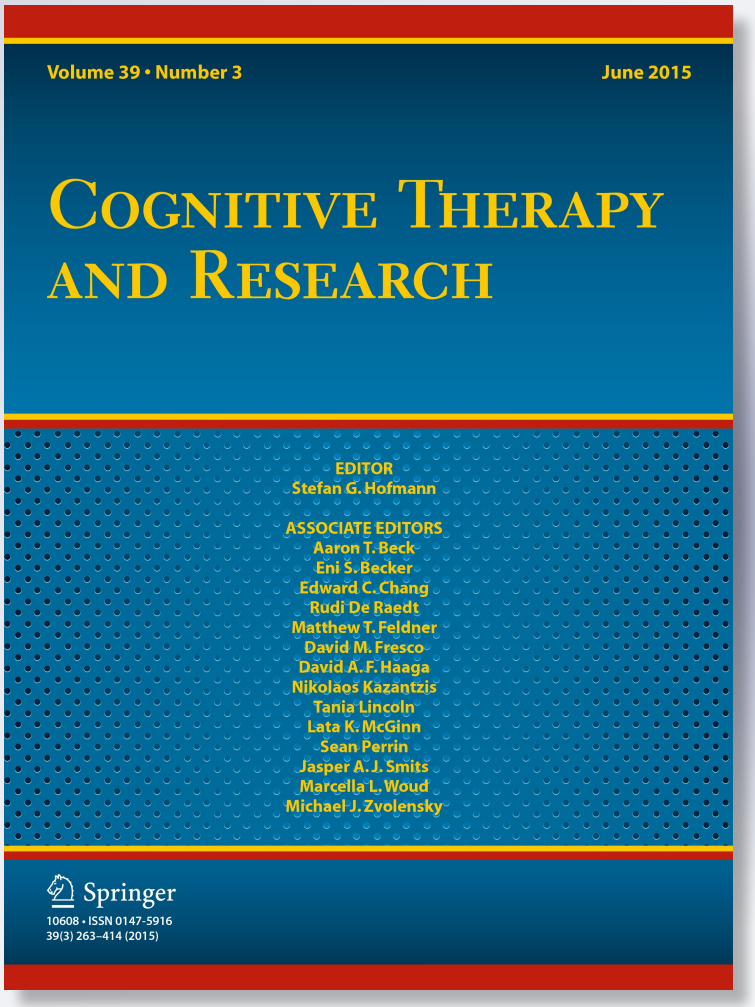
Emotion Regulation Flexibility

Amelia Aldao, Gal Sheppes & James J. Gross

Cognitive Therapy and Research

ISSN 0147-5916
Volume 39
Number 3

Cogn Ther Res (2015) 39:263-278
DOI 10.1007/s10608-014-9662-4



Springer

Cogn Ther Res (2015) 39:263–278
DOI 10.1007/s10608-014-9662-4

ORIGINAL ARTICLE

Emotion Regulation Flexibility

Amelia Aldao · Gal Sheppes · James J. Gross

Published online: 1 January 2015

Abstract How do people flexibly regulate their emotions in order to manage the diverse demands of varying situations? This question assumes particular importance given the central role that emotion regulation (ER) deficits play in many forms of psychopathology. In this review, we propose a translational framework for the study of ER flexibility that is relevant to normative and clinical populations. We also offer a set of computational tools that are useful for work on ER flexibility. We specify how such tools can be used in a variety of settings, such as basic research, experimental psychopathology, and clinical practice. Our goal is to encourage the theoretical and methodological precision that is needed in order to facilitate progress in this important area.

Keywords Emotion regulation flexibility · Emotion regulation · Context · Affective science · Psychopathology

A. Aldao (✉)
Department of Psychology, The Ohio State University, 1835 Neil Ave, Columbus, OH 43215, USA
e-mail: aldao.1@osu.edu

G. Sheppes
School of Psychological Sciences, Tel Aviv University, 69978 Tel Aviv, Israel
e-mail: sheppes@post.tau.ac.il

J. J. Gross
Department of Psychology, Stanford University, Stanford, CA 94305-2130, USA
e-mail: gross@stanford.edu

Emotion Regulation Flexibility

It has long been appreciated that inflexible responses are generally maladaptive because the environment in which people live is in constant flux. Scholars within psychology have examined response flexibility in a wide range of domains, including attention (e.g., Koster et al. 2009; Hallion and Ruscio 2011; Calcott and Berkman in press), executive control (e.g., Williams et al. 1996; Etkin et al. 2006), goal pursuit (e.g., Wrosch et al. 2003), and affect (e.g., Rottenberg et al. 2005; Cunningham et al. 2008; Kuppens et al. 2010). Overall, this burgeoning literature has largely supported the notion that greater flexibility tends to be associated with enhanced adaptation to the environment, as evidenced by better mental health.

One recent addition to this line of work has been the examination of emotion regulation (ER) flexibility (see reviews by Kashdan and Rottenberg 2010; Hollenstein et al. 2013; Bonanno and Burton 2014). This nascent literature suggests that ER flexibility is associated with good mental health, and as such, it has been considered to be adaptive (e.g., Bonanno et al. 2004; Westphal et al. 2010; Gupta and Bonanno 2011; Aldao and Nolen-Hoeksema 2012b; Kashdan et al. in press). Consequently, a consensus is emerging that understanding ER flexibility is crucial for the identification, prevention, and treatment of the affective disturbances that characterize many mental disorders (e.g., Kashdan and Rottenberg 2010; Aldao 2013; Bonanno and Burton 2014).

However, one impediment to progress in this area is that there is much heterogeneity in how ER flexibility is conceptualized. In particular, investigators have primarily focused on either identifying basic processes that are shared among most people or on delineating individual differences. From a process-based perspective, Hollenstein

et al. (2013) adopted a dynamic systems developmental approach and specified three levels at which ER flexibility might occur, namely, moment-to-moment fluctuations in affect/behavior within one context, correspondence between variability in affect/behavior and contextual demands, and macro-level fluctuations over the course of development (e.g., trait flexibility). From an individual differences perspective, Bonanno and Burton (2014) directed attention to people's variability in their sensitivity to context, implementation of ER strategies, and responsiveness to feedback. Similarly, Kashdan and Rottenberg (2010) identified individual differences in the ability to recognize and adapt to situational demands, to shift mindsets and behavioral repertoires, to maintain a balance among life domains, and to being aware, open, and committed to behaviors that are linked to personally held values.

This heterogeneity in definitions has translated into widely different operationalizations of ER flexibility. For example, it has been operationalized as the variability in the use of ER strategies across situations (e.g., Aldao and Nolen-Hoeksema 2012a; Sheppes et al. 2014), the interactions among ER strategies (e.g., Aldao et al. 2014), and the ability to follow instructions to use one ER strategy or another one (e.g., Bonanno et al. 2004; Westphal et al. 2010; Gupta and Bonanno 2011). Such heterogeneity has made it challenging to synthesize findings across studies, and this has, in turn, resulted in even grater confusion at the conceptual level. Thus, we believe that it is critical to develop a clear conceptualization of ER flexibility that can be utilized to identify how this process unfolds for most people, as well as how it varies as a function of individual differences.

Further adding to the confusion regarding ER flexibility is the widespread agreement that this process—however it is defined—is inherently adaptive. In our view, this assumption is problematic because incorporating the outcome (i.e., adaptiveness) within the conceptualization of a process (i.e., ER flexibility) short-circuits what should be an empirical investigation of the contexts in which such process is (and perhaps is not) helpful. For example, if there is an expectation that ER flexibility ought to be correlated with good mental health, studies producing more nuanced patterns (e.g., negative associations, influences of moderators) might have a difficult time getting published. In contrast, by approaching the study of ER flexibility with a less rigid set of assumptions, the possibility will remain open for the development of a more sophisticated understanding of how and when this process can be most beneficial. In the words of Lazarus (1985) when talking about the adaptiveness of defense mechanisms, "there can be no satisfactory answer to the question of adaptational outcomes of denial without there also being a sound basis for identifying, describing, and measuring the defensive process itself" (pp. 163).

Moving forward, we believe that it will be essential to develop a definition of ER flexibility that remains agnostic as to its adaptiveness. By this we do not mean to imply that ER flexibility is a maladaptive process. Rather, we contend that it will be of utmost importance to approach the study of ER flexibility with a less rigid set of assumptions about its adaptiveness. By doing so, we will be able to reach a better understanding of how and when this process may confer an advantage, and thus, lead to better mental health.

In this review, we propose that ER strategies can be enacted with various degrees of variability across situations and that when such variability is synchronized with changes in the environment (as reflected by changes in the external world and/or in the person's appraisals of their surroundings), it constitutes an instance of ER flexibility. In other words, ER flexibility refers to the ability to implement ER strategies that are synchronized with contextual demands. Further, we incorporate a motivational framework, and propose that the adaptive value of ER flexibility must be empirically demonstrated rather than simply assumed. In some cases—such as when it facilitates the pursuit of goals (e.g., Carver and Scheier 1998; Bradley and Lang 2000; Gray and McNaughton 2000)—it may be adaptive. When it interferes with goal pursuit, however, it may not be adaptive. Of note, we conceive of ER as spanning both deliberate and automatic processes (and everything in between; see Mauss et al. 2006; Gyurak et al. 2011; Koole and Rothermund 2011) and, as such, our conceptualization of ER flexibility is intended to be applied to all kinds of regulatory processes, regardless of where they fall on the deliberate-automatic continuum.

