

## Self-Regulation and Chronic Pain: The Role of Emotion

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*Adjustment to chronic pain is examined within the context of a model that emphasizes goal-centered self-regulatory processing. Individual differences in adjustment to chronic illness have typically been examined from within the framework of stressful person–environment transactions. However, it may be useful to examine a broader array of person–environment transactions encountered in the context of working toward personal goals. Self-regulation may be especially challenging for people with chronic pain because of the link between pain and emotion. Consistent with this perspective, we will focus on the role of emotion as an energizing force in self-regulation and discuss the implications for managing pain. We will suggest that pain and concomitant negative emotion pervasively bias information processing, constrain the selection of goals, and the ongoing process of self-regulation.*

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Living with a chronic pain is a balancing act. People with chronic pain are required to make daily decisions about how best to cope with illness-related demands while managing other role-related obligations. Although some people become overwhelmed by the demands of illness and daily life, many, if not most, remain focused and well adjusted, and do not require the services of a mental health professional. But just how do those with chronic pain juggle multiple and often competing demands? Why do some redouble their coping efforts following a health set back, whereas others become demoralized? We believe that one way to address these questions is to take a *motivational* organizing perspective, emphasizing the role of patients' aspirations, personal strivings, or goals as key moderators or mediators of long-term adaptive success (e.g., Emmons, 1999; Karoly, 1991, 1999; Karoly & Ruehlman, 1996). Consistent with this motivational perspective, we will focus on the key role of emotion as an energizing force in self-regulation and discuss the emotion-related implications for managing pain.

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In the field of health psychology, researchers have typically examined individual differences in adjustment to chronic illness within the framework of stressful person–environmental transactions (Lazarus & Folkman, 1984). However, despite the heuristic power of the stress-coping perspective, theoretical, methodological, and practical challenges have been issued (see Coyne & Racioppo, 2000; Lazarus, 2000), including the observation (Folkman & Moskowitz, 2000) that disproportionate attention has been paid to *negative affect*, and that the co-occurrence of positive and negative affect deserves greater scrutiny. We concur, and further contend that it may be useful to examine a broader array of person–environmental transactions, particularly those encountered in the context of working towards personal goals. One reason for broadening the sphere of inquiry is that stressful transactions make up a relatively small proportion of daily life. Whether measuring major life events, hassles, or interpersonal stressors, studies document that stressful events are (thankfully) relatively infrequent (Zautra, Guarnaccia, & Dohrenwend, 1986; Zautra, Hamilton, Potter, & Smith, 1999). Thus, by focusing only on stressful (negative) events, we may be missing other important aspects of daily experience. A second reason is that, within a goal-centered self-regulatory model (e.g., Karoly, 1999), stress may be defined in terms of potential goal disruption. That is, an event is only considered stressful (or challenging) to the extent that it impedes or threatens to impede people's ongoing goals or personal projects.

Consequently, although we contend that it is critical to examine a broader range of daily activities than have usually been examined in health psychology research, we pointedly assert that it is necessary to focus upon those activities that are motivationally salient. Empirical data (as well as common sense) suggest that activities linked with personal goals are likely to be perceived as important to the individual and relevant to his or her environmental perceptions, adjustment, and quality of life. For example, Cantor and her colleagues found that college students were more emotionally engaged by daily events, if those events were related to an important life goal than if events were unrelated to a goal (Cantor et al., 1991). Similarly, Lavalee and colleagues found that goal-related events were processed more elaborately than nongoal related events (Lavalee & Campbell, 1995). Specifically, college students were more likely to ruminate about a goal-relevant stressful event and the event was more likely to provoke self-focused attention than if the event was not goal-relevant. This higher-level processing is consistent with construal level theory (CLT), a framework that proposes that temporal distance alters peoples' responses to delayed events. That is, individuals tend to use more schematic but also more decontextualized processing to make sense of distant events (such as goals; cf., Trope & Liberman, 2000). The relevance of goal construal to the individual's quality of life is likewise illustrated by the work of Kuijer and deRidder (2003) who reported that, whereas goals provide a source of meaning to chronically ill patients, a discrepancy between the *importance* of goals and their perceived *attainability* was associated with *lower* levels of quality of life and psychological well being. Taken together, these studies illustrate that personal meaning and subjective states, such as well being, are tied to a broad array of goal-related person–environment transactions and to the manner in which these transactions are cognitively construed and organized.

