Coping and Health:

A Comparison of the Stress and Trauma Literatures

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Even a cursory review of *PsychLit* reveals that well over 20,000 articles on stress and coping processes have been published in the past two decades (Aldwin, 1999). A smaller proportion of these has specifically examined how individuals cope with trauma. Due to differences between researchers in how trauma is defined, a definitive number is difficult to determine. However, a search for the key words trauma and coping yielded 1,000 articles. Given the magnitude of this literature, we will not attempt to provide a full review. However, we will briefly outline the different theoretical and methodological approaches to coping (for more complete reviews see Aldwin, 1999; Lazarus, 2000; Parker & Endler, 1996; Schwarzer & Schwarzer, 1996). Then we will examine the similarities and differences between coping with general problems and coping with trauma. Finally, we will provide whether a brief review of the relationship between coping and health outcomes, and focus on whether coping strategies can affect both the psychological and physical outcomes of trauma.

THEORETICAL AND METHODOLOGICAL APPROACHES TO COPING

There are four basic theoretical and methodological approaches to coping. Psychoanalytic approaches focus on the use of defense mechanisms, while personality approaches focus on coping styles. Both of these assume that adaptation is primarily a function of personal characteristics. In contrast, the coping process approach draws upon cognitive behavioral models, and is more likely to emphasize environmental demands and influences on coping. Coping process approaches tie the coping strategies to a particular stressful episode. Finally,

daily coping processes use experience sampling techniques to examine how individuals cope throughout the course of the day with a wide variety of problems.

Psychoanalytic Approaches

Research on how individuals adapt grew out of early psychoanalytic studies of defense mechanisms, which are considered to be unconscious ways of warding off anxiety. DSM-IV (American Psychiatric Association, 1994) currently identifies seven major types of defense mechanisms, and orders them hierarchically from more to less severe. The most severe is defensive dysregulation, which refers to frankly psychotic processes involving projection, denial, and delusion. Action refers to acting out, passive aggression, or apathetic withdrawal, and major image-distorting mechanisms include autistic fantasy, projective identification, and splitting. The less severe or "immature" mechanisms include disavowal (denial, projection, and rationalization), minor image-distorting (devaluation, idealization, and omnipotence), and mental inhibitions (displacement, dissociation, intellectualization, repression, and the like). High adaptive or "mature@ defense mechanisms include altruism, humor, and sublimation, as well as suppression.

Cramer (2000) compared the similarities and differences between defense mechanisms and coping processes. Defense mechanisms are unconscious, nonintentional, dispositional, hierarchical, and associated with pathology, while coping processes are conscious, used intentionally, situationally determined, nonhierarchical, and associated with normality. In other words, defense mechanisms are designated *a priori* as being more or less adaptive, and are not

consciously chosen. Individuals nonetheless can be characterized by primary defensive styles or defense mechanisms that they are most likely to exhibit under a wide variety of circumstances. In contrast, coping processes are thought to be consciously chosen and are responsive to environmental demands. Rather than hierarchically ordered, the effectiveness of coping processes is thought to vary as a function of appropriateness to environmental demands.

Defense mechanisms are traditionally studied via the use of intensive interviews and case studies. However, a number of inventories have been developed to assess defense mechanisms via self-report, including Gleser & Ihilevich (1969), Haan (1965) and Joffe & Nadich (1977). However, the psychometric properties of these scales are questionable (Cramer, 1991; Davidson & MacGregor, 1998). Of more recent vintage is a Defense Style Questionnaire (Bond, Gardiner, & Sigel, 1983). However, as Cramer (2000) points out, there is a logical inconsistency in asking individuals to report on unconscious processes, and researchers are more likely to use observational methods and/or rely upon qualitative research coding interview or projective materials.

In part because of the difficulty of systematically assessing defense mechanisms, there have been few large-scale studies of the adaptational outcomes of defensive strategies. Indeed, more research has been directed to identifying the developmental trajectory of defense mechanisms (Vaillant, 1977, 1993), as well as in identifying predictors of the use of immature defenses, including personality and affective disorders (see Cramer, 2000, for a review). Nonetheless, the study of defense mechanisms truly set the stage for understanding how people cope with both stress and trauma.