We begin with an overview of the historical underpinnings of ER flexibility, where we argue that the difficulties modeling interactions between individuals and their contexts can be traced back to the psychodynamic and coping literatures. We contend that understanding past efforts in related domains is necessary for real progress in this new exciting area of research. We then move on to a discussion of the current research on ER flexibility. Following that, we delineate our translational framework and present a series of computational tools that we have developed to assess ER flexibility across basic and clinical research. We conclude with a discussion of how these computational tools can be adapted in the context of clinical practice.

Precursors to the Contemporary Study of Emotion Regulation Flexibility

Before discussing the literature on ER flexibility, it is useful to review its two precursors: flexibility in the use of defense

mechanisms and flexibility in the implementation of coping strategies. Doing so is important because the conceptual and methodological heterogeneity that characterizes the current work on ER flexibility was also prominent in these earlier literatures. In other words, the challenges now faced by researchers seeking to understand ER flexibility are not merely the result of our current thinking or methods, but rather they reflect long standing patterns of difficulties defining and capturing complex dynamic patterns of interactions between individuals and their environments. Thus, if this current iteration of the study of affective flexibility is to have a lasting impact on basic research and clinical science, it becomes essential that we take into account the strengths and limitations of prior work.

Psychodynamic Approaches

Defense mechanisms were conceptualized as unconscious processes instantiated by the ego in order to keep intrapsychic conflict (manifested as anxiety) outside of conscious awareness (e.g., Caligor et al. 2011; A. Freud 1936; Willick 1995). Thus, their study constitutes one of the earliest attempts at identifying the mechanisms underlying the downregulation of anxiety. Importantly, different types of defense mechanisms were thought to underlie various forms of psychopathology. In particular, a distinction was made between primitive defenses (e.g., splitting, projection, introjection, denial), which were believed to appear early on in development and to characterize patients with severe psychopathology (e.g., psychotic, borderline), and mature defenses (e.g., repression, undoing, sublimation, intellectualization), which were thought to develop later in life and to characterize neurotic patients (see Cramer 2008). In other words, some defenses were conceptualized as adaptive whereas others were considered to be maladaptive.

However, as the study of defenses continued to mature, psychologists began to develop an understanding that some putatively adaptive defenses might sometimes serve maladaptive functions and vice versa. For example, Anna Freud (1965) proposed that whether a defense could be considered normal or pathological was contingent upon several factors, such as whether it was utilized in response to a specific drive or against drive activity more generally. Similarly, theoretical work by Melanie Klein (see Segal 2012) suggested that defenses could be considered adaptive when they matched the type and level of threat. Later on, Lazarus (1985) reviewed the evidence on denial and concluded that its adaptiveness might be contingent upon contextual demands.

More broadly, Block and Block (1980) emphasized the importance of transactional relationships between the person and their environment by conceptualizing ego control and ego resiliency. Ego control is the ability to delay gratification, contain impulses, inhibit affect, and isolate environmental distractors. It varies as a function of the person and/or their surroundings. Ego resiliency pertains to the ability to adjust the degree of ego control in order to adapt to environmental demands. In this respect, a person high in ego resiliency is able to increase or decrease their amount of ego control in order to maximize fit with the environment. Thus, the function of ego resiliency is to enhance affective-based fit with the environment, and as such, it constitutes a precursor of ER flexibility.

In the mid 1990s, Block and Kremen (1996) developed a self-report inventory of ego resiliency that has since been utilized in a number of studies seeking to understand patterns of flexible affective responding. For example, Waugh et al. (2011) found that high ego resiliency was associated with greater variability in participants' responses to positively and negatively valenced pictures in a laboratory task. In a related study, Waugh et al. (2008) found that participants high in ego resiliency evidenced better affective recovery following the anticipation of threat than those low in ego resiliency. In a longitudinal investigation following undergraduate students through their 4 years of college, Galatzer-Levy and Bonanno (2013) found that ego resiliency predicted better adjustment over time. Thus, a number of studies suggest that greater ego-resiliency (i.e., flexibility) might be associated with better mental health.

Without question, this psychodynamic work constituted an extremely important first step in the development of an understanding of flexible affective-based interactions between individuals and their environments. However, as we mentioned earlier, this work was characterized by the same limitations that persist in the current literature on ER flexibility. Specifically, there was a lack of agreed upon definition of what constituted flexibility (beyond ego resiliency) and yet, there was an assumption that it was inherently adaptive. Importantly, as this work gave rise to the stress and coping literature, this transition was characterized by a renewed interest in conceptualizing and operationalizing flexibility.

Stress and Coping Approaches

In contrast to the defense mechanisms, coping strategies have been conceptualized as conscious attempts at modifying the environment or one's stress responses (e.g., Lazarus 1983; Folkman et al. 1986). Researchers have primarily differentiated between problem- and emotion-focused coping strategies. The former entail altering the demands posed by stressful situations, whereas the latter consist of modifying stress responses generated by such

situations (e.g., Folkman et al. 1986). Paralleling the tendency in the psychodynamic literature to consider defenses as adaptive or maladaptive, the early research on coping strategies was also characterized by the classification of coping mechanisms as inherently beneficial or detrimental. Specifically, problem-focused strategies were considered to be more adaptive than emotion-focused strategies because their use was associated with fewer symptoms of psychopathology and with greater adjustment (e.g., Austenfeld and Stanton 2004)

Also paralleling the progression that took place in the psychodynamic literature, as the research on coping strategies began to accumulate, investigators started to examine the use of coping strategies in relation to contextual demands (e.g., Lazarus 1985; Thoits 1995). This led to a recognition that problem-focused strategies were more adaptive when situations were controllable and that emotion-focused strategies provided a greater advantage when the situations were uncontrollable (e.g., Folkman et al. 1986). For example, Cheng (2001) found that participants who endorsed higher flexibility (conceptualized as relying on problem-focused coping in controllable situations and emotion-focused coping in uncontrollable situations) showed greater adaptation in and outside the lab (for similar findings in a daily diary study, see Park et al. 2004).

Although this work on coping flexibility introduced a more rigorous and systematic approach to the conceptualization and operationalization of this process than had its psychodynamic predecessors, some confusion remained. Specifically, it was largely assumed that for each of type of situation (controllable or uncontrollable stressors) there was one right way of coping (problem- or emotion-focused). Thus, this represented a fairly narrow approach, which was further exacerbated by the fact that, as Lazarus (1985) has pointed out, stress represents only a subset of all possible affective reactions. Further adding to the heterogeneity in the conceptualization of this process, other studies conceived of flexibility as simply the variability in the use of coping strategies across situations (e.g., Lam and McBride-Chang 2007; Bonanno et al. 2011; Galatzer-Levi et al. 2012). Importantly, and paralleling the trend in the transition from the psychodynamic to the stress and coping literature, as the stress and coping literature gave rise to contemporary work on ER, the interest in understanding patterns of flexibility continued to grow.

Emotion Regulation Flexibility: Initial Conceptualizations and Findings

By the mid 1990s, investigators began to focus on identifying how people regulated their emotions in order to meet contextual demands. Critical in this transition was the definition of ER as the "process by which individuals influence which emotions they have, when they have them, and how they experience and express (them)" (Gross 1998, pp. 275). Central to this definition was the notion that "because emotions are multicomponential processes that unfold over time, emotion regulation involves changes in emotion dynamics" (pp. 275).

Gross (1998) proposed a process model, which differentiates among ER strategies based on the point in the emotion-generative process in which they have their primary impact. The family of strategies that people utilize before the emotions have reached full force is known as "antecedent-focused" and it includes the categories of situation selection (e.g., avoiding a party), situation modification (e.g., drinking alcohol to reduce party-related anxiety), attentional deployment (e.g., distracting oneself by thinking about the time when the party will be over), and cognitive change (e.g., reappraising the anxiety to remind oneself that there is no real threat at the party). The family of strategies implemented while the emotion is taking place is known as "response-focused" and it consists of response modulation strategies (e.g., suppressing one's facial expressions at the party in order to hide one's anxiety). Importantly, according to Gross' model, not all emotions need to be regulated all the time. Rather, they need to be modified in a context-dependent manner, that is, only when they interfere with the production of desired behaviors (Gross 1998, 2013).

Since Gross' 1998 article, there has been an explosion in the number of studies devoted to identifying the mechanisms by which different ER strategies can modify emotions as these unfold over time (see reviews by Nolen-Hoeksema et al. 2008; Koole 2009; Aldao et al. 2010; Sheppes and Gross 2011; Webb et al. 2012; Gross 2013). For example, a recent meta analysis of the effects of strategies on modifying affect in the laboratory (Webb et al. 2012) suggests that reappraisal might be more effective than expressive suppression ($d = .36$ versus .16). Converging evidence comes from a clinical science meta analysis (Aldao et al. 2010) suggesting that the habitual use of reappraisal (and acceptance and problem solving) has negative associations with symptoms of psychopathology ($d = -.21$), whereas the frequent use of expressive suppression (and rumination and avoidance) is positively linked with symptoms ($d = .40$). This work led to the conceptualization of the former strategies as putatively adaptive and the latter ones as putatively maladaptive. This paralleled the initial trend in the psychodynamic and coping literatures to identify processes as inherently adaptive or maladaptive.