## THE VIEW OF EMOTION FROM THE GOAL SYSTEM SELF-REGULATORY MODEL

Integrating various theoretical traditions, Karoly (1999, 2004) has suggested that a model in which personal goals serve as the primary unit of analysis can best organize normative daily experience as well as pathological functioning. The goal system self-regulatory model proposes that there is an intimate relationship between emotional arousal and self-regulation (Karoly, 1999). Karoly's position is consistent with theories of emotion that posit different evolutionary roots for positive and negative emotions. Two factor models of emotion commonly include positive emotions as part of an activation or reward seeking system and negative emotions as part of a harm avoidance system (e.g., Gray, 1982; Lang, Bradley, Fitzsimmons, et al., 1998; Lang, Bradley, & Cuthbert, 1998; Watson, Wiese, Vaidya, & Tellegen, 1999; Zautra, 2003). Consistent with this formulation, emotions are likely to exert their influence on the selection of goals as well as on the ongoing process of self-regulation. By viewing motivated action as essentially goal-directed rather than reactive or stress-responsive, this model can be used to investigate the cognitive and emotional consequences of positive person–environment transactions as well as the effects of events commonly labeled as “stressful.”

Throughout the remainder of the article, we will focus on the likely intersections between emotion and goal-related cognition. A special effort has been made to highlight the additional challenges faced by individuals who are also managing chronic pain. Specifically, we will suggest that pain and negative emotion pervasively bias information processing and thus constrain the selection of goals as well as the ongoing process of self-regulation. Within this overall framework, we will also focus on structural theories of emotion and emotion regulation as potential sources of individual differences in goal related adjustment. Finally, we will consider emotion regulation as it has been approached in the context of the coping literature and as a stand-alone construct.

## CHRONIC PAIN, GOALS, AND SELF-REGULATION

There is a high degree of variability in the adjustment to chronic pain and we believe that individual differences in adjustment can best be understood by identifying goal-related mediators and moderators of goal-pursuit. Karoly (1999) identified 14 goal-system facets that may act as causal pathways underlying successful or unsuccessful self-regulation. It is beyond the scope of this paper to review each of these facets. Instead, we will focus narrowly on those facets that may be most closely linked with emotions and emotion regulation.

### Goal Content

Within the context of a goal-based model of motivation, goal content has been defined as the endpoint or target of personal aspirations (Karoly, 1993a, 1993b). Karoly has likened the pursuit of goals to elements of navigation, referring to goal

pursuit as *psychological wayfaring*. Following this navigational metaphor, choosing a destination is the first navigational task. Consistent with two-factor models of emotion, emotion is likely to have an influence on the type of goals selected by an individual wayfarer (Gray, 1982; Lang, Bradley, Fitzsimmons, et al., 1998; Lang, Bradley, & Cuthbert, 1998; Watson et al., 1999). Specifically, it has been hypothesized that negative emotions such as sadness, fear, and anxiety activate short-term harm-avoidant goals (e.g., Gray, 1994). In contrast, positive emotions such as amusement, joy, and contentment have been theorized to activate appetitive, reward-seeking, long-term "broaden and build" goals such as self-improvement projects, building and maintaining social networks, and creative pursuits (Fredrickson, 1998; Gray, 1994). Thus, enduring moods and short-term emotional reactions may play an important antecedent role when choosing a destination.

For those with chronic pain, emotions are likely to exert a particularly strong influence on goal-content because of the well-established relationship between pain and negative emotion. Numerous studies have linked pain with emotional dysregulation (e.g., Manne & Zautra, 1989; 1990; Smith & Christiansen, 1996; Weinberger, Hiner, & Tierney, 1987; Zautra et al., 1997; Zautra, Burleson, Matt, Roth, & Burrows, 1994). For instance, the prevalence of depression is higher in chronic pain populations than in those without pain (Brown, 1990; Dickens, McGowan, Clark-Carter, & Creed, 2002; Hawley & Wolfe, 1988). Moreover, longitudinal studies have shown that pain exacerbations are correlated with negative mood (Affleck, Tennen, Urrows, & Higgins, 1992; Zautra, Smith, Affleck, & Tennen, 2001; Zautra & Smith, 2001). Studies such as these suggest that, on average, people with chronic pain may be more vulnerable to negative emotions as well as to persistent negative moods.

Why such a strong link between pain and negative emotion? Perhaps it is because pain and emotion tend to activate similar goal-related trajectories. For instance, pain and negative emotions tend to activate similar cognitive processes, such as increased vigilance and self-focused attention (see Eccleston & Crombez, 1999; Janssen & Leiden, 2002 for reviews of the cognitive sequelae of pain and negative affect). Functionally, pain and negative affect are danger signals, alerting the organism to the presence of a threat and activating behaviors with harm-avoidance as their goal (Eccleston & Crombez, 1999). Pain and negative emotions certainly can act independently, but may nevertheless activate parallel goal-trajectories (see Bolles & Fanselow, 1980 for possible distinctions between the goal trajectories for pain and fear). However, there may be causal linkages as well. As suggested by the prospective data collected by Affleck and colleagues (Affleck et al., 1992), pain often activates the negative emotion system, perhaps as a redundant alarm.