Coping Styles.

A major outgrowth of the psychoanalytic literature was the conception of coping styles, which borrowed some of the language from psychoanalysis but was more focused on how people deal with information than how they deal with emotions *per se.* The earliest typology was repression-sensitization (Byrne, 1964). Repressors avoid or suppress information, while sensitizers seek or augment information. This dichotomy has reappeared in many different guises over the past 30 years, with blunting-monitoring (Miller, 1980) and approach-avoidance (Roth & Cohen, 1986) being the current manifestation of dichotomy. In general, approach-monitoring-vigilant coping styles have been shown to be associated with better outcomes in a variety of situations, while repression-avoidant-blunting styles are associated with poorer outcomes (for reviews, see Aldwin, 1999; Roth & Cohen, 1986).

Dichotomizing coping strategies into two broad modalities can be psychometrically appealing. Certainly Endler and Parker (1990) have shown that the factor structure of coping style inventories, which currently focus more on problem- vs. emotion-focused coping, are more stable than process measures, and often correlate reasonably well with psychological symptom inventories. However, even early research by Lazarus and his colleagues showed that both types of coping were used in over 80% of episodes, and often individuals in highly stressful situations alternate between approaching and avoiding the problem (Folkman & Lazarus, 1980; Lazarus, 1983). Nonetheless, the use of particular emotion-focused coping strategies may be more consistent across time and strategies, suggesting that individuals may have characteristic ways of dealing with and/or expressing emotion (see Aldwin, 1999).

Coping Process

As mentioned earlier, the coping process approach draws upon the cognitive behavioral perspective, and argues that coping is flexible and responsive to environmental demands, as well as personal preferences. In this model, how individuals cognitively appraise situations is the primary determinant of how they cope. The four primary appraisals are benign, threat, harm/loss, and challenge, and these are influenced both by environmental demands and individual beliefs, values, and commitments (Lazarus & Folkman, 1984). Rather than examining general coping styles, coping process approaches examine how individuals cope with a particular stressor.

Coping process approaches have recently come under attack from a variety of perspectives. Critics have charged that the factor structure for such inventories as the Ways of Coping is not stable, either across time or across samples (Endler & Parker, 1990) although the factor structure for the COPE (Carver, Scheier, & Weintraub, 1989), another widely-used coping measure, is also less than satisfactory (Schwarzer & Schwarzer, 1996). However, the factor structure for coping process measures may not be stable precisely because they are responsive to environmental demands (Schwartz & Daltroy, 1999). Coyne & Racioppo (2000) also criticized coping inventories as being too vague to generate clinically meaningful results, and argued for more situation-specific inventories (which, however, would also create problems of generalizability across situations).

Nonetheless, there is broad agreement concerning the types of coping strategies that exist. There are five general types: problem-focused coping, emotion-focused coping, social support,

religious coping, and making meaning. Note that coping strategies are not mutually exclusive, and even strategies which may seem orthogonal, such as suppressing and expressing emotions, may be used sequentially in the same situation. Within each general type of coping strategy, there may be several subtypes.

Problem-focused coping includes cognitions and behaviors that are directed at analyzing and solving the problem. It may include "chunking" or breaking a problem into more manageable pieces, seeking information, and considering alternatives, as well as direct action. Sometimes delaying or suppressing action is seen as a separate problem-focused strategy. Delaying action or decisions may be used in health circumstances in which people are waiting for the outcome of tests, and suppressing action may be useful in avoiding actions which may make a problem worse, such as acting in anger.

Emotion-focused coping is often seen as a strategy in and of itself, but is best conceived as involving different sub-types. Avoidance and withdrawal may be different from expressing emotion, and suppression, setting one's emotions aside in the service of a problem-solving effort, is clearly different from the use of substances to regulate emotion. Avoidance, withdrawal, and substance use are most generally associated with poor outcomes (Aldwin & Revenson, 1987).