However, also akin to the literatures on defense mechanisms and coping processes, the study of ER strategies has become progressively more focused on identifying the

contextual factors that might influence their implementation and adaptiveness. For example, in a recent study, the ability to implement reappraisal was *negatively* associated with depressive symptoms when participants faced uncontrollable stress, and *positively* associated with symptoms when stress was controllable (Troy et al. 2013). This led the authors to conclude that, in the context of controllable situations, people might be better off by seeking to modify those situations rather than their emotions (this argument is conceptually similar to the one put forward in the coping literature regarding emotion- and problem-focused coping). In another study, the spontaneous use of avoidance in the middle of a social interaction task predicted greater changes in social anxiety from mid- to post-task. Importantly, this association was found only when participants had been prompted to share intimate details of their lives and not when they had been instructed to make small talk (Kashdan et al. in press). As such, these findings suggest that the concomitants (and perhaps even the effects) of avoidance in social situations might vary as a function of intimacy.

In recent years, a number of studies have sought to examine the flexible implementation of ER strategies. In one study, the variability with which putatively adaptive ER strategies (e.g., reappraisal, acceptance) were implemented across a number of situations was associated with fewer symptoms of psychopathology. Such relationships were not observed for the putatively maladaptive strategies (e.g., suppression, rumination), which led the authors to conclude that the beneficial effects of putatively adaptive strategies might be more context-dependent than the detrimental effects of the putatively maladaptive strategies (Aldao and Nolen-Hoeksema 2012a). In a follow-up study, Aldao and Nolen-Hoeksema (2012b) sought to examine the puzzling finding that putatively adaptive strategies have smaller associations with mental health than do the putatively maladaptive strategies (e.g., Aldao et al. 2010). Using a large community sample, they found that the habitual use of putatively adaptive and maladaptive ER strategies interacted with each other to predict symptoms of depression, anxiety, and alcohol abuse. Specifically, *only* when participants endorsed high levels of putatively maladaptive strategies, was the negative association between putatively adaptive strategies and symptoms significant. The authors interpreted these findings as providing evidence that people with a rich repertoire of ER strategies (i.e., high levels of adaptive and maladaptive strategies) might know how to flexibly implement adaptive strategies in response to contextual demands, and thus, might derive greater benefits from using them (for a replication with patients receiving CBT for social anxiety disorder, see Aldao et al. 2014).

From an experimental perspective, Bonanno et al. (2004) developed an expressive flexibility paradigm, in which participants are asked to watch emotion-eliciting pictures and are instructed to suppress or enhance their facial expressions. Researchers then calculate a flexibility score that reflects participants' ability to modify expressions upon command. Greater expressive flexibility scores in this task have been consistently associated with better mental health and grater adjustment in the face of stressors (e.g., Bonanno et al. 2004; Westphal et al. 2010; Gupta and Bonanno 2011). In another set of studies, Sheppes et al. (2014) have shown that emotional, cognitive, and motivational factors affect the selection of different ER strategies. Specifically, when stimuli are low in intensity, cognitive demand is low, and long-term goals are activated, participants have a preference for implementing reappraisal; conversely, when stimuli are high in intensity, cognitive demand is high, and short-term goals are activated, participants report a preference for utilizing distraction.

Although this work on ER flexibility is characterized by greater conceptual clarity and methodological complexity than the psychodynamic or coping literatures, conceptual and methodological confusion remains. As we mentioned earlier, there is no clear definition of what ER flexibility entails and yet there is an assumption that this process—however it may be defined—is inherently adaptive. Moreover, there is great heterogeneity in how investigators have operationalized this process, ranging from the variability in the use of ER strategies across situations (e.g., Aldao and Nolen-Hoeksema 2012a; Sheppes et al. 2014) to the ability to follow instructions to use one strategy or another one (e.g., Bonanno et al. 2004). Thus, in the next sections, we propose a definition of ER flexibility and provide computational tools to aid in its consistent operationalization across basic research, experimental psychopathology, and clinical practice.

Defining Emotion Regulation Flexibility

People vary in the extent to which they use ER strategies in response to different situations that vary in critical affective dimensions, such as emotional valence (e.g., Mauss et al. 2011), motivation (e.g., Carver and Scheier 1998; Tamir et al. 2008; Gable and Harmon-Jones 2011) and interpersonal context (e.g., Marroquin 2011; Zaki and Williams 2013; Hofmann 2014). To the extent that this ER variability is synchronized with changes in the environment (as reflected by changes in external situations and/or in the person's appraisals of them), it reflects ER flexibility.

This conceptualization of ER flexibility draws upon basic research on affective chronometry (e.g., Thompson 1994; Gross 1998, 2013; Davidson et al. 2000; Sheppes and Gross 2011) and motivation (e.g., Bradley and Lang 2000; Magen and Gross 2010) as well as on the burgeoning

literature on affective disturbances in psychopathology (e.g., Gratz and Roemer 2004; Kring and Sloan 2009; Aldao et al. 2010; Jazaieri et al. in press). From this perspective, ER flexibility is adaptive insofar as it facilitates the pursuit of personally meaningful goals (e.g., Vohs and Heatherton 2000; Johnson 2005; Magen and Gross 2010; Watkins 2010; Dickson and Moberly 2012; Aldao and Mennin 2014). Thus, its adaptiveness is anchored to behavioral outcomes.

One way of visualizing the relationship between ER variability, ER flexibility, and adaptive outcomes is via two concentric circles (see Fig. 1). The large one represents variability in the use of ER strategies (ER variability) and the small one represents those instances in which ER variability is in sync with changes in environmental demands (ER flexibility). The ER flexibility circle has two arrows that point at two types of outcomes: adaptive (i.e. achieving goals) and maladaptive (i.e., not achieving goals).

ER Variability

We define ER variability as the variation in the use of one or more ER strategies across a number of situations. ER variability is a necessary, yet not sufficient condition for ER flexibility. For example, if a person is haphazardly using expressive suppression throughout his workday, his regulation will have high variability, but this variability might not help him achieve his goals. In fact, this kind of emotional lability is characteristic of many forms of psychopathology (e.g., Linehan 1993; Farmer and Kashdan 2013). To use an analogy, let us envision a lamp with a flickering light. The light has high variability, but we cannot make any reasonable assumptions about its usefulness until we know what kind of lamp it is, where it is, and who is using it and why.

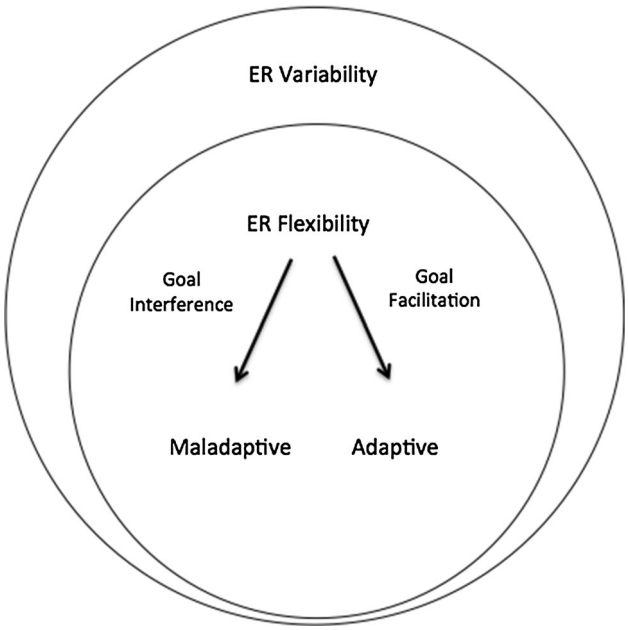


Fig. 1 ER flexibility framework

ER Flexibility

We define ER flexibility as the degree of covariation between ER variability and changes in the environment, where the environment might consist of external events and/or appraisals of emotional reactions to such events. ER flexibility is similar to ER variability in that it is also a necessary, yet not a sufficient condition for adaptation. For instance, a person might feel quite angry every time a particularly obnoxious coworker starts speaking. This might be accompanied by an intense urge to roll his eyes. However, when his boss is present, he might be motivated to suppress his facial expressions of anger. If he uses expressive suppression every time he feels his anger rising at his coworker, the covariation between the time series of ER variability and that of environmental changes will be high, thus suggesting a high degree of ER flexibility. Critically, this information is not yet sufficient for us to ascertain whether that person's flexible use of suppression is helping him achieve his goals. If we return to the analogy of the flickering light, let us now imagine that the lamp is a strobe light at a wedding and that it is flickering in sync with music. Although we can sensibly assume that a strobe light that flickers in sync with music is on average more useful than a strobe light that does not match the tempo, we still do not have sufficient information to determine its usefulness for the goals of a given guest.