Although pain and emotion may play an important role in the types of goals selected by the individual, it is also likely that goal content is related to affective outcomes. For instance, among elderly respondents in the Terman Study for the Gifted (Terman et al., 1925), goals such as maintaining autonomy, social involvement, and achievement motivation covaried with psychological health (Holahan, Moos, Holahan, & Prennan, 1985). Holahan and colleagues focused on individual goals, whereas another approach has been to examine the relationship between the overall pattern of personal goals and adjustment. For instance, senior community residents who reported few symptoms of depression and relatively high self-esteem

also had goal profiles that reflected a high value on maintaining social connections and personal independence and a low value on goals such as wanting to “slow down” (Rapkin & Fischer, 1992). It has been argued that examining the overall pattern of goals rather than focusing on goals in isolation yields a more complete picture of adjustment because people simultaneously pursue multiple, and sometimes incompatible goals (Karoly et al., in press; Turner, Thorpe, & Meyer, 1998).

In a recent study of patients with Fibromyalgia (FMS), FMS-management goals were related to affective and disease specific outcomes (Hamilton, Karoly, & Zautra, 2004). Participants were asked to rank order 12 FMS specific goals. Cluster analysis was used to identify three subgroups of participants with qualitatively different profiles. The first group endorsed goals such as “getting on with life, despite my FMS” and gave low priority to social validation goals. People with this goal-profile were labeled as “self-sufficient.” The second group gave high priority to goals such as “Find a health professional who can cure my FMS” and low priority to social validation goals. This goal-profile was labeled as “treatment seeking.” The third group gave higher priority to social-validation goals such as “Convince people (doctors and my family) that I have a genuine medical problem,” than to goals related to finding effective treatment for FMS from either traditional or nontraditional sources.

Perhaps not surprisingly, goal profiles correlated with differences in negative affect. Participants who placed a higher value on goals related to social validation, also reported high levels of pain and negative affect. In contrast participants who said that they valued goals related to becoming more self-sufficient reported relatively low levels of pain and negative affect. It will be important for future research to employ longitudinal methodologies to determine whether goal content is a determinant of adjustment, whether feelings such as pain and negative affect tend to bias the selection and valuation of goals, or whether both processes occur.

If emotional well-being influences the selection and the valuation of a particular goal, than it is likely that the relationship between goal content and affective outcomes is mediated in the social context within which a person pursues his or her goals. As suggested by the fibromyalgia study (Hamilton et al., 2004), health goals that depend on cooperation from other people, as characterized by the social validation goal-profile, may set the stage for the experience of personal distress. Consistent with this formulation, the goal profiles that reflected a high need for social-validation were linked with reduced perceptions of social support, perceptions that there was less support for pursuing FMS related goals, and perceptions that network members actively interfered with the pursuit of FMS related goals. In addition, these fibromyalgic women reported more interpersonal conflict than women with treatment seeking or self-sufficient goal profiles. These results emphasize the need for goodness-of-fit between goals and social resources (Karoly, 1999).

The results reported by Hamilton et al. (2004) are consistent with theories that focus on the functional evolutionary differences of positive and negative affect systems. Illness-related goal profiles were related to individual differences in negative affect. In contrast, other studies have found that aspects of goal pursuit were more strongly related to the positive affect system. For instance, Affleck and colleagues reported that among women with fibromyalgia, perceived barriers to goal-related progress created a disturbance in positive affect, but not negative affect (Affleck

et al., 1998). Although the focus of inquiry was different from that of the fibromyalgia study of Hamilton et al. (i.e., goal content vs. dynamics of goal pursuit), the crucial distinction between these studies may be in the goal content. Hamilton and colleagues focused on harm-avoidant illness-related goals. In contrast Affleck and colleagues asked people with fibromyalgia to report on the process of working toward “reward seeking” or “broaden and build” goals such as maintaining social networks and improving health or fitness. A synthesis of this body of work suggests that goal-related affective outcomes may be closely tied to the type of goal that is measured.

Although there is a limited amount of research on how people choose and value goals, available research suggests that there are strong connections between how one feels (emotionally and otherwise) and how one chooses to invest one’s goal-directed energy. Thus, managing chronic pain may constrain the selection of goals; with pain management (harm avoidant) goals taking greater precedence over broaden and build goals. Further, selecting the right pain-management goal appears to have implications for the social-context in which goals are pursued. Although the direction of these relationships are not clear, it is likely that there is a recursive relationship linking pain, emotion, goals, and the social environment.

### **Goal Process Representation**

Karoly (1999) suggests that how people appraise the process of navigating toward an important goal holds implications for its eventual attainment. He likens goal process representation to a “mental map” of the journey, a map that includes one’s efficacy appraisals, planning, progress-related self-praise and self-criticism, and process-related emotional arousal. Research from several sources suggests that this facet of a dynamic motivational model may provide a particularly important intersection between pain, emotion, and self-regulation.