Seeking social support and religious coping are strategies that involve elements of both problem-focused and emotion-focused coping. Support seeking may include asking for advice, concrete aid, emotional support, or justification for one's perceptions and/or actions (Thoits, 1986). Similarly, religious coping, which includes prayer, is generally considered a form of emotion-focused coping, but may involve asking for advice or even concrete aid. The study of

religious coping strategies is as yet in its infancy (Pargament, 1997), and the associations of to outcome measures by vary by religious denomination (Park, Cohen, & Herb,1990). In general, religious coping may be most helpful with uncontrollable stressors (Aldwin, 1994) or for lower socioeconomic status groups (Cupertino, Aldwin, & Schulz, 2000).

Social support, conceptualized as social integration (Berkman & Syme, 1994), and social disclosure (Smythe, 1998) are almost always associated with better mental and physical health outcomes, in coping studies. However, seeking social support is almost always associated with poorer outcomes (Monroe & Steiner, 1986). The reasons for this are not well understood, but may devolve around negative reactions from others (Rook, 1998), or perhaps the act of seeking support may be indicative of poor networks or a catastrophizing coping style.

Finally, making meaning is a strategy that is least well understood. It involves trying to make sense of the problem, and, in the general coping literature, may be called "cognitive reframing." It involves such strategies as "looking for the silver lining" or trying to perceive positive aspects of the current problem. Making meaning may be most often used in coping with extreme stressors, such as trauma or major losses (Mikulincer & Florian, 1996), and thus will be discussed in greater detail in the trauma section.

Daily Process Coping

Daily process coping involves the assessment of coping strategies generally directed at specific problems once or more per day. Respondents may be asked to fill out questionnaires every evening, or they may be beeped and fill out mini inventories on the spot. To date, only a handful of coping studies have utilized this method (for a review, see Tennen, Affleck, Armeli, &

Carney, 2000). The correlation between process and retrospective measures of coping is a matter of some controversy. While some claim that it is fairly low (Ptacek, Smith, Espe, & Raffety, 1994), examination of the raw data reveals that, in at least one study (Stone et al., 1998), the correlation is actually quite high, about .7 (although only the r^2 was reported). Further, Schwarzer and Schwarzer (1996) have criticized the psychometric properties of daily process measures, as they are of necessity quite short and often consist of single items.

Nonetheless, the associations between momentary coping and process outcome measures tend to be encouraging, although there are within-subject and between-subject (aggregated) analyses may differ in some curious ways which merit further investigation. For example, Affleck et al. (2000) examined daily diary associates between coping and alcohol consumption in moderate- to heavy-drinking men and women. Aggregating the data, they found problem-focused coping had no effect average consumption, emotion-focused coping was negatively-related to consumption, but avoidant coping was positively related. However, a very different pattern of results emerged from the within subjects analyses. Instead of the aforementioned pattern, they found an inverse relationship between problem-focused coping and alcohol consumption. The reasons for this are unclear, but may relate to average differences in alcohol consumption. For similar reasons, it would make sense that within-subject analyses of pain patients should show a more protective effect of coping strategies on pain than between-subject analyses (Tennen & Affleck, 1996).

COPING WITH TRAUMA

It is one thing to describe individual differences in dealing with everyday stressors or even life events, but it is quite another thing to generalize this to traumatic situations. By definition, traumatic situations are generally outside of individuals' usual experience, and most individuals have not developed the necessary repertoires to know how to deal with such events (although military personnel and some categories of civil servants such as police, firefighters, and emergency medical technicians do receive training). Indeed, at first glance, the initial reaction to major trauma seems stereotypical reports of emotional numbing, cognitive impairment, and aimless wandering have been reported for such disparate traumas as tornadoes (Wallace, 1956), concentration camps (Bettelheim, 1943), nuclear blasts (Lifton, 1968), and combat (Solomon, 1993). It would be tempting to argue that the environmental press of trauma is so great that there are few individual differences in reaction to it. However, closer examination of the trauma literature reveals marked individual differences in how people cope even with traumatic situations, although clearly environmental factors may constrain choices. Further, as we shall see, how coping strategies can influence the long-term psychological and perhaps physical responses to the trauma.