Adaptiveness of ER Flexibility

We propose that ER flexibility is adaptive when it results in an enhanced likelihood of achieving personally meaningful goals (extrinsic, such as losing weight, or intrinsic, such as experiencing calmness[1]). From this simple idea, two important considerations follow. First, in order to determine whether a particular instance of ER flexibility facilitates or hinders adaptation, we ought to compare it to a different response (e.g., another instance of ER flexibility; or not showing ER flexibility). In other words, adaptation is relative. Second, inherent in the notion of adaptation is that it must *produce* some sort of change in the relationship

[1] Intrinsic goals need not be always hedonic (i.e., reduce negative and/or increase positive affect). In fact, a growing literature suggests that in many instances people engage in counter-hedonic, or instrumental, emotion regulation (i.e., increase negative and/or reduce positive affect; see work by Tamir et al. 2008; Tamir et al. in press).

between organism and environment. Thus, we emphasize the importance of moving beyond correlational designs in order to identify the causal mechanisms linking ER flexibility with adaptation.

Let us turn to an example. The office worker from the example above uses two ER strategies, expressive suppression and reappraisal,[2] with a great deal of flexibility. In scenario 1, he has a goal of not letting people notice his anger. In that case, his flexible use of suppression will likely result in a greater likelihood of achieving this goal than his flexible use of reappraisal. Let us now imagine that in scenario 2, he has a goal of paying attention to what is being said. Given that suppression interferes with one's ability to recall important information (e.g., Richards and Gross 2000), we would now be more inclined to say that his flexible use of this strategy will lead to a lower likelihood of goal achievement than his flexible use of reappraisal. In terms of our analogy, the flickering strobe light might be quite useful for a teenager when he wants to dance furiously, but not so useful for a guest who wants to have a relaxed conversation with a relative.

We emphasize the achievement of goals for conceptual and methodological reasons. Conceptually, the ability to pursue–and achieve–personally meaningful goals is an essential aspect of one's ability to interact successfully with the environment. Specifically, setting goals allows us to notice discrepancies between our current states and our desired states, and these discrepancies, in turn, motivate our behavior (e.g. Higgins 1997; Carver and Scheier 1998). The more we engage in motivated behaviors that reduce the discrepancy between where we are and where we would like to be, the more our adaptation is maximized.

Indeed, the pursuit of goals is so central to our ability to interact with the environment that difficulties with goal pursuit characterize psychopathology. Mental disorders tend to entail the prioritization of short-term goals that provide immediate reliefs and/or rewards over long-term goals that, although less emotionally salient, might lead to greater adjustment (e.g., Hayes et al. 1999; Martell et al. 2001; Barlow 2002; Johnson 2005; Watkins 2010; Rodebaugh and Shumaker 2012; Aldao and Mennin 2014). For example, individuals who suffer from anxiety disorders tend to respond to anxiety-provoking situations by avoiding them. Although this is quite useful for achieving the short-term goal of anxiety reduction, it interferes with the goal of actively engaging with the world around and, consequently, leads to greater isolation, more symptoms, and, consequently, more pervasive dysfunction (e.g., Barlow 2002; Mennin and Fresco 2014). Thus, delineating the relationship between ER flexibility and goal pursuit can result in a better understanding of the dysregulated affective/motivational mechanisms underlying psychopathology (e.g., how does avoidance get reinforced in the anxiety disorders? how does anehdonia get reinforced in depression?) as well as in the development of more targeted interventions and prevention efforts that can more effectively reduce the prevalence and impact of mental illnesses.

Methodologically, the examination of goal-pursuit is critical to our understanding of the adaptiveness of ER flexibility because goals can be easily assessed and manipulated, and this affords us the opportunity to identify the causal mechanisms by which ER flexibility might facilitate adaptation. This is particularly important in light of the fact that previous research has primarily identified *correlates* of ER flexibility (e.g., Bonanno et al. 2004; Westphal et al. 2010; Gupta and Bonanno 2011; Aldao and Nolen-Hoeksema 2012a, 2012b; Kashdan et al. in press). Thus, by being able to manipulate ER flexibility and its outcomes (affective and behavioral), we can develop a more in depth understanding of the circumstances under which this process might be most beneficial.

Support for the viability of focusing on the effects of ER on goal-driven behaviors comes from a growing number of affective science investigations (see review by Aldao and Christensen, in press; Christensen and Aldao, in press). For example, in one study, angered participants instructed to use rumination were more likely deliver blasts of noise to another participant than those not given rumination instructions (Bushman 2002). A number of recent studies suggest that using reappraisal in the context of risk taking tasks might actually lead to riskier decisions (e.g., Heilman et al. 2010; Van't Wout et al. 2010). A long line of research on rumination indicates that implementing this strategy in the laboratory leads to impairments in problem solving, particularly among those with elevated depression symptoms (see review by Nolen-Hoeksema et al. 2008). Thus, the growing literature on the behavioral outcomes of ER provides an important methodological roadmap for the identification of the circumstances under which ER flexibility might be most adaptive. We now turn to a more in-depth discussion of the calculations relevant to ER flexibility.

Computational Tools for Assessing ER Flexibility and Its Adaptiveness

In this section, we provide tools for assessing ER flexibility and estimating its adaptiveness. Of note, these tools are

[2] Our examples focus on the ER strategies of reappraisal and expressive suppression because there is a vast experimental literature documenting the mechanisms underlying their selection, implementation, and consequences (e.g. Gross 2013; Sheppes et al. 2014; Webb et al. 2012). However, our framework can be utilized with a wide range of strategies, such as acceptance (e.g., Hayes et al. 1999), rumination (e.g., Nolen-Hoeksema et al. 2008), worry (e.g., Borkovec et al. 2004), self-injury (e.g., Nock 2010), and emotional eating (e.g., Aldao and Dixon-Gordon 2014), among others.

meant to represent a starting point for investigators conducting this type of research. In fact, we would like to invite investigators who decide to implement these equations to share their experiences using them.

The proposed methods are largely based on the tools of ecological momentary assessment (EMA), whereby investigators sample processes of interest (in this case affect) at multiple times and across a number of different contexts (e.g., Feldman Barrett and Barrett 2001). In the past 15 years, dozens of studies have utilized EMA to identify how people experience and regulate their emotions (e.g., Kuppens et al. 2010; Moberly and Watkins 2010; Farmer and Kashdan 2013). More recently, a number of studies have also experimentally manipulated the use of ER strategies (e.g., reappraisal, suppression, rumination) outside of the lab (e.g., Huffziger et al. 2013; Koval et al. in press). Thus, there are plethora of guidelines and protocols for effectively collecting "real time" data on affective experiences in various populations. More importantly, the growing popularity of data analytic tools such as multilevel modeling has made it possible for more investigators to comfortably utilize this type of design.

Our framework relies on EMA heavily by requiring the assessment of: (1) emotional experiences, (2) use of ER strategies, and (3) achievement of goals across multiple time periods that map onto different contexts, in both real-life and controlled laboratory settings. The one substantial area of divergence between our approach and traditional EMA studies actually places our approach at an advantage. Specifically, whereas EMA studies largely focus on assessing experiences *outside* of the laboratory (which can lead to various degrees of participant fatigue and the ensuing reductions in compliance; e.g., Feldman Barrett and Barrett 2001), our approach advocates both, out- and in-the lab assessments (ideally jointly, thus increasing internal and external validity). Given that attrition rates in the laboratory are significantly lower than those outside of the laboratory, the incorporation of lab-based assessments (either as stand-alone or in conjunction with outside assessments), can lead to a greater level of precision and thus result in a more in-depth understanding of patterns of ER flexibility.

Clearly, the utility of these tools hinges on participants' ability to understand and report on their emotional experiences, goals, and behaviors.[3] Two points bear directly on this issue. First, the presence of automatic ER processes might result in biased estimates (e.g., Mauss et al. 2006; Gyurak et al. 2011; Koole and Rothermund 2011). Thus, it will be important to conduct psychometric work showing high correspondence between automatic and deliberate regulation (Aldao 2013). In this respect, one task assessing automatic ER that seems to be particularly well suited for understanding contextual variation is the implicit association test (IAT; Mauss et al. 2006). The IAT assesses implicit attitudes (e.g., good/bad, me/not me) in the use of discrete ER strategies (e.g., reappraisal, suppression). Investigators could administer a classic IAT (e.g., reappraisal paired with good/bad, me/not me) and assess correspondence with trait level reports in the use of ER strategies. Additionally, they could administer a context-based IAT (e.g., reappraisal paired with work environment; reappraisal paired with home environment) and map those attitudes with ER variability across contexts.

Second, people who suffer from mental disorders are particularly prone to having difficulties labeling their emotions (e.g., Gratz and Roemer 2004; Mennin et al. 2007; Kring et al. 2011; Vine and Aldao 2014), misattributing functions to ER strategies (e.g., people with generalized anxiety disorder (GAD) tend to perceive their excessive worry as a useful problem solving tool; e.g., Borkovec et al. 2004), and having difficulties connecting their behavior with the pursuit of specific goals (e.g., Hayes et al. 1999; Johnson 2005; Watkins 2010; Dickson and Moberly 2012; Rodebaugh and Shumaker 2012). In this respect, it will be essential to take advantage of the versatility afforded by controlled experimental settings and conduct psychometric work to assess the magnitude and sources of these discrepancies.

Assessing ER Variability

Before turning to the assessment of ER flexibility, it is necessary that we discuss the estimation of ER variability. In essence, two types of ER variability can be calculated: within- and between-strategy variability. The within-strategy variability is a time series that reflects the variability with which a given ER strategy is used over time.