For instance, researchers have employed prospective designs to investigate, via an electronic diary methodology, the relations between aspects of goal process representation including perceptions of goal progress, goal effort, and interference with goal accomplishment and daily measures of pain, mood, fatigue, and restorative versus nonrestorative sleep (Affleck et al., 1998, 2001). In the studies of women with Fibromyalgia by Affleck and his colleagues, the emphasis was on linking the daily accomplishment of health and social goals to changes in pain, fatigue, and affect. On days when patients reported greatest pain and fatigue, goal progress and effort were disrupted by the perception of increased barriers to goal attainment (Affleck et al., 1998, 2001). In addition, disruptions in the pursuit of health and social goals had serious day-to-day affective consequences. Positive affect was diminished on days when participants perceived that pain and fatigue hindered progress towards health and social goals (Affleck et al., 1998). Conversely, making progress toward a social or interpersonal goal was associated with improved positive mood, regardless of that day’s pain or fatigue. Interestingly, the debilitating effects of pain and fatigue were less pronounced for women with a more optimistic explanatory style (Affleck et al., 2001). These results suggest that day-to-day accomplishments of health and

social goals have important affective consequences for women with chronic pain, independent of their pain management goals.

A related study suggested that the demands of living with chronic pain color emotion as well as goal process representations. In this research, the emphasis was on examining how pain affected the process of working toward important goals (Karoly & Ruchman, 1996). In a national study of adults' occupational goals, respondents with mild to moderate pain were compared to respondents without pain. Compared to those without pain, people with pain reported more negative affect and less positive affect associated with pursuing work-related goals. In addition, pain was linked with lowered valuation of work-related goals, lower self-efficacy for pursuing goals, increased self-criticism, and a heightened perception of conflict between work-goals and nonwork goals.

The work of Karoly and colleagues and Affleck and colleagues has strongly linked pain and emotion to goal process representation. The study to be discussed next did not assess dimensions of goal process, but instead suggested that it would be fruitful to examine the relationship between emotion and goal process representation in the context of promoting exercise for patients with chronic pain. Focusing on elderly arthritis patients, researchers found that baseline assessments of affect predicted responsiveness to an exercise intervention (Villanueva, Cornett, Castro, & Yocum, 2000). People with high levels of positive affect showed improvement in pain as well as in perceptions of general health. In contrast, people with more moderate or low positive affect did not report improvement on these dimensions. It should be noted that differences between groups were unrelated to program attendance (I. Villanueva, personal communication, November 12, 2003). Although this study did not examine the relationship between affect and goal process representations, it does suggest that positive affect may have a profound effect on how people experience the process of exercise as well as how people perceive the benefits of exercise. Specifically, positive emotions may bias people's appraisals of goal related progress and thus enhance the effectiveness of pain-management interventions.

A closer examination of the results reported by Affleck et al. (1998), Karoly and Ruchman (1996), and Villanueva et al. (2000) raises interesting possibilities for the role of chronic pain as a force for shaping the nature of situation-act-outcome sequences. That is, chronic pain seems to constrain emotional engagement with goal related daily activities and to negatively bias appraisals of the process of goal pursuit. In short, people in the above-mentioned studies were able to do what they needed to do, but pain made it harder and less enjoyable. It is also important to note that there appear to be individual differences in the way emotion is related to pain and to self-regulation. In the next section we consider two overarching theoretical structures linking emotion, cognition, and pain.

## **THEORIES OF EMOTION AND SELF-REGULATION**

The first theory focuses on individual differences in responsiveness to progress-related feedback. Consistent with two-factor models of emotion (e.g., Gray, 1982, 1987), Carver and colleagues (e.g., Carver, Lawrence, & Scheier, 1996; Carver &

Scheier, 1990) suggest that positive emotions are linked with satisfaction of the appetitive system (also known as the Behavioral Activation System: BAS), and that negative emotions are linked with activation of goals related to harm avoidance (Behavioral Inhibition System: BIS). The self-regulatory model articulated by Carver and colleagues specifies that emotion originates from midcourse evaluations (or goal-process representations) of progress towards a goal. The resulting emotional response determines subsequent goal-directed actions such as perseverance versus disengagement (Carver & Scheier, 1990; Carver, 2004). In the context of this self-regulatory model, individual differences in adjustment are thought to predict differential sensitivity to either positive feedback (BAS sensitivity), or negative feedback (BIS sensitivity).

Laboratory studies testing affective responses to approach-oriented and avoidant-oriented tasks have provided support for the hypothesis that people differ in sensitivity to reward and punishment (Carver & White, 1994; Carver, 2004). Differential sensitivity to BAS cues may help to explain the individual differences in response to the exercise intervention reported by Villanueva et al. (2000). Specifically, early work on the BIS/BAS scales showed that there was a moderate correlation between positive affect and measures of BAS sensitivity (Carver & White, 1994). Thus, the positive affectivity reported by some of Villanueva and colleagues may be a marker of BAS sensitivity.