Aldwin (1999) identified four ways in which the pattern of coping responses in traumatic situations differs from that from ordinary life events. First, individuals in traumatic situations may feel they have less control over their cognitions and behaviors. Solomon (1993, p. 43) quoted a crack paratrooper during the Yom Kippur war, who, despite his elite training, found himself frozen in the middle of action, unable to move to help his fellow soldiers. Such freezing reactions may also be common in rape (Burgess & Holstrom, 1976). In naturalistic descriptions

of people in traumatic situations, the use of defense mechanisms such as dissociation, repression, and denial may be much more widespread (Ward, 1988). Indeed, when being tortured, either by one's political enemies or one's parents, dissociation may be the only option available (Figley, 1983).

Second, disclosure may be of particular importance in traumatic situations. While seeking social support may be associated with poorer outcomes with everyday stressors, in trauma situations, individuals who disclose to others typically do much better both in terms of short and long-term outcomes (Smythe, 1998; Lee, Vaillant, Torrey, & Elder, 1995). However, the reaction of others in the social environment may moderate this relationship. In particular, individuals who experience negative reactions from others may have worse outcomes than individuals who did not disclose (Silver, Holman, & Gil-Rivas, 2000).

Third, the process of coping with trauma is usually much more extended than is coping with general hassles or even life events, especially if an individual develops post-traumatic stress disorder (Horowitz, 1986). Indeed, the sequellae of major trauma has been documented to last for decades (Aldwin, Levenson, & Spiro, 1994; Kahana, 1992; Schnurr, Spiro, Aldwin, & Stukel, 1998). Epstein (1991) has referred to trauma as the 'atom-smasher' of personality, and the process of reconstructing both lives and sense of identity may take years (Lomranz, 1990).

Thus, it is not surprising that fourth difference, 'making meaning', is a strategy which has particular utility in traumatic situations (Mikulincer & Florian, 1996). Making meaning may entail both reorganization of existing cognitive-motivational structures, as well as reappraisal or reinterpretation of not only the event but also the context of the event in a person's life. Loss

events may also entail a search for meaning, especially if those events are sudden or traumatic (Wortman, Battle, & Lemkau, 1997). While this search for meaning may be painful in and of itself, and sometimes fruitless, as Wortman and her colleagues have often documented, it may also set the stage of post-traumatic growth (Aldwin & Sutton, 1998; Lieberman, 1992; Tedeschi, Park, & Calhoun, 1998).

Indeed, of the most intriguing aspects of the coping with trauma literature are the hints that trauma may constitute a major avenue for personality change in adulthood. For example, Schnurr, Rosenberg, & Friedman (1993) examined change in MMPI scores from college to mid-life as a function of combat exposure. They found that MMPI scores were most likely to improve in men who had moderate levels of combat exposure, compared to those who had heavy exposure -- or none at all. Similarly, Park, Cohen, & Murch (1996) found that students who perceived growth as a result of a major stressor increased in optimism over the course of a year. While some aspects of personality are widely believed to change as a function of trauma exposure (Epstein, 1991), more studies documenting this are needed. In particular, the possible mediating function of coping strategies merits further investigation (Aldwin, Lachman, & Sutton, 1996).

In addition to these four differences, another way in which studies of coping with trauma differ from general studies of coping with stress is that trauma studies sometimes focus on just one strategy. Examples of such studies include self-blame (Davis, Lehman, Silver, Wortman, & Ellard, 1996; Delhanty et al., 1997), "undoing" (Davis, Lehman, Wortman, Silver & Thompson, 1995), and "temporal orientation" (Holman & Silver, 1998). Surprisingly, while self-blame in everyday situations is generally associated with poor outcomes, in traumatic situations such as

rape or automobile accidents, self-blame may be associated with positive outcomes in that it provides at least an illusion of control in what are often uncontrollable situations. For example, if a rape victim blames herself for approaching a stranger in a car, she may feel that she would be able to avoid such circumstances in the future. Undoing is a particularly intriguing strategy, but may not be specific to trauma. Indeed, it would be very interesting to see how often and under what circumstances this strategy is used in everyday coping. Nonetheless, there have been a number of studies of trauma using standardized coping checklists, and, as we shall see, the process of coping with trauma may be more important for health outcomes than the exposure to trauma itself (Wolfe, Keane, Kaloupek, Mora, & Winde, 1993).