Although constructing a separate time series for each ER strategy can be quite useful, this might not capture the complexity of the process by which people regulate their emotions over time. In other words, it is quite sensible to assume that when someone implements a strategy and they are not satisfied with it (either with the extent to which they are implementing it or with the effects it is producing), they might switch to another strategy rather than stop their regulation process altogether (see Gross, in press, for a broader discussion of emotion regulation dynamics). This means that when someone "turns down" (or off) a strategy in the middle of a regulation processes, they likely "turn on" (or up) another one (e.g., Wolgast et al. 2011). For

[3] This challenge, of course, it not specific to the study of ER flexibility, but rather it pertains to the broader field of affective science, since regardless of the methodological complexity of a given study, investigators still rely on participants' verbal reports of their emotional experiences.

example, if a person had to rate his use of ER strategies at each point, he might endorse using suppression at a level of 5 at time 1, at a level of 2 at time 2, and at a level of 6 at time 3. In addition, he might rate his use of reappraisal at a level of 1 at time 1, at a level of 6 at time 2, and at a level of 3 at time 3. This means that at time 1, his primary strategy was suppression, at time 2 he switched to reappraisal, and at time 3 he switched back to suppression. Here, we would first calculate the between-strategy variability at each time point (e.g., standard deviation, intraclass correlation). Then, we would save those coefficients and plot them against time to obtain the time series of between-strategy variability.

Critical to the calculation of both within- and between-strategy variability is the identification of the number and type of situations that constitute the space in which such variability is assessed. This is the case because variability is a relative measure. For example, whereas a man might experience a great deal of ER variability in one type of situation (e.g., at home), he might have lower ER variability in another situation (e.g., at work). The number of dimensions is potentially endless and the choice of comparison conditions ought to balance serving theoretical and methodological considerations.[4]

Assessing ER Flexibility

Let us now examine whether a person's variability in his use of ER strategies constitutes ER flexibility. Here we want to assess the extent to which the variability in his use of strategies (whether it is one or many) covaries with changes in the environment. We propose two ways of doing so. A first approach would consist of regressing ER variability (i.e., use of strategies over time) over changes in the environment (i.e., positive versus negative affect, home versus work situations) in multi-level models. Next, we would save residuals for each participant. A residual is the difference between the observed and expected value for each point of data in the predictor variable in a regression analysis. A positive residual indicates that an observed value is higher than its expected value. In this case, it would indicate that a participant has greater ER variability than the environmental variability he is encountering (relative to the rest of the sample). In other words, he is more flexible than other people in those same situations. Conversely, a negative residual indicates that the observed value is smaller than the expected value. This suggests that a participant is less flexible than other individuals. Lastly, a residual close to zero indicates that the observed value is close to the expected value. This suggests that a participant has an average level of ER flexibility. However, it is important to keep in mind that each participant's residual represents a value that is relative to that of the rest of the sample. Thus, it is not feasible to compare residuals across samples or studies.

This brings us to our second possibility: to calculate a standardized coefficient, such as a cross correlation. Here we would cross correlate the time series of ER variability with that of environmental variability. Larger coefficients would indicate that ER variability and environmental changes are covarying together and, thus, that the participant is evidencing elevated ER flexibility. Negative coefficients as well as those close to zero would indicate lower covariation between these two time series and, consequently, reduced ER flexibility.

Whether we assess ER flexibility via residuals or cross-correlations, we might want to test whether it is characterized by a lag, in which changes in environmental variability would *precede* changes in the use of ER strategies or vice versa. Thus, some people might need a few seconds (or minutes) to fully implement an ER strategy—or to be consciously aware of its implementation. For these people, changes in the environment would precede changes in emotion regulation. Other people, by contrast, might (correctly) anticipate environmental changes, in which case changes in the use of ER strategies would precede changes in the environment. Thus, we might want to calculate residuals by regressing ER variability at time t on environmental changes at time $t - 1$(or $t + 1$). Similarly, we might want to estimate cross-correlations between ER variably at time t and environmental changes at time $t - 1$(or $t + 1$). We could then examine various lags to determine which one will result in more stable estimates of ER flexibility.

As noted above, the magnitude and direction of such lags might be susceptible to individual differences. Support for this comes from work on emotional inertia (i.e., autocorrelation of emotions over time), which has been associated with symptoms of depression (Kuppens et al. 2010). This suggests that depressed individuals might take longer to initiate a regulatory process than healthy controls. Or they might select/implement ER strategies that do not effectively modify emotions in a particular context (e.g., Ehring et al. 2010). In either case, it will be important to model individual differences in lags between environmental changes and the enactment of regulatory processes.

[4] Although both types of variability are related (i.e., if one uses strategy A with great variability across situations, that means that within each one of those situations, there might be greater variability in the strategies that are used), it is also possible that there might be individual differences in the tendency to display one type of variability versus the other one. Within-strategy variability might reflect the ability to initiate and stop a given process (i.e., inhibition) whereas between-strategy variability might reflect the process of searching for the best possibility. Thus, it will be important for future work elucidate the extent to which each type of variability is susceptible to individual differences.

Measuring Adaptiveness

Once we have determined that a person utilized expressive suppression with a great deal of flexibility, we need to evaluate the extent to which that flexibility helped him pursue his goals, and thus, was adaptive. This entails several steps.

First, we need to determine the extent to which ER flexibility covaried with the achievement of his goals over time. In the example of the man seeking to regulate this anger at work, we need to assess how his ER flexibility covaried with (1) hiding his facial expressions of anger and (2) remembering with great detail what was said at the meetings. Once again, we could calculate this via residuals in multi-level models or cross-correlations.

Second, we need to set up the comparison condition. The nature of this comparison condition will vary as a function of whether we are estimating within- or between-strategy variability. When estimating within-strategy variability, we may want to compare the covariation between one strategy's flexible use and goal achievement outcomes to that of another strategy's flexible use and those same outcomes. For example, by comparing the covariation between ER flexibility and goal achievement outcomes for suppression and reappraisal, we can determine whether his suppression or reappraisal flexibility is more adaptive. Importantly, we can re-run this equation and compare the use of reappraisal to that of other strategies (e.g., rumination, acceptance). This will result in different estimates of adaptation. We can then average them to obtain an index of the average adaptation associated with his flexible use of reappraisal in those situations.

If we were estimating between-strategy variability, we would want to compare different permutations of strategies to determine which ones account for greater adaptation. For example, we could compare the between-strategy variability of suppression, reappraisal, acceptance, and rumination to that of suppression, reappraisal, and acceptance.

Third, once we have calculated the four estimates of the associations between ER flexibility (suppression, reappraisal) and goal achievement (hiding facial expressions, remembering information), we can plug each of each of them into the following equation:

$$\begin{aligned}\text{Adaptation} = {} & (\text{goal}_{1f1} * \text{w}_1 - \text{goal}_{1f2} * \text{w}_1) \\ & + (\text{goal}_{2f1} * \text{w}_2 - \text{goal}_{2f2} * \text{w}_2) + \ldots. \\ & + (\text{goal}_{nf1} * \text{w}_n - \text{goal}_{nf2} * \text{w}_n)\end{aligned} \quad (1)$$

Where $goal_{1f1}$ denotes the covariation between suppression flexibility and hiding facial expressions, $goal_{1f2}$ denotes the covariation between reappraisal flexibility and hiding facial expressions, $goal_{2f1}$ denotes the covariation between suppression flexibility and remembering information, and $goal_{2f2}$ denotes the covariation between reappraisal flexibility and remembering information. A positive value in the first parenthesis would indicate that suppression flexibility is more adaptive than reappraisal flexibility when his goal is to hide his facial expressions. A negative value in the second parenthesis would indicate that suppression flexibility is less adaptive than reappraisal flexibility when his goal is to remember information. Whether the sum of both of these parentheses leads to a positive or negative adaptation will be a function of: (1) the magnitude of the differences between suppression and reappraisal flexibility for each type of goal, (2) the weight assigned to each type of goal (as indicated by *w1* and *w2*). If the magnitudes of the differences are comparable for each goal and this man assigns greater value to hiding his facial expressions (*w1*), then total adaptation will be positive. Conversely, if he assigns greater value to remembering information (*w2*), his adaptation will be negative.[5]

Thus far, we have emphasized the notion that ER flexibility is adaptive only insofar as it leads to an increased probability of achieving personally meaningful goals. However, short-term goals can at times be in conflict with long-term goals (e.g., Mischel et al. 1989; Baumeister and Vohs 2007; Fujita 2011). Importantly, such goal conflict tends to be more pronounced in the context of psychopathology (e.g., Youngstrom and Izard 2008; Hayes et al. 1999; Watkins 2010). As we mentioned earlier, goal dysregulation has been implicated with the phenomenology of a number of mental disorders, including anxiety (e.g., Rodebaugh and Shumaker 2012; Aldao and Mennin 2014), depression (e.g., Martell et al. 2001; Dickson and Moberly 2012), and bipolar disorder (e.g., Johnson 2005).