Some researchers have hypothesized that differential sensitivity is a component of temperament (e.g., Davidson & Fox, 1989). However, it may also be the case that conditions such as chronic pain diminish BAS sensitivity and/or increase BIS sensitivity. Although Carver and Scheier specify that emotions arise from process-related appraisals, they also predict that emotional states and moods can influence the appraisal process itself (Carver & Scheier, 1990). Drawing on work in the information processing literature, Carver and Scheier note that emotion has been found to bias retrieval processes (e.g., Bower, 1981; Bower & Mayer, 1989), to increase perceived salience of mood-congruent memories (e.g., Pyszczynski, Holt, & Greenberg, 1987), appraisals of goal related progress (Forgas & Moylan, 1987), and appraisals of social interactions (Forgas & Bower, 1987; Forgas, Bower, & Krantz, 1984). Thus, pain-related negative affect could have a pervasive impact on the evaluation of goal-related progress and resulting affect, as was observed by Karoly and Ruehlman (1996), whereas periodic pain flare-ups may have a state-dependent effect on BAS/BIS sensitivity.

The second theory to propose an overarching theoretical relationship between emotion, cognition, and pain is the Dynamic Model of Affect (DMA: Reich, Zautra, & Davis, 2003; Zautra, 2003). Carver and colleagues suggest that differential BAS/BIS sensitivity is an important predictor of individual differences in adjustment (Carver & White, 1994). However, Zautra and colleagues assert that adjustment is related to individual differences in the underlying structure of affect as well as limitations in information processing (e.g., Reich et al., 2003; Zautra, 2003). In contrast to models that suggest an invariant single dimensional model or a two-dimensional, orthogonal model of affect, the DMA posits that the relationship between positive and negative affect is state dependent (Reich et al., 2003). Across studies of people with arthritis (e.g., Zautra et al., 2001) as well as older adults with and without pain (Zautra, Reich,

Davis, Nicolson, & Potter, 2000), mood reports indicate that during periods of low stress, positive and negative moods appear to fluctuate independently. By contrast, during periods of high stress, positive affect becomes constrained by negative affect and the structure of affective space approaches unidimensionality.

Although both models predict individual differences in the response to stressful events, the DMA may be a more useful tool for understanding the day-to-day affective consequences of living with chronic pain. Carver and Scheier's model focuses on emotional reactions (or affect in their terminology) to individual events (e.g., Carver & Scheier, 1990). The DMA focuses more broadly on mood states that could encompass emotional energy from many goal-transactions as well as emotional energy linked to pain or other physical states (Zautra, 2003). Further, the DMA appears to provide a more accurate prediction of emotional responses to reward seeking during periods of increased stress. The DMA suggests that during periods of low stress, cognition and affect are free to vary in conjunction with multiple goal-directed trajectories. In contrast, during periods of high stress, cognitive and affective processing becomes narrowly focused on threat-reduction to the exclusion of processing positive information that is unrelated to the threat (Reich et al., 2003; Zautra, 2003). The end result is consistent with the finding that emotional rewards were attenuated during periods of increased pain (Affleck et al., 1998, 2001). In contrast, Carver (2004) has recently argued that "frustrative non-reward" (failures to achieve reward-seeking goals) should result in increased negative affect rather than decreased positive affect. To the extent that a reduced ability to make progress on social and health-related goals can be seen as real-world examples of "frustrative non-reward," this model seems to make an inaccurate prediction about the relationship between emotion and the pursuit of broaden and build goals.

Although it may be difficult for people to function adequately during periods of increased pain, many people do so without compromising a sense of well being. Such individual differences may be related to "emotional complexity." Zautra and colleagues have coined this term to describe the ability to maintain opposing affects (Reich et al., 2003; Zautra, 2003). In the context of a goal-centered, self-regulatory model, during times of stress an "emotionally complex person" might retain the ability to respond to positive events and use that energy to fuel additional goal directed efforts.

Emotional complexity may be partially determined by attitudes towards emotions. One meta-cognitive model of emotions suggests that mood clarity, or the understanding of emotions, is a dimension of emotional intelligence and a prerequisite to thoughtful regulation of emotion (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995). According to this model, mood clarity is defined as the ability to distinguish clearly between emotions and to tolerate negative emotions. In accordance with this theory, mood clarity has been found to predict mood-complexity during times of stress. Compellingly, the relationship between mood-clarity and the decoupling of positive and negative affect has been demonstrated in a laboratory experiment examining the response to social stressors in patients with osteoarthritis (DeVellis, Carl, DeVellis, Blalock, & Patterson, 1998), as well as in a weekly diary study examining the response to pain flare-ups in patients with rheumatoid and osteoarthritis

(Zautra et al., 2001). The latter study also assessed the relationship of positive affect to negative affect during times of increased pain. Persons with more positive affect reported less negative affect even when pain was high. These studies suggest that there are subtle individual differences in the relationship between pain and emotion that could have important implications for self-regulation.