COPING AND HEALTH OUTCOMES

There is a large literature on trauma and long-term health outcomes that will be reviewed by Baum and Dougall (this volume); instead, we will focus on the coping and health outcomes literature. The relationships detailed in this literature are highly complex, in large part because it is atheoretical, and thus difficult to organize effectively. Therefore, we will organize this review by type of outcomes, limiting it to physical health outcomes, with the exception of PTSD. The first section will focus on PTSD, as it is particularly germane to trauma, and the second to self-reported health outcomes. The third will focus on biomedical indicators such as cortisol, immune, cardiovascular reactivity, and lipids, while the fourth section summarizes research on coping and the progression of disease or disease outcomes. Finally, we will review the coping intervention

literature, that is, studies which have actively sought to change how individuals cope with the particular stressor they are facing in an attempt to modify disease progression or outcomes.

Coping and PTSD

There is a growing recognition that how individuals cope with trauma may be more important in the development of post-traumatic stress disorder (PTSD) than the occurrence of the trauma itself (Aldwin, 1999; Mikulincer & Florian, 1996). For example, Fairbank, Hansen, & Fitterling (1991) compared coping strategies of three groups of WWII male veterans, prisoners of war (POWs) with PTSD, those without, and veterans who were not POWs. POWs with PTSD were more likely to use wishful thinking, self-blame, and self-isolation, whereas POWs without PTSD were more likely to use reappraisal coping. Aldwin, Levenson, & Spiro (1994) also found that the perceived benefits of military service also resulted in lower PTSD symptoms in WWII veterans. Vietnam veterans who used more emotion-focused coping were also more likely to report PTSD.

The Israelis have also conducted a number of studies in this area. One prospective study of combat soldiers in the Lebanon War found that wishful thinking and denial were also predictive of PTSD over the course of a year (Solomon, Mikulincer, & Benbenishty, 1989). Concurrent use of problem-focused coping was inversely related to PTSD two to three years after the war in the same population (Solomon, Mikulincer, & Abitzur, 1988). Israeli civilians who used palliative coping during the SCUD missile bombing were more likely to experience negative stress reactions (Zeidner & Hammer, 1992).

As mentioned earlier, the impact of emotional disclosure of trauma may be moderated by the reactions of others in the environment. Specifically, Stephens and Long (2000) found that New Zealand police officers who received positive peer communication and who could easily talk about trauma had lower PTSD scores and lower levels of physical symptoms.

The effects of trauma on health may be mediated through the development of PTSD (Baum, Cohen, & Hall, 1993; Davidson & Baum, 1993; Schnurr, Spiro, & Paris, 2000). Once again, coping strategies may have an indirect effect on health. If their use can prevent the development of PTSD, the adverse heath effects of trauma may be ameliorated.

Coping and Self-Reported Health Outcomes

While there is a fairly extensive literature on coping and mental health outcomes (for reviews see Aldwin, 1999; Lazarus & Folkman, 1994; Zeidner & Saklofske, 1996), there are surprisingly few studies of coping and self-reported physical health symptoms in general populations. Most occur in the context of clinical populations and disease progression, which usually include both biomedical and self-report outcomes, and are reviewed below. However, we did find a few studies which used either worker or student populations.

. Eriksen, Hege & Ursin (1999) examined the interaction between psychological demands, coping, and control in a large sample of Norwegian postal service workers. They found that individual coping styles were more important for subjective health complaints than were either control or organizational factors. Specifically, coping, as assessed by the Utrecht Coping List, moderated the effects of job stress such that individuals with low demands and high coping had the fewest health complaints, while those with high demands and low coping reported the

most. Interestingly, individuals with high demands and high coping had high perceptions of job stress but did not report high levels of symptoms.