Let us imagine that a woman has a long-term goal of losing weight and she has started a low-carb diet. Thus, eating pastries at work represents a conflict with her long term goal. Let us now imagine that her coworkers regularly bring pastries to work to celebrate birthdays and all kinds of joyous events. Every time she sees these pastries, she experiences intense cravings. She also experiences anxiety about losing control and overeating. Let us now imagine that this week, she has a short-tem goal of not eating pastries. Time and again, she uses reappraisal to reduce the intensity of her cravings (e.g., "I want to lose 20lbs so that I can look great when I go on vacation next summer"). She implements it with high flexibility (e.g., every time

[5] We could also compare the same strategy (or combination of strategies) to different goals (that we could experimentally manipulate). For example, this would allow us to answer whether a man's suppression flexibility is more adaptive for hiding facial expressions than for remembering information. In this case, we would (1) assign a 0 to the second term in each parenthetical term, and (2) subtract one parenthetical term from the other one.

someone brings pastries). Thus, this flexibility has a positive association with her abstinence from eating pastries, and as such, it is quite adaptive.

Let us now imagine she is having a particularly stressful week in which she is worrying excessively a about a number of things. As a result, she wants to seek comfort in food. So her short-term goal is to indulge in the pastries. Again, she uses reappraisal, but she does so in order to reduce her anxiety about not sticking to her diet (e.g., "I can always make up for it by going to the gym more often"). She implements it with high flexibility. This flexibility has a positive association with eating the pastries, and thus, it also quite adaptive. However, her short-term goal of eating pastries interferes with the achievement of her long-term goal of losing weight. As a result, she ends up feeling sad about going off her diet and she is not able to offset any potential weight gain by exercising more vigorously. This makes her worry about her weight even more, and this generates more stress, which, in turn, makes it more difficult for her to focus on her long-term goals.

In its present form, our equation does not capture these discrepancies between short- and long-term goals that are so critical for understanding adaptation—and mental health. Thus, we propose to add a multiplying constant, "g" that affects the entire equation:

$$\begin{aligned}\text{Adaptation} = {} & ((\text{goal}_{1f1} * w_1 - \text{goal}_{1f2} * w_1) \\ & + (\text{goal}_{2f1} * w_2 - \text{goal}_{2f2} * w_2) \_ \ldots \\ & + (\text{goal}_{nf1} * w_n - \text{goal}_{nf2} * w_n)) * \mathbf{g}\end{aligned} \quad (2)$$

When short- and long-term goals are in accord with each other (e.g., not eating pastries when one wants to lose weight), g is greater than 1. Conversely, when short- and long-term goals are in conflict with each other (e.g., eating pastries when one wants to lose weight), g is smaller than 1.

We propose than a useful first step in deriving the constant g would be to examine the same short-term goals (e.g., refrain from eating a piece of cake) in individuals who vary in the long-term implications of that behavior (e.g., thin versus obese individuals). Conversely, investigators could examine how different short-term goals (e.g., refrain from eating cake, working out) might relate to the achievement of the same long-term goal (e.g., being in good shape). It would also be important to estimate g in healthy and clinical samples while holding all other elements of the equation constant. This would allow us to determine that, whereas both groups of participants might have equal amounts of ER flexibility and of short-term adaptation, they might experience vastly different amounts of long-term adaptation. A more nuanced approach to the estimation of the constant g would consist of comparing adaptation when pursuing disorder-relevant goals (e.g., touching dirty objects in the context of obsessive compulsive disorder) with adaptation when pursuing disorder-irrelevant goals (e.g., having a conversation with a stranger in the context of obsessive compulsive disorder). We would expect g to be smaller in the pursuit of disorder-relevant goals than in the pursuit of disorder-irrelevant goals, but much remains to be uncovered about the mechanisms underlying these differences. It is our hope that modeling this constant will lead to a more nuanced understanding of the mechanisms by which individual differences in goal conflict might relate to ER flexibility and long-term adaptation.

Significance for Clinical Practice

In this article, we have outlined a comprehensive framework for the study of ER flexibility that integrates basic processes and individual differences. Further, we have provided a series of computational tools to be utilized in experimental studies seeking to assess and/or manipulate ER variability, ER flexibility, and the adaptive value of such flexibility. However, as the interest in ER flexibility continues to grow within clinical science, it will be of utmost important to adapt these computational tools so that they can be implemented in the contexts of treatment research and clinical practice. In the remaining paragraphs we offer a series of suggestions to that end.

Participants in treatment outcome studies usually complete extensive assessment procedures before, during, and after treatment. In some cases, these patients repeat these assessments with two independent diagnosticians so that investigators can estimate the reliability of such assessments. It is also common for patients to complete follow-up assessments. Thus, on average, these patients participate in a handful of assessments over the course of several months. Because such assessments tend to be in the order of several hours and they are usually conducted in research clinics and centers, it is quite feasible for patients to participate in experimental studies akin to the ones utilized in basic and experimental psychopathology research (e.g., Goldin et al. 2009). Thus, the equations presented above will be well suited for the comprehensive assessments that take place in the context of treatment outcome research. The only difference is that rather than comparing a group of individuals with psychopathology to a group of healthy controls, investigators would be comparing patients in different treatment arms (e.g., waitlist vs. active treatment; pre versus post treatment; post treatment versus follow-up).

The situation is different when we turn to clinical practice, where one practitioner treats a number of patients who vary in their clinical presentations. Here, the computational tools described thus far are no longer useful, since they rest on the assumption that providers are collecting data from numerous participants and analyzing them at the

group level via complex statistical models. Thus, we propose that one parsimonious way of adapting such tools to the clinic would consist of their incorporation into the weekly reports that patients complete in-between sessions. The quintessential weekly report tool in the context of cognitive behavioral interventions is the dysfunctional thought record (Beck 2011), which consists of an assessment of the automatic negative thoughts (i.e., critical self-evaluative thoughts that arise quickly in the context of emotional situations) and emotions that take place in a particular situation. In addition, this form has room for patients to write out alternative responses to the automatic thoughts and to describe the outcomes of utilizing (or failing to implement) such responses. This tool is essential for practitioners to develop a more in-depth understanding of their patients' struggles, as well as for patients to have a structure outside of the therapy session under which to identify and critically evaluate their automatic thoughts.

We propose to modify the dysfunctional thought record in order to facilitate the assessment of the information that can be used to assess patterns of flexible emotional responding (see Table 1). This ER flexibility thought record represents a much simplified version of the calculations depicted above for two critical reasons: (1) patients need to be able to fill them out quickly as they go through their day, and (2) practitioners need to be able to score these manually in session. As Table 1 shows, this ER flexibility record contains the following columns: (1) situation description, (2) emotions experienced, (3) goals pursued, (4) importance of such goals, (5) use of ER strategies, (6) effectiveness of such strategies in facilitating the achievement of those goals, (7) description of long-term goals, (8) extent to which the short-term goal is in conflict with the long-term goal (this is the multiplying constant "*g*" we discussed above; when goals are in harmony, it takes a value greater than 1 and when goals are conflict, it takes a value smaller than 1), and (9) adjusted adaptation after taking into account the relationship between short- and long-term goals.

Table 1 contains hypothetical data from the example we presented of a woman eating pastries at work when this might present a conflict with her long-term goal of losing weight. This record consists of two situations. In both cases, a coworker brought pastries and made her feel excited and anxious. In situation 1, her goal was to not eat the pastries (importance score was 7). She used reappraisal to downregulate her excitement about these pastries. This strategy was quite helpful (effectiveness score was 8). The short-term adaptiveness was 56. On another day, she was feeling stressed out, so she was now determined to eat the pastries because they would provide comfort (importance score was 7). She again used reappraisal, but this time to reduce her anxiety about the negative implications that

Table 1 Sample ER flexibility record including goal conflict

Situation			Short term goals					Long term goals	Short-long term goal congruency multiplier	Adjusted adaptation
Situation number	Situation description	Emotions experienced	Goal	Goal Importance	ER strategies		Short term adaptation (Goal Importance × Effectiveness)			
					Name of strategy	Effectiveness for goal achievement				
1	Coworker brings pastries to the office	Excitement, anxiety	A) Don't eat pastries at work	7	A) Reappraisal (reduce excitement)	8	56	A) Lose Weight	1.5	84
2	Coworker brings pastries to the office	Excitement, anxiety	A) Eat pastries at work	7	A) Reappraisal (reduce anxiety)	8	56	A) Lose weight	.5	28

eating these pastries would have for her diet (effectiveness score was 8). Thus, the short-term adaptiveness was also 56.

In the first situation, not eating pastries was aligned with her long-term goal of losing weight, so the multiplying constant *g* was greater than 1. This led to an adjusted adaptation score of 84. In the second situation, her short-term goal of eating the pastries interfered with her long-term goal of losing weight, so the multiplying constant *g* was smaller than 1. This resulted in an adjusted adaptation score of 28. As we collect more data from this patient, we would be able to start developing a more in-depth understanding of how and when she might be flexibility regulating her emotions to pursue short-term goals that pose a problem for her long-term functioning. We could then help her modify her flexible utilization of ER strategies so that she can balance short- and long-term goals.

As this example suggests, it can be relatively straightforward to track and quantify, patients' flexible regulation of emotions. Needless to say, this example is by no means exhaustive and practitioners and patients can take this ER record into many directions to assess—and modify–ER flexibility across a number of situations, goals, emotions, and ER strategies. This record can also provide a very valuable glimpse into patterns of ER variability. As we discussed above, some patients exhibit very low or very high ER variability (e.g., Linehan 1993; Rottenberg et al. 2005; Kuppens et al. 2010; Farmer and Kashdan 2013) so this record could also be used to identify—and treat—such deficits. We are excited to see how this thought record is utilized to treat affective disturbances in the context of psychosocial interventions.