Attitudes towards emotion and emotional complexity are also likely to be important determinants of the effectiveness of self-regulation. For instance, sensitivity to positive affective stimulation may promote persistence in the face of barriers. However, the qualitative aspects of emotion are only one affective determinant of effective self-regulation. Within the goal systems self-regulatory framework, emotion regulation is seen as an instrumental self-regulatory skill that may determine whether emotion has adaptive or detrimental effects on self-regulation.

### EMOTION REGULATION AND COPING

Thus far, we have focused on establishing a link between pain and negative emotion that has implications for biasing information processing in the context of self-regulation. However, there appear to be significant individual differences in the strength of the relationship between pain and emotion. Several studies have documented that pain does not always correlate with increased negative affect (Affleck et al., 1992, 1998) and that people vary in the duration of pain-related suffering (Hamilton et al., in press). The capacity to self-regulate emotion may be the key difference between those who endure a great deal of pain related suffering and those who can separate the experience of pain from emotional responses to pain.

In health psychology research, it has been common to include emotion regulation as a dimension of emotion focused coping. However, there are several reasons to disentangle emotion-regulation from coping. One of the most compelling reasons is that coping and emotion regulation have inherently different goals. Coping encompasses a broad range of cognitive or behavioral strategies designed to mitigate the effects of a stressful encounter (Lazarus & Folkman, 1984). In contrast, the goal of affect regulation is often to change an affective state, which may or may not be related to the resolution of a specific stressor (Gross & John, 1998). By collapsing these two targets of aspiration, researchers may be overlooking important aspects of self-regulation.

There have been several attempts in the coping literature to stratify coping responses according to goals. For instance, coping efforts have been partitioned along the lines of problem-focused coping and emotion-focused coping (Lazarus & Folkman, 1984), primary and secondary coping (Rothbaum, Weisz, & Snyder, 1982), and active and passive coping (Brown & Nicassio, 1987). Although the rationale underlying each of these factor structures was slightly different, each model suggested a dichotomy between coping efforts directed toward the stressor and coping efforts that were inward directed, often with emotion-regulatory goals. In addition most of these models have pathologized inward-directed efforts.

In general, researchers have abandoned models of coping that stratify coping efforts according to the actor's goal trajectory. Instead researchers have turned to heterogeneous scales such as the Vanderbilt Multidimensional Pain Coping Inventory (Brown & Nicassio, 1987) or the COPE (Carver, Scheier, & Weintraub, 1989) that include subscales reflecting emotion-regulation goals. For pragmatic reasons, researchers frequently use factor analysis to combine smaller subscales, often producing one facet that combines adaptive inward directed items (e.g., cognitive restructuring) with efforts actively directed toward the stressor, another facet that includes items pertaining to seeking social support, and a third facet that includes items that reflect maladaptive cognitive responses to stressors (e.g., Zautra, Hamilton, & Burke, 1999). Although this approach to measurement often produces facets that predict better or worse adjustment to stressors such as pain, the effect sizes are typically small, especially for coping efforts that are thought to be adaptive (see Zautra & Wrabetz, 1991 for a review of the coping literature).

Reexamining the coping process in the context of a goal directed system might shed light on the underlying structure of coping and facilitate a clear understanding about coping-related outcomes. In fact, a recent theoretical article has recommended using goals, rather than content, as an organizing framework for understanding individual differences in coping responses (Skinner, Edge, Altman, & Sherwood, 2003). By classifying coping efforts based on their respective adaptive function, many of the pitfalls of content-based classification systems can be avoided. For instance, a wide variety of coping strategies can be directed toward the same goal, whereas two people may use a single strategy to achieve very different goals (Skinner et al., 2003). Consider the example of using distraction as a strategy for managing chronic pain. Distraction from pain could be an end in itself (a harm avoidance goal), or distraction could be used as a means to accomplish other goals (a reward seeking goal). Differences in the functional meaning of the coping effort may have significant implications for the nature of affective outcomes.

A useful first step within the context of understanding adjustment to chronic pain would be to ask people to report the occurrence of pain flare-ups, pain management goals, and finally the strategies used to achieve pain management goals. Although it is easy to assume that all people would value the goal of pain reduction, other goals may be of equal or greater importance. For instance, pain reduction may be secondary to goals such as getting restorative sleep, getting on with life despite pain, or convincing others that pain is real (Hamilton et al., 2004). Gathering information about both goals and coping strategies would allow researchers to answer a number of important questions including whether coping classification schemes based on adaptive functions (i.e., goals) are reliable across people. In addition, and perhaps more importantly, matching goals with coping strategies would allow researchers to determine whether adaptive outcomes were related to selecting the right goal, the right coping strategy, or a good fit between goal and coping strategy.