Pisarsi, Bohle, & Callan (1998) examined coping and physical symptoms among shift workers. There were both direct and mediated effect of coping on health outcomes. Specifically, disengagement coping strategies were directly related to increased physical symptoms, but emotional expression was mediated through both conflicts and support. Thus, emotion expression appeared to increase physical symptoms via increased work conflicts and concomitant psychological symptoms, but to decrease physical symptoms through increased family support. Unfortunately, this study did not provide any test of the statistical significance of the indirect paths, and thus we cannot contrast the relative strengths of the indirect paths. However, it does make a certain amount of sense that complaining to coworkers may increase distress and result in more physical symptoms, while complaints to family may elicit more support and thus decrease symptoms.

Finally, two studies found that the relationship between coping and physical symptoms disappeared once controlling for personality factors such as neuroticism (Costa & McCrae, 1986) and anxiety (Hemenover & Dienstbier, 1998). However, both of these studies used coping style measures with general outcomes, and thus it is not surprising that the personality traits would better predict a general outcome. More work is needed to determine if the relationship between coping processes and a time-specific measure of physical symptoms would be similarly overwhelmed by personality. Based on prior research with psychological symptom outcomes, (Bolger, 1990), we suspect that the effect of personality on health is at least partially mediated

through coping strategies, but that coping strategies will have independent effects on symptoms, but research is needed to confirm that.

Coping and Biomedical Outcomes

There are literally hundreds of studies in humans showing that stress affects both the neuroendocrine and immune systems, and there is a general agreement that there are individual differences in the effects of stress. Situational constraints such as controllability and personality factors such as Type A have been extensively studied (for reviews see Biondi & Picardi, 1999; Cohen & Herbert, 1996; Frankenhauser & Johansson, 1986; Herbert & Cohen, 1993; Olff, 1999). However, it is more difficult to actually demonstrate a relationship between coping strategies *per se* and Ahard@ biomedical outcomes, in part because there are surprisingly few published studies (although the number of studies examining disease outcomes is growing). Although Biondi and Picardi (1999), in their otherwise excellent review of stress and neuroendocrine factors, state that there is 'a large body of evidence that coping strategies may significantly influence hormonal responses to both laboratory stressors and real life stress situations' (p. 133), closer examination reveals that they based this conclusion on only four published studies. Further, most reviews focus on a particular biomedical outcome, and we felt that providing an overview of several outcomes might prove instructive.

Our initial strategy was to divide the coping and biomedical outcomes literature into laboratory, field, disease outcomes, and intervention studies, separately by coping with stressors vs. coping with trauma in order to provide meaningful contrasts. However, the gaps in the literature made this strategy over-optimistic. While it is not surprising that there were no

laboratory studies on coping with trauma, it turns out that most of the field studies of coping and neuroendocrine outcomes involved traumatic situations. Thus, we will combine both stressor and trauma studies in the same categories, noting differences and similarities, where appropriate.

Laboratory studies. Most laboratory studies examining the effect of coping on neuroendocrine outcomes rely on personality assessments of defenses or coping styles. In these often unpublished studies, defensiveness, avoidance, and repression are typically associated with higher cortisol levels (Biondi & Picardi, 1999). Bossert et al. (1988) found no relationship between coping styles and cortisol, but their sample size was very small (12 men). Van Eck, Nicholson, Berkhof, & Sulon (1996), using a larger sample, also found no relationship between coping style and salivary cortisol. Bohnen, Nicholson, Sulon, & Jones (1991) found that 'comforting cognitions', a type of cognitive reframing, was negatively associated with cortisol response.

A handful of studies have also examined specific coping strategies and cardiovascular outcomes. Tomaka, Blascovich, & Kelsey (1992) found no association between repressive coping and psychophysiological reactivity to stress, once the effect of social desirability was controlled. However, Vitaliano, Russo, Paulsen, & Bailey (1995) examined cardiovascular recovery from laboratory stressors in older adults, and found that avoidance coping was positively related to diastolic blood pressure and heart rate. The same laboratory also found similar findings among caregivers of Alzheimer patients (Vitaliano et al., 1993). Controlling for standard risk factors such as smoking, avoidance coping was associated with higher levels of cardiovascular reactivity.