Concluding Remarks

For more than a century, psychologists have been interested in understanding people's ability (or lack thereof) to flexibly change how they feel in order to adaptively interact with the ever-changing environment. However, this topic has proven to be one of the most complex puzzles in the study of affect. In this review, we have provided a framework to organize and guide the basic and clinical study of how people can flexibly regulate their emotions. Specifically, we presented a conceptual framework and a series of computational tools for investigators to utilize in the lab and for practitioners to implement in the clinic. It is our hope that this article can inspire investigators seeking to take clinical affective science into new frontiers as well as practitioners seeking to treat affective disturbances in their patients. We look forward to hearing how the suggestions hereby provided are implemented and expanded upon in the next few years.

Acknowledgments The authors would like to thank Kara Christensen, Lee Dunn, Andre Plate, Ilana Seager, and Anne Wilson for their comments on earlier versions of this manuscript.

Conflict of Interest This work received no funding/support and the data have not been presented elsewhere. Given that this is a theoretical review, there was no involvement of human or animal subjects.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (national and institutional). Informed consent was obtained from all individual subjects participating in the study. If any identifying information is contained in the paper the following statement is also necessary—Additional informed consent was obtained from any subjects for whom identifying information appears in this paper.

Animal Rights No animal studies were carried out by the authors for this article.

References

Aldao, A. (2013). The future of emotion regulation research: Capturing Context. *Perspectives on Psychological Science, 8*, 155–172.

Aldao, A., & Christensen, K. (in press). Linking the expanded process of emotion regulation to psychopathology by focusing on behavioral outcomes of regulation. *Psychological Inquiry.*

Aldao, A., & Dixon-Gordon, K. (2014). Broadening the scope of research on emotion regulation strategies and psychopathology. *Cognitive Behaviour Therapy, 43*, 22–33.

Aldao, A., Jazaieri, H., Goldin, P., & Gross, J. J. (2014). Adaptive and maladaptive emotion regulation strategies: Interactive effects during CBT for social anxiety disorder. *Journal of Anxiety Disorders, 28*, 382–389.

Aldao, A., & Mennin, D. S. (2014). Emotion regulation in anxiety disorders. In P. Emmelkamp & T. Ehring (Eds.), *International Handbook of Anxiety Disorders: Theory, Research, & Practice* (pp. 191–200). New York: Wiley.

Aldao, A., & Nolen-Hoeksema, S. (2012a). The influence of context on the implementation of adaptive emotion regulation strategies. *Behaviour Research and Therapy, 50*, 493.

Aldao, A., & Nolen-Hoeksema, S. (2012b). When are adaptive strategies most predictive of psychopathology? *Journal of Abnormal Psychology, 121*, 276–281.

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion regulation strategies across psychopathology: A meta-analysis. *Clinical Psychology Review, 30*, 217–237.

Austenfeld, J. L., & Stanton, A. L. (2004). Coping through emotional approach: A new look at emotion, coping, and health-related outcomes. *Journal of Personality, 72*, 1335–1364.

Barlow, D. H. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic* (2nd ed.). New York: Guilford Press.

Baumeister, R. F., & Vohs, K. D. (2007). Self-regulation, ego depletion, and motivation. *Social and Personality Psychology Compass, 1*, 115–128.

Beck, J. S. (2011). *Cognitive therapy: Basics and beyond* (2nd ed.). New York: Guilford Press.

Block, J. H., & Block, J. (1980). The role of ego control and ego resiliency in the organization of behavior. In W. A. Collins (Ed.), *Development of cognition, affect, and social relations: The minnesota symposia on child psychology* (Vol. 13, pp. 39–101). Hillsdale, N.J.: Lawrence Earlbaum.

Block, J., & Kremen, A. M. (1996). IQ and ego resiliency: Conceptual and empirical connections and separatedness. *Journal of Personality and Social Psychology, 70*, 349–361.

Bonanno, G. A., & Burton, C. L. (2014). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science, 8*, 591–612.

Bonanno, G. A., Papa, A., O'Neill, K., Westphal, M., & Coifman, K. (2004). The importance of being flexible: The ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science, 15*, 482–487.

Bonanno, G. A., Pat-Horenczyk, R., & Noll, J. (2011). Coping flexibility and trauma: The perceived ability to cope with trauma (PACT) scale. *Psychological Trauma: Theory, Research, Practice, & Policy, 3*, 117–129.

Borkovec, T. D., Alcaine, O., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. G. Heimberg, C. L. Turk, & D. S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice*. New York: Guilford Press.

Bradley, M. M., & Lang, O. J. (2000). Measuring emotion: Behavior, feeling, and physiology. In R. D. Lane & L. Nadel (Eds.), *Cognitive neuroscience of emotion* (pp. 242–276). New York: Oxford University Press.

Bushman, B. J. (2002). Does venting anger feed or extinguish the flame? Catharsis, rumination, distraction, anger, and aggressive responding. *Personality and Social Psychology Bulletin, 28*, 724–731.

Calcott, R. D., & Berkman, E. T. (in press). Attentional flexibility during approach and avoidance motivational states: The role of context shifts in attentional breadth. *Journal of Experimental Psychology: General*, *143*(3), 1393–1408. http://dx.doi.org/10.1037/a0035060.

Caligor, E., Diamond, D., Yeomans, F. E., & Kernberg, O. F. (2011). The interpretive process in the psychoanalytic psychotherapy of borderline personality pathology. *Journal of the American Psychoanalytic Association, 57*, 271–301.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.

Cheng, C. (2001). Assessing coping flexibility in real-life and laboratory settings: A multimethod approach. *Journal of Personality and Social Psychology, 80*, 814–833.

Christensen, K. A., & Aldao, A. (in press). Tipping points for adaptation: Connecting emotion regulation,motivated behavior, and psychopathology. *Current Opinion in Psychology*.

Cramer, P. (2008). Seven pillars of defense mechanism theory. *Social and Personality Psychology Compass, 2*, 1963–1981.

Cunningham, W. A., van Bavel, J. J., & Johnsen, I. R. (2008). Affective flexibility: Evaluative processing goals shape amygdala activity. *Psychological Science, 19*, 152–160.

Davidson, R. J., Jackson, D. C., & Kalin, N. H. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin, 126*, 890–909.

Dickson, J. M., & Moberly, N. J. (2012). Reduced specificity for personal goals and explanations for goal attainment in major depression. *PLoS ONE, 8*, 1–5.

Ehring, T., Tuschen-Caffier, B., Schnulle, J., Fischer, S., & Gross, J. J. (2010). Emotion regulation and vulnerability to depression: Spontaneous versus instructed use of emotion suppression and reappraisal. *Emotion, 10*, 563–572.

Etkin, A., Egner, T., Peraza, D. M., Kandel, E. R., & Hirsch, J. (2006). Resolving emotional conflict: A role for the rostral anterior cingulate cortex in modulating activity in the amygdala. *Neuron, 51*, 871–882.

Farmer, A. S., & Kashdan, T. B. (2013). Affective and self-esteem instability in the daily lives of people with social anxiety disorder. *Clinical Psychological Science, 2*, 187–201.

Feldman Barrett, L., & Barrett, D. J. (2001). An introduction to computerized experience sampling in psychology. *Social Science Computer Review, 19*, 175–185.

Folkman, S., Lazarus, R., Dunkel-Schetter, C., & DeLongis, A. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology, 50*, 992–1003.

Freud, A. (1936). *The ego and the mechanisms of defense*. New York: International University Press.

Freud, A. (1965). *Normality and pathology in childhood*. New York: International University Press.

Fujita, K. (2011). On conceptualizing self-control as more than the effortful inhibition of impulses. *Personality & Social Psychology Review, 15*, 352–366.

Gable, P. A., & Harmon-Jones, E. (2011). Attentional consequences of pregoal and postgoal positive affect. *Emotion, 11*, 1358–1367.

Galatzer-Levi, I. R., Burton, C. L., & Bonanno, G. A. (2012). Coping flexibility, potentially traumatic life events, and resilience: A prospective study of college student adjustment. *Journal of Social and Clinical Psychology, 31*, 542–567.

Galatzer-Levy, I. R., & Bonanno, G. A. (2013). Heterogeneous patterns f stress over the four years of college: Associations with anxious attachment and ego-resiliency. *Journal of Personality, 81*, 476–486.

Goldin, P. R., Manber, T., Hakimi, S., Canli, T., & Gross, J. J. (2009). Neural basis of social anxiety disorder: Emotional reactivity and cognitive regulation during social and physical threat. *Archives of General Psychiatry, 66*, 170–180.

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment, 26*, 41–54.

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety* (2nd ed.). New York: Oxford University Press.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2*, 271–299.

Gross, J. J. (2013). Emotion regulation: Taking stock and moving forward. *Emotion, 13*, 359–365.

Gross, J.J. (in press). Emotion regulation: Current status and future prospects. *Psychological Inquiry*.

Gupta, S., & Bonanno, G. A. (2011). Complicated grief and deficits in emotional expressive flexibility. *Journal of Abnormal Psychology, 120*, 635–643.

Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation: A dual-process framework. *Cognition and Emotion, 25*, 312–400.

Hallion, L. A., & Ruscio, A. M. (2011). A meta analysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin, 137*, 940–958.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: Guilford Press.

Heilman, R. M., Crişan, L. G., Houser, D., Miclea, M., & Miu, A. C. (2010). Emotion regulation and decision making under risk and uncertainty. *Emotion, 10*, 257–265.

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist, 52*, 1280–1300.

Hofmann, S. G. (2014). Interpersonal emotion regulation model of mood and anxiety disorders. *Cognitive Therapy & Research, 38*, 483–492.

Hollenstein, T., Lichtwarck-Aschoff, A., & Potworowski, G. (2013). A model of socioemotonal flexibility at three time scales. *Emotion Review, 5*, 397–405.

Huffziger, S., Ebner-Priemer, U., Eisenbach, C., Koudela, S., Reinhard, I., Zamoscik, V., & Kuehener, C. (2013). Induced ruminative and mindful attention in everyday life: An experimental ambulatory assessment study. *Journal of Behavior Therapy and Experimental Psychiatry, 44*, 322–328.

Jazaieri, H., Urry, H. L., & Gross, J. J. (2013). Affective disturbance in psychopathology: An emotion regulation perspective. *Journal of Experimental Psychopathology, 4*, 584–599.

Johnson, S. L. (2005). Mania and dysregulation in goal pursuit: A review. *Clinical Psychology Review, 25*, 241–262.

Kashdan, T. B., Goodman, F. R., Machell, K. A., Kleiman, E. F., Monfort, S. S., Ciarrochi, J. & Nezlek, J. B. (2014). A contextual approach to experiential avoidance and social anxiety: Evidence from an experimental interaction and daily interactions of people with social anxiety disorder. *Emotion, 14*, 769–781.

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review, 30*, 865–878.

Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. *Cognition and Emotion, 23*, 4–41.

Koole, S., & Rothermund, K. (2011). "I feel better but I don't know why". The psychology of implicit emotion regulation. *Cognition and Emotion, 265*, 389–399.

Koster, E. H. W., Fox, E., & MacLeod, C. (2009). Introduction to the special section on cognitive bias modification in emotional disorders. *Journal of Abnormal Psychology, 118*, 1–4.

Koval, P., Butler, E. A., Hollenstein, T., Lanteigne, D., & Kuppens, P. (in press). Emotion regulation and the temporal dynamics of emotions: Effects of cognitive reappraisal and expressive suppression on emotional inertia. *Cognition & Emotion.*

Kring, A. M., Germans Gard, M., & Gard, D. E. (2011). Emotion deficits in schizophrenia: Timing matters. *Journal of Abnormal Psychology, 120*, 79–98.

Kring, A. M., & Sloan, D. S. (2009). *Emotion Regulation and Psychopathology*. New York: Guilford Press.

Kuppens, P., Allen, N. B., & Sheeber, L. (2010). Emotional inertia and psychological maladjustment. *Psychological Science, 21*, 984–991.

Lam, C. B., & McBride-Chang, C. A. (2007). Resilience in young adulthood: The moderating influences of gender-related personality traits and coping flexibility. *Sex Roles, 56*, 159–172.

Lazarus, R. S. (1983). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology, 44*, 1–21.

Lazarus, R. S. (1985). The costs and benefits of denial. In A. Monat & R. S. Lazarus (Eds.), *Stress and coping: An anthology* (2nd ed., pp. 154–173). New York: Columbia University Press.

Linehan, M. M. (1993). *Cognitive-behavioral treatment for borderline personality disorder*. New York: Guilford Press.

Magen, E., & Gross, J. J. (2010). Getting our act together: Toward a general model of self-control. In R. Hassin, K. Ochsner, & Y. Trope (Eds.), *Self-control in society, mind, and brain* (pp. 335–353). Oxford: Oxford University Press.

Marroquin, B. (2011). Interpersonal emotion regulation as a mechanisms of social support in depression. *Clinical Psychology Review, 31*, 1276–1290.

Martell, C. R., Addis, M. E., & Jacobson, N. S. (2001). *Depression in context: Strategies for guided action*. New York: Norton.

Mauss, I. B., Evers, C., Wilhelm, F. H., & Gross, J. J. (2006). How to bite your tongue without blowing your top: Implicit evaluation of emotion regulation predicts affective responding to anger provocation. *Personality and Social Psychology Bulletin, 32*, 589–602.

Mauss, I. B., Tamir, M., Anderson, C. L., & Savino, N. S. (2011). Can seeking happiness make people happy? Paradoxical effects of valuing happiness. *Emotion, 11*, 807–815.

Mennin, D. S., & Fresco, D. M. (2014). Emotion regulation therapy. In J. J. Gross (Ed.), *Handbook of emotion regulation* (2nd ed., pp. 469–490). New York: Guilford Press.

Mennin, D. S., Holaway, R., Fresco, D. M., Moore, M. T., & Heimberg, R. G. (2007). Delineating components of emotion and its dysregulation in anxiety and mood psychopathology. *Behaviour Therapy, 38*, 284–302.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 244*, 933–938.

Moberly, N. J., & Watkins, E. R. (2010). Negative affect and ruminative self-focus during everyday goal pursuit. *Cognition and Emotion, 24*, 729–739.

Nock, M. W. (2010). Self-injury. *Annual Review of Clinical Psychology, 6*, 339–363.

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*, 400–424.

Park, C. L., Armeli, S., & Tennen, H. (2004). Appraisal-coping goodness of fit: A daily Internet study. *Personality and Social Psychology Bulletin, 30*, 558–569.

Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Personality Processes & Individual Differences, 79*, 410–424.

Rodebaugh, T. L., & Shumaker, E. A. (2012). Avoidance goals for a specific social situation influence activated negative and positive affect. *Cognitive Therapy & Research, 36*, 36–46.

Rottenberg, J., Gross, J. J., & Gotlib, I. H. (2005). Emotion context insensitivity in major depressive disorder. *Journal of Abnormal Psychology, 114*, 627–639.

Segal, H. (2012). *Introduction to the work of Melanie Klein*. London: Karnac Books.

Sheppes, G., & Gross, J. J. (2011). Is timing everything? Timing considerations in emotion regulation. *Personality & Social Psychology Review, 15*, 319–331.

Sheppes, G., Scheibe, S., Suri, G., Blechert, J., & Gross, J. J. (2014). Emotion regulation choice: A conceptual framework and supporting evidence. *Journal of Experimental Psychology: General, 143*, 163–181.

Tamir, M., Bigman, Y. E., Rhodes, E., Salerno, J., & Schreier, J. (in press). An expectancy-value model of emotion regulation: Implications for motivation, emotional experience, and decision making. *Emotion.*

Tamir, M., Mitchell, C., & Gross, J. J. (2008). Hedonic and instrumental motives in anger regulation. *Psychological Science, 19*, 324–328.

Thoits, P. A. (1995). Stress, coping, and social support processes: Where are we? What next? *Journal of Health and Social Behavior, 36*, 53–79.

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development, 59*, 25–52.

Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A person-by-situation approach to emotion regulation: Cognitive reappraisal can either help or hurt, depending on the context. *Psychological Science, 24*, 2505–2514.

Van't Wout, M., Chang, L. J., & Sanfey, A. G. (2010). The influence of emotion regulation on social interactive decision-making. *Emotion, 10*, 815–821.

Vine, V., & Aldao, A. (2014). Impaired emotional clarity in psychopathology: A transdiagnostic deficit with symptom-specific pathways through emotion regulation. *Journal of Social and Clinical Psychology, 33*, 319–342.

Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science, 11*, 249–254.

Watkins, E. (2010). Dysregulation in level of goal and action identification across psychological disorders. *Clinical Psychology Review, 31*, 260–278.

Waugh, C. E., Fredrickson, B. L., & Taylor, S. F. (2008). Adapting to life's slings and arrows: Individual differences in resilience when recovering from an anticipated threat. *Journal of Research in Personality, 42*, 1031–1046.

Waugh, C. E., Thompson, R. J., & Gotlib, I. (2011). Flexible emotional responsiveness in trait resilience. *Emotion, 11*, 1059–1067.

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feelings: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin, 138*, 775–808.

Westphal, M., Seivert, N. H., & Bonanno, G. A. (2010). Expressive flexibility. *Emotion, 10*, 92–100.

Williams, J. M. G., Matthews, A., & MacLeod, C. (1996). The emotional Stroop task and psychopathology. *Psychological Bulletin, 120*, 3–24.

Willick, M. S. (1995). *Psychoanalysis: The main concepts. Defense (ch.37)*. New Haven: Yale University Press.

Wolgast, M., Lundh, L., & Viborg, G. (2011). Cognitive reappraisal and acceptance: An experimental comparison of two emotion regulation strategies. *Behaviour Research and Therapy, 49*, 856–858.

Wrosch, C., Scheier, M. F., Miller, G. E., Schulz, R., & Carver, C. S. (2003). Adaptive self-regulation of unattainable goals: Goal disengagement, goal reengagement, and subjective well-being. *Personality and Social Psychology Bulletin, 29*(12), 1494–1508.

Youngstrom, E., & Izard, C. E. (2008). Functions of emotion and emotion-related dysfunction. In A. Elliot (Ed.), *Handbook of approach and avoidance motivation* (pp. 367–385). New York: Taylor & Francis Group.

Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion, 13*, 803–810.