This approach also conceptually separates emotion regulation from other forms of coping. There are several reasons for doing so. The first reason is that emotion regulation may play an antecedent role in effective stress management that is distinct from other forms of coping responses. Recall that the DMA predicts that during times of stress, one's affective space is constrained and positive affect is drowned out

by negative affect. Constriction of positive affect may play a particularly detrimental effect on coping responses. There is a body of literature that documents the role of emotion on decision-making. In a number of studies, experimental manipulations of emotion were associated with different problem solving strategies (Isen, 1984, 1990, 1993; Isen & Daubman, 1984; Isen, Daubman, & Nowicki, 1987; Isen & Means, 1983; Isen, Niedenthal, & Cantor, 1992). In one illustrative study, positive moods were found to facilitate creative problem solving when compared to negative mood (e.g., Isen et al., 1987). Isen suggests that emotions affect the way people evaluate and categorize information (Isen & Daubman, 1984). Specifically, her research suggests that negative emotions produce classification schemes that are narrow. In contrast, positive emotions have been found to result in classification schemes that were relatively broader and less restrictive. In the context of our model of self-regulation, negative emotions may restrict the range of potential coping responses whereas positive emotions may facilitate a more creative approach-oriented style of coping.

Because of the organizing effects of emotion on self-regulation, emotional regulation may determine whether people use adaptive or nonadaptive methods of coping. Consistent with this prediction, emotion regulation as measured by the Negative Mood Regulation expectancy scale (NMR; Catanzaro & Mearns, 1990), has been found to correlate with indices of coping. Specifically, several studies have shown an inverse relationship between beliefs that one can attenuate a negative mood and the use of coping strategies that are often classified as avoidant and a positive relationship between the NMR and approach-oriented coping strategies (Brashares & Catanzaro, 1994; Catanzaro, 1997; Mearns & Mauch, 1998). We should note that although the relationship between this index of emotion regulation and measures of coping is consistent with our understanding of self-regulation, these studies provide no way to determine whether emotional regulation augmented adaptive coping responses or whether the measures simply tap similar constructs.

A second reason for separating emotion regulation from coping is that these two constructs seem to relate differently to emotional outcomes. In a study of women with rheumatoid arthritis, the mood-repair subscale of the trait meta-mood scale predicted the duration of emotional response to periods of increased pain (Hamilton, Zautra, & Reich, *in press*). For most women, pain exacerbations did not have lasting implications for their adjustment to chronic pain. However, pain episodes appeared to predict extended periods of suffering in a subgroup of women who said that they had trouble regulating emotion. In contrast, dimensions of active coping were related to positive affect at the time of the pain exacerbation, but did not appear to have a prospective relationship with positive or negative emotion. One interpretation of these data is that coping may have an immediate effect on emotional response, whereas emotion regulation may be related to recovery from stressful events.

Researchers interested in the modulation of emotions have taken various approaches to defining the construct of emotion regulation. Initial studies of emotion regulation focused on identifying and categorizing strategies for regulating emotion (e.g., Gallup & Castelli, 1989; Morris & Reilly, 1987; Parkinson & Totterdell, 1999; Rippere, 1977; Thayer, Newman, & McClain, 1994; Totterdell & Parkinson, 1999). Other researchers in this area have adopted a more conceptual approach to measuring emotion regulation. For instance, Catanzaro and colleagues focus on

perceived competency for emotion regulation (Catanzaro & Mearns, 1990). Salovey and colleagues frame emotion regulation in the context of a developmental model of meta-cognition about emotion. Perhaps the most comprehensive model of emotion regulation was proposed by Gross (1998). Gross's theory of emotion regulation does not specify the methods of emotion regulation. Instead, Gross describes emotion-regulation as alterations in the time course of an emotional response. Thus emotion regulation is defined as processes that change the emergence, duration, and intensity of emotion.

Although these models of emotion regulation have proven useful in predicting adjustment, all possess the same limitations. The most notable limitation is that many of these models equate adaptive emotional regulation with the reduction of negative emotions (see Gross, 1998; Thayer et al., 1994 as exceptions). However, skilled regulation would include the ability to upregulate both positive and negative emotions (e.g., Gross, 1998). Second, existing models of emotion regulation do not incorporate emotion regulation within a broader model of functioning and do not answer fundamental questions such as "When is it useful to regulate emotion?" "Can emotions be harnessed to optimize functioning?" "Is negative emotion always bad?" Incorporating emotion regulation into a broader model of self-regulation may be the key to understanding why some people adjust well to chronic illnesses and some people adjust poorly.

By incorporating emotion regulation within a goal-centered self-regulatory model we can examine a broad array of mood-regulation goals. From a motivational perspective, the most important dimension of emotion regulation may be the ability to recruit positive affect. In the context of chronic pain populations, positive emotional arousal has been linked with health benefits (Affleck et al., 1998; Karoly & Ruhlman, 1996) and positive affect may be required to sustain goal-directed activity in the face of temporary setbacks or health downturns. Thus, from a goal systems self-regulatory perspective, the ability to up- and down-regulate emotional states is considered to be a hallmark of effective goal pursuit.

## SUMMARY AND CLINICAL RECOMMENDATIONS

Self-regulation presents a challenge for people who must manage chronic pain. The primary function of pain is to disrupt other ongoing activities and to direct attention toward the cause of injury or the extent of tissue damage (Eccleston & Crombez, 1999; Zautra, 2003). In addition, the onset of pain also typically activates negative emotions, which may supplement activation of the harm-avoidant system. Accordingly, periods of increased pain may draw attention away from ongoing pleasurable activities and may diminish processing of positively toned information. Further, it is not only the experience of pain, but also the anticipation of pain that may reduce processing capacity for positive information (Zautra, 2003). Consistent with the literature presented above, pain is likely to diminish enjoyment and benefits derived from goal directed activity (Affleck et al., 1998; Karoly & Ruhlman, 1996; Villanueva et al., 2000), may make individuals less likely to select approach-related goals (e.g., Gray, 1982; Lang, Bradley, Fitzsimmons, et al., 1998, Lang, Bradley, & Cuthbert, 1998;

Watson et al., 1999), and may constrain coping responses when things go awry (e.g., Isen et al., 1987).

Although pain and emotion may drive aspects of self-regulation, self-regulation also appears to influence emotion. For instance, pain management goals were correlated not only with negative emotion but also with characteristics of the social network (Hamilton et al., 2004). This study suggests that therapists who are working on goal setting with chronic pain patients should elicit input from family members, friends, and perhaps medical personnel. If there is not a good fit between resources and goals, the patient may become demoralized as he or she recognizes a lack of support or encounters social interference.

It is also important to note that there are individual differences in the way that people process pain and emotion-related information. Salovey and colleagues conceptualized mood-clarity and mood-repair as two dimensions of emotional intelligence (Salovey et al., 1995). Notably, research reported here documents that emotional complexity and emotion regulation not only relate directly to the experience of emotion, but also relate to coping responses and to pain related suffering (Brashares & Catanzaro, 1994; Catanzaro, 1997; DeVellis et al., 1998; Hamilton, Zautra, & Reich, in press; Mearns & Mauch, 1998).

In the context of these studies, emotion regulation and emotional complexity are conceptualized as traits. However, it is more likely that these are acquired instrumental skills. Therapies such as Cognitive Behavior Therapy (CBT) that focus on changing the relationship between thoughts and emotions have been found to improve emotion regulatory skills (Beck, Rush, Shaw, & Emery, 1979). In addition, therapies such as mindfulness meditation (Kabat-Zinn, 1990) include techniques that promote emotional awareness and distress tolerance. The use of these techniques has been found to be useful in the management of chronic pain (e.g., Kabat-Zinn, 1990; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn, Lipworth, Burney, & Sellars, 1986).

Finally, we contend that it may be as important to examine the consequences of working towards approach-oriented goals, as it is to focus on stressful events. Individuals able to work on their health and social goals during periods of increased pain also reaped emotional rewards (Affleck et al., 1998). This suggests that therapists must emphasize to patients that it is important to maintain focus on other goals, even during painful flare-ups in disease activity. All too often, both patients and therapists become focused on distress management and lose sight of goals related to an enhanced sense of well being. To paraphrase Zautra (2003), therapists and patients need to think in two [emotional] dimensions.

A final note and a word of caution. Zautra emphasizes the importance of thinking in two emotional dimensions, and the importance of retaining the ability to process positive emotional information during periods of stress (Zautra, 2003). This may be more easily said than done for many people. Throughout the paper, we have implied that goals can be primed (unconsciously) by environmental stimuli, as can emotional reactions. Current research on depressive cognition may provide a potential mechanism. Neuroimaging studies of depressed patients have shown disproportionate activation of limbic centers such as the amygdala when compared with activity in centers of executive functioning (Siegle, Moore, & Thase, 2004; Siegle, Steinhauer,

Thase, Stenger, & Carter, 2002; Siegle & Thayer, 2004). If pain automatically elicits negative affect and avoidance goals, then the clinician needs to find ways to override the influence of these pernicious factors. Just telling patients to “think happy thoughts” won’t do it.

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