Individuals who show the highest levels of cardiovascular reactivity also show the greatest immune system disturbances to stress (Herbert, Coriell, & Cohen, 1994). While there is a growing literature on stress and immune functioning (for reviews, see Cohen & Herbert, 1996; Herbert & Cohen, 1993; Kiecolt-Glaser & Glaser, 1995), we located no laboratory studies which examined induced stressors, coping, and immune outcomes. This is surprising in view of the fact that the immune response to stressors occurs in minutes (Eriksen, Olff, Murison, & Ursin, 1999), even before cortisol responses, and thus the immediate impact of coping on immune function could be studied. However, most of the coping and neuroendocrine lab studies were done in the 1970's and 1980's, when the specificity of coping was not as yet well understood and most studies relied on defenses and coping styles. Thus, the absence of coping and immune studies in the laboratory may reflect a more mature understanding of coping. Nonetheless, carefully constructed laboratory studies could clear up some of the conflicting findings in the field studies.

Field studies. Although animal studies have indicated that coping style is linked to neuroendocrine profiles in feral animals (Koolhaas et al., 1999), there are a limited number of field studies assessing the effects of coping on neuroendocrine outcomes in humans. Perhaps the most consistent finding is between urinary cortisol and the effectiveness of defenses. Vickers (1988) reviewed five field studies with stressors ranging from military basic training to having a fatally ill child, each of which found that individuals with effective defenses had lower levels of urinary cortisol.

Studies of coping strategies and neuroendocrine outcomes have yielded mixed results. For example, an early study by Schaeffer & Baum (1984) showed that stress associated with the nuclear power plant disaster at Three Mile Island was related to urinary cortisol, as were psychological and physical symptoms, but coping styles were not. However, coping styles were related to lower levels of distress (Baum, Fleming, & Singer, 1983), which presumably should have some effect, albeit indirect, on cortisol and catecholamines outcomes.

Arnetz et al. (1991) conducted a prospective study of 354 employees of a telecommunications plant that was being downsized. Not surprisingly, long-term unemployment was associated with high levels of serum cortisol. However, coping was only indirectly related to cortisol via its effect on mastery. Emotion-focused coping was negatively related to mastery, which in turn was inversely associated with cortisol.

Avoidance coping may be more directly related to cardiovascular outcomes. In a study of caregivers, avoidance coping was associated with higher levels of cholesterol fractions such as triglycerides, and low density lipoproteins (LDLs), but with lower levels of high density lipoproteins (HDLs) (Vitaliano, Russo, & Niaura, 1995). Aldwin, Levenson, Spiro, & Ward (1994) found that instrumental action was positively associated with HDLs and negatively with triglycerides, while self-blame showed the opposite pattern. Thus, the relations between coping and cholesterol may actually be more consistent that than between coping and cortisol, but many more studies are needed to show a consistent effect.

A handful of studies have examined coping and immune system outcomes. Jamner, Schwartz, & Leigh (1988), in a study of outpatients with stress-related disorders, found that

repressive coping was negatively related to monocyte counts, but positively related to eosinophile counts. However, the repressors were also more likely to be taking antihistamines, so interpretation of this study is difficult. In a study of undergraduates, repressors had significantly higher antibody titers to Epstein-Barr, an indicator of a stressed immune system (Esterling, Antoni, Mahendra, & Schneiderman, 1990). This pattern was not replicated by Solomon, Segerstrom, Grohr, Kemeny, and Fahey (1997) in their study of earthquake victims. Repressive coping, as indicated by a Type C personality inventory, was unrelated to a variety of immune system outcomes, including lymphocyte subjects, lymphoid cell mitogenesis, and NK cell cytotoxity. However, there was an interaction between generalized distress and life disruption, such that individuals with high levels of disruption who did not report being distressed had impaired immune functioning (lower levels of CD3+ and CD8+). The authors' interpretation was that this was indirect support for the impact of repressive coping on immune function.

With the exception of this last article, all of the studies reviewed in this section examined the main effects of coping on biomedical outcomes. However, coping is thought to be a moderator of the effects of stress, which would necessitate the examination of the interaction effects between stress and coping on outcomes. We located only two studies which did so, and thus merit some examination in depth.

In a small sample of 11 seropositive males, Goodkin, Fuchs, Feaster, Leeka, & Rishel (1992) found main effects of active coping on CD4+ cells; Active coping was associated with higher cell counts. While the interaction did not reach significance, contrast comparisons of

means within the high stressor group suggested that there were also significant differences in both total lymphocyte and T_4 cells, with highly stressed active copers having higher cell counts than highly stressed passive copers.

Goodkin and his colleagues (1992) repeated this study in a larger sample of 62 seropositive males. Carefully controlling for a variety of nutritional and lifestyle factors which affect immune function, there were main effects of coping on natural killer cell counts (NKCC), while venting emotions was associated with lower NKCCs. The interaction effect between stress and active coping was not significant. However, there was no indication that the authors centered the interaction terms to account for multicollinearity (cf., Cohen & Cohen, 1975). There was evidence of bouncing betas, as the beta for stress in the main effects model was .72 but -25.69 in the interaction effects model. Thus, the lack of significance of the interaction terms is difficult to interpret.

Summary. Despite the hundreds of biomedical studies that have been done on stress and biomedical outcomes, relatively few studies have linked actual coping strategies with such indicators. The early laboratory studies relied primarily on trait measures of defenses, and various indices of what basically is emotional repression were related to higher cortisol levels. In addition, avoidant and repressive coping are related to greater cardiovascular reactivity and impaired immune function. However, there is some indication that positive coping is related to better outcomes. Problem-focused or active coping is related to higher natural killer and CD4+ cell counts and higher HDL levels. The results regarding coping and cholesterol are promising, but need more replication.

Besides its sparseness, a big limitation of this area is that most studies examine only main effects; given that coping is thought to be a moderator of stress, more studies should examine interaction effects. Barron & Kenny (1986) caution, however, that valid examination of interaction effects often require very large sample sizes, which may be difficult to achieve in very small samples typical of psychoneuroendocrine and immune (PNI) studies (cf., Mishra, Aldwin, Colby, & Oseas, 1991). Another possible solution is for small sample studies to use jack-knife or boot-strap statistical techniques, which may provide more accurate assessments of the standard errors in small PNI samples (Aldwin, Spiro, Clark, & Hall, 1991).

Coping and Disease Outcomes

There is a much more extensive literature on coping and disease outcomes. Several studies have examined pain and symptomology for individuals with chronic illnesses such as rheumatoid arthritis, the progression of serious illnesses such as AIDS and cancer, and even mortality (for reviews, see Garssen & Goodkin, 1999; McCabe, Schneiderman, Field, & Skylar, 1991; Tennen & Affleck, 1996; Zautra & Manne, 1992). These reviews often highlight the complex relationship between coping and outcomes.

A variety of personal and contextual factors may moderate the effects of coping on health outcomes. For example, a review of studies on coping with rheumatoid arthritis (Zautra & Manne, 1992) showed that there were some strategies that were associated with positive and negative outcomes such as pain. However, the results were often inconsistent, and depended upon coping efficacy, family environments, and personality dispositions. For example, the effect of relying on others has different effects depending upon the severity of illness. Relying on

others led to increased psychological distress among women with rheumatoid arthritis who were in relatively good health, but lower levels of distress for women who were in poorer health (Reich & Zautra, 1995). Helgeson, Cohen, Schulz, & Yasko (2000) showed that social support groups had the most positive effect on physical functioning for those breast cancer patients who lacked natural support or had fewer personal resources, but were harmful for those women who had high levels of support.

Further, the effects may vary by type of arthritis disease. Affleck et al. (1999) found that emotion-focused coping was positively associated with increased pain in rheumatoid arthritis patients, but decreased pain in osteoarthritis patients. The emotion-focused coping coded in this study involved seeking support and venting to others. Affleck et al. suggested that the differences between these two groups were due to the response of the caregivers. