependent variables. The 2-part equation for

this model is given below:

$$DailyAffect_{ij} = \beta_{0j} + \beta_{1j}DailyReappraisal_{ij} + \beta_{2j}DailyMindfulness_{ij} +$$

$$\beta_{3j}DailySuppression_{ij} + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$

$$\beta_{1j} = \gamma_{01} + \mu_{1j}$$

$$\beta_{2j} = \gamma_{02} + \mu_{2j}$$

$$\beta_{3j} = \gamma_{03} + \mu_{3j}$$

In these analyses *Daily Affect_{ij}* was the dependent measure for person *i* on occasion *j*,

and β_{1j}–β_{3j} are coefficients denoting the random slope between the regulation strategy and

affect. When all three strategies were entered into a regression equation at step 1, predicting

daily negative affect, all were found to be significant unique predictors (mindfulness $\beta =$

-1.39, t(3012) = -12.55, $P < 0.001$, cognitive reappraisal $\beta = -0.31$, t(3012) = -2.48,

$P < 0.05$, and emotion suppression $\beta = 0.81$, t(3012) = 6.87, $P < 0.001$).

The three ER strategies were then entered together into a regression equation at

step 1, predicting daily positive affect, again resulting in all three strategies achieving

statistical significance as unique predictors (mindfulness $\beta = 0.96$, t(3016) = 6.80, $P < 0.001$,

cognitive reappraisal $\beta = 1.44$, t(3016) = 8.37, $P < 0.001$, and emotion suppression $\beta = -.73$,

t(3016) = -5.30, $P < 0.001$).

Spillover Effects of Emotion Regulation Strategies

The static, within-day relationships discussed so far do not address the issue of

directionality. To gain further insight into the relationship between daily ER and emotional

well-being, we conducted a series of analyses examining so-called "spillover effects"—the

effect that carries over from one day to the next (for example, Farmer & Kashdan, 2012).

First we estimated three separate models for each of the three strategies by positive and

negative affect to examine the effect of previous-day strategy use on next-day affect

experiences. Model 1 examined a basic spillover effects model with previous-day strategy

use predicting next-day positive and negative affect. Reciprocal effects were then examined

by estimating the effect of lagged positive and negative affect on next-day strategy use.

Model 2 then estimated a random slopes model, where the slope of daily affect was allowed

to vary. Model 3 tested a random slopes model in which strategy use was also allowed to

vary. In all cases, chi-square difference tests indicated that Model 2 was the best fitting

model ($P < 0.01$). Model 2 tested the lagged effect of ER strategy on next-day affect, and

then the lagged effect of daily affect on next-day ER strategy.

Results indicate that cognitive reappraisal, emotion suppression, and mindfulness

have differential effects on next-day affect experiences. Accounting for the previous day's

negative affect, there was no main effect for cognitive reappraisal on next-day negative affect

($\beta = -0.03$, $t(2926) = -1.51$, $P > 0.05$). Reversing this equation, controlling for cognitive

reappraisal, there was also no main effect for negative affect on next-day cognitive

reappraisal ($\beta = -0.006$, $t(2921) = -1.514$, $P > 0.05$). Accounting for the previous day's

positive affect, there was a significant main effect for cognitive reappraisal on next-day

positive affect ($\beta = 0.09$, $t(2933) = 4.387$, $P < 0.05$). There was, however, no significant

reciprocal effect for positive affect on the next day's cognitive reappraisal ($\beta = -0.001$,

$t(2936) = -.098$, $P > 0.05$).

Controlling for the previous day's negative affect, there was no main effect for

emotion suppression on next-day negative affect ($\beta = 0.012$, $t(2926) = 0.641$, $P > 0.05$).

Reversing this equation, controlling for emotion suppression, there was a main effect for

negative affect on next-day emotion suppression ($\beta = 0.045$, $t(2921) = 3.08$, $P < 0.05$).

Accounting for the previous day's positive affect, there was no main effect for emotion suppression on next-day positive affect ($\beta = 0.021$, t(2933) = 1.11, $P > 0.05$). There was also no reverse effect for positive affect on the next day's emotion suppression ($\beta = -0.003$, t(2936) = $-.25$, $P > 0.05$).

Mindfulness had the most robust lagged relationships with daily positive and negative affect. Controlling for the previous day's negative affect, there was a main effect for mindfulness on the next day's negative affect ($\beta = -.072$, t(2913) = $-.365$, $P < 0.05$). Reversing this equation, controlling for mindfulness, there was also a main effect for negative affect on next-day mindfulness ($\beta = -.043$, t(2908) = -2.72, $P < 0.05$), supporting a reciprocal influences model of the relationship between daily mindfulness and negative affect. Accounting for the previous day's positive affect, there was no main effect for mindfulness on next-day positive affect ($\beta = 0.002$, t(2921) = 0.12, $P > 0.05$). There was, however, a reverse effect for positive affect on the next day's mindfulness ($\beta = 0.033$, t(2914) = 2.09, $P < 0.05$).

Gender, Age, and Ethnicity as Trait Moderators of Daily Emotion Regulation

Next, we explored the potential moderating effect of gender, age, and ethnicity on the daily regulation of positive and negative affect. No significant interactions were found for gender or ethnicity ($P < 0.05$). However, a significant interaction was found for cognitive reappraisal $\times$ age for daily negative affect. As can be seen in Figure 4.4, among the younger adults in the sample, cognitive reappraisal was associated with *higher* levels of daily negative affect but was associated with increasingly lower levels of negative affect with age, crossing a zero line of effect at about age 20 ($\beta = -0.1.24$, t(2814) = -2.27, $P = 0.023$). No other significant interactions were found for regulatory strategies $\times$ age.
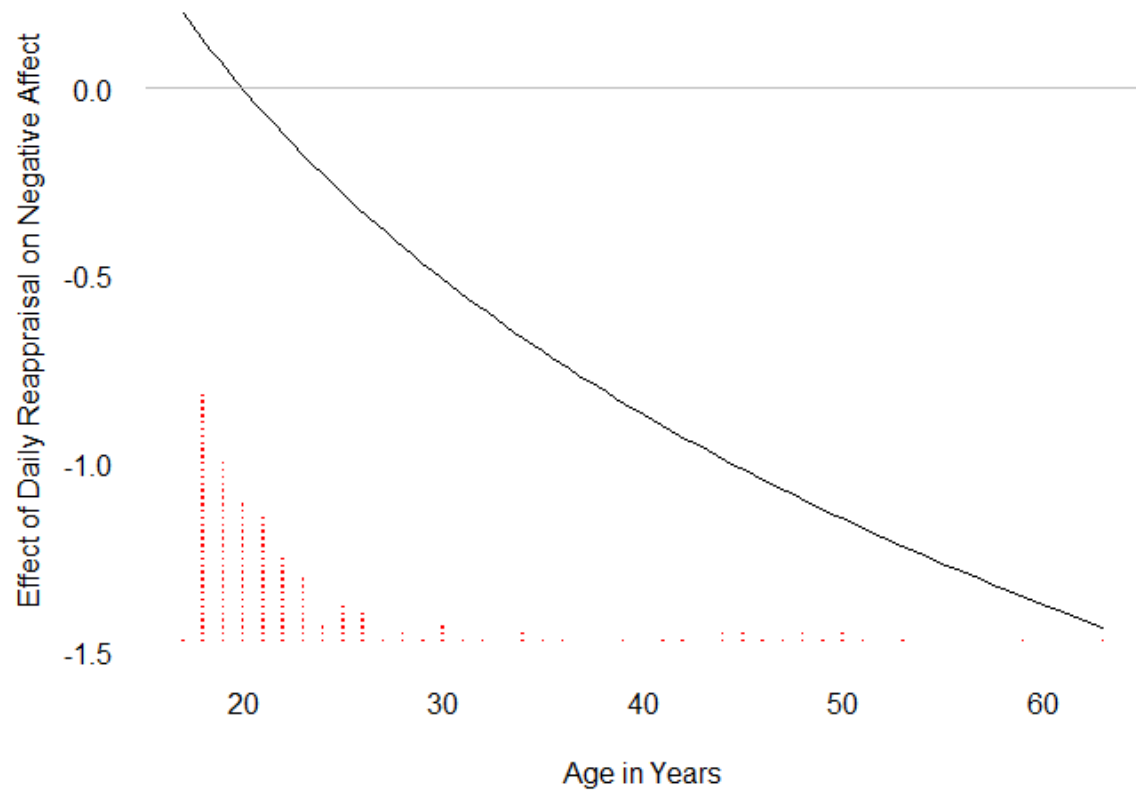
Figure 4.4. Age as a moderator of the relationship between daily cognitive reappraisal and negative affect

Discussion

A plethora of evidence exists suggesting general "adaptive" or "maladaptive" profiles

for particular ER strategies depending on their association with emotional well-being

outcomes (Gross, 2002). Recent theoretical (Gross, 2015) and empirical (Aldao, 2013)

literature on ER, however, suggests a contextual approach to ER in which the ultimate

adaptiveness of a given strategy depends on the person in a given context. The primary aim

of this study was to use daily diary methodology to further our understanding of the

relationship between ER strategies and emotional well-being as it is experienced in daily life.

A core assumption of this research was that results obtained from daily measures may differ

from those collected from one-off trait assessments.

In general, associations between daily and trait measures were evidenced to be weak to non-existent. In particular, correlations between trait and daily measures of similar underlying constructs were weakly related overall. For example, trait and daily positive affect were found to be statistically unrelated, meaning that the general degree of positive affect a person reported at the beginning of the study (trait) was not predictive of their positive affect as reported over the next 21 days. An exception was daily and trait negative affect, which were found to be modestly related (0.33). Trait versions of ER strategies were found to be unrelated to their daily counterparts, although there was a trend towards significance for daily–trait correlations for both reappraisal and suppression. We interpret these, broadly speaking, low to non-existent daily–trait correlations as evidence of the distinctiveness of the daily and trait measures. It should be noted, however, that the daily measure of mindfulness used in this study was derived from the trait MAAS and not the LMS (the trait mindfulness measure used in this study). Nonetheless, these results suggest that relationships that have been found at the trait level in the ER literature from one-off trait administrations are likely on occasion to yield different results from measures given daily or more frequently, consistent with the assertions of Nezlek (2007).

Emotion Regulation in Daily Life

A central finding of the present study relates to the results of the random slope models, which suggest that, for almost all people, daily mindfulness is associated with higher levels of positive affect and lower levels of negative affect, supporting the idea of a general adaptive profile for mindfulness (Chambers et al., 2009). The converse pattern was found for emotion suppression, supporting the idea of a general "maladaptive" profile for the strategy. However, the benefit or lack thereof varied markedly within people. For example, for some people, increased mindfulness was associated with substantial decreases in negative affect. For others, there was only a slight benefit of mindfulness, and a slight lack of benefit in

suppression in relation to emotional well-being. Cognitive reappraisal produced the most complex picture within-person for negative affect. Amongst some people, it was associated with decreased negative affect, whereas for others it was associated with increased negative affect.

The finding that daily cognitive reappraisal is not *generally* related to decreased negative affect in daily life is inconsistent with a vast literature, informed by a trait measurement approach, which has generally found the strategy to be related to decreased negative affect (Gross & John, 2003), and to therefore have a general adaptive profile. The results of the current study thus converge with those of Brans et al. (2013), who tracked ER on multiple instances within days, and similarly found no significant relationship between daily cognitive reappraisal and negative affect. Taken together, these two studies provide initial daily process evidence that on days when people experience lower levels of negative affect, they do not report engaging in higher levels of cognitive reappraisal. Investigating this matter further, the current study found that cognitive reappraisal was in fact related to decreased negative affect in approximately half of the participants, but that in the other half it was related to *increases* in negative affect. This indicates that significant variation exists in the relationship between daily reappraisal and negative affect between people. For some people, it seems, reappraisal is associated with benefits to emotional well-being, whilst for others it may have a problematic relationship to emotional well-being.

Notwithstanding these findings, the current study also found that daily cognitive reappraisal was in fact a strong predictor of daily positive affect. One possible implication of this is that, whilst cognitive reappraisal may not necessarily assist with regulating intense *negative emotions* once they are activated, the strategy may help with maintaining more consistent *positive affect* experiences on a daily basis. A behavioral explanation for this could be that cognitive reappraisal may contribute to a person's level of behavioral activation,

leading to increased opportunity to contact rewarding contingencies in the environment, leading to more positive affect (for example, Jacobson, Martell, & Dimidjian, 2001; Hayes et al., 1999). These findings support recent conceptualizations of ER which frame the effectiveness of different ER strategies as being dependent on person and context (for example, Aldao, 2013; Gross, 2015), and highlight the need for further studies to investigate moderators and contextual factors which might explain why reappraisal is associated with benefits for some people but not others.

Similar results were found when looking at the effect of strategy use from one day to the next. Cognitive reappraisal was a significant predictor of next-day positive affect but not negative affect. Interestingly, there was no effect of emotion suppression on next-day positive or negative affect; rather, negative affect appears to predict more emotion suppression on subsequent days. For mindfulness, a reciprocal influences model was supported for negative affect, with mindfulness predicting lower negative affect, and lower negative affect predicting higher next-day mindfulness. However, mindfulness did not predict next-day positive affect; rather, positive affect was found to influence next-day mindfulness. These "spillover" findings suggest a complex relationship between regulatory strategies and emotional experiences, such that the directionality of the relationship may not always be linear where strategies directly impact emotional experiences, as is often assumed; rather, emotions appear in some contexts at least to also impact the use of strategies. Similar studies tracking several instances of emotional experience within days would be expected to shed further light on the issue of the directionality in the relationship between strategies and emotional experiences.

Multilevel regressions indicated links between the three daily strategies, suggesting that people often use multiple and seemingly contradictory strategies on any given day. However, the correlations between these strategies were weak. For example, there was only

about 7% shared variance between daily mindfulness and suppression—a surprising finding, since the constructs have been proposed by some to be antithetical processes (for example, Chambers et al., 2009). Similarly, daily reappraisal was found to predict lower levels of daily mindfulness, contrary to some theoretical positions which posit mindfulness to be a prerequisite for reappraisal ability (for example, Troy, Shallcross, Davis, & Mauss, 2013; Garland, Gaylord, and Fredrickson, 2011). Interestingly, reappraisal predicted higher emotion suppression in daily life, suggesting that in some contexts perhaps cognitive reappraisal may serve an emotion suppressive function, consistent with the view of cognitive reappraisal held by most mindfulness-based approaches to psychotherapy (for example, Hayes et al., 1999).

Cognitive Reappraisal Improves with Age

The present data suggest that an important factor moderating the effect of daily reappraisal on negative affect is a person's maturity. For the younger adults in the sample, daily reappraisal was associated with more negative affect, but for those 20 years and older, reappraisal was associated with increasing benefits to emotional well-being. Whilst we are cautious, given this university sample is inherently more representative of younger adults, the impact of age on cognitive reappraisal deserves further empirical study. In particular, these results are at odds with the popular notion in the ER literature (Urry & Gross, 2010), supported by empirical studies using one-off assessments (for example, Optiz, Rauch, Terry, and Urry, 2012), that the effectiveness of cognitive reappraisal may actually *decline* with age. At the other end of the maturity continuum, our finding that cognitive reappraisal is associated with decreased benefits for teenagers naturally calls for similar daily diary studies of ER in younger samples. Broadly speaking, we interpret these age moderator results as being consistent with a flexibility view of ER (Kashdan & Rottenberg, 2010), and the notion that older adults may become better skilled at both applying (Sahdra, Ciarrochi, & Parker, 2016) and choosing between the regulatory strategies with age (Urry & Gross, 2010).

Implications for Clinical Models

The current findings have some implications for behavioral and cognitive approaches to clinical interventions that warrant discussion. Firstly, these results may be interpreted as challenging to therapy interventions such as traditional cognitive behavior therapy which emphasize cognitive reappraisal of "negative automatic thoughts" as a core therapeutic ingredient necessary in assisting with the regulation of negative emotions. In the current sample, we found that daily reappraisal showed no consistent relationship to daily negative affect. This may in part be explained by our secondary analyses, which found that cognitive reappraisal was associated with *both* increases and decreases in negative affect, depending on the person. If these results were to hold for clinical populations, this would indicate that for people presenting with high levels of negative affect as a core clinical problem (perhaps the vast majority of clinical patients), reappraisal may not be a universally beneficial strategy, and in some cases may in fact lead to increased negative affect. Future studies are needed, utilizing intensive longitudinal designs such as we have implemented in the current study, with a range of clinical populations to test whether these assertions can be generalized.

Our results also converge with a small but growing literature from cognitive behavior therapy treatment outcome studies which similarly indicate that cognitive reappraisal may not be a universally useful regulation strategy for promoting health and emotional well-being. For example, Brozovich and colleagues (2015) recently found in their randomized controlled trial of cognitive behavior therapy for social anxiety disorder that decreases in rumination over the course of their cognitive behavior therapy study, rather than increases in reappraisal, were associated with treatment outcome, indicating that, in this context at least, reappraisal did not appear to be a key mechanism of change. Interestingly, this study also found a positive relationship between baseline rumination and reappraisal, indicating that amongst people suffering social anxiety disorder, reappraisal was actually positively associated with

rumination. Notwithstanding this, the current study did find that cognitive reappraisal was associated with decreased negative affect for some people *and* increased positive affect for most, indicating that much more needs to be studied in relation to the contextual influences governing cognitive reappraisal and its relationship to emotional well-being. Future studies are needed to answer the question: In what contexts and for whom is cognitive reappraisal an effective ER strategy for negative affect? We also interpret the current results as being generally supportive of recent "contextual" approaches to therapy which view mindfulness as a broadly beneficial ER strategy, and which hold that appreciating flexibility and context is fundamental to understanding healthy ER (Hayes et al., 1999).

In terms of translating these findings into clinical practice, some strategies appear to be quite generally problematic (for example, emotion suppression), whilst others appear to have a more adaptive general profile (for example, mindfulness). However, we argue that the current results point to the importance of a more "contextual" approach to therapy involving ER problems, grounded in individualized case formulation and an appreciation for the individual and their particular context. That is, therapy endeavors involving ER may benefit from an explicit awareness that all strategies, putatively adaptive or maladaptive, may be effective for certain people and in certain contexts, and this requires careful assessment.

Limitations and Future Directions

Although the methods used in the current study have extended the study of ER beyond standard trait and single-occasion measurement approaches, these results must be understood in the light of several limitations. Firstly, our daily measures are self-report measures that participants complete at the end of each day, albeit in the context of an intensive, repeated measurement design. This means that, whilst some of the problems associated with self-reporting may have been minimized (for example, recall bias), they have not been eliminated completely. Future research may benefit from considering additional

measurement approaches which minimize bias, including event-contingent scheduling where participants report events as they occur several times throughout one day.

The current results also relate to emotional experiences in a broad way, describing relations with global negative and positive affect. Whilst a useful starting point, this design did not uncover how daily ER functions with more specific emotions (for example, guilt, shame, anger etc.) or dimensions of emotional experiences (for example, high and low active affect). Future studies might consider investigating whether the current results hold across a range of more nuanced dimensions of emotion. Relatedly, we have operationalized emotional well-being in the current study as involving more positive and less negative affect. We acknowledge that this definition of emotional well-being is not universally accepted, and may in fact be in direct conflict with the stance adopted in many mindfulness-based therapy models which may emphasize outcomes of quality of life or valued living (for example, Hayes et al., 1999).

Another potential issue relates to the 2-item daily cognitive reappraisal measure, which retains two items from Gross and John's (2003) original trait ERQ: "When I want to feel more positive emotion, I change what I am thinking about" and "When I want to feel less negative emotion, I change what I am thinking about". Although this 2-item combination has been used by other authors (for example, Nezlek & Kuppens, 2008), it could be argued that these items in isolation may not accurately reflect the construct of reappraisal as intended, but could function more as a form of distraction. We note, however, that Brans et al. (2013) used different items in their 2-item state measure ("I have changed the way I think about what causes my feelings" and "Did you see the event that caused your feelings from a different perspective?") and, as noted above, reported similar findings on the lack of relationship between reappraisal and negative affect.

It should also be noted that the use of the ERQ measures of cognitive reappraisal and emotion suppression are also very specific, and may not always map meaningfully onto other definitions of the constructs as they are used in research or in the clinic. For example, the way in which the reappraisal items are structured (for example, "When I want to experience less negative emotion, I change what I am thinking") implies that reappraisal is used to avoid emotions. However, in practice this may not always be the case. For example, in cognitive behavior therapy, reappraisal is often used in order to help patients to engage more with emotions or emotion-eliciting situations (for example, exposure), or to test out negative beliefs experientially (for example, behavioral experiments).

A more major limitation of the current study is that contextual factors outside of "the person" were not studied. This means that, whilst we were able to ascertain that the utility of ER strategies differed by person, and that age moderates the effect of one strategy, we were unable to yet uncover more specific contextual influences governing daily ER. Future studies investigating the contextual nuances of daily ER are clearly needed. For example, whilst emotion suppression was generally associated with poor emotional well-being for most people, there were still some individuals for whom emotion suppression appeared to be related to greater emotional well-being over the course of the study. This is consistent with a contextual view of ER and emerging research which indicates that even putatively "maladaptive" strategies such as emotion suppression may be associated with benefits in some contexts (Mitmansgruber, Beck, & Schüßler, 2008).

Finally, the use of a sample of university students in this study also limits the generalizability of the results. In particular, given that some of the central findings of this study relate to the regulation of negative affect, it is important to note that mean levels of negative affect in this sample appear quite low. This has implications for generalizing to clinical samples, which by their very nature are more likely to be more distressed. Extending

the current findings to clinical samples, and samples that experience higher levels of negative affect, is thus clearly needed. Relatedly, no data was collected regarding participants' psychological history or their past or current experience of psychotherapy or related practices (for example, meditation). These variables may be important moderators of daily ER and so warrant attention in future daily process studies.

The current data adds to a growing literature in support of a contextual view of ER and the need for more ecologically valid methods to uncover the nature of emotional well-being. Empirical examinations and intervention programs may benefit from a contextual view of emotion-regulation difficulties, where strategies are closely matched to the person and their particular context. Such a view shows promise in furthering our understanding of the nuances of ER and what are the best contributors to a particular person's daily emotional well-being.

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Chapter 5: Emotion Regulation Strategies in Daily Life: The Usefulness of Cognitive Reappraisal Depends on Whether Psychological Needs are Met

Submitted to *Emotion* for review.

Abstract

A contextual view of emotion regulation (ER) argues that no single strategy is inherently "good" or "bad"; rather, the usefulness of the strategy depends upon the person using it and the situation. To empirically test this framework, research methodology must be able to capture meaningful contexts and their variability. We used a daily diary methodology with multilevel modeling data analyses ($n = 187$) to test a hypothesis that the usefulness of three ER strategies (cognitive reappraisal, mindfulness, emotion suppression) depends on whether a person's psychological needs (for belonging, competence, and autonomy) have been met. Our results found partial support for this hypothesis. The use of cognitive reappraisal was associated with less negative affect and more positive affect when people had unmet psychological needs, but was far less beneficial for people whose psychological needs were satisfied. Interestingly, cognitive reappraisal was associated with significant *increases* in negative affect among people reporting satisfied psychological needs. In particular, the relative benefits of using habitual cognitive reappraisal were highly dependent on how much a person believed they felt a sense of belonging. Thus, there appears to be a potentially important link between the internal strategy of cognitive reappraisal and more social, externally derived sources of well-being.

Introduction

ER theory (Gross, 1998; 2002) argues that suffering results from the implementation of maladaptive ER strategies (such as emotion suppression and rumination) instead of

adaptive strategies (such as cognitive reappraisal and mindfulness). Self-determination theory (Ryan & Deci, 2000; 2017) argues that suffering results from a failure to satisfy the basic psychological needs for *belonging*, *competence*, and *autonomy*. Both theories have received substantial empirical support (Gross, 2013; Ryan & Deci, 2017). Surprisingly, there has been little examination of how the psychological processes identified in these theories interact. The two theories have generated substantial but largely independent research bases.

Our research program brings these theories together within a study of psychological need satisfaction and the regulation of daily negative and positive affect. The core hypothesis is that, if people are getting their relational, competence, and autonomy needs met in their lives, they will have less need to use internal strategies such as cognitive reappraisal to down-regulate negative emotions and up-regulate positive emotions. More specifically, we assume that people with psychological need satisfaction have *external* resources that give them meaning and help them regulate affect. For example, if people are surrounded by loved ones and have their need for belonging satisfied, they may be able to manage difficult times and negative affect by talking to their loved ones. In such a context, internal strategies such as reappraisal may provide relatively little added value. Stated another way, if people lack supportive people around them and are not getting their belonging needs met externally, they may need to use internal strategies such as reappraisal. Similar arguments can be made for competence and autonomy-supportive environments, as described below.

In this study, we define the "usefulness" of an ER strategy as the extent to which greater use of the strategy is associated with more daily positive affect, less daily negative affect, or both. We hypothesize that a person's level of need satisfaction will moderate the link between ER strategy use and the experience of daily positive and negative affect. If people are getting their needs met, ER strategies (for example, reappraisal) will be relatively unnecessary at best, and unhelpful at worst (for example, suppression).

Emotion Regulation and Well-being

ER has been described as an unfolding process whereby people attempt to modulate their emotions, their response to emotions, or triggering situations to respond appropriately to contextual demands (Gross, 1998). Regulatory "strategies" have been framed generally as either adaptive (for example, cognitive reappraisal and mindfulness) or maladaptive (for example, emotion suppression and rumination) because of their relationships to emotional distress, behavior, cognition, and psychopathology (Gross, 1998; Gross & John, 2003). In this research program, we focus on three of the most well studied ER strategies: cognitive reappraisal, emotion suppression, and mindfulness.

Cognitive reappraisal is an *antecedent*-focused strategy defined as a form of perspective modification involving construing potentially triggering situations in a way that changes emotional expression before full activation of the emotion has occurred (Gross & John, 2003). Emotion suppression is a *response*-focused strategy that involves attempts to actively dampen the expression of one's feelings (Gross & Levenson, 1993).

A raft of studies implementing mostly one-off trait assessments have demonstrated that reappraising, compared to using no strategy and compared to using response-focused regulatory strategies, is related to benefits in emotional well-being. In a range of emotion-inducing contexts, reappraisal has been argued to effectively decrease negative affect, and to do so without significant physiological expense: when group averages are examined, there appear to be few to no adverse effects (Gross, 2002; Mauss, Cook, Cheng, & Gross, 2007). Past studies have demonstrated that people who frequently engage in reappraisal generally experience more positive and less negative affect and demonstrate better self- and peer-reported interpersonal functioning (Gross & John, 2003). A contrasting profile has emerged from trait studies of emotion suppression. Researchers have found that emotion suppression is useful when people want to hide their emotion-expressive behavior, but not useful in

providing relief from the subjective experience of negative emotions, and that it also comes

at a substantial cost to a person's cognition, physiology, and social functioning (Gross, 2002).

Over the past 10 years, *mindfulness* has been increasingly conceptualized within an

ER framework. Within this framework, it has been proposed to be antithetical to the

putatively problematic strategy of emotion suppression, while also representing an "adaptive"

alternative to cognitive reappraisal (Chambers, Gullone, & Allen, 2009). Mindfulness has

been popularly defined as "paying attention in a particular way: on purpose, in the present

moment, and non-judgmentally" (Kabat-Zinn, 1994, p. 4). This definition characterizes

mindfulness as being made up of:

(a)   an *awareness* component, in which one's attention is being purposely focused on the

        present moment

(b)   an *accepting* stance towards this experience, characterized by an attitude of curiosity

        and openness (Bishop, 2002; Sahdra et al., 2017).

Within an ER framework, it has been hypothesized that mindfulness may facilitate a

healthier engagement with and expression of emotions, protecting against the problems

associated with both under-engagement (such as experiential avoidance) and over-

engagement of emotions (such as disturbing emotions) characteristic of psychopathology

(Chambers et al., 2009). It is thought that these benefits should ultimately promote a more

contextually sensitive and flexible style of emotional responding (Arch & Landy, 2015). In

contrast to cognitive reappraisal, which is largely concerned with changing the negative

content of cognitions, mindfulness works to promote a healthier *relationship* to cognitions

and emotional experiences, characterized by awareness and acceptance. (Chambers et al.,

2009). Mindfulness has been proposed in some circles as overcoming some of the potential

drawbacks of cognitive reappraisal as an adaptive strategy, which some have argued may be

used as a form of experiential avoidance (Hayes, Strosahl, & Wilson, 1999). Mindfulness has

been consistently associated with benefits to positive and negative affect across self-reported,

behavioral, and neural outcomes (Arch & Landy, 2015).

A Daily Process Approach to Emotion Regulation: The Importance of Context

The above theories and research have led to the notion that some ER strategies (such

as cognitive reappraisal and mindfulness) have a generally "adaptive" profile, while others

(such as emotion suppression and rumination) have a generally "maladaptive" profile (Arch

& Landy, 2015; Gross & John, 2003). Recent research and theory have called this approach

into question, arguing that the usefulness of any strategy will ultimately depend on many

factors, including aspects of the environment (for example, controllability) (Haines et al.,

2016), the age of the person (Brockman, Ciarrochi, Parker, & Kashdan, 2017), and the

function of the strategy (for example, avoidance) (Aldao & Nolen-Hoeksema, 2012). In this

"contextual" framework, strategies may present as maladaptive via several pathways,

including when they:

(a)   are ineffective (that is, they do not modify the emotional experience as desired)

(b)   have been improperly developed

(c)   have short-term benefits that are outweighed by long-term costs to the individual and

        their goals

(d)   are applied inflexibly, in ways that are not sensitive to features of the environment

        (Werner & Gross, 2010; Kashdan & Rottenberg, 2010).

Aldao (2013) goes further, arguing that the adaptiveness of any strategy cannot be

understood free from the context in which it is deployed.

Given the significance of context to the process of ER, Aldao (2013) suggests that

research must now focus on "capturing context", implementing methodologies that are best

positioned to capture the "contextual variability" of ER strategies. Aldao defines context

broadly as including "all of the circumstances that surround a given process" and proposes a framework in which context is made up of an interaction between four elements:

(a)   the organism carrying out the regulation (for example, demographics, personality traits, psychological processes within the person)

(b)   the emotion-eliciting stimuli in the environment (environmental antecedents)

(c)   the selection and implementation of strategies (strategy skill)

(d)   the types of outcomes considered (for example, short-term versus long-term consequences).

It is important to note that, from this position, context includes aspects that go beyond the physical environment. This is consistent with contextual-behavioral science approaches, which define context pragmatically as a changeable stream of events that have an organizing impact on people's behavior (Hayes & Ciarrochi, 2015; Hayes, Villatte, Levin, & Hildebrandt, 2011; Hayes, Strosahl, & Wilson, 1999). "Behavior" is defined broadly in this tradition as anything the organism does, including overt behavior such as "jumping up and down" and covert behavior such as "feeling bad" in particular moments of time.

Ecological momentary assessment (EMA) approaches, including diary studies, hold promise for studying the process of ER as it unfolds, because the dynamic relationships between the four aspects of context noted above (person-level variables, antecedents, selected strategies, consequences) can be modeled in a way that maximizes ecological validity and captures the impact of significant moderating variables (Aldao, 2013; Kashdan & Rottenberg, 2010). Recent research into ER using EMA methods is indeed starting to uncover contextual variability in ER. In a study of ER in daily life, Brockman et al. (2017) found that the putatively "adaptive" strategy, cognitive reappraisal, was not generally beneficial in regulating negative emotions on any given day or from one day to the next. Further, while mindfulness was found to be generally beneficial to ER for most people in the sample, and

suppression was found to be problematic (lower positive affect and higher negative affect),

that was not the case for all people in the sample. Furthermore, the study found that age

predicted the usefulness of cognitive reappraisal: the strategy was less useful for younger

people and more useful with age. These findings support a contextual view of ER in which

the utility of strategies varies among people, highlighting that psychological variables and

traits may be a source of contextual variability in ER.

Another recent EMA study found similar contextual variability for reappraisal, which,

as implemented in daily life, was not broadly associated with emotional benefits. Rather, the

study found that benefits from daily reappraisal occurred only when it was employed in

situations that were perceived as "uncontrollable", as opposed to "controllable" (Haines

et al., 2016).

Basic Psychological Needs and Emotion Regulation

Contextual-behavioral science models assume that strategies such as reappraisal,

mindfulness, and suppression are types of behavior that can be more or less useful, depending

on context. "Usefulness" is defined as the extent to which strategies support valued activity

and satisfy basic human needs (Ciarrochi, Atkins, Hayes, Sahdra, & Parker, 2016; Hayes,

Strosahl, & Wilson, 1999; Hayes & Ciarrochi, 2015). Thus, from this perspective, people's

primary purpose in life is not to up-regulate or down-regulate emotions, but to engage in

valued activity and to satisfy basic needs (Gloster et al., 2017). ER is not an end, but a means

to support need satisfaction.

Self-determination theory (SDT) is a comprehensive theory of human motivation and

well-being that places the satisfaction or thwarting of the basic human psychological needs

for relatedness (or belonging), competence, and autonomy as central to human well-being

and development (Deci & Ryan, 2000). From an SDT perspective, well-being occurs to the

degree that a person's social context supports rather than impairs the satisfaction of basic

psychological needs. Conversely, "ill-being" (a blanket term for psychological states characterized by high levels of emotional distress and vulnerability and low levels of positive affect and vitality) results from social contexts that are unsupportive or thwarting of basic need satisfaction (Vansteenkiste and Ryan, 2013). SDT posits that, to experience optimal levels of well-being, people need to feel a sense of *relatedness* to other people and groups, believe they are *competent* navigators of their internal and external environments, *and* need to experience *autonomy* or self-determination in relation to the way they act within their life context (Ryan & Deci, 2017).

Although specific links between the SDT and ER frameworks have not been thoroughly examined, SDT predicts that people experiencing low need satisfaction are likely to experience higher levels of negative affect and may use compensatory coping strategies as a result. Vansteenkiste and Ryan (2013) theorize that the activation of negative affect resulting from individuals experiencing thwarted needs in their life context can lead to the use of "maladaptive coping mechanisms" in an attempt to soothe the negative emotional states activated by unhelpful social contexts. SDT thus describes a process in which emotional vulnerability occurs as a result of people being unable to satisfy their basic psychological needs, and in which individuals are motivated to cope or soothe themselves using behavioral regulatory strategies. This is largely consistent with the literature on ER, which similarly describes a process by which people actively use ER "strategies" to modulate their feelings and associated behaviors to respond appropriately to environmental demands (Gross, 1998).

A key difference between ER theory and SDT is that ER theory views internal strategies as the key driver of well-being, whereas SDT views need satisfaction in the *external environment* as the key driver (Ryan & Deci, 2017). There is clear evidence that need satisfaction is in part a result of supportive environments. For example, Gagné (2003)

conducted two studies investigating the individual and environmental predictors of need satisfaction and prosocial behavior and found that levels of reported parental autonomy support in one's social context predicted increases in the satisfaction of all three basic psychological needs. Furthermore, need satisfaction fully mediated the relationship between reported levels of parental autonomy support and prosocial behavior. Similarly, La Gaurdia and colleagues (La Guardia, Ryan, Couchman, & Deci, 2000) found robust associations between the attachment security that participants experienced in current relationships and the satisfaction of all three basic psychological needs. Van den Broeck, Vansteenkiste, De Witte, Soenens and Lens (2010) found similar results when studying the link between environmental supports and need satisfaction in the workplace. Specifically, they found that the environmental job resources of task autonomy, skill use, and social support predicted corresponding increases in the satisfaction of the basic psychological needs for belonging, competence, and autonomy.

A number of SDT studies support a mediation model in which features of the environment influence need satisfaction, which in turn influences well-being. For example, Legate, DeHaan, Weinstein, and Ryan (2013) reported that the satisfaction of participants' relatedness needs was predicted by their current experiences of ostracism in the environment and mediated the link between ostracism and psychological distress. Studies such as this support the SDT premise that need-supportive environments promote well-being through need satisfaction and that, conversely, toxic environmental conditions promote ill-being and psychological distress through the thwarting of need satisfaction. Similar results have been found in daily process studies of need satisfaction. Ryan, Bernstein, and Brown (2010) studied the so-called "work effect" versus "weekend effect" as aspects of the environment and found that basic psychological need satisfaction mediated the positive relationship between the weekend effect and indices of psychological well-being.

Based on this evidence, we posit that need-satisfying environments may help regulate and improve well-being and make internal strategies relatively less necessary. To use a metaphor, just as someone with great height may have less need to jump to reach something on a shelf, someone with supportive relationships, stimulating work and hobbies, and a sense of authorship over their life may have less need to use internal ER strategies to manage their emotions. A person with such a supportive life context may instead manage negative affect by talking with a loved one or becoming fully absorbed in their job or hobby.

The interplay between SDT and ER theory may have interesting implications for both theories. From an SDT perspective, regulatory strategies may be useful to the degree that they are need supportive versus need thwarting. However, because the theory emphasizes supports for need satisfaction and well-being in the external environment, SDT studies have not extensively studied regulatory strategies outside of mindfulness or 'awareness', a strategy seen as most potentially useful in personality 'integration' (Ryan & Deci, 2017). Thus, analyses of a wider range of emotion regulation strategies in relation to need satisfaction may shed light on what regulatory strategies may be most conducive to need satisfaction, and thus therapy. ER theory has almost solely focused on the role of internal regulatory strategies on well-being, and has not laid out a comprehensive theory of the role of context on the process of ER. The concept of need satisfaction holds promise as an explaining variable that may shed light on people's emotion regulation goals; what motivates people to regulate in some situations and not others? Here rather than coming up with its own theory of context, ER theory may, at least in the first instance, borrow from SDT and understand the role of context through the gaze of SDT. Does need satisfaction play a role in the regulation of positive or negative emotions?

There is a clear need to link ER theory and research and the current search for "contextual variance" with theory and research underlining the importance of need-supportive contexts.

For this study, we were particularly interested in a person's need satisfaction because, unlike for measures of ER strategies, the impact of context is inbuilt in the construct of *need satisfaction*. The construct represents an interaction between the person and their environment: "the person in context" (covering two of the four domains of context proposed by Aldao, 2013). This study examined the importance of a person's need satisfaction in the process of daily ER by:

(a)   examining the relationship between three different ER strategies as implemented in daily life and a person's need satisfaction

(b)   testing a moderation model in which the relationship between daily ER and emotional well-being depends upon a person's need satisfaction.

We hypothesized that the relationship between the use of daily ER and the experience of daily positive and negative affect would be greater among people experiencing unmet psychological needs and lower among those with satisfied psychological needs.

Method

Participants

Data was collected from 187 university students (40 men, 133 women, 14 with missing data) with a mean age of 23.9 years (SD = 9.06) and an ethnic composition of 53.1% Caucasian, 11.7% Latino/Hispanic, 11.2% Asian, 7.1% African-American, 1.6% Middle Eastern, 1.1% Native American, and 6.5% other. The 187 participants provided 3,852 days of data at an average of 20.59 days per person.

Procedure

Ethical approval was given by the Human Subject Review Board at George Mason University, USA (Approval #477961). Participants were recruited through an online portal for students seeking to participate in research, as well as flyers and online advertisements for a study on personality and behavior. Recruited participants' ages ranged from 17 to 63. During the consent process, participants were informed that the purpose of the study was to better understand people's experiences of emotions in daily life. After completing the study, subjects received research credit as a part of their course unit and raffle tickets in a draw to win one of ten $25 gift certificates. Participants completed a 1½ hour induction session in which they provided baseline data, including demographic information, and were trained in how to correctly complete the daily online survey. They were then asked to complete this survey before going to sleep on each day over the next 21 days. They received weekly reminder emails that emphasized the importance of compliance, confidentiality, and the time-and-date stamping of online entries. The resultant data represents a large intensive longitudinal data set. The current study is the second of three studies which employed this data to investigate the contextual nature of ER processes. The first of these studies has already been published (Brockman, Ciarrochi, Parker, & Kashdan, 2017).

Measures

Daily Emotion Regulation

Daily emotion suppression was measured using a modified 3-item state measure adapted from the 10-item Emotion Regulation Questionnaire (ERQ; Gross & John, 2003): "I keep my emotions to myself" (item 2), "When I am feeling positive emotions, I am careful not to express them" (item 4), and "When I am feeling negative emotions, I make sure not to express them" (item 9). The ERQ is designed to assess individual differences in the habitual use of cognitive reappraisal and expressive suppression as ER strategies. The 3-item state

measure of emotion suppression was parsed down from a 4-item state measure used in a previous study (Kashdan & Steger, 2006), which produced evidence of acceptable construct validity and internal consistency (0.97).

Daily cognitive reappraisal was measured using a modified 2-item state measure adapted from items 1 and 3 of the ERQ. The two items were "When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about" (item 1), and "When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about" (item 3). The cognitive reappraisal factor measures the tendency of people to engage in construing potentially emotion-eliciting situations in ways that change their emotional impact (Gross & John, 2003). The two items were chosen based upon a study by Kashdan and Steger (2006) that reported acceptable construct validity and internal consistency (0.97) for the 4-item state measure of cognitive reappraisal.

The 5-item state Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a measure of state mindfulness, defined as an open state of mind in which one's attention is sensitively in contact with the present moment, simply observing what takes place as it unfolds (Brown & Ryan, 2003).

For this study, a 3-item version of the state MAAS was used so as not to overburden respondents without any corresponding benefit in validity or reliability (for example, Farmer & Kashdan, 2012). The two items drawn from the state MAAS used for our study were (1) "I found myself preoccupied with the future or the past" and (2) "I found myself doing things without paying attention." A third item ("I accepted my feelings, thoughts, and bodily sensations without judging or trying to change them") was constructed and added so as to broaden our mindfulness measure to include an "acceptance" aspect emphasized by some mindfulness researchers (for example, Bishop, 2002).

Participants were asked to indicate how frequently they had experienced each item that day using a 6-point Likert type scale from 1 (*Almost always*) to 6 (*Almost never*), on which high scores were reflective of increases in daily mindfulness. The original state MAAS has shown excellent psychometric properties (for example, reliability = 0.92; Brown & Ryan, 2003) and has been shown to be predictive of trait MAAS scores and both lower negative and higher positive daily affect, independently of the trait MAAS (Brown & Ryan, 2003).

Daily Positive and Negative Affect

Daily positive and negative affect were measured by responses to six positively valanced adjectives (excited, enthusiastic, happy, relaxed, calm, and satisfied) and six negatively valanced adjectives (nervous, embarrassed, upset, sad, bored, and disappointed). Participants answered using a 7-point scale with endpoints 1 ("Did not feel this way at all") and 7 ("Felt this way very strongly"). Daily negative affect and positive affect measures were found to have adequate reliability (0.68 and 0.73, respectively) in a previous diary study (Machell, Goodman, & Kashdan, 2015).

Trait Needs Satisfaction

The General Need Satisfaction Scale (GNSS) (Gagné, 2003) contains 21 items that measure the satisfaction of three psychological needs: autonomy (7 items), competence (6 items), and relatedness (8 items). When combined, the three scales give an overarching measure of global need satisfaction. Participants respond on a 7-point Likert scale ranging from 1 (*Not at all true*) to 7 (*Very true*) to show how well each psychological need is generally satisfied in their life; for example, "I really like the people I interact with" (belonging), "Most days I feel a sense of accomplishment from what I do" (competence), and "I feel like I am free to decide for myself how to live my life" (autonomy). Global need satisfaction and the three subscales have demonstrated good psychometric properties (for example, reliability=0.69–0.89; Brown & Ryan, 2003) and are predictive of trait MAAS

scores and both lower negative and higher positive daily affect, independently of the trait

MAAS (Brown & Ryan, 2003).

Analytical Strategy

We used multilevel modeling data analysis techniques to account for the nested

structure of our data and to test for individual variation in slopes using the "nlme" package

(Pinheiro, Bates, DebRoy, & Sarkar, 2014) of the statistical program "R" Version 3.0.3

(R Core Development Team, 2014). While the data were treated using multilevel models,

they retained an inherently autoregressive structure (that is, Monday data were more likely to

be similar to Tuesday data than to Wednesday data). Therefore, we incorporated an

autoregressive error structure of lag-1 to ensure appropriate standard errors. The average

intra-class correlations for daily reappraisal, daily mindfulness, and daily suppression were

0.63, 0.49, and 0.57, respectively, indicating an acceptable level of variability in the daily

measures of ER. The intra-class correlation coefficients (ICCs) for daily negative and

positive affect were 0.33 and 0.39, respectively.

Results

Preliminary Results

We first examined the zero-order correlations between aggregated daily ER variables

(strategies and affect) and trait need satisfaction (see Table 5.1). Consistent with previous

trait literature, the three needs of belonging, competence, and autonomy were positively

interrelated (Ryan & Deci, 2017). Satisfaction of an individual's needs (global, belonging,

competence, autonomy) was related to decreases in daily negative affect but was unrelated to

daily positive affect. Trait belonging and autonomy were found to be unrelated to the use of

daily ER strategies. However, we found trait competence to be related to less frequent use of

daily cognitive reappraisal and increased use of daily mindfulness.

Table 5.1. Means, standard deviations, reliabilities and correlations between trait need satisfaction, daily emotion regulation strategies, and daily affect

Daily measure	Mean (SD) α	1	2	3	4	5	6	7	8	9
1) Trait need satisfaction (global)	108.48 (15.87) 0.88	–	0.84^b	0.81^b	0.85^b	-0.17^a	0.05	0.06	–0.16	–0.22
2) Trait autonomy	33.18 (5.72) 0.73		–	0.61^b	0.54^b	-0.19^a	–0.06	<0.01	–0.14	–0.15
3) Trait competence	31.06 (5.68) 0.72			–	0.49^b	-0.22^a	–0.05	0.34^a	-0.35^a	–0.14
4) Trait relatedness	44.24 (7.59) 0.84				–	-0.21^a	0.10	0.08	0.06	< 0.01
5) Daily negative affect	9.84 (4.77) 0.90					–	-0.36^b	-0.52^b	–0.01	0.21^b
6) Daily positive affect	16.38 (5.84) 0.92						–	0.20^a	0.34^b	-0.17^a
7) Daily mindfulness	14.01 (3.49) 0.94							–	–0.13	-0.30^b
8) Daily cognitive reappraisal	7.40 (3.43) 0.97								–	0.32^b
9) Daily emotion suppression	8.13 (4.04) 0.96									–

a   Significance level $P < 0.05$.

b   Significance level $P < 0.01$.

Notes: Daily measures are averaged by person. Reliabilities for the daily measures were calculated from the ICCs. The reliabilities for the trait measures represent Cronbach's alphas.

Main Analyses

Our main hypothesis was that trait need satisfaction would moderate (interact with) the link between daily ER and daily negative and positive affect such that those experiencing greater need satisfaction would benefit less from the use of the ER strategies. To test this, we ran a series of six hierarchical multilevel models. Daily data was nested within person, and the models predicted positive and negative affect using the main effects of each strategy and

global need satisfaction, and the interaction between them. We focused on the global need satisfaction scale (six tests), rather than the individual need scales (18 tests), to minimize the risk of type 1 error. We decided to examine individual need satisfaction effects only if the global need satisfaction effect was significant.

As shown in Table 5.2, results of the six omnibus tests indicated that daily cognitive reappraisal was the only strategy found to interact significantly with need satisfaction. Consistent with our hypothesis, a significant reappraisal × need satisfaction interaction was found for both positive and negative affect, such that reappraisal was associated with greater benefits for those experiencing low need satisfaction. Following the guidelines of Cohen, Cohen, West, and Aiken (2013), we performed simple slope analyses to evaluate the slopes of cognitive reappraisal in relation to daily positive and negative affect at two standard deviations above and below the mean for need satisfaction (see Figure 5.1). Simple slope analyses revealed that reappraising was associated with significant decreases in negative affect among people whose needs are not being satisfied (B = –1.04, SE = 0.27, T = –3.86, $P < 0.05$), but with significant *increases* in negative affect among people whose needs are being satisfied (B = 0.54, SE = 0.25, T = 2.16, $P < 0.05$).

In addition, reappraisal was associated with *increases* in positive affect among people experiencing low need satisfaction (B = 2.51, SE = 0.32, T = 7.89, $P < 0.001$), but no effect among those experiencing high need satisfaction (B= 0.30, SE = 0.29, T = 1.03, $P > 0.05$).

Table 5.2. Hierarchical multilevel models showing the main effects and interaction of ER strategy and trait need satisfaction on daily positive and negative affect

Strategy	Daily positive affect		Daily negative affect	
	Estimate	SE	Estimate	SE
(Intercept)	16.57[c]	0.30	9.91[c]	0.23
Daily cognitive reappraisal	1.41[c]	0.14	–0.25[a]	0.12
Need satisfaction	0.52	0.31	–0.97[c]	0.23
Reappraisal × need satisfaction	–0.55[c]	0.13	0.40[c]	0.12
–				

(Intercept)	16.58[c]	0.31	9.93[c]	0.19
Daily mindfulness	1.09[c]	0.12	−1.57[c]	0.10
Need satisfaction	0.40	0.32	−0.79[c]	0.19
Mindfulness × need satisfaction	−0.13	0.12	0.04	0.10
−				
(Intercept)	16.55[c]	0.31	9.92[c]	0.22
Daily emotion suppression	−0.73[c]	0.13	0.88[c]	0.11
Need satisfaction	0.46	0.32	−0.86[c]	0.22
Suppression × need satisfaction	0.07	0.13	−0.10	0.11

a   Significance level $P < 0.05$.

b   Significance level $P < 0.01$.

c   Significance level $P < 0.001$.

Reappraisal by Need Satisfaction

Reappraisal by Need Satisfaction

Figure 5.1. Relationship between daily cognitive reappraisal and daily affect at high (black) and low (grey) levels of global need satisfaction

Post hoc Analyses of Specific Need Satisfaction and Daily Reappraisal

Given the significant interaction between global need satisfaction and reappraisal, we sought to unpack that interaction by looking at the specific needs that made up the global need construct. While the three needs are known to highly correlate, previous SDT research has found satisfaction of the three needs to have differential effects in some contexts (Ryan & Deci, 2017). We were interested in whether the interaction effect generally held across all three core needs, or whether it was specific to certain needs. Again, we used multilevel analyses, with daily data nested within person. Each individual need satisfaction and its interaction with daily reappraisal were entered into the model simultaneously; thus, they acted as covariates for each other. Full results are reported in Table 5.3.

Table 5.3. Hierarchical multilevel models showing the main effects and interaction of daily cognitive reappraisal and trait need satisfaction on daily positive and negative affect.

	Daily positive affect			Daily negative affect	
	Estimate	SE		Estimate	SE
(Intercept)	16.55[c]	0.30		9.92[c]	0.23
Daily cognitive reappraisal	1.42[c]	0.14		–0.26[a]	0.11
Competence	–0.33	0.40		–0.17	0.31
Relatedness	0.61	0.37		–0.30	0.29
Autonomy	0.33	0.41		–0.68[a]	0.32
Reappraisal × relatedness	–0.45[b]	0.16		0.40[b]	0.14
Reappraisal × competence	0.18	0.17		0.05	0.15
Reappraisal × autonomy	–0.41[a]	0.17		0.03	0.15

a   Significance level $P < 0.05$.
b   Significance level $P < 0.01$.
c   Significance level $P < 0.001$.

Three of the possible six interactions were found to be significant. First, daily cognitive reappraisal was found to be a significant predictor of daily negative affect when controlling for the three trait needs of belonging, competence, and autonomy, predicting decreases in daily negative affect. A significant interaction was observed for belonging on the relationship between daily cognitive reappraisal and both positive and negative affect. Daily

reappraisal was associated with beneficial ER (lower negative affect and higher positive affect) for those low on trait belonging in terms of both their daily positive and negative affect. Simple slope analyses revealed that reappraising was associated with significant decreases in negative affect among people whose belonging needs are not being satisfied (B = –4.21, SE = 0.27, T = –4.21, $P < 0.01$), but with significant *increases* in negative affect among people whose belonging needs are being satisfied (B= 0.63, SE = 0.25, T = 2.50, $P < 0.05$) (see Figure 5.2).
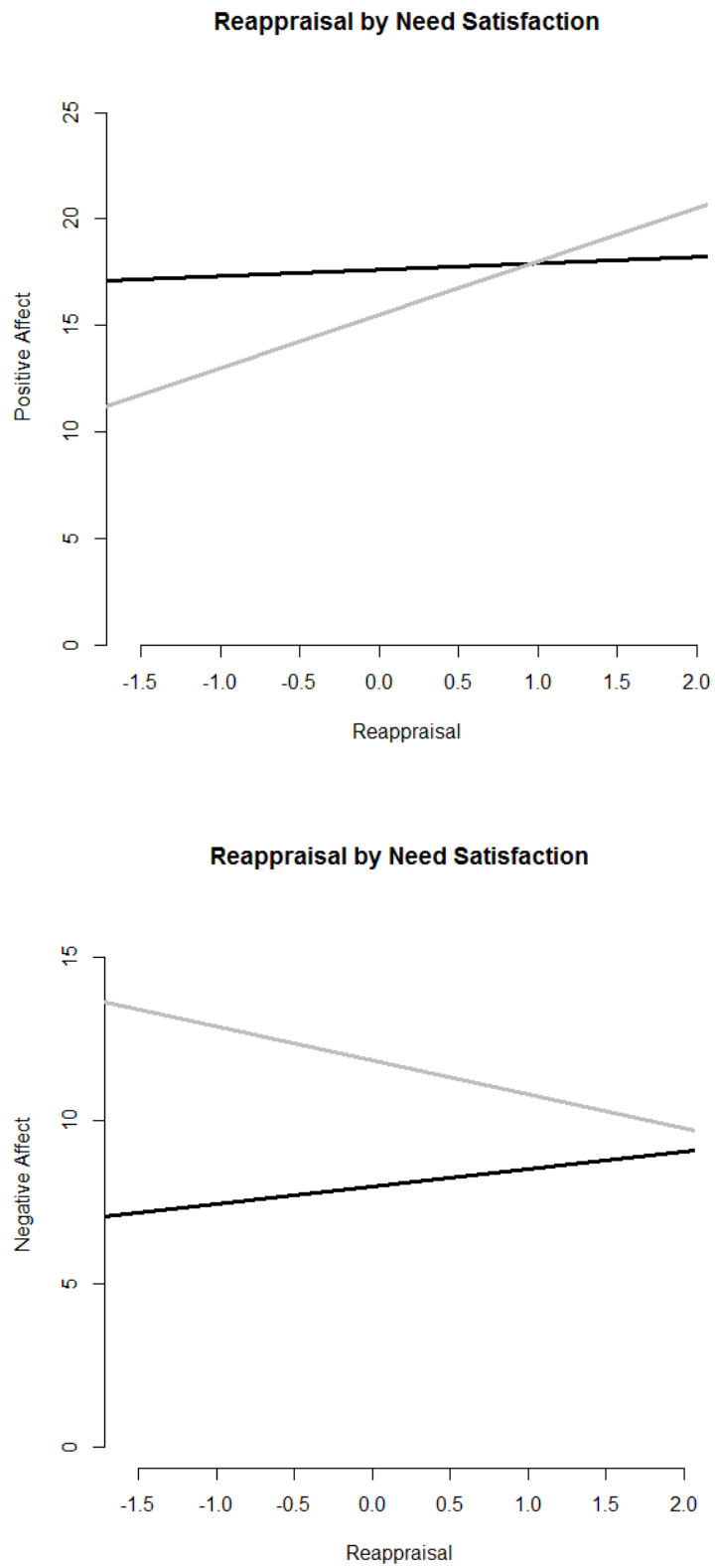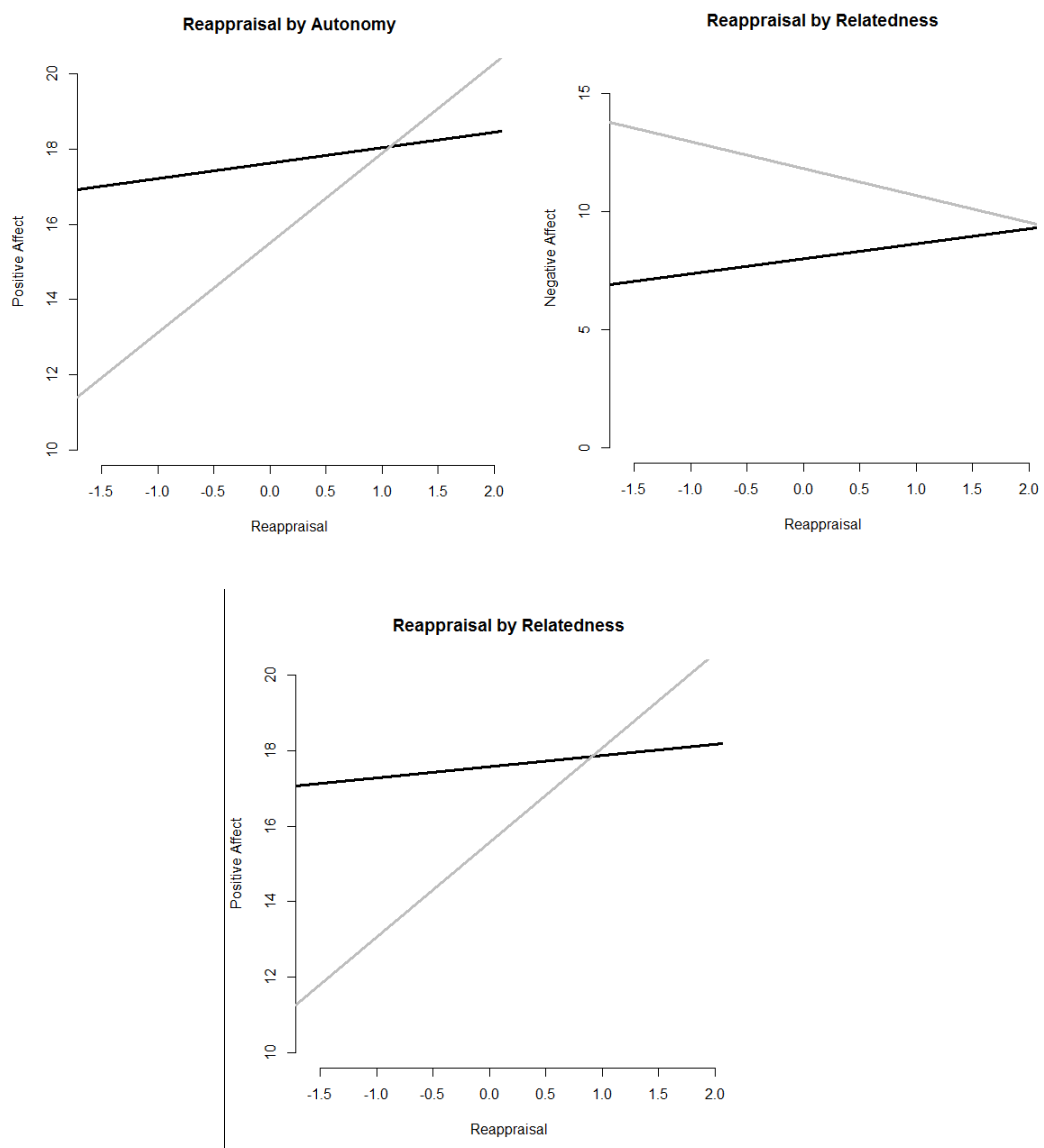

Figure 5.2. Relationship between daily cognitive reappraisal and daily affect at high (black) and low (grey) levels of trait need satisfaction

In addition, reappraisal was associated with *increases* in positive affect among people experiencing low need satisfaction (B = 2.45, SE = 0.32, T = 7.87, *P* < 0.001), but with no effect among those experiencing high need satisfaction (B = 0.32, SE = 0.29, T = 1.08, *P* > 0.05) (see Figure 5.2). This finding is consistent with our general hypothesis that the effect of ER strategies would be reduced for those experiencing high need satisfaction, and suggests that the reappraisal × need interactive effect is largely due to the effect of the belonging need.

Notwithstanding this, one more significant individual need × reappraisal interaction was found for reappraisal × autonomy for *positive affect*. Consistent with our overall hypothesis, reappraisal was associated with significant *increases* in positive affect among people experiencing low autonomy (B= 2.39, SE = 0.31, T = 7.60, *P* < 0.001), but with no significant moderating effect among those experiencing high autonomy (B = 0.41, SE = 0.29, T = 1.41, *P* > 0.05) (see Figure 5.2).

Discussion

Contemporary theories of emotional well-being emphasize context as being inextricably linked to ER (Aldao & Nolen-Hoeksema, 2012; Ciarrochi, Atkins, et al., 2016; Gross, 2013; Kashdan & Rottenberg, 2010). Gross's theory has contributed much to our understanding of the impact of a range of regulatory strategies on the experience of emotions (for example, Gross, 1998), but has not focused on explaining the contextual factors that influence the process of ER. SDT provides a framework by which we can understand the role of context through the concept of basic psychological need satisfaction. Our study sought to understand the influence of a person's trait need satisfaction (the tendency to perceive one's environment to be need supportive) on the use and utility of three ER strategies. Specifically, we tested a hypothesis that the use and influence of regulatory strategies on daily affect experiences would be attenuated to the extent that people were getting their needs met. We

found support for the reappraisal strategy only. Cognitive reappraisal was found to be helpful for people low in need satisfaction, in that they experienced more well-being on the days they used the strategy and less on the days they did not use it. In contrast, among people high in need satisfaction, cognitive reappraisal appeared to be of no value for managing daily positive affect and of negative value for managing negative affect.

Cognitive Reappraisal and Social Connection: A Special Relationship?

Belonging, competence, and autonomy need satisfaction tend to be moderately related, but can be distinguished (Ryan & Deci, 2017). We found that belonging need satisfaction was particularly important in understanding the daily effects of reappraisal. People reporting high levels of belonging did not benefit from employing cognitive reappraisal, whereas people reporting low levels of belonging showed clear benefits. We think this to be an important finding that may explain the efficacy of cognitive reappraisal interventions in many studies, despite some recent criticisms (for example, Hofmann & Asmundson, 2008; Longmore & Worrell, 2007).

Cognitive reappraisal is a core strategy taught in many empirically supported forms of psychological therapy (Beck, 1979; Ciarrochi, Robb, & Godsell, 2005). If reappraisal is only beneficial for some, why then has it been shown to produce such beneficial effects in therapy? First, relationship problems are overrepresented among those suffering psychopathology (Whisman & Baucom, 2012). Further, many common psychological problems present with characteristic deficits in relationships and intimacy, including depression (Zlotnick, Kohn, Keitner, & Della Grotta, 2000), social anxiety (Alden & Taylor, 2004), eating disorders (Broberg, Hjalmers, & Nevonen, 2001), and post-traumatic stress disorder (Taft, Watkins, Stafford, Street, & Monson, 2011). Nowhere is this more pertinent than in the case of suicide, for which social isolation is known to be one of the central risk/protective factors (Trout, 1980). Clearly, some of the major drivers of distress and

disability among those suffering mental health problems are problems with intimacy and relationships. Interpreted through this lens, our results suggest that reappraisal may be a worthy default strategy for patients who present for therapy, because many of them will be struggling to get their relatedness needs satisfied. SDT posits that, ideally, people's emotions are often regulated externally through supports in their social environment. We suggest that many clients, through their isolation and generally low levels of belonging, may lack access to this supportive "external voice" and thus may benefit from developing their own supportive "internal voice" through cognitive techniques such as reappraisal.

However, cognitive interventions have been applied across a range of clinical and non-clinical contexts and populations under the general assumption that addressing negative thoughts through reappraisal and "positive thinking" is universally beneficial (Beck, 1979; Hayes, 2008). For example, school-based, universal interventions often teach youth that, if they experience negative or discouraging thoughts, they need to reappraise them in a positive light (Barrett, Farrell, Ollendick, & Dadds, 2006; Ciarrochi et al., 2016). Our current findings challenge this idea. Among people who are getting their relatedness needs met, there seems to be no benefit from habitual reappraisal. Rather, the current data suggest that reappraising may be counterproductive when sources of social support exist in the person's environment.

Our findings intersect with a recent EMA study by Haines et al. (2016), who found stressor "controllability" to be an important source of contextual variability for the effect of daily reappraisal on negative affect. In that study, reappraisal was associated with beneficial ER for those perceiving their environment as uncontrollable, but more problematic for those perceiving a high level of controllability in their environment. Perhaps the ability to derive need satisfaction from one's social context may be an important dimension of the experience of "controllability". In other words, it could be that people perceive their environment as more controllable when they have more social support in their environment. Future studies of

daily ER that implement need satisfaction and situational control in the same study are needed to evaluate this possibility.

Clinical Implications

While cognitive therapy has tended to focus almost entirely on changing factors within the person (for example, changing cognitions, building skills, implementing ER strategies), our study indicates that one of the key strategies routinely taught to clients—cognitive reappraisal—appears to be useful only insofar as it helps to compensate for a lack of belonging. This holds important implications for clinical practice. First, our data suggest that some internal strategies may be most useful when they are used to compensate for threats to a person's need satisfaction. Second, an important and yet understudied route to well-being may be found through a more explicit focus on building social connectedness (Ciarrochi, Morin, Sahdra, Litalien, & Parker, 2017). It is well known that social isolation is toxic for emotional and physical health (Hawkley & Cacioppo, 2010). These data converge with recent research that has called for a focus on the development of interventions that more explicitly address the widespread societal problem of loneliness and social isolation (Mann et al., 2017). Lastly, our data are consistent with a "flexibility" view of ER (Aldao & Nolen-Hoeksema, 2012) and reappraisal (Haines et al. 2016). Rather than cognitive reappraisal being a broadly beneficial strategy, our study has uncovered need satisfaction as an important source of contextual variability in the utility of the strategy. From this perspective, strategies such as reappraisal are useful to the degree that they support need satisfaction and value-supportive behavior (Ciarrochi et al., 2016). Our data are consistent with this view. Teaching ER strategies such as reappraisal may be most effective if they are taught in order to promote more engaged and flexible behavior in line with a person's needs and values, rather than merely to down-regulate negative affect *per se*. This also converges with several contemporary models of psychological therapy that hold need satisfaction (Young, Klosko, &

Weishaar, 2003) and values-guided behavior (Hayes et al., 1999; Gloster et al., 2017) as central to well-being, and the ultimate aim of therapy.

Limitations and Future Directions

Although the methods used in this study highlight an important source of contextual variability in ER, these results should be understood in the light of several limitations. First, our daily measures, completed in the context of an intensive, repeated measurement design, are still self-reported end-of-day measures. So, while some of the potential drawbacks of self-reported data (such as recall bias) may have been minimized, they have not been eliminated entirely. Future research may benefit from considering EMA measurement approaches that minimize bias further, such as event-contingent reporting schedules in which participants report events soon after they occur, several times throughout one day.

This study has operationalized emotional well-being as more positive and less negative affect. We acknowledge that this definition of emotional well-being is not universally accepted, and may in fact be in conflict with the stance adopted in many mindfulness-based therapy models that emphasize outcomes of quality of life or valued living (for example, Hayes et al., 1999). However, recent work suggests that most self-reported measures of well-being converge onto a single dimension from happiness to meaning and purpose in life (for example, Disabato, Goodman, Kashdan, Short, & Jarden, 2016). Future EMA studies of ER process could add to the knowledge base by moving away from purely affective outcome measures and examining the role of daily ER in a range of well-being outcomes.

Another potential issue relates to the 2-item daily cognitive reappraisal measure, which retains two items from Gross and John's (2003) original trait ERQ: "When I want to feel more positive emotion, I change what I am thinking about" and "When I want to feel less negative emotion, I change what I am thinking about." We note that other existing state

measures of reappraisal do not necessarily map well onto the items used in Gross's measure. Brans and colleagues (Brans, Koval, Verduyn, Lim, & Kuppens, 2013) used a 2-item state measure: "I have changed the way I think about what causes my feelings" and "Did you see the event that caused your feelings from a different perspective?" These items seem to pull more for a "perspective taking" shift that is not evident in our items. Our findings relate only to reappraisal as defined by our measure and might not necessarily hold up for different forms of reappraisal. Future research is needed to see whether there are different forms of reappraisal, and whether our findings apply to them.

Similarly, the use of the ERQ measure of cognitive reappraisal to derive a measure of habitual reappraisal might not necessarily map well onto reappraisal and "cognitive restructuring" interventions as they are applied in practice. Future studies are needed to test whether the efficacy of cognitive reappraisal interventions is moderated by need satisfaction as it is applied in clinical practice.

Also, while our study identifies need satisfaction as an important contextual factor at the level of the person, little is known about moderators of the ER process at the daily level. We found that substantial variance in measures of ER occurs at both the person and the daily levels. Future EMA research is needed to examine other sources of contextual variability in ER that may lie at more proximate levels of context. For example, even though we have found that need satisfaction is an important moderator at the trait level, no studies have yet investigated the impact of daily need satisfaction on the ER process.

The use of a sample of university students in this study also limits the generalizability of the results. Given that the central findings and implications of this study relate largely to the regulation of negative affect, it is important to note that mean levels of negative affect in this sample were quite low. This has implications for generalizing to clinical sample populations, which by their nature are likely to be more distressed.

This study adds to a growing literature in support of a contextual view of ER in which strategies are not viewed as inherently "good" or "bad". Empirical examinations and intervention programs alike may benefit from a contextual view of emotion-regulation difficulties, in which strategies are closely matched to the person and their particular context. The promise of studying ER using more ecologically valid methods is being realized, but studies such as this have only scratched the surface. The chase is on to uncover further contextual variability in ER processes.

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Chapter 6: Emotion Regulation in Daily Life: Exploring the Effects of Positive and Negative Events on the Usefulness of Emotion Regulation Strategies

Abstract

A contextual view of emotion regulation (ER) posits that no particular regulatory strategy is inherently "good" or "bad". Rather, the usefulness of ER strategies ultimately depends upon the person using them and the situation in which the strategies are used. Recent empirical studies, well suited to capturing meaningful contexts and their variability, are starting to shed light on the contextual nature of ER. We used a daily diary methodology with multilevel modeling data analyses ($n = 187$) to test a moderation hypothesis: that the use and influence of regulatory strategies (cognitive reappraisal, emotion suppression, mindfulness) on daily affect experiences would depend upon the frequency of positive and negative events people reported on a given day. We used multilevel modeling to conduct a number of tests of event $\times$ ER strategy interactions and found evidence of two reliable contextual effects. First, we found that reappraisal was associated with less negative affect on days when people experienced high levels of negative performance events, but *more* negative affect when used on days with low levels of negative performance events. Second, for positive affect, the habitual use of emotion suppression was associated with emotional costs only on days when the strategy was implemented in the context of more frequent positive social events. There appeared to be no emotional cost to emotion suppression when it was used on days with less frequent positive social events. We discuss our results in terms of Gross's process model of ER, and we make recommendations for future efforts to study contextual variability in ER processes.

Introduction

Gross's ER theory is increasingly influential in psychological formulations of well-being (Tamir & Gross, 2011) and psychopathology (Werner & Gross, 2010), providing an empirical and theoretical basis for contemporary psychological approaches to ER (Kring & Sloan 2009; O'Toole, Skytte, Mennin, & Fresco, 2014). The core idea of ER theory is that people are active regulators of their emotional experiences, making use of regulatory "strategies" to modulate emotional responses in line with situational requirements and their activated goals (Gross, 1998; 2015). Specific regulatory strategies have been construed as having *generally* adaptive or maladaptive "profiles" depending upon their immediate relationship with and impact on affect, behavior, cognition, psychopathology and well-being (Gross, 1998; Gross & John, 2003). However, recent formulations of ER are moving away from this "general profile" approach in favor of a contextual approach that seeks to uncover "contextual variability" in the utility of ER strategies (Aldao, 2013; Gross, 2015). Following this line of research, our study sought to uncover daily sources of contextual variability in the utility of ER strategies in a daily diary study of positive and negative events and ER processes. Are ER strategies useful only to the extent that they are used in conjunction with daily events? For example, is cognitive reappraisal most useful when used on days with more negative events?

We focus on three of the most well studied ER strategies: cognitive reappraisal, emotion suppression, and mindfulness. We also take a hedonic approach to ER, defining the "usefulness" of an ER strategy as the extent to which greater use of the strategy is associated with higher daily positive affect, lower daily negative affect, or both (Tamir & Gross, 2011).

The Importance of "Capturing Context"

Gross (1998; 2002) proposes a "modal model" of emotion generation in which emotions unfold over time as a multicomponent process. The model suggests that emotional responding:

(a)   begins with situational triggers (either external environmental events or internal private events, such as thoughts)

(b)   that are attended to

(c)   leading to an evaluation of the situation's relevance with regard to a person's activated goals or "concerns" (Frijda, 1988)

(d)   which then results in emotional responses characterized by a sequence of changes in behavior, bodily sensations, and physiology (see Figure 6.1).
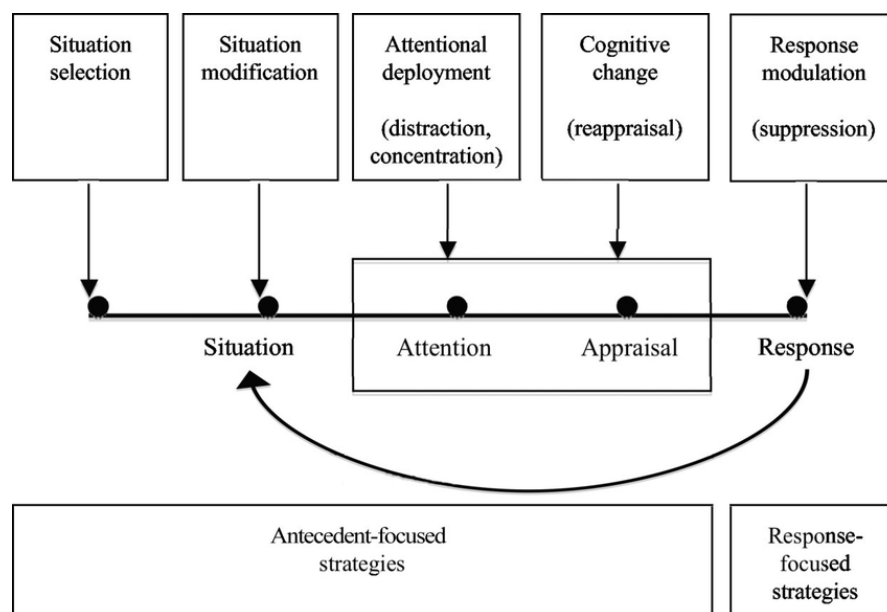
Figure 6.1. James Gross's process model of emotion regulation

Source: Gross (1998; 2002). Taken from T. L. Webb, E. Miles, & P. Sheeran, "Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation", *Psychological Bulletin*, 2012, 138(4), p. 775. Copyright 2012 by American Psychological Association.

The model suggests that regulatory strategies can be applied to "modulate" both negative and positive emotions at different stages of the emotion generative process, giving shape to its final experience (see top of Figure 6.1). This process of emotion generation and

regulation has been called the *process model* of ER (Gross, 1998; 2002). This notion of an interaction between activating events and cognitive and behavioral processes, giving rise to final emotional experiences, is central to many empirically supported treatments (Beck, 1979; Jacobson, Martell, & Dimidjian, 2001; Young, Klosko, & Weishaar, 2003).

A multitude of ER strategies have been proposed based on this process model, including emotion suppression, cognitive reappraisal, mindfulness, acceptance, avoidance, rumination, and worry (Gross 1999; Arch & Landy, 2015). According to the model, regulatory strategies can be categorized depending on where they are implemented in the ER chain, as either *antecedent*-focused strategies (situation selection, situation modification, attentional deployment, cognitive change) deployed before the full activation of the emotional response, or *response*-focused strategies (response modulation, affective suppression) deployed once the emotional response has occurred.

Most theory of and research into ER has led to the general notion that some ER strategies (for example, cognitive reappraisal, and mindfulness) have a generally "adaptive" profile, while others (such as emotion suppression and rumination) have a generally "maladaptive" profile (Gross & John, 2003, Arch & Landy, 2015). However, recent research and theory have argued that this approach to ER is limiting because it ignores the inherent contextual nature of ER. Gross (2015) argues that a core characteristic of ER is "the activation of a goal to influence the emotion trajectory". Goals guide ER through a process of valuation of the emotion in relation to the person's goals in each situation, activating behavioral responses relevant to a summation of the situation (Gross, 2015). For Gross, the regulation of an emotional response does not occur in a vacuum but within an evaluation of the emotion-in-context. For example, one can imagine someone with a difficult boss becoming intensely angry, thinking something like: "I need to control my anger here or else I might lose my job." Conversely, someone being assaulted in the street may appraise their

activating anger as energizing and useful for their assumed goal of self-protection and might make no attempt to down-regulate the emotion.

Werner and Gross (2010) argue that regulatory strategies may present as maladaptive via several pathways, including when they:

(a)   are not effective (that is, they do not modify the emotional experience as desired)

(b)   have not been properly developed

(c)   have short-term benefits that are outweighed by long-term costs to the individual and their goals

(d)   are poorly implemented, in an inflexible, context-insensitive way.

Given the central significance of context to the process of ER, Aldao (2013) suggests that research should now focus on "capturing context", implementing methodologies that are well positioned to capture "contextual variability" in the process of ER. Aldao defines context in a broad way as including "all of the circumstances that surround a given process" and proposes a guiding framework in which context is made up of an interaction between four possible elements:

(a)   aspects of the organism carrying out the strategy (for example, demographics, personality traits, psychological processes within the person)

(b)   the emotion-eliciting stimuli in the environment (environmental antecedents)

(c)   the selection and implementation of strategies (for example, ER strategies)

(d)   the types of outcomes that are relevant (for example, short-term versus long-term consequences).

This model of contextual influences in ER is shown in Figure 6.2.
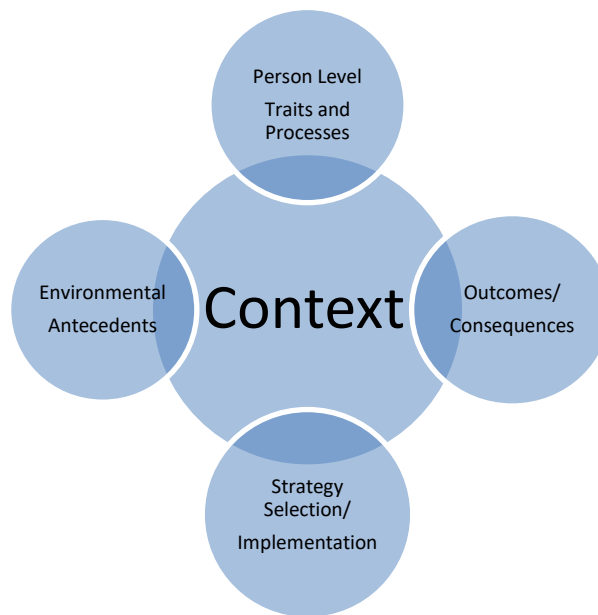
Figure 6.2. A pictorial description of Aldao's model of contextual influences in emotion regulation processes

This broad definition of context is consistent with modern contextual-behavioral

science approaches, which define context pragmatically as the variable stream of events that

have an organizing influence on people's behavior (Hayes & Ciarrochi, 2015; Hayes,

Villatte, Levin, & Hildebrandt, 2011; Hayes, Strosahl, & Wilson, 1999). Within this tradition,

"behavior" is also defined broadly as anything the organism "does", including overt behavior

such as "avoiding relationships" and covert behavior such as "reappraising".

Ecological momentary assessment (EMA) approaches, including diary studies, are a

promising means of studying the process of ER as it unfolds, because the dynamic

relationships between the four aspects of context noted above (for example, person-level

variables, antecedents, and consequences) can be modeled in a way that maximizes

ecological validity and captures the impact of significant moderating variables (Aldao, 2013;

Aldao & Nolen-Hoeksema, 2012; Ciarrochi et al., 2015). Recent research into ER using

EMA methods is indeed starting to fulfil this promise. Consistent with a contextual approach

to ER, Brockman, Ciarrochi, Parker and Kashdan (2017a) found in a study of ER in daily life

that a putatively "adaptive" strategy—cognitive reappraisal—was not generally beneficial in

regulating negative emotions on any given day or from one day to the next. Further, while

some strategies (such as mindfulness) were found to have generally beneficial profiles of

regulation and others (for example, emotion suppression) had a more maladaptive general

profile, that was not the case for all people in the sample. That study also found a contextual

effect: age predicted the utility of cognitive reappraisal, and reappraising was less useful for

younger people but became more useful with age. Those findings support a contextual view

of ER in which the utility of ER strategies varies among people and highlight the possible

role of psychological variables and traits as a source of contextual variability in ER, as

suggested by Aldao's (2013) model of context in ER.

Another recent EMA study found evidence of yet more contextual variability for the

strategy of cognitive reappraisal. Haines and colleagues (2016) found that habitual

reappraisal was not associated with general emotional benefits in daily life. Rather, that study

found that daily reappraisal was beneficial only when employed in situations that were

perceived by the subject as "uncontrollable", as opposed to "controllable". We interpret this

as evidence that one source of contextual variability may indeed be environmental

antecedents (Aldao, 2013). So far, however, no studies have used EMA to explore the effect

of specific environmental contexts on the usefulness of specific ER strategies.

Another recent study of daily ER found contextual variability in the strategy of

cognitive reappraisal as a result of trait need satisfaction—that is, the degree to which a

person experiences their context as generally satisfying their psychological needs (Brockman,

Ciarrochi, Parker, & Kashdan, 2017b). The study found that habitual reappraisal was

associated with emotional benefits for those who reported low need satisfaction in their lives,

and with emotional costs for those implementing the strategy while reporting high levels of

need satisfaction. That paper provided evidence of contextual variability derived from a

person's characteristic or typical level of need satisfaction. Understanding the role of less

stable contextual influences (for example, daily events) is a logical next step in this line of

research and is consistent with Aldao's (2013) model of context in ER.

Daily Positive and Negative Events and Well-Being

A long history exists in the well-being literature indicating that everyday positive and

negative events are key contributors to emotional well-being, above and beyond the impact of

"major life events", such as the death of a loved one (Kanner, Coyne, Schaefer, & Lazarus,

1981). Relatively broad agreement exists in the empirical literature that people experience

better well-being on days that involve more frequent positive events, and reduced well-being

on days that involve more negative events (Nezlek & Allen, 2006; Machell, Kashdan, Short,

& Nezlek, 2015). Those findings have been found to hold across affective (for example,

positive and negative affect) and non-affective (for example, self-esteem) well-being

outcomes in studies of everyday life (Nezlek & Allen, 2006). These empirical findings

provide evidence for the notion, central to theories of emotion and psychopathology (for

example, Moors, Ellsworth, Scherer, & Frijda, 2013), including ER theory (Gross, 2015), that

everyday events serve as key antecedents to emotional experiencing.

So far, no studies of daily life have examined the interplay between daily events and

the use of ER strategies and the experience of daily emotional well-being. While both

internal strategies (for example, Brockman et al., 2017a) and external events (for example,

Nezlek & Allen, 2006) have been found in separate studies to predict daily well-being, no

study has yet brought these two important predictors together in a study of daily life.

Given the strong associations found between events and well-being, and between ER

strategies and well-being, our study sought to explore the hypothesis that the frequency of

daily positive and negative events will moderate the impact of using ER strategies, such that

the strategies will be most useful on bad days (with higher negative and lower positive

events), and less useful on good days (with higher positive and lower negative events). This study therefore aims to answer the following research questions:

1.   What is the relationship between the frequency of positive and negative events, ER strategy use, and positive and negative affect as they are experienced in daily life?

2.   What are the relative contributions of strategy use and daily events to daily positive and negative affect? We hypothesize that both should be important. Strategies and daily events should all significantly predict unique variance in daily positive and negative affect (Hypothesis 1).

3.   Do positive and negative events moderate the impact of ER strategies in daily life? That is, is the strength of the relationship between the use of ER strategies and affect dependent upon the extent to which the person is having a good day (with many positive events) or a bad day (with many negative events) (Hypothesis 2).

Method

Participants

Data was collected from 187 university students (40 men, 133 women, 14 with missing data) with a mean age of 23.9 years (SD = 9.06) and an ethnic composition of 53.1% Caucasian, 11.7% Latino/Hispanic, 11.2% Asian, 7.1% African-American, 1.6% Middle Eastern, 1.1% Native American, and 6.5% other. The 187 participants provided 3,852 days of data at an average of 20.59 days per person.

Procedure

Ethical approval was given by the Human Subject Review Board at George Mason University, USA (Approval #477961). Participants were recruited through an online portal for students seeking to participate in research, as well as flyers and online advertisements for a study on personality and behavior. Recruited participant ages ranged from 17 to 63. During the consent process, participants were informed that the purpose of the study was to better

understand people's experiences of emotions in daily life. After completing the study, subjects received research credit as a part of their course unit and raffle tickets in a draw to win one of ten $25 gift certificates. Participants completed a 1½ hour induction session in which they provided baseline data, including demographic information, and were trained in how to correctly complete the daily online survey. They were then asked to complete this survey before going to sleep each night over the next 21 days. They received weekly reminder emails that emphasized the importance of compliance, confidentiality, and the time-and-date stamping of online entries. The resultant data represents a large intensive longitudinal data set. The current study is the third of three studies which employed this data to investigate the contextual nature of ER processes. The first of these studies has already been published (Brockman, Ciarrochi, Parker, & Kashdan, 2017).

Measures

Daily Emotion Regulation

Daily emotion suppression was measured using a modified 3-item state measure adapted from the 10-item Emotion Regulation Questionnaire (ERQ; Gross & John, 2003): "I keep my emotions to myself" (item 2), "When I am feeling positive emotions, I am careful not to express them" (item 4), and "When I am feeling negative emotions, I make sure not to express them" (item 9). The ERQ is designed to assess individual differences in the habitual use of cognitive reappraisal and expressive suppression as ER strategies. The 3-item state measure of emotion suppression parses down from a 4-item state measure used in a previous study (Kashdan & Steger, 2006), which was reported to have high reliability (0.97).

Daily cognitive reappraisal was measured using a modified 2-item state measure adapted from items 1 and 3 of the ERQ: "When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about" (item 1) and "When I want to feel less

negative emotion (such as sadness or anger), I change what I'm thinking about" (item 3). The

cognitive reappraisal factor measures the tendency of people to engage in construing a

potentially emotion-eliciting situation in ways that change its emotional impact (Gross &

John, 2003). The two items were chosen based upon a study by Kashdan & Steger (2006),

who reported high reliability (0.97) for the 4-item state measure of cognitive reappraisal.

The 5-item state Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003)

assesses the short-term expression of a receptive state of mind in which attention, informed

by a sensitive awareness of what is occurring in the present moment, is simply observing

what is taking place as it unfolds (Brown & Ryan, 2003).

For this study, a 3-item version of the state MAAS was used so as not to overburden

respondents without any corresponding benefit in validity or reliability (for example, Farmer

& Kashdan, 2012). Two items drawn from the state MAAS used for the current study were

(1) "I found myself preoccupied with the future or the past" and (2) "I found myself doing

things without paying attention." A third item ("I accepted my feelings, thoughts, and bodily

sensations without judging or trying to change them") was constructed and added so as to

broaden our mindfulness measure to include an "acceptance" aspect emphasized by some

mindfulness researchers (for example, Bishop, 2002). Participants were asked to indicate how

frequently they had experienced each item that day. They used a 6-point Likert type scale

from 1 (*Almost always*) to 6 (*Almost never*), in which high scores were reflective of increases

in daily mindfulness. The original state MAAS has been shown to have excellent

psychometric properties (for example, reliability = 0.92; Brown & Ryan, 2003) and to be

predictive of trait MAAS scores and both lower negative and higher positive daily affect,

independently of the trait MAAS (Brown & Ryan, 2003).

Daily Positive and Negative Affect

Daily positive and negative affect were measured by responses to six positively valanced adjectives (excited, enthusiastic, happy, relaxed, calm, and satisfied) and six negatively valanced adjectives (nervous, embarrassed, upset, sad, bored, and disappointed). Participants answered using a 7-point scale with endpoints 1 ("Did not feel this way at all") and 7 ("Felt this way very strongly"). The daily negative affect and positive affect measures have been found to have adequate reliability (0.68 and 0.73, respectively) in previous diary studies (Machell, Goodman, & Kashdan, 2015; Brockman et al., 2017a).

Daily Positive and Negative Events

Daily events were measured using event items originally derived from the Daily Events Survey (Butler, Hokanson, & Flynn, 1994) and modified for use in EMA studies of well-being (for example, Nezlek & Allen, 2006; Machell et al., 2014). A total of 26 events were measured: 7 positive social, 7 positive achievement, 6 negative social, and 6 negative achievement. For each day, participants rated events using the following scale:

0 = did not occur

1 = occurred and not important

2 = occurred and somewhat important

3 = occurred and pretty important

4 = occurred and extremely important.

For each day, event ratings were averaged to create four event composite scores for each of positive social, negative social, positive achievement, and negative achievement events. Items included "Went out to eat with a friend/date" (social positive), "Tried to do homework and couldn't understand it" (achievement negative), "Did well on a school or work task (for example, test, assignment, job duty)" (achievement positive), "Had plans fall through to spend time with someone special" (social negative). Previous EMA studies of

well-being have reported the four composite scores to be valid and reliable (0.88–0.92)

predictors of daily well-being (Nezlek & Allen, 2006; Machell et al., 2015). Consistent with

previous uses of this measure, we generated and used frequency counts of daily events per

category rather than composite scores. We did this so that we could decrease any possible

confounds between our measures of ER and daily events (Nezlek & Allen, 2006; Machell et

al., 2015).

Analytical Strategy

We used multilevel modeling data analysis techniques to account for the nested

structure of our data and to test for individual variation in slopes using the "nlme" package

(Pinheiro, Bates, DebRoy, & Sarkar, 2014) of the statistical program "R" Version 3.0.3

(R Core Development Team, 2014). While the data were treated using multilevel models,

they retained an inherently autoregressive structure (that is, Monday data were more likely to

be similar to Tuesday data than to Wednesday data). Therefore, we incorporated an

autoregressive error structure of lag-1 to ensure appropriate standard errors. The average

intra-class correlations for daily reappraisal, daily mindfulness, and daily suppression were

0.63, 0.49, and 0.57, respectively, indicating an acceptable level of variability in the daily ER

strategies. Average intra-class correlations for positive social, positive performance, negative

social, and negative performance events were 0.40, 0.40, 0.42, and 0.47, respectively, also

indicating an acceptable level of variability in the four daily events variables. The intra-class

correlation coefficients (ICCs) for daily negative and positive affect were 0.33 and 0.39,

respectively.

Results

Preliminary Results

We first examined the zero-order correlations between daily ER variables (strategies

and affect) and daily events (see Table 6.1). Interestingly, all four event types, positive and

negative, were *positively* correlated in daily life, perhaps indicating more total behavioral

engagement on a given day. Positive events were significantly related to increases in

cognitive reappraisal, while negative events were significantly related to decreases in

mindfulness and increases in emotion suppression. Positive events were related to increases

in positive affect but did not relate to daily negative affect. Negative events were related to

increased negative affect and decreased positive affect.

Table 6.1. Means, standard deviations, reliabilities and relationships between daily events, daily emotion regulation strategies, and daily affect

Daily measure	Mean (SD) α	1	2	3	4	5	6	7	8	9
1) Positive social events	3.16 (1.86) 0.92	–	0.43[b]	0.26[b]	0.21[b]	–0.05	0.41[b]	0.03	0.14[a]	–0.03
2) Positive performance events	2.68 (1.92) 0.92		–	0.20[b]	0.16[b]	–0.03	0.22[b]	–0.01	0.19[a]	0.08[a]
3) Negative social events	1.07 (1.46) 0.92			–	0.50[b]	0.39[b]	–0.12[a]	–0.21[b]	0.01	0.16[a]
4) Negative performance events	1.80 (1.57) 0.94				–	0.32[b]	–0.12[a]	–0.22[b]	–0.01	0.10a
5) Daily negative affect	9.84 (4.77) 0.90					–	–0.36[b]	–0.52[b]	–0.01	0.21[b]
6) Daily positive affect	16.38 (5.84) 0.92						–	0.20[a]	0.34[b]	–0.17[a]
7) Daily mindfulness	14.01 (3.49) 0.94							–	–0.13	–0.30[b]
8) Daily cognitive reappraisal	7.40 (3.43) 0.97								–	0.32[b]
9) Daily emotion suppression	8.13 (4.04) 0.96									–

a Significance level $P < 0.05$.

b Significance level $P < 0.01$.

Note: Reliabilities were calculated from the ICCs.

Main Analyses

To test Hypothesis 1, we first sought to assess the extent to which the three strategies

(reappraisal, mindfulness, suppression) and four daily event categories (positive and negative

social and performance events) predicted unique variance in daily positive and negative

affect. We conducted multilevel regression analyses that included these seven independent variables (predictors) at level 1 (the within-person level) in two models, with daily negative and positive affect as the dependent variables. The model is given as:

$yij = \beta oj + \beta 1jDailyReappraisal + \beta 2jDailyMindfulness + \beta 3jDailySuppression +$

$\beta 4jPositivePerformance + \beta 5jNegativePerformance + \beta 6jPositiveSocial +$

$\beta 7jNegativeSocial$

In these analyses, yij is the dependent measure for person j on occasion i, and $\beta 1j$ to $\beta 7j$ are coefficients denoting the random intercept between the seven daily predictor variables and daily affect. When all seven variables were entered into a regression equation at step 1, predicting daily negative affect, mostly consistent with Hypothesis 1, all but one (cognitive reappraisal) were found to be significant unique predictors in expected directions (see Table 6.2). Fully consistent with Hypothesis 1, when all seven variables were entered into a regression equation at step 1, predicting daily positive affect, all were found to be significant unique predictors in expected directions. Mindfulness and positive social and performance events uniquely predicted beneficial daily affect profiles. Negative social and performance events, along with emotion suppression, predicted increased negative and decreased positive affect. The effect of reappraisal on negative affect dropped out once placed alongside the other six predictors for negative affect.

Table 6.2. Hierarchical multilevel models showing the unique main effects of daily events and ER strategies on daily positive and negative affect

	Daily positive affect		Daily negative affect	
	Estimate	SE (SD)	Estimate	SE (SD)
(Intercept)	16.51[c]	0.22 (2.74)	9.72[c]	0.17 (2.06)
Daily cognitive reappraisal	1.10[c]	0.12	–0.19	0.10
Daily mindfulness	0.79[c]	0.10	–1.28[c]	0.09
Daily emotion suppression	–0.56[c]	0.11	0.69[c]	0.10
Positive performance events	0.53[c]	0.10	–0.46[c]	0.09
Negative performance events	–0.55[c]	0.11	0.53[c]	0.10

Positive social events	2.08[c]	0.10	–0.56[c]	0.09
Negative social events	–0.55[c]	0.11	1.09[c]	0.09

a   Significance level $P < 0.05$.

b   Significance level $P < 0.01$.

c   Significance level $P < 0.001$.

Moderation Analyses

Our second hypothesis was that the frequency of daily positive and negative events would moderate (interact with) the link between daily ER and daily negative and positive affect, such that those having better days (with more positive and fewer negative events) would benefit less from the use of the ER strategies. To test this, we ran a series of six hierarchical multilevel models to test for the unique interactive effects of each strategy × each event category on positive and negative affect. Daily data were nested within person, and the models predicted positive and negative affect by using the main effects for each strategy, the four daily events, and the four strategy × event interactions. Full statistics for the six hierarchical models are reported by strategy in tables 6.3, 6.4 and 6.5.

We were interested in the unique interaction effects for each strategy × event category for positive and negative affect (24 tests). In order to minimize the possibility of type 1 error, we used a stringent alpha of 0.002 based on a Bonferroni correction. Only two interactions achieved significance at this stringent alpha level. Following the guidelines of Cohen, Cohen, West, and Aiken (2013), we also performed simple slope analyses to observe the slopes of the two significant interactions ($\alpha = 0.002$) at two standard deviations above and below the mean on the respective event category (see figures 3 and 4).

First, there was a significant reappraisal × negative performance event interaction for negative affect ($P \leq 0.002$). As can be seen in Figure 6.3, reappraisal was associated with less negative affect (B = 2.40, SE = 0.22, T = 10.75, $P < 0.01$) when used on days when people experienced more negative performance events, but was associated with more negative affect

when used on days with fewer negative performance events (B = –2.44, SE = 0.21, T = –11.42, *P* < 0.01).
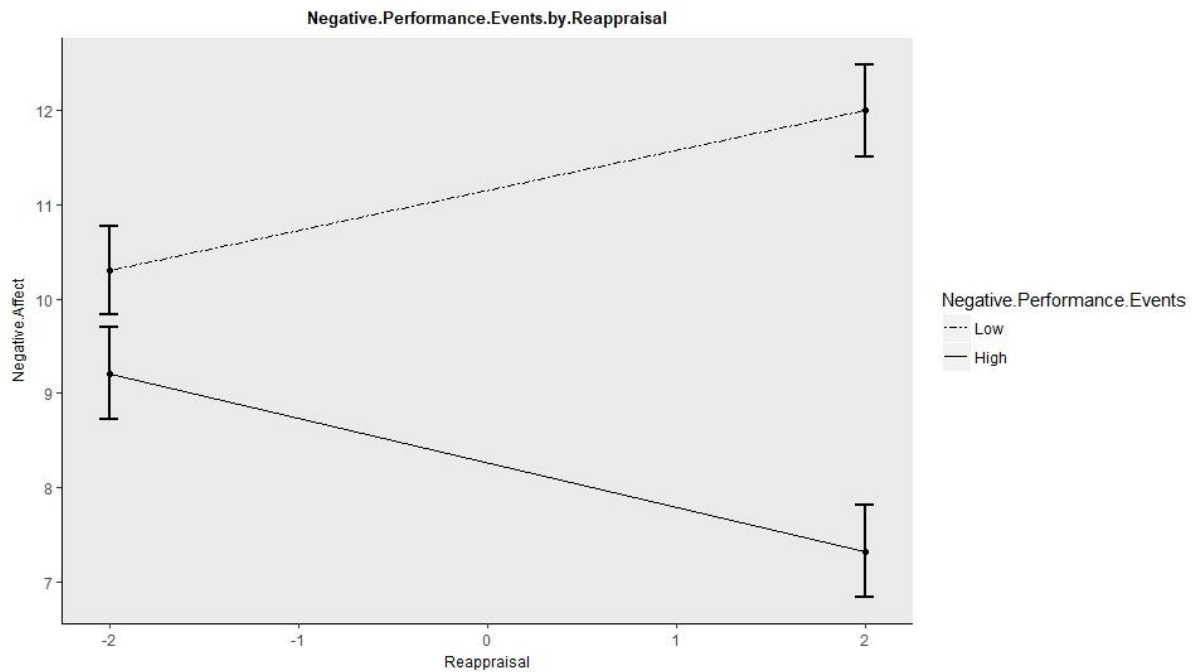
Figure 6.3. Relationship between daily cognitive reappraisal and negative affect at high and low levels of negative performance events

Second, there was a significant emotion suppression × positive social event interaction for positive affect (*P* ≤ 0.002). As can be seen in Figure 6.4, the use of emotion suppression was associated with less positive affect on days when the strategy was implemented in the context of more frequent positive social events (B = –2.51, SE = 0.23, T = –10.75, *P* < 0.01). However, emotion suppression had no significant effect on positive affect when used on days with fewer positive social events (B = 1.48, SE = 0.25, T = 1.73, *P* > 0.05). These results only partially support our moderation hypothesis. There was not broad support for an interaction between daily events and the usefulness of strategies.
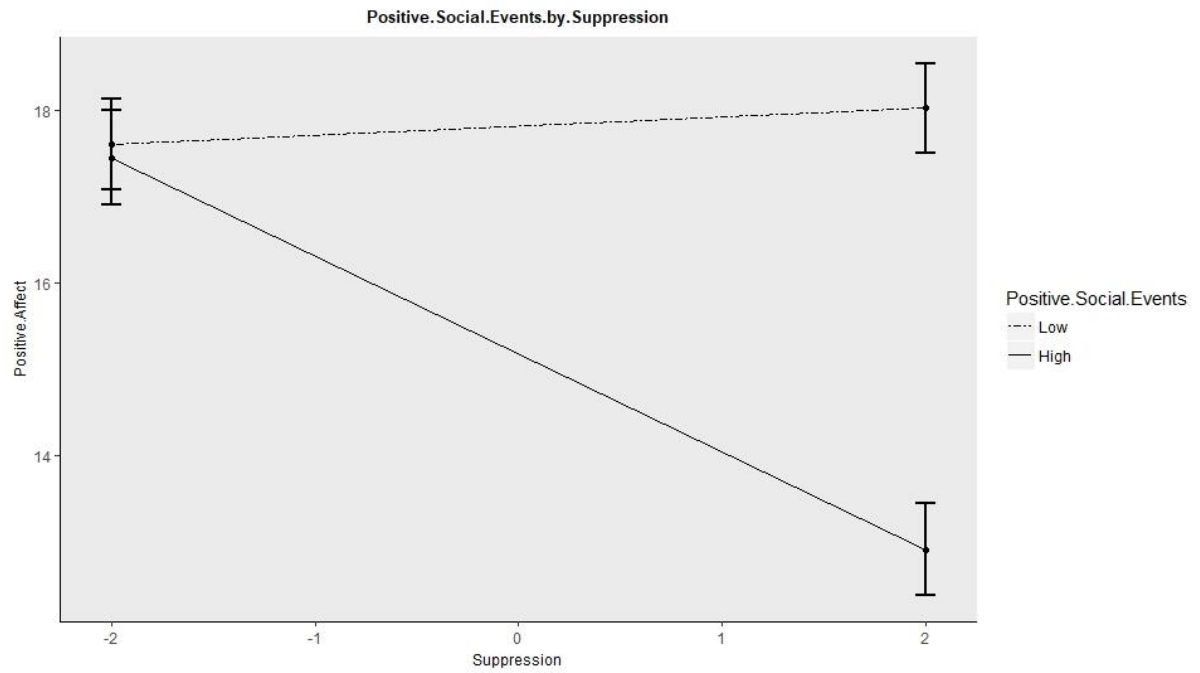
Figure 6.4. Relationship between daily emotion suppression and positive affect at high and low levels of positive social events

Table 6.3. Hierarchical multilevel models showing the unique main and interaction effects of daily mindfulness and events on daily positive and negative affect.

	Daily positive affect		Daily negative affect	
	Estimate	SE (SD)	Estimate	SE (SD)
(Intercept)	16.52[b]	0.24 (2.95)	9.69[b]	0.17 (2.00)
Daily mindfulness	0.75[b]	0.11	−1.30[b]	0.09
Positive performance events	0.56[b]	0.10	−0.43[b]	0.09
Negative performance events	−0.60[b]	0.11	0.54[b]	0.10
Positive social events	2.20[b]	0.10	−0.61[b]	0.09
Negative social events	−1.01[b]	0.11	1.15[b]	0.09
Mindfulness × positive performance events	−0.15	0.10	0.13	0.08
Mindfulness × negative performance events	0.01	0.10	−0.08	0.08
Mindfulness × positive social events	0.06	0.10	0.18[a]	0.08
Mindfulness × negative social events	0.13	0.10	−0.11	0.09

a   Significance level $P < 0.05$.

b   Significance level $P \leq 0.002$.

Table 6.4. Hierarchical multilevel models showing the unique main and interaction effects of daily cognitive reappraisal and events on daily positive and negative affect.

	Daily positive affect		Daily negative affect	
	Estimate	SE (SD)	Estimate	SE (SD)
(Intercept)	16.55[b]	0.23 (2.84)	9.70[b]	0.19 (2.29)
Daily cognitive reappraisal	0.99[b]	0.12	–0.02	0.10
Positive performance events	0.51[b]	0.10	–0.43[b]	0.09
Negative performance events	–0.68[b]	0.11	0.72[b]	0.10
Positive social events	2.19[b]	0.10	–0.71[b]	0.09
Negative social events	–0.1.02[b]	0.11	1.22[b]	0.10
Reappraisal × positive performance events	–0.03	0.10	0.09	0.09
Reappraisal × negative performance events	0.22[a]	0.11	–0.30[b]	0.10
Reappraisal × positive social events	–0.17	0.10	–0.05	0.09
Reappraisal × negative social events	0.05	0.11	0.16	0.10

a   Significance level $P < 0.05$.
b   Significance level $P \le 0.002$.

Table 6.5. Hierarchical multilevel models showing the unique main and interaction effects of daily emotion suppression and events on daily positive and negative affect.

	Daily positive affect		Daily negative affect	
	Estimate	SE (SD)	Estimate	SE (SD)
(Intercept)	16.46[b]	0.24 (2.93)	9.75[b]	0.19 (2.28)
Daily emotion suppression	–0.52[b]	0.11	0.79[b]	0.10
Positive performance events	0.57[b]	0.11	–0.45[b]	0.09
Negative performance events	–0.67[b]	0.11	0.70[b]	0.10
Positive social events	2.21[b]	0.10	–0.64[b]	0.09
Negative social events	–0.1.03[b]	0.11	1.19[b]	0.10
Suppression × positive performance events	0.02	0.10	–0.13	0.09
Suppression × negative performance events	0.02	0.10	0.06	0.09
Suppression × positive social events	–0.39[b]	0.10	0.03	0.09
Suppression × negative social events	0.24[a]	0.11	–0.21[a]	0.10

a   Significance level $P < 0.05$.
b   Significance level $P \le 0.002$.

While we focused only on interactions that achieved our stringent alpha, we also explored other interactions that achieved significance at the less stringent alpha of 0.05.

These findings should be treated with caution, given the multiple tests implemented and the risk of type 1 error. We report them here is a potential guidepost for future research. The results are presented in Figure 6.5.

First, there was a significant ($P < 0.05$) reappraisal × negative performance events interaction, but for positive affect (see Table 6.4). On days when people experienced more negative performance events, cognitive reappraisal was associated with less positive affect (B = –1.03, SE = 0.24, T = –4.16, $P < 0.01$). On days when people experienced fewer negative performance events, reappraisal was associated with significantly more positive affect (B = 3.00, SE = 0.24, T = 12.56, $P < 0.01$).

Two significant ($P < 0.05$) emotion suppression × negative social event interactions were also observed (see Table 6.5). On days when people experienced more frequent negative social events, emotion suppression was associated with less positive affect (B = – 2.57, SE = 0.23, T = –2.11, $P < 0.05$) and more negative affect (B = 3.15, SE = 0.21, T = 15.14, $P < 0.01$). On days when people experienced fewer negative social events, suppression was associated with significantly more positive affect (B = 1.58, SE = 0.25, T = 2.07, $P < 0.05$) and less negative affect (B = –1.58, SE = 0.22, T = –7.09, $P < 0.01$).

Finally, there was a significant mindfulness × positive social event interaction for negative affect (see Table 6.3). On days when people experienced more frequent positive social events, mindfulness was associated with more positive affect (B = 1.01, SE = 0.21, T = 4.81, $P < 0.01$). On days when people experienced less frequent positive social events, mindfulness was associated with less positive affect (B = 3.64, SE = 0.20, T = 18.02, $P < 0.01$).
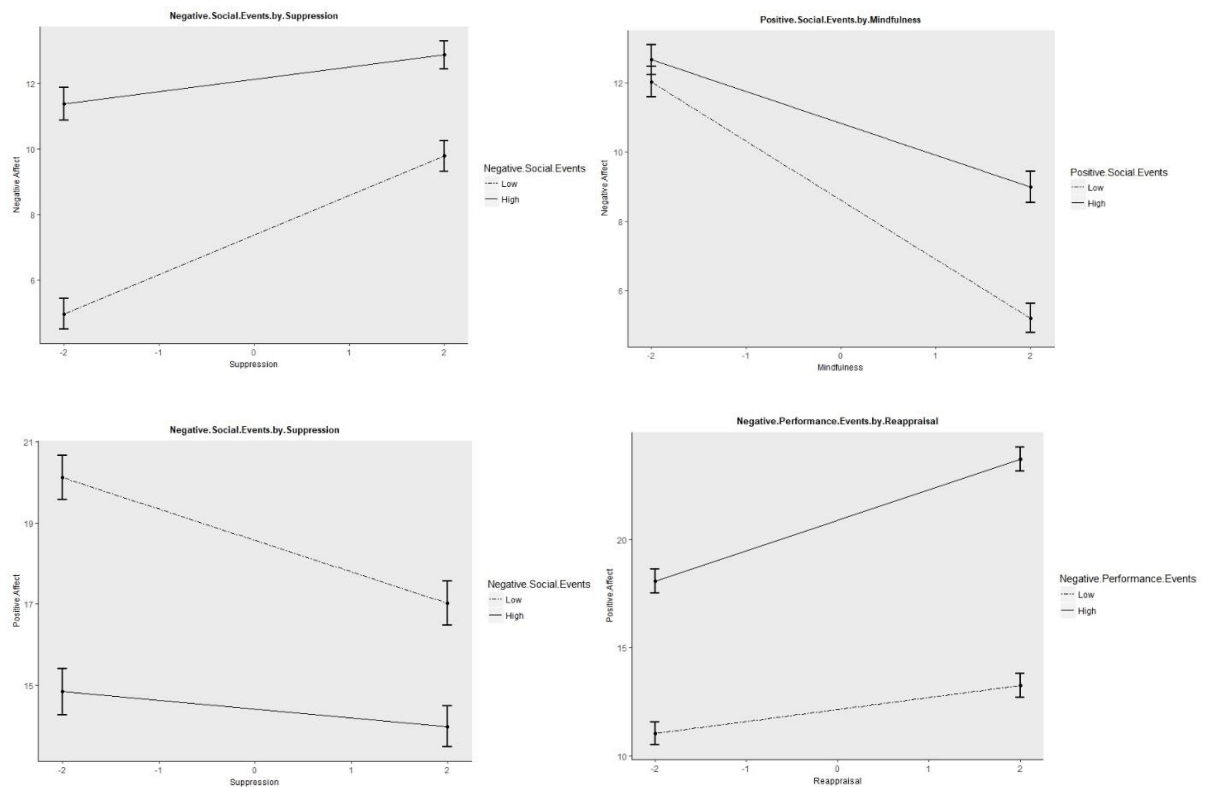
Figure 6.5. Relationship between regulatory strategies and daily affect at high and low levels of daily events

Discussion

Current theories of emotional well-being emphasize context as being inextricably linked to ER (Gross, 2013; Aldao & Nolen-Hoeksema, 2012; Ciarrochi, Atkins, Hayes, Sahdra, & Parker, 2016). Gross's process model of ER (1998; 2002) suggests a key role for situational events as triggers for episodes of emotion generation. The model suggests that ER strategies are implemented to "modulate" the experience and expression of emotions in line with a person's activated goals. We sought to explore the role of context on daily ER at this micro level, examining the influence of reported daily positive and negative events (the tendency to perceive one's environment as being need-supportive) on the use and utility of three ER strategies. Specifically, we sought to test a hypothesis that the use of ER strategies and their influence on daily affect experiences would depend on the frequency of positive and negative events reported on a given day. That is, on days when people experienced more positive events, the effect of ER strategies on their emotional experiences would be *reduced.*

For those experiencing less frequent positive events, we expected that the effect of ER strategies would be more pronounced. Similarly, on days when people experienced higher levels of negative events, we expected the effect of ER strategies on their emotional experiences to be *attenuated,* while for those experiencing fewer negative events in a given day, the effect of ER would again be *reduced*. Rather than finding broad support for this idea, we found evidence of a more complex interplay between particular daily events and ER strategies and their influence on the process of daily ER.

The main findings of this study relate to the two significant moderation effects.

First, we found evidence of contextual variability in the relationship between cognitive reappraisal and negative affect, depending upon the frequency of reported negative performance events. Reappraisal was associated with less negative affect when used on days when people experienced more episodes of negative performance events, but was associated with more negative affect when used on days with fewer negative performance events. This suggests that reappraisal may be most beneficial when dealing with negative performance situations, and potentially harmful when dealing with less negative performance events. This finding may at least partially explain previous daily diary results that have demonstrated reappraisal to be associated with emotional benefits for some and with emotional costs for others (Brockman et al., 2017a). It is particularly interesting that we have found one daily context in which the putatively adaptive strategy of reappraisal seemed not to benefit. This suggests that if reappraisal is deployed habitually, even on days where there is no negative performance event to reappraise, people are likely to experience more negative affect.

Second, reliable evidence was found for contextual variability in the relationship between emotion suppression and positive affect, depending upon the frequency of positive social events. The use of emotion suppression was associated with emotional costs (less positive affect) only on days when the strategy was implemented in the context of more

frequent positive social events. This can be understood in terms of behavioral models that suggest people engaging in suppression might not benefit from sources of reinforcement available to them when their social environment is favorable (Jacobson et al., 2001; Hayes et al., 1999). There appears to be no emotional cost or benefit to emotion suppression when it is used on days with less frequent positive social events. In this context, the strategy appears to be neutral, at least in terms of people's experience of positive affect. This is important insofar as it shows one context in which the putatively maladaptive strategy of suppression is not associated with maladaptive ER. That is, suppressing one's emotions might not be universally toxic for one's positive affect, but only insofar as the strategy blocks access to social reinforcement when that is available. This makes sense. Emotion suppression should not be constantly maladaptive in all contexts and for all outcomes; otherwise, it would be unlikely to persist so pervasively. Rather, it makes more sense that the costs of suppressing may be more nuanced, and possibly more obvious over time.

Specificity of Effects

Given Gross's process model (1998; 2002), the current results are also somewhat surprising. The model suggests a key role for ER strategies that function to "modulate" our experience of emotions, either before full activation (antecedent-focused) or after full activation (response-focused). While our study did uncover some interesting and potentially important sources of contextual variability in the ER process as a function of daily events, it is noteworthy that such moderation processes were mostly either absent or small. We believe this in itself may turn out to be an important finding. Our study did not find widespread sources of variability in ER occurring due to levels of positive and negative events encountered. We believe this suggests two areas for further exploration.

First, it could be that more important sources of contextual influence lie not at people's daily (situational) level but in their broader life context. For example, it may be that

the situation does not matter as much if a person is getting their needs met overall in their life. This would be consistent with a recent study that found contextual variability in the utility of reappraisal as a consequence of a person's reported levels of general need satisfaction (Brockman et al., 2017b).

Second, Aldao's model of context in ER suggests several other contextual categories that may turn out to be more important to ER than the person's daily situation. It could be that the personality traits and characteristics brought to bear on the ER process (for example, trait neuroticism, trait loneliness) are a key. It could be, for example, that the daily situation matters very little, but what matters is how "neurotic" the person is in the situation. This makes intuitive sense. It could be said that everybody has to endure difficult situations from time to time, but that not everyone becomes emotionally dysregulated. Future studies should look to other potential sources of contextual influence outside of the situation.

Within-Day Relationships

We uncovered a number of interesting within-day relationships that also warrant some discussion. Consistent with Gross's process model, positive events predicted increases in positive affect, while negative events were related to increases in negative affect. Positive events, however, were not related to negative affect, but negative events did predict decreases in positive affect. The finding that experiencing more positive events did not predict decreases in negative affect runs contrary to models of "savoring", which posit a key role for the savoring of positive events in the regulation of stress and negative affect (Tugade & Fredrickson, 2007).

Interestingly, all four event types, positive and negative, were *positively* associated in daily life. We believe this could indicate that people whose daily lives are more behaviorally active will be more likely to report more events regardless of their type. That is, those who engage in approach behavior may receive more benefits from the environment, but also open

themselves up to negative interactions. This is consistent with modern behavioral accounts of well-being that emphasize the environment as an ongoing source of reinforcement (Jacobson et al., 2001; Hayes et al., 1999).

Positive events were associated with higher levels of cognitive reappraisal, while negative events predicted significant *decreases* in mindfulness and *increases* in emotion suppression. These results may indicate that the ease with which people can access and use various strategies could depend on the type of event that they face. It could be that reappraisal is easy to access when things are going well, and suppression easy to apply when things are not. Further, it turns out that mindfulness, while most associated with decreased negative affect, may be the most difficult to implement when facing negative life events. These findings may bear relevance to emerging theory relating to the importance of ER choice (Sheppes et al., 2014).

Given the lack of widespread interactive effects of event × strategy, we were interested in a regression model that simultaneously entered events and strategies together to predict positive and negative affect. Those analyses revealed that the relationships between the predictors (events and strategies) were largely distinct. Events and ER strategies both appear to be important predictors of well-being in their own right. The only exception was the effect of reappraisal on negative affect, which was found to be non-significant when placed alongside the events and other strategies in a regression model. This suggests that reappraisal may have more of a mediation relationship with life events and affect rather than a moderation relationship, in line with cognitive mediation models of distress (for example, Beck, 1979).

Limitations and Future Directions

We do not wish to emphasize the significant interactions reported at the less stringent alpha level ($P < 0.05$), as they are potentially less reliable, given the multiple interactions

employed. This reveals an important limitation of the current study, which is sample size.

While the sample is large by conventional standards, the large number of interactions

employed presents as a serious risk of type 1 error. At the same time, taking steps to control

the risk of type 1 error in this study (Bonferroni correction) also exposes us to an inflated risk

of type 2 error. Our approach in this study has been to err on the side of caution,

acknowledging the problem at both ends. We have attempted to balance these two concerns

while still providing some meaningful data on contextual influences on ER at the daily level.

Notwithstanding these issues, we believe that these less reliable ($P < 0.05$) interactions

represent interesting directions for future diary studies of ER looking for sources of

contextual variability at the within-day level. These findings may turn out to be important

sources of contextual variability in ER if replicated in future EMA studies of ER.

Our daily self-report measures were completed by participants at the end of each day

in the context of an intensive, repeated measurement design. So, while some of the problems

associated with self-reporting may have been minimized (for example, recall bias), they were

not eliminated entirely. Future research may benefit from considering EMA measurement

approaches that minimize bias even further, including event-contingent reporting schedules

in which participants report events as they arise, several times throughout one day (for

example, Brans, Koval, Verduyn, Lim, & Kuppens, 2013). Furthermore, whether results now

being obtained from end-of-day reports differ from those obtained from more frequent

reporting schedules is an important question.

Another potential issue relates to the 2-item daily cognitive reappraisal measure,

which retains two items from Gross and John's (2003) original trait ERQ: "When I want to

feel more positive emotion, I change what I am thinking about" and "When I want to feel less

negative emotion, I change what I am thinking about." We note that other state measures of

reappraisal use items that appear to reflect a different form of reappraisal. Brans et al. (2013)

used a 2-item state measure: "I have changed the way I think about what causes my feelings" and "Did you see the event that caused your feelings from a different perspective?" These items appear to define reappraisal more in terms of a change in "perspective" that is not evident in our items. Our findings relate only to reappraisal as defined by our measure and might not necessarily hold up for different forms of reappraisal.

The use of a sample of university students in this study also limits the generalizability of the results. Given that the central findings and implications of this study relate to the regulation of both negative and positive events and affect, it is important to note that mean levels of negative affect and negative events in this sample were relatively low. This has implications for generalizing to clinical sample populations, which by their nature are likely to be more distressed. Replication of the current methodology to more distressed clinical samples is warranted.

Our study adds to a growing literature in support of a contextual view of ER in which strategies are not viewed as inherently "good" or "bad". The study has contributed to that literature, finding some significant sources of contextual variability in ER due to the impact of daily events. However, the most important finding of this study may be that daily events may be more pertinent to emotion generation than to emotion regulation. On the basis of this one study, there appear to be no widespread interactive effects between ER strategies and daily positive and negative events. Rather, their impacts on emotional well-being seem to be largely distinct.

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Chapter 7: Discussion and Conclusion

Contextual approaches to ER posit that the utility of regulatory strategies ultimately depends on aspects of the person and the situation (Kashdan & Rottenberg, 2010; Gross, 2015). The broad aim of this program of study was to take our understanding of ER processes beyond what we have come to understand from single-occasion measurement approaches. While it has become increasingly clear that ER processes are context dependent, empirical tests of this formulation using suitable methodologies in a range of meaningful contexts are lacking. In taking a daily processes approach using multilevel data analyses, the three studies in this thesis have uncovered several new findings on the process of daily ER.

The three studies emerged in a linear fashion. First, in Study 1 (Chapter 4), my colleagues and I established that a daily process approach is relevant to studying ER, providing evidence for the notion, central to a contextual approach to ER, that the utility of a strategy depends on the person. Next, Study 2 (Chapter 5) examined contextual variability in ER at the macro level in the environmental context, testing a hypothesis that the utility of three regulatory strategies would depend on the degree to which people experienced need satisfaction in their lives. Finally, Study 3 (Chapter 6) examined the role of situational context on the process of ER using the constructs of positive and negative daily events. In contrast to the macro context examined in Study 2, Study 3 therefore examined the role of context at a more micro, daily level.

In this final chapter of the thesis, I first integrate and discuss the central findings that emerged from the three empirical studies, before considering the main implications of those findings in connection with prominent theories of emotional well-being. I then explore potential practical implications of the thesis findings, outline limitations and future directions emerging from this body of work, and discuss the main conclusions of the research.

Emotion Regulation in Daily Life

A key rationale for applying a daily process approach to the domain of ER is the argument that trait measures of ER processes might not map well onto daily regulatory processes that are inherently contextual and dynamic, and that unfold across discrete periods of time (Aldao, 2013). This is indeed what was found in Study 1, which explored the relationships between relevant daily and trait measures. In general, trait and daily measures implemented in this study failed to converge significantly with each other. Conversely, daily-to-daily and trait-to-trait relationships tended to relate well to each other. This points to the distinctiveness of ER processes measured at the within-person versus between-person level and validates the daily process approach taken in the studies in this thesis.

Looking first at the relationship between the three strategies (Study 1), and as would be expected, daily mindfulness was found to be related to lower levels of daily emotion suppression. This is consistent with the notion of mindfulness as being antithetical to suppressing one's emotions (Chambers, Gullone, & Allen, 2009). However, daily reappraisal was associated with higher levels of daily suppression and lower levels of daily mindfulness. This suggests that habitual reappraisal may, at least in some circumstances, be a form of suppression or avoidant regulation (see, for example, Hayes, Strosahl, & Wilson, 1999). Further, the finding that higher daily reappraisal is related to lower *daily* mindfulness conflicts with emerging theory and evidence drawn from a trait-measurement approach that has suggested mindfulness and reappraisal to be complementary, with mindfulness being required for successful reappraisal (Garland, Gaylord, & Park, 2009). The present results do not necessarily contradict past results, but do at least suggest that the trait and daily level measures are reflecting different processes.

Looking next at the daily relationships between strategies and affect in Study 1, mindfulness and emotion suppression were significantly related to positive and negative

profiles of regulation, respectively. Cognitive reappraisal was strongly related to increases in

positive affect, but, surprisingly, no relationship was found between the strategy and negative

affect. This is inconsistent with a vast literature, informed by trait-measurement

methodologies, that has associated reappraisal with broad benefits to emotional well-being

(Gross 2002; Aldao, Nolen-Hoeksema, & Schweizer, 2010). However, it is consistent with

studies of daily life to date (Nezlek & Kuppens, 2008; Brans, Koval, Verduyn, Lim, &

Kuppens, 2013; Haines et al., 2016). This suggested that there may be no universal benefit to

habitual reappraisal.

Emotion Regulation Depends on the Person

The daily relationships found in Study 1 do suggest a general adaptive regulatory

profile for mindfulness (related to less negative and more positive affect), and a general

maladaptive profile for emotion suppression (related to less positive and more negative

affect). These findings are consistent with the plethora of studies that have used single-

occasion measurement to examine ER strategies (Gross, 2002; Chambers et al., 2009; Aldao

et al., 2010). However, digging a little deeper into the Study 1 results revealed a more

nuanced picture: the usefulness of these two strategies varied markedly among people. That

is, for some people, mindfulness was associated with very small emotional benefits, and for

others, large benefits. The converse pattern was also seen for emotion suppression, which

was associated with a large range of mostly problematic regulatory effects. Interestingly,

however, there were still some individuals in the sample whose well-being was negatively

associated with mindfulness and positively associated with emotion suppression, which is

consistent with the view that categorizing strategies via "general profiles" may be limited.

One of the most interesting findings to emerge from Study 1 involved cognitive

reappraisal and negative affect. A vast literature, informed by a trait-measurement approach,

has shown the strategy to be related to decreased negative affect and a range of benefits to

well-being (John & Gross, 2004; Aldao et al., 2010). However, Study 1 showed that, for

approximately half the sample, habitual reappraisal was associated with *lower* negative

affect, while for the remainder, the strategy was related to *increased* negative affect. These

results differ from the results obtained from similar studies relying upon a trait-measurement

approach, but are consistent with similar studies of daily life (Nezlek & Kuppens, 2008;

Brans et al., 2013) Taken together, these early daily process studies provide initial evidence

that people do not necessarily experience lower negative affect on days when they engage in

more cognitive reappraisal. For some people, it seems, reappraisal is associated with benefits

to emotional well-being, while for others it may have a problematic relationship to emotional

well-being.

Notwithstanding these findings, Study 1 also found that daily cognitive reappraisal

was in fact the strongest predictor of daily positive affect. One possible implication of this is

that, while cognitive reappraisal might not necessarily assist in regulating intense *negative*

emotions once they are activated, the strategy may help in maintaining more consistent

positive affect experiences on a daily basis. A behavioral explanation for this could be that

cognitive reappraisal might contribute to increases in behavioral activation, leading to

increased opportunity to contact rewarding contingencies in the environment, leading to more

positive affect (see, for example, Jacobson, Martell, & Dimidjian, 2001; Hayes et al., 1999).

These findings support recent conceptualizations of ER that frame the effectiveness of

different ER strategies as being dependent on the person and context (for example, Aldao,

2013; Gross, 2015) and highlight the need for further studies to investigate moderators and

contextual factors that might explain why reappraisal is associated with benefits for some

people but not others.

A core tenet of contextual approaches to ER is that the utility of strategies ultimately

depends on the person and their situation (Kashdan & Rottenberg, 2010). The within-person

results in Study 1 demonstrate proof of concept of this idea. According to these data, the

utility of all three strategies varied significantly between individuals. To my knowledge this

is one of the first daily process studies to provide this evidence. The results of Study 1 thus

confirm a key proposition of a contextual view of ER: that the usefulness of regulatory

strategies depends on the person. Significant contextual variability was found in the three

daily strategies as a function of the people using them. Of particular interest, cognitive

reappraisal showed the highest pattern of variability, crossing the "zero line" of influence,

such that it was associated with beneficial regulation for half of the participants, and with

more problematic regulation for the other half. These results provide proof of concept for

Aldao's (2013) model of context in ER, which holds that significant variability in ER may lie

at the level of the person, and validate the use of a daily process approach to studying ER

processes. However, these findings also opened up many more questions. In particular, if ER

depends on the person *and* the situation, what situational influences in the environment are

important to the utility of regulatory strategies?

Contextual Variability in the Utility of Emotion Regulation

In line with Aldao's (2013) assertion that ER research must now search for contextual

variability in the effects of ER strategies, and armed with the knowledge that significant

variability in daily ER existed at the level of the person, all three dissertation studies sought

to identify aspects of context that could explain the variability.

Emotion regulation depends on age

Study 1 explored the potential moderating effect of gender, age, and ethnicity on the

daily regulation of positive and negative affect, finding a significant interaction only for

cognitive reappraisal × age on daily negative affect. For younger adults in the sample,

cognitive reappraisal was associated with *higher* levels of daily negative affect. However,

reappraisal use was associated with increasingly lower levels of negative affect with age,

crossing a zero line of effect at about age 20. For younger adults, reappraising was associated with increased negative affect, but for those over 20 years of age the strategy was associated with increasing benefits to the regulation of negative feelings.

Studies into age-related effects on emotions have, for some time now, consistently found that older people experience better profiles of emotional well-being than younger people (Charles & Carstensen, 2010). Thus far, single-occasion measurement approaches, including laboratory assessments, have failed to find any consistent evidence for age-related differences in the use or effectiveness of regulatory strategies (Sims & Carstensen, 2014). Age-related differences for reappraisal, in particular, have been varied. Some trait studies have suggested that reappraisal effectiveness may decline due to cognitive problems related to aging (Urry & Gross, 2010; Optiz, Rauch, Terry, & Urry, 2012). Other trait studies have found older adults to be more successful in their use of reappraisal (Lohani & Isaacowitz, 2014). It has been suggested that empirical approaches to understanding this issue have so far been limited by methodologies with poor ecological validity (Sims, Hogan and Carstensen, 2015). The reappraisal × age interaction found in Study 1 is the first to show such an effect using the daily diary methodology.

While caution must be advised, given the reliance in this thesis on a university-derived sample consisting of many more younger adults, the impact of age on cognitive reappraisal deserves further empirical study. These current results are at odds with the popular notion in the ER literature (Urry & Gross, 2010) that the effectiveness of cognitive reappraisal may *decline* with age, supporting instead the idea of age-related benefits to cognitive reappraisal (Lohani & Isaacowitz, 2014).

While these results provide some confirmation of age-related benefits of reappraisal, they do not explain why age may be important. Explaining this will be an interesting next step in this line of research. One key possibility is that older adults may become better skilled

at applying (Sahdra, Ciarrochi, and Parker, 2016) and selecting between possible regulatory

strategies with age (Urry & Gross, 2010), perhaps indicating better flexibility in the

implementation of strategies as the situation requires (Kashdan & Rottenberg, 2010). People

may become better, through experience, at predicting when reappraisal may be most

successful, and when they may be better off abandoning that strategy in favor of another.

Another possibility could be that different types of reappraisal are implemented by younger

and older people. It could be that younger people reappraise in ways that reframe the

situation (for example, "It's not that bad"), whereas older people may reappraise in ways that

show a degree of acceptance (such as "It is what it is"). Further research is needed to

understand why older adults seem to benefit more from their daily use of cognitive

reappraisal in relation to negative affect.

At the other end of the developmental spectrum, the finding that cognitive reappraisal

is associated with decreased benefits for teenagers naturally calls for similar daily diary

studies of ER in younger samples. ER appears to be central to the development of children

(Kiel & Kalomiris, 2015), but little is known about ER in the daily life of children and or

adolescents. In light of the age-related findings of Study 1, and given the prominence of

cognitive restructuring interventions in evidence-based treatments for children and youth

(Rapee et al., 2006; Barrett, Farrell, Ollendick, & Dadds, 2006; Ciarrochi et al., 2016),

further exploration of when and why ER strategies may be most beneficial to children and

adolescents is needed. In particular, it appears to be important, on the basis of the findings in

this thesis, that we should be cautious in making generalizations from empirical research on

ER across developmental periods.

The Usefulness of Daily Cognitive Reappraisal Depends upon a Person's Need

Satisfaction

In Study 2 (Chapter 5), my colleagues and I sought to understand the role of a person's environmental context using people's reports of the level of need satisfaction experienced in their lives. Gross's (2015) extended process model of ER implies a key role for a person's goals and values in the emotion generation and regulation process. People feel things and are motivated to regulate their emotions in line with what they "care about" in the world. This model emphasizes the role of regulatory strategies in maintaining emotional well-being, but does not specify the processes by which people are motivated. Largely missing from the model are considerations of what people care most about, and how those motivations influence ER processes.

Self-determination theory (SDT) emphasizes the satisfaction of three basic psychological needs (for autonomy, relatedness, and competence) in a person's life context as the central determinant of motivation and emotional well-being. Regulatory strategies in this model are useful to the extent that they assist people to experience satisfaction of the three basic psychological needs. Empirical research supports both models, but rarely have they been considered in synergy. In Study 2, my colleagues and I integrated ER theory and SDT in the hope of better understanding the role of a person's need satisfaction—a level of macro environmental context—in the daily process of ER. Based upon theory and research, I hypothesized that the use of regulatory strategies and their influence on daily affect experiences would be attenuated to the extent that people were getting their needs met. That is, I expected regulatory strategies to be least useful for those experiencing the greatest levels of need satisfaction in their lives, and most useful for those who were struggling to get their needs met. I found support for this hypothesis for the reappraisal strategy only. Cognitive reappraisal was more helpful for people experiencing low need satisfaction, in that they

experienced greater levels of well-being (lower negative and higher positive affect) on the days they reappraised more, and lower emotional well-being on days they engaged in less reappraisal. In contrast, among people high in need satisfaction, cognitive reappraisal appeared to be of no value for the managing of daily positive affect and was associated with higher, rather than lower, levels of negative affect.

Cognitive reappraisal and social connection: A special relationship? To further understand this reappraisal × need satisfaction interaction, Study 2 further examined the interactive effects of reappraisal on the needs for autonomy, relatedness, and competence. The study found that, for the most part, the interaction between reappraisal and need satisfaction could be explained by the *relatedness* need. This provides more nuanced information on the role of need satisfaction in the reappraisal strategy, suggesting a special connection between our social context and the strategy of reappraisal. People reporting high levels of relatedness did not benefit from using cognitive reappraisal, whereas people reporting low levels of belonging showed clear benefits. But why might a person's social context be such a determining factor in the usefulness of the person's efforts to self-regulate via reappraisal? SDT posits that, ideally, people's emotions are regulated externally through supports in their social environment. Intersecting this with ER theory, I suggest that, for many people, greater access to sources of social support in the environment may function as a supportive "external voice", a form of interpersonal ER (Rimé, 2008). However, people who are more socially isolated may need to develop and rely on the internal strategy of reappraisal to assist with healthy regulation. That is, in the absence of a healthy "external voice" to assist with regulation, they may have to develop their own supportive "inner voice" to take over this function. So why, then, might people high in relatedness and who reappraise more experience more negative affect? They presumably have access to both sources of regulation (internal and external). One admittedly speculative possibility is that these people, in sticking

with the internal reappraisal strategy despite sources of support in the social environment, may fail to capitalize on such support and the inherent benefit to their relatedness need satisfaction that such support entails. Much of the theory of and research into ER has focused on people's internal strategies. The results from Study 2 suggest a key role for relationships and social connections in ER processes. The implications of these findings for theories of ER and well-being are further discussed in the section below on theoretical implications.

Cognitive reappraisal, relatedness and "controllability". These results indicate that relationship need satisfaction moderates the reappraisal – well-being link. This can be mapped to other contextual findings in the literature on daily cognitive reappraisal. Similarly to Study 2 of this thesis, a study of daily ER by Haines et al. (2016) found stressor "controllability" to be an important moderator of the link between daily reappraisal and negative affect. In that study, daily reappraisal was associated with less negative affect among those perceiving their environment as uncontrollable, and more negative affect among those perceiving a high level of controllability in the environment. It could be that these two contextual findings are related, in that a person's ability to derive need satisfaction from their social context may be an important dimension of the experience of "controllability". In other words, it could be that people perceive their environment as more controllable when they have more social support in their environment. Future studies of daily ER that implement need satisfaction alongside measures of situational control are needed to evaluate this possibility.

Correlations between need satisfaction and daily ER. It is also important to consider the direct relationships between need satisfaction and daily ER processes. Consistent with Study 1 in this thesis, there was a general low correspondence between *trait* need satisfaction and *daily* process measures. Nonetheless, there were several significant relationships of interest. First, as would be predicted from SDT, the satisfaction of global need and the three

needs that constitute it (autonomy, relatedness, and competence) were all related to lower

daily negative affect. However, no corresponding relationships were found between need

satisfaction and people's daily experiences of positive affect. There has been an increasing

focus in the SDT model on the prediction of wellness and thriving that flows on from the

satisfaction of the three basic psychological needs (Ryan & Deci, 2017). The Study 2 results

suggest that general need satisfaction is more pertinent to people's experience of daily

negative affect than positive affect. This is not to suggest that global need satisfaction does

not predict well-being and positive affect at a trait level, only that it seems not to matter as

much to the daily ebb and flow of positive affect.

Three explanations for these results are considered. First, they may be due to

discrepancies between the trait and daily measures. Need satisfaction was measured at the

trait level as a measure of general need satisfaction. Perhaps if need satisfaction were

measured at the daily level a link would be observed between need satisfaction and positive

affect. Second, it may be that general need satisfaction has impacts on positive affect over a

longer period of time, rather than on a daily basis. Third is the possibility, supported by the

moderator results of Study 2, that need satisfaction may have an effect on daily positive

affect only in interaction with other processes (such as regulatory strategies).

Only two correlations between daily regulatory strategies and need satisfaction were

found to be significant. Both involved competence. Again, this may be an artifact of the

differing measurement approaches. Notwithstanding this, greater satisfaction of one's

competence needs was related to more mindfulness and less reappraisal. This means that

people who feel more competent in their lives are more likely to use mindful ER, while those

who experience less competence in their lives may need to use reappraisal more to regulate

negative emotions that arise from general feelings of incompetence in the world. While these

correlations did not hold across the three needs, they are consistent with the notion in SDT

that some strategies (such as mindfulness) are *integrative*, while others (such as suppression) may be *controlled* (Ryan & Deci, 2017; Roth et al., 2014). These results hint at the possibility that reappraisal may be a more controlled form of regulation.

The Role of Daily Positive and Negative Events in the Process of Daily ER

Leading on from the results of Study 2, which found contextual variability in the usefulness of reappraisal at a macro level of environmental context (general need satisfaction), Study 3 (Chapter 6) sought to understand more proximate (micro) environmental influences by examining the well-being consequences of types of daily event (positive and negative social events and positive and negative performance events).

Within-day effects. All four event types, including positive and negative, were *positively* correlated in daily life. In Study 3, my colleagues and I speculate that on days when people are more behaviorally active in their daily lives they may be more likely to experience more events of every type, regardless of their valence. If this is true, then it would mean that, in order to experience positive events and interactions, one would also need to risk the experience of negative events. This is consistent with the notion that, in order to experience well-being, one needs to be able to accept the unavoidable negative events that come from valued activity (Jacobson et al., 2001; Hayes et al., 1999). This also makes sense from an SDT perspective: in pursuing need satisfaction, one will presumably have to contend with situations of *need thwarting* along the way.

These findings highlight a paradox: approaching situations with the hope of deriving reinforcement may inevitably also open people up to more negative events. Thus, it may be that regulatory strategies that maximize a person's ability to *both* contact and capitalize on positive events and cope with negative events may be of greatest utility to the individual. For example, while the strategy of experiential avoidance may help a person avoid experiencing

negative events, the strategy also tends to disqualify them from experiencing everyday positive events required for reinforcement and positive affect.

Within-day relationships were also found between certain event categories and regulatory strategies. First, daily cognitive reappraisal predicted more frequent daily positive events. This is consistent with the "upward spiral" theory of reappraisal (Garland, Gaylord, & Park, 2009), which suggests that reappraisal may help people engage more with positive experiences, thus leading to greater levels of positive affect. Negative events were significantly related to decreases in mindfulness and increases in emotion suppression, consistent with the results of Study 1, which looked at the correspondence between the strategies and negative affect. One admittedly speculative interpretation of these results is that "looking on the bright side", or reappraisal, may be easier when there *is* a bright side; that is, when one is experiencing positive affect. Similarly, it would seem that mindfulness, while the best predictor of lower negative affect, is least likely to be implemented on days with more frequent negative life events. These findings may be relevant to emerging theory and research relating to the importance of ER choice (for example, Sheppes et al., 2014).

Gross's process model of ER (1998, 2002) proposes a clear link between activating events (antecedents) and the generation of positive and negative emotions. All things being equal, positive events will lead to a process that eventuates in the experience of positive affect, while negative events lead to the experience of negative affect. This basic antecedent–emotion link was validated in the within-person results in Study 3. Positive events were related to increases in positive affect but did not relate to daily negative affect, suggesting a direct pathway between positive events and positive affect. Negative events were related to increased negative affect *and* decreased positive affect.

Before examining any interactive event × strategy effects, it was important in Study 3 to establish the distinctiveness of effects between events and regulatory strategies in the

prediction of positive and negative affect. While there is plenty of evidence to suggest separately the importance of daily events and regulatory strategies for daily emotional experiences, Study 3 brought these two influences together within the same study. It found that the effects of daily events and strategies on daily positive and negative affect were almost entirely distinct. The only exception was the effect of reappraisal on negative affect, which was found to be non-significant when placed alongside all other events and strategies in one model. Daily events and regulatory strategies both appear to be important predictors of emotional well-being in their own right.

Moderation (Context) Effects of Daily Positive and Negative Events

Evidence from two theories suggested that the usefulness of regulatory strategies may depend upon the frequency of positive and negative events that people encounter on a given day. First, Gross's process model (1998, 2002, 2015) proposes that strategies function to "modulate" the impact of triggering antecedent events. Second, Aldao's (2013) model of context in ER suggests a key role for antecedent events as a source of contextual variability. Therefore, it was a logical next step to examine the influence of daily events on the usefulness of the three strategies studied in this thesis. Study 3 focuses on two reliable interactions that were found at the conservative adjusted alpha level.

Daily performance events and cognitive reappraisal. First, the study found some evidence that explains, to some degree, the Study 1 finding that reappraisal was beneficial for some and problematic for others in terms of negative affect. Study 3 found that reappraisal was associated with *lower* levels of negative affect only on days when people had more frequent negative performance events, but was associated with *more* negative affect when implemented on days with few negative performance events. This suggests that, on a daily basis, reappraisal may be most beneficial when dealing with negative performance situations, but potentially harmful when used on days involving few or no negative performance events.

It is particularly interesting that a daily context was found in which the putatively adaptive

strategy, reappraisal, is not beneficial. This suggests that, if reappraisal is deployed

habitually, even on days where there is no negative performance event to reappraise, people

may be more likely to experience negative affect. However, this study also found one daily

situation in which cognitive reappraisal seems to be *more* effective: on days when people

experience more negative performance situations, reappraisal appears most useful in

buffering the ill effects of negative affect. This finding potentially links with the findings of

Haines and colleagues (2016), who found that reappraisal was less useful when deployed in

more controllable situations and more useful in uncontrollable situations. It may be that

people experiencing more frequent negative performance situations experience those

situations as more "uncontrollable". Future daily process studies may benefit from examining

the relationship between appraisals of controllability and negative performance contexts.

　　　　Daily social events and emotion suppression. The second reliable interaction to

emerge from Study 3 was the relationship between emotion suppression and positive affect,

which depended significantly upon the frequency of reported positive social events. Emotion

suppression was associated with emotional costs (less positive affect) only on days when the

strategy was implemented in the context of more frequently occurring positive social events.

One possible explanation for this finding is that people engaging in suppression may miss out

on sources of reinforcement that might be available to them in the social environment

(Jacobson et al., 2001; Hayes et al., 1999). While Study 1 found no enduring cost of

suppression on negative affect, Study 3 demonstrated how emotion suppression may be

detrimental to daily well-being by reducing opportunities for experiences of positive affect.

Looking further into this interaction, no emotional cost or benefit to people's positive affect

was observed when suppression was used on days with less frequent positive social events. In

this context, the strategy appears to be neutral, at least in terms of people's experience of

positive affect. This is also important insofar as it shows one context in which the putatively

maladaptive strategy of suppression is not associated with maladaptive ER.

Given that these findings were specific to social situations, I speculate that

suppression may often be employed in social interactions with the goal of managing

interpersonal relationships. Studies of trait emotion suppression have found a positive

association between the strategy and poor interpersonal functioning (Gross, 2002). Sharing

too much emotion may have a negative social consequence, either in the short term or at

some later time. These results, however, suggest a potential downside of the strategy in terms

of positive affect. Suppression may therefore have a complex relationship to well-being. It

may possibly assist in maintaining social relations, but at some cost to deriving social

reinforcement. This may indicate that people who suppress their emotions more in social

situations are "playing it safe" socially, preferring to avoid the potential negative social

consequences of sharing emotions, but rather pursuing social reinforcement that may be

available from such interactions.

Conclusions on the role of positive and negative events. Gross's process model (1998,

2002) suggests a key role for ER strategies that function to "modulate" our experience of

emotions, either before full activation (antecedent-focused) or after full activation (response-

focused). The use of the term *modulation* infers a kind of intervening relationship resembling

statistical moderation. While Study 3 uncovered two potentially important sources of

contextual variability in ER as a function of daily events, it is noteworthy that such

moderation processes were mostly either absent or small and unreliable. While this is not a

problem for contextual understandings of ER, which suggest that the utility of strategies

differs by situation (for example, Aldao, 2013), we could not find widespread evidence of

statistical moderation. It may be that the effects of daily events and strategies occur as more

distinct processes. Alternatively, it may be that the intervening relationship between daily

events, strategies, and affect is more of a mediatory relationship. Nonetheless, this may turn

out to be an important finding. In Study 3, we could not find evidence of widespread sources

of variability in the usefulness of the strategies occurring due to the frequency of positive and

negative events encountered. Two subsequent areas for future study are thus implied. First, it

could be that more important sources of environmental influence lie not at the daily

(situational) level but in their broader life context. For example, consistent with the need

moderator results of Study 3, it may be that daily events do not matter as much if a person is

experiencing greater overall need satisfaction in their life. That is, perhaps a person's macro

environmental context (how things are generally going across time) may be more important

than the micro level of context (what specific things happen on a particular day). Further,

Aldao's (2013) model of context suggests several other contextual categories that may turn

out to be more important than daily events to the utility of strategies. The personality traits

and characteristics (such as trait anxiety) brought to bear on the regulation process could be

more important. Future studies should therefore look to other potential sources of contextual

influence outside of the daily situation.

Emotion Regulation as a Dynamic Process

The process of ER has been posited to be a dynamic one, unfolding across discrete

periods of time (Gross, 2015). The daily process approach employed in this thesis was able to

uncover several insights into the nature of this process by examining so-called "spillover

effects"—the relationship between ER variables across time, from one day to the next. This

approach is also able to examine directionality and the possibility of reciprocal relationships

(see, for example, Marsh & Martin, 2011), looking deeper into the daily effects to understand

nuances in ER that might occur over time.

Study 1 (Chapter 4) found that mindfulness predicted increases in next-day positive

affect but not vice versa. This implies that the effects of mindfulness on positive affect from

one day to the next are quite enduring, lasting at least a day. Further, this result is consistent

with the "broaden and build" theory of positive affect, which suggests that mindfulness may

promote the "savoring" of positive experiences in the environment, thus leading to positive

affect (Garland et al., 2015). Daily process evidence has confirmed the daily savoring –

positive affect link (Jose, Lim, & Bryant, 2012), and Study 1 of this thesis confirms the daily

mindfulness – positive affect link across days. Future work on daily process are needed to

bring mindfulness and savoring together into the same study.

Interestingly, a reciprocal influences model was supported for mindfulness and

negative affect. Evidence was found that mindfulness leads to lower next-day negative affect,

and that lower negative affect leads to higher next-day mindfulness. It could be that an

important mechanism underpinning the success of mindfulness may be that the strategy

promotes a protective momentum or "spiral" in relation to lower negative affect that is not

easily shifted when negative events arise in the environment. While higher daily mindfulness

may protect from such a negative spiral, the reverse is also true, according to this

interpretation. Lower mindfulness and higher negative affect may combine to contribute

towards a negative spiral, leading to emotion dysregulation. While this is quite speculative,

there is some theoretical support for the notion that mindfulness protects from the activation

of such downward spirals by providing distance from negative thinking processes (Teasdale

et al., 2000). What is perhaps most interesting here is that I and my colleagues were able to

tease out, to some degree, the way the effect of mindfulness unfolds across time. The notion

of building "momentum", or preventing a negative "spiral", may be an interesting direction

for future research investigating the mechanisms underpinning the benefits of mindfulness.

The spillover results from Study 1 showed evidence of directionality; that is, that

reappraisal predicts increases in positive affect, and not vice versa. This is also consistent

with the "upward spiral" theory of positive affect, which suggests a key role for cognitive

reappraisal in the maintenance of positive emotions (Garland et al., 2009). However, no significant relationship was found between cognitive reappraisal and next-day negative affect, consistent with the within-day relationships found.

Emotion suppression has tended to be framed as a maladaptive regulatory strategy because of its relationships to psychopathology and negative outcomes (Gross, 2002; John & Gross, 2004). The daily spillover effects found in Study 1 tell a different story: at least in the short term, across days, there appear to be no negative consequences of emotion suppression. First, emotion suppression was not found to predict lower next-day positive affect, as was found in the within-day models. Second, evidence was found that negative affect predicts next-day suppression and not vice versa. This suggests that, rather than emotion suppression being a *cause* of daily negative affect, it is more likely to be a response to it. This is an important finding because the positive associations found between suppression and negative affect have often been interpreted as evidence that the strategy may be responsible. The spillover results from Study 1 suggest that, at least in the short term, that might not be the case. People suppress in reaction to negative emotions, not vice versa. This is consistent with the process model of ER, which categorizes emotion suppression as a response-focused strategy (Gross, 2002). Taken together with results from the literature on suppression as a trait, this suggests that, while emotion suppression may have a maladaptive profile in sum and in the long term (John & Gross, 2004; Roemer, Litz, Orsillo, & Wagner, 2001; Aldao et al., 2010), the strategy may persist partly because it produces little negative affect in the short term. Here it seems that consideration of the time frame may be a key factor in understanding the potential harm (or utility) of emotion suppression.

Consideration of Previously Published Studies of this Dataset

Two studies previously published form this data set have a clear relevance to the current results. The first (Pond et al., 2012) explored *emotion differentiation* - differentiating

one's emotions into discrete categories, finding it to be a resiliency factor in buffering the expression of aggressive behaviour in those experiencing high levels of anger. While it seems clear from these results that emotion differentiation is likely beneficial to healthy emotion regulation, it is left unclear how this might operate. We speculate two possibilities in light of the current theses focus on models of emotion regulation. First, given emotion regulation occurs in light of a person's activated goals (Gross, 2015), it is possible that being able to notice and differentiate one's emotional state, is a requirement for understanding the implications of this emotional response on one's goals. One may be less likely to be motivated to reduce their anger response in light of their currently activated goals whilst they do not yet recognise their current state of anger. This links to a second possibility, that differentiating one's emotions is driven by mindfulness as an emotion regulation strategy. Being able to 'notice' and recognise one's emotional state has clear overlaps with definitions of mindfulness. Further, Study 1 of this thesis found daily mindfulness to be the most consistent predictor of daily emotional well-being, similar results to the contextualised results of Pond and colleagues (2012) on emotion differentiation and anger using this same data-set. This link between emotion differentiation and mindfulness has been made in a recent review of emotion differentiation research (Kashdan, Barrett, & McKnight, 2015), but as of yet, has not been tested empirically.

A second article, previously published using this data set, also bears relevance to the current thesis (Kashdan, Goodman, Mallard, & DeWall, 2016). This study conducted an intensive examination of the situational determinants of anger over the course of 21 days using daily diary (2,342 anger episodes) and qualitative methodology. Firstly, it was found that personality traits including anger, mindfulness, psychological need satisfaction, the Big Five) were poor predictors of anger in daily life. This is consistent with the results of study one of this thesis which showed similar poor correlations between daily and trait constructs.

Five anger trigger themes emerged from the qualitative analysis of triggers for anger episodes: other people, psychological and physical distress, intrapersonal demands, environment, and diffuse/undifferentiated/ unknown. This shows that although 'negative events' are often associated with emotional consequences; these consequences differ depending on the perceived source of the aversion. Combining quantitative with qualitative methodology in this case, has been able to shed more light than focusing on quantitative methodology alone, particularly when analysing negative events, as was done is study three of this thesis. Future studies of the role of positive and negative events on emotion regulation may benefit from this 'mixed-diary methods' approach.

Theoretical Implications

This thesis rests largely on Gross's process model of ER (Gross, 1998; 2002; 2015), which has proven to be a useful central framework for the three studies. Other models of well-being influencing this investigation include Aldao's (2013) model of context, and SDT (Ryan & Deci, 2017). I now discuss the central implications of the current thesis for relevant models of ER and well-being.

The results of this thesis fall mainly into line with Gross's process model. Support was found in the three studies of daily life for the core notion that ER depends on the person (Study 1) and the situation in which it is deployed (studies 2 and 3). Evidence was also found for the role of positive and negative events (Study 3) in the generation of positive and negative affect, respectively. However, little widespread evidence was found for the principle that regulatory strategies moderate or "modulate" the influence of positive and negative events. Rather, the roles of positive and negative events and regulatory strategies were largely distinct. While Study 3 tested the modulation hypothesis by testing for statistical moderation, it may be that the relationship between daily events and regulatory strategies is

based more on mediation. Another core tenet of the process model is that emotion generation

and regulation is a dynamic process that unfolds over time. The daily diary approach

confirmed this aspect of the model, and several new insights were gleaned from treating the

data in this way. I now discuss some implications of the core findings for the three strategies

examined in this thesis.

Mindfulness

This work sought to examine contextual variability in the usefulness of regulatory

strategies. This approach assumes that no strategy is good or bad *per se*, but that its

usefulness will depend on context. While evidence was found in Study 1 that the utility of

daily mindfulness differed significantly among individuals, in all three studies the findings

indicate that mindfulness is the most broadly beneficial strategy compared to the other two

strategies examined. Mindfulness was consistently associated with beneficial ER, and the

benefits tended to be less sensitive to context. Daily mindfulness practice was not found to

have significant moderation effects on daily affect for all of the context effects examined in

the three studies (trait demographics, need satisfaction, daily events). Mindfulness, therefore,

appeared least sensitive to context. This is not to say that mindfulness was *always* associated

with benefits. Several individuals identified in the within-person analyses in Study 1 reported

negative relationships between mindfulness and emotional well-being over 21 days.

However, overall, they were outliers. So, while I was able to confirm the contextual model of

mindfulness (that is, its effects varied between people), it was also clear that mindfulness had

the most universally beneficial effects of the three strategies examined. While I and my

colleagues were not able to find any reliable contextual effects to explain variability in the

utility of mindfulness, in future studies it will be important to find the sources of such

variability.

Emotion suppression

Emotion suppression has consistently been associated with problematic ER in a literature that has thus far been dominated by single-occasion measurement. This strategy has often been characterized as broadly maladaptive. Overall, my thesis paints a less negative picture of the strategy. While the strategy was broadly associated with the most problematic profile of regulation, two findings support a more nuanced and less negative view of it. First, the daily spillover effects noted in Study 1 indicate that, across days, there appear to be no enduring negative consequences of emotion suppression, at least in the short term. The use of emotion suppression did not predict next-day positive affect. Further, rather than emotion suppression predicting next-day negative affect, the study found evidence that the strategy is driven instead by increases in previous-day negative affect. This suggests that, rather than daily emotion suppression being a *cause* of daily negative affect, it is rather more likely to be a response to it. Secondly, Study 3 produced evidence that the relationship between emotion suppression and decreases in positive affect depended significantly upon the frequency of reported positive social events; that is, emotion suppression was associated with emotional costs (less positive affect) only on days when the strategy was implemented in the context of more frequently occurring positive social events. There was no significant cost in positive affect from using the strategy on days when there were less frequent positive social events. This implies that emotion suppression may on some occasions lead to decreased emotional well-being by reducing opportunities to experience positive affect. Taken together, these results hint that emotion suppression might not be so detrimental to emotional well-being in the short term, but that, when it is, that may be because of a reduced capacity to capitalize on positive social events.

Cognitive reappraisal

The strategy of cognitive reappraisal has consistently been flagged as having a general beneficial profile of ER (Gross, 2002; John & Gross, 2004). Relying on a daily process approach, this thesis has instead found the relationship between reappraisal and well-being to be highly variable. While Study 1 found reappraisal to be broadly associated with benefits to people's experience of positive affect, it was clear that for negative affect the strategy seems to function quite differently, depending upon the person. The strategy was also found to be most associated with context effects in all three studies. This work found that moderation (context) effects explained variability in the relationship between reappraisal and negative affect as a function of a person's age (Study 1), level of need satisfaction (Study 2), and frequency of daily negative performance events (Study 3). Given that sources of variability in the utility of mindfulness and emotion suppression were less reliable, and given that the utility of reappraisal for negative affect was so variable among individuals, these results constitute evidence that the usefulness of reappraisal, in particular, may be highly dependent on context. It was the only strategy of the three that seemed to be associated with benefits for some and emotional costs for others. Some practical implications of this distinction are discussed below.

For this thesis, Aldao's (2013) model of context in ER provided a framework within which contextual variability could be examined. The model defines context broadly as an interaction between four types of influences:

(a)   environmental antecedents

(b)   person-level traits and psychological processes

(c)   strategy selection and skill

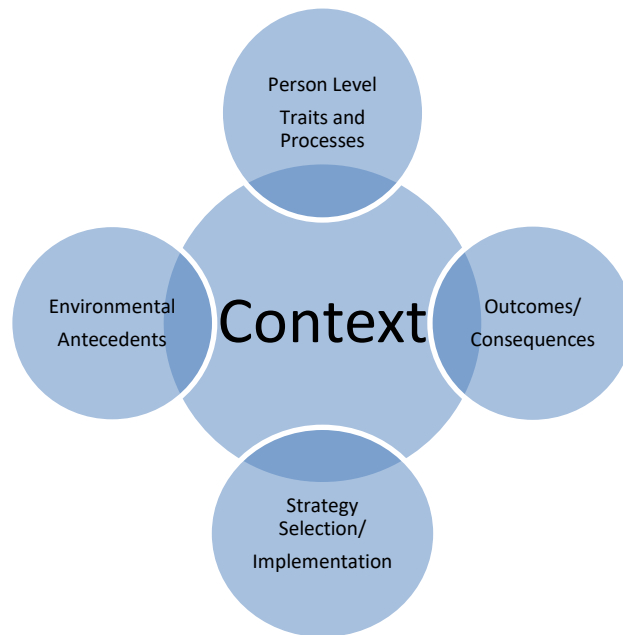(d)   the outcomes and/or consequences considered.

Figure 7.1. A pictorial description of Aldao's framework for the systematic study of contextual factors in emotion regulation

The results of the current work are proof of concept for Aldao's model of context in the study of ER. In the three studies, meaningful contexts (such as trait demographics, need satisfaction, and daily events) and their variability were modelled in relation to their impact on the process of daily ER. This thesis demonstrates that this model can indeed be used to guide study into contextual influences in ER. Future research considerations that flow on from this in light of the model are discussed in the section below on limitations and future research directions.

Study 2 explicitly examined the intersection of people's general need satisfaction and the strategies that they use to regulate their emotions day by day. SDT (Ryan & Deci, 2017) posits that the satisfaction of basic psychological needs (for autonomy, relatedness, and competence) is central to emotional well-being. In this model, regulatory strategies are generally viewed as useful to the degree that they assist in need satisfaction (Ryan & Deci, 2017; Roth et al., 2014). Strategies that lead to need satisfaction result in psychological growth and well-being and are termed *integrative* strategies, whereas strategies that primarily

function to control or simply cope with emotions are termed *controlled* strategies. While

controlled forms of regulation may help to reduce the immediate impact of emotional

episodes, they are not necessarily conducive to need satisfaction, and so may have

maladaptive consequences over time through *needs thwarting*. The moderator results of

Study 2 suggest that cognitive reappraisal may be a form of controlled regulation. The

strategy was most useful for people who were not experiencing need satisfaction, and less

useful for those experiencing high levels of need satisfaction. Consistent with SDT, this

suggests that strategies such as reappraisal may function to help people in regulating

emotions that result from the thwarting of basic psychological needs. This view of reappraisal

as a controlled form of regulation is also tentatively supported by the negative relationship

found between the satisfaction of competence needs and reappraisal, suggesting that people

may use the strategy more in contexts that do not support the person's competence needs.

Conversely, the positive correlation found in Study 2 between competence need satisfaction

and daily mindfulness is consistent with the view in SDT that mindfulness generally

functions as an integrative form of regulation. The negative correlations found between need

satisfaction and daily negative affect support the SDT view that need satisfaction is central to

daily emotional well-being, but similar need – positive affect relationships were notably

absent. It may be that these links, if they exist, do not exist at the trait level of need

satisfaction, and there were generally poor levels of agreement between trait and daily

variables across the three studies. Future studies can build upon the work in Study 2

examining the link between SDT and ER by investigating the role of daily sources of need

satisfaction in the daily process of ER.

The results of this thesis contribute to a growing field of enquiry in the ER literature

known as *interpersonal ER* (Rimé, 2007; Zaki & Williams, 2013; Marroquín, 2011).

Proponents of the interpersonal ER perspective argue that ER is an inherently social process

and that the vast majority of ER episodes occur in social contexts (Levenson, Haase, Bloch, Holley, & Seider, 2013). Other people are both triggers for, and receivers of, our emotional episodes and experiences, and many of our regulatory strategies (such as emotion suppression) appear either to have other people in mind or to rely totally upon others to enact (for example, emotional sharing). This thesis contributes to this literature. People's experience of connection and ER processes appear to be fundamentally entwined. In Study 3, positive and negative social events, respectively, were unique predictors of people's daily experiences of positive and negative affect. In Study 2, the moderation effect of reappraisal on daily negative affect depended largely on connection needs, suggesting that our connection with others may have a key regulatory and well-being function. In line with literature on interpersonal ER, this suggests that the interpersonal strategy of "sharing" may be related to the internal strategy of cognitive reappraisal. People may rely on more internal forms of regulation when other forms of regulation are not available in the social context. Again, in Study 3, moderation results suggested that the putatively maladaptive strategy of suppression was only problematic for people who used the strategy on days that involved more frequent positive *social* events. This suggests a key role for the social regulation of positive affect. More research is needed to model the role of more interpersonal forms of ER, such as emotional sharing (Zaki & Williams, 2013) alongside the internal or intrapersonal regulatory strategies studied in this thesis.

Self-Determination Theory and Emotion Regulation

Study two investigated the interplay between SDT and ER theory, and may have important implications for both theories. Emotion regulation theory has focused on the role of internal regulatory strategies on well-being, and has not laid out a comprehensive theory of the role of context on the process of ER. The theory does suggest however, that context matters, that people are motivated to regulate their emotions to the degree that their emotions

may bear relevance to their activated goals in a given context. However, the theory is not extended to explain what goals motivate people in the process of emotion regulation. Nor does it attempt to explain what contexts might lead to attempts to regulate. Study two of this thesis, is to my knowledge, the first empirical study to use the SDT concept of need satisfaction to model the role of context on the process of daily emotion regulation. In study two we demonstrate proof of concept of this idea; need satisfaction moderated the impact of one strategy in particular, cognitive reappraisal, showing that the strategy was most useful when people reported low need satisfaction, and least useful when experiencing high need satisfaction. This shows that at least for some strategies, need satisfaction may be an important contextual factor determining the utility of the strategy. While this result is in itself interesting, it is perhaps more interesting because it shows that SDT variables, such as need satisfaction and thwarting, may be used to model context and motivation in studies of emotion regulation strategies. Future studies may continue this line of enquiry.

Looking at implications for SDT from study two, and what strategies may be more or less conducive to need satisfaction, the results are patchy but interesting. First, no consistent relationship was found between the daily ER strategies and (trait) need satisfaction, perhaps reflecting the differing measurement approach (Mischel & Shoda, 1995). This is interesting because SDT would suggest that mindfulness should be a most conducive strategy to need support and psychological integration (Ryan & Deci, 2017). While study one showed daily mindfulness to be the most consistent predictor of daily emotional well-being, study two showed no relationship between daily mindfulness and trait need satisfaction. It also appears that cognitive reappraisal, may have a special relationship with need satisfaction, such that it appears, at least at a daily level, to be a viable 'compensatory' strategy for low levels of need satisfaction, particularly relatedness. The correlations in study one also shows a positive correlation between daily reappraisal and trait competence, implying the strategy may be

conducive to supporting one's competence needs. Conversely, daily emotion suppression was related to decreases in the experience of competence. These initial results demonstrate that ER strategies can be studied along SDT constructs to unpack the relationships between regulatory strategies and need satisfaction. Future studies, measuring need satisfaction at the daily or state level are required to further investigate these results. While we stop short of, on the basis of these initial results, calling for an integrated model of SDT and ER theory, study two of this thesis has shown how the theory and empirical literature of both traditions can inform each other. SDT can provide a model of context for analysing the utility of emotion regulation strategies. ER theory, provides a plethora of regulatory strategies that may be studied from an SDT perspective.

Trait versus interactionist theories of personality

The results in study 1, of a general lack of association between trait and daily measures in the face clear daily-to-daily, and trait-to-trait associations wades into a long standing debate on trait versus interactionist approaches to studying personality. It is clearly of interest that consistent associations were found between trait variables, and between daily variables, but that in general poor associations were seen in daily-trait correlations, even when corresponding to the same putative construct (e.g. cognitive reappraisal). This is consistent with previous studies that have found that psychological states and traits are often poorly correlated (Nezlek, 2007; Shiffman, Stone, & Hufford, 2008). The interesting trait moderator results found across the three empirical studies generally support the utility of interactionist approaches to studying personality (e.g. Mischel & Shoda, 1995; Nezlek, 2007), and further demonstrates that trait measures, may on many occasions be a poor predictor of an individual's daily experiences and behaviors (and vice versa). Given that so much of psychology has as its core focus, the prediction and influence of people's

psychological states and daily behavior, interactionist approaches (e.g. Nezlek, 2007), continue to hold promise in integrating the field, showing how the dynamic interplay of psychological states, traits, behaviors, and situations may be modelled to further our understanding of human nature 'in context'.

Practical Implications of the Thesis

The overall findings in this thesis support a contextual approach to ER in which no ER strategy is considered to be inherently good or bad. There may be situations and social contexts in which emotion suppression is useful, at least in the short term, and others in which mindfulness is problematic. Clinicians and researchers using the ER model and its strategies should therefore do so as part of a contextual approach. It is difficult to make broad claims about the utility of one strategy over another; rather, such decisions will need to be made with the aid of situation-specific functional analyses (see, for example, Dougher & Hayes, 2000).

While we should not rely too heavily on a general profile approach, the current results support the view that some ER strategies have broader benefits than others. Mindfulness, implemented daily, was the most broadly beneficial of the three strategies studied, at least in terms of daily positive and negative affect. The results generally support recent "contextual" approaches to therapy that:

(a)   view mindfulness as a more broadly beneficial ER strategy

(b)   hold that appreciating flexibility and context is fundamental to understanding healthy

ER (Hayes et al., 1999).

The outlook for cognitive reappraisal is more complex. The usefulness of the strategy appears to be highly variable, to depend on the outcome of interest (positive versus negative affect) and to be very sensitive to context. While the strategy seems to be particularly well

suited to the maintenance of positive affect, its relationship with negative affect is tenuous. These results may be interpreted as challenging to therapy interventions, such as traditional cognitive-behavioral therapy, that emphasize the reappraising of "negative automatic thoughts" as a core therapeutic technique and a core skill for healthy ER (Beck, 1979). In our sample populations, my colleagues and I found that daily reappraisal had no consistent relationship to daily negative affect. Those people who seemed to benefit the most were those who were older, who experienced a lack of need satisfaction in their life, and who struggled with daily negative performance events. For others, such as younger people, reappraisal was associated with *more* negative affect. The healthy regulation of negative affect is a key therapeutic target for many psychological problems. These results are only preliminary and are derived from a relatively healthy sample of university students, but if they were to hold for clinical populations that would indicate that reappraisal might not be a universally beneficial strategy and in some cases might lead to increased negative affect. Future studies are needed, using intensive longitudinal designs such as those used by my colleagues and me and covering a range of clinical populations, to determine whether these results can be generalized.

These results also suggest that inflexibility in the application of ER strategies may be a central issue. Reappraisal, used by people in contexts that were needs satisfying, was associated with more negative affect. Emotion suppression, used by people experiencing frequent positive social events, produced more negative affect. These results are consistent with the view that flexibility in the implementation of regulatory strategies may be centrally important to their utility (Kashdan & Rottenberg, 2010). Indiscriminate use of ER strategies may indicate inflexibility**.** Therefore, approaches that aim to teach a flexible approach to self-regulation appear to be promising, regardless of the strategies used (for example, Hayes et al., 1999; Villatte, Villatte, & Hayes, 2015).

Traditional behavioral and cognitive approaches to therapy have tended to focus almost entirely on changing factors within the person (for example, changing cognitions, building skills, and implementing ER strategies). The results of Study 2 indicate that one of the key strategies routinely taught to clients—cognitive reappraisal—appears to be useful only insofar as it helps to compensate for a lack of connection. This indicates that reappraisal may be most useful if taught within a flexibility framework, rather than indiscriminately, but it also suggests that an important route to well-being may be found through a more explicit focus on building social connectedness (Ciarrochi, Morin, Sahdra, Litalien, & Parker, 2017). It is well known that social isolation is toxic for emotional and physical health (Hawkley & Cacioppo, 2010). These data converge with recent research that has called for a focus on the development of interventions that more explicitly address the widespread societal problem of loneliness and social isolation (Mann et al., 2017).

Limitations and Future Directions

The limitations of the studies in this thesis are described in detail in chapters 4, 5 and 6. Here, I discuss several limitations of the thesis as a whole and consider future directions for research into ER that flow on from the thesis.

Notwithstanding the potential strengths and benefits of using secondary data, one of the central limitations of this thesis involves the use of archival data. Many of the limitations of the studies can be understood as a trade-off in costs and benefits from adopting this approach. First, the list of measures included might not have been optimal. For example, there are alternative conceptualizations of reappraisal (see, for example, Haines et al., 2016), but only the one included in the archive could be used. While the daily measure of reappraisal is the most dominant, well-used one, and is based on the most prominent conceptualization of reappraisal (Gross, 2002), it would have been useful to contrast different measures and conceptualizations of the strategy. The studies in this thesis were constrained to

the measure of reappraisal that was available, which was based on one definition of cognitive reappraisal (Gross, 2002).

Second, a similar issue involves the use of the trait measure of need satisfaction in Study 2. While this measure makes absolute sense as a moderator of ER, questions about the role of daily need satisfaction could not be examined. They almost certainly would have been if these data had been collected with the explicit purpose of this thesis in mind.

Third, there were also limitations in the strategies that could be examined. While the studies in this thesis focused on three strategies commonly studied in the trait literature (mindfulness, cognitive reappraisal, and emotion suppression), it is clear that other strategies may be relevant (such as rumination, worry, experiential avoidance, and emotional sharing). Future studies of regulatory strategies in daily life would benefit from moving beyond the strategies examined here.

Researchers of ER are currently particularly interested in the role of flexibility (Kashdan & Rottenberg, 2010). Including a daily measure of flexibility would have undoubtedly added to the studies in this thesis.

Fourth, the use of a sample of university students in the three studies limits the generalizability of the results. In particular, given that some of the central findings of this thesis relate to the regulation of negative affect, it is important to note that mean levels of negative affect in the sample appear quite low. This limits generalization to clinical populations, which by their nature are more likely to be more distressed and have less social connection. Extending the current findings to clinical samples, and to samples that experience higher levels of negative affect, is thus clearly needed. On a related point, no data on participants' psychological history, or their past or current experience of psychotherapy or related practices (such as meditation), were collected. These variables may be important moderators of daily ER and so warrant attention in future daily process studies of ER.

A strength, but also a limitation, of this thesis was the end-of-day reporting schedule used for data collection. This means that, while some of the problems associated with self-reporting (such as recall bias across time) may have been minimized, they have not been eliminated completely. Future research may benefit from considering additional measurement approaches that minimize bias, such as event-contingent reporting in which participants report events as they occur several times throughout one day. Such an approach is also likely to provide additional "in the moment" contextual information for discrete episodes of ER. While this will certainly be of benefit by extending the current results, it does not diminish the utility of the end-of-day reporting schedule employed in this thesis, as one important aspect of ER is that it unfolds over time. Thus, understanding ER from one day to the next is as important as understanding the dynamics of discrete episodes. It is likely that both approaches will yield important, and potentially different, insights on how the ER process unfolds over time.

While modelling habitual strategy use sheds some light on how these strategies function in daily life, this study has not attempted to evaluate the efficacy of strategies via intervention studies. This means that any discussion of practical implications is inevitably speculative. However, I hope that the findings in this thesis will inform future studies with a more applied and practical focus, and that they might inform clinicians applying the ER model in their clinical practice.

In this thesis, I have used Aldao's (2013) model of context to help guide an examination of contextual variability in the utility of three regulatory strategies. I have examined contextual variability at the level of the person (trait demographics), and at the level of the situational context (need satisfaction, daily events). Aldao's model provides a good road map from which future daily process studies of ER can be guided.

A core feature of this thesis has been a focus on environmental antecedents in examinations of contextual variability. While there are certainly other types of antecedents (such as state need satisfaction and different relational contexts, such as "being criticized") that warrant further study in this domain, this thesis has made a good initial examination of contextual effects, surveying an example of macro context (need satisfaction) as well as micro context (daily events).

However, the lack of widespread reliable context effects for daily events in Study 3 suggests that other person-level moderators may be of importance. Person-level variables are characteristics of the regulator brought to bear on the regulation process. Aldao and Tull (2015) identify several such characteristics that have been found to be important to ER in experimental and single-occasion studies, which are thus promising for future daily process studies. They include the developmental stage (Crowell, Puzia & Yaptangco, 2015), culture (Ford & Mauss, 2015), genetics (Hawn et al., 2015), and psychopathology (Rosenthal, Fang, & Chapman, 2015) of the regulator. The Aldao (2013) model of context also suggests that the skill and choice involved in implementing strategies are also important contextual variables to consider. Several possibilities in this contextual domain that have recently been considered and that may inform future daily process studies include the automaticity of regulatory strategies (Christou-Champi, Farrow, & Webb, 2015), the skill involved in implementing a strategy (Roemer et al., 2001), emotion differentiation skill (Smidt & Suvak, 2015), and distress tolerance (Law, Khazem, & Anestis, 2015).

Perhaps a most important consideration in future daily process studies of ER will be the types of outcomes considered. The three studies in this thesis have, like most studies in the area to date, operationalized emotional well-being as involving more positive and less negative affect. This has been termed the "hedonic" view of ER (Tamir & Gross, 2011). This definition of emotional well-being is not universally accepted, even in the field of ER

research. Tamir and Gross (2011) suggest that the process model of ER ultimately dictates that people are motivated to regulate for both hedonic reasons and functional reasons. While in many instances people naturally try to down-regulate negative affect and up-regulate positive affect, there are contexts in which the inverse applies. People may be motivated to up-regulate their anger when defending themselves from physical assault, and down-regulate feelings of happiness and relief that they might feel at the funeral of a loved one. ER research to date, including the studies in this thesis, has tended to take a hedonic approach. Kashdan, Young, and Machell (2015) argue for a contextual approach to outcomes in future ER research, which may include more functional outcomes such as quality of life, valued living (see, for example, Hayes et al., 1999), and need satisfaction (Ryan & Deci, 2017).

Taking a hedonic approach to outcomes, the three studies in this thesis also define emotions broadly, using measures of global negative and positive affect. While it is a useful starting point, this approach is limited in its capacity to uncover how daily ER functions with more specific emotions (such as guilt, shame, and anger) or dimensions of emotional experiences (such as high and low active affect). Future daily process studies are needed to evaluate whether the current results hold across a range of more nuanced dimensions of emotional experience.

Conclusion

Modern accounts of ER are increasingly focused on the role of context. However, it is not enough to merely acknowledge the importance of context. Rather, research is needed to inform us about the contextual nuances governing this important human process. This thesis has contributed to a small but growing literature seeking to understand ER using daily process approaches. While several of my findings have further validated previous findings based on single-occasion measures, the daily process approach used here has uncovered several new findings on the process of ER. The three studies in this thesis converge in

support of a contextual approach to ER in which the utility of an ER strategy depends on the

person and the situation, and which unfolds over time. The three studies provide proof of

concept for a daily process approach to studying ER.

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Abbreviations

EMA	ecological momentary assessment
ER	emotion regulation
ERQ	Emotion Regulation Questionnaire
GNSS	General Need Satisfaction Scale
ICC	intra-class correlation
LMS	Langer Mindfulness Scale
MAAS	Mindful Attention and Awareness Scale
PANAS	Positive and Negative Affect Schedule
SDT	self-determination theory

Research Portfolio Appendix

Published Article

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. (2017). Emotion regulation strategies

in daily life: Mindfulness, cognitive reappraisal and emotion suppression. *Cognitive*

Behaviour Therapy, *46*(2), 91–113. doi:/10.1080/16506073.2016.1218926

Potential Publications

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. Emotion regulation strategies in daily

life: The usefulness of cognitive reappraisal depends on whether psychological needs
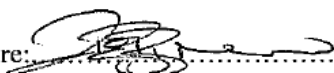
are met. Under review at *Emotion.*

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. Emotion regulation in daily life:

Exploring the role of positive and negative events in the usefulness of emotion

regulation strategies. In preparation for submission to *Cognitive Therapy and*

Research.

Statement of Contributions: Study 1

Statement of Contributions Study 1

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. (2017). Emotion regulation strategies in

daily life: mindfulness, cognitive reappraisal and emotion suppression. *Cognitive*

Behaviour Therapy, 46(2), 91-113. doi:/10.1080/16506073.2016.1218926

I, Robert Brockman conducted this study and acknowledge my contribution to this paper is 70%.

Signature:...

This study was supervised by Professor Joseph Ciarrochi (Primary), Associate Professor

Philip Parker (Secondary), and Professor Todd Kashdan (Associate). They contributed

their expertise to this paper substantively and methodologically. Thus, the contribution of

each supervisor to the above paper is 5%-10%.

Signatures:

Professor Joseph Ciarrochi...

Associate Professor Philip Parker...

Professor Todd Kashdan............ *Todd Kashdan* ....

Statement of Contributions: Study 2

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. Emotion regulation strategies in daily life:

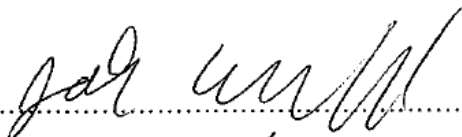The usefulness of cognitive reappraisal depends on whether psychological needs are met.

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This study was supervised by Professor Joseph Ciarrochi (Primary), Associate Professor

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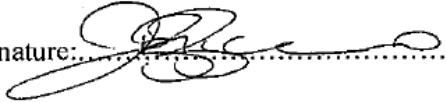
Statement of Contributions: Study 3

Statement of Contributions Study 3

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. Emotion Regulation in Daily Life:

Exploring the Role of Positive and Negative Events on the Usefulness of Emotion

Regulation Strategies. In preparation for submission to *Cognitive Therapy & Research.*

I, Robert Brockman conducted this study and acknowledge my contribution to this paper is 70%.

Signature:..

This study was supervised by Professor Joseph Ciarrochi (Primary), Associate Professor

Philip Parker (Secondary), and Professor Todd Kashdan (Associate). They contributed

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each supervisor to the above paper is 5%-10%.

Signatures:

Professor Joseph Ciarrochi...

Associate Professor Philip Parker......................................

Professor Todd Kashdan...

Subject:	2015-92N Ethics Review Exemption - Non-Identifiable Data
From:	Res Ethics (Res.Ethics@acu.edu.au)
To:	Joseph.Ciarrochi@acu.edu.au; rrbroc002@myacu.edu.au; Philip.Parker@acu.edu.au;
Cc:	Res.Ethics@acu.edu.au;
Date:	Tuesday, 12 May 2015, 11:35

Dear Applicant,

Principal Investigator: Prof Joseph Ciarrochi
Co-Investigator: Dr Phil Parker,
Student Researcher: Robert Brockman(HDR student)
Ethics Register Number: 2015-92N
Project Title: emotion regulation in context
Risk Level: Deidentified Data
Date Approved: 12/05/2015
Ethics Clearance End Date: 31/12/2015

This email is to advise that your application for access to non-identifiable data has been reviewed by the Australian Catholic University's Human Research Ethics Committee.

HREC notes that the project will be using previously collected non-identifiable data which can be exempt from review according to the National Statement on Ethical Conduct in Human Research (NHMRC 2007) section 5.1.22 and 5.1.23.

The Australian Catholic University notes Dr Todd Kashdan from George Mason University, will provide access to data in a de-identified format.

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Publication: Cognitive Behaviour Therapy

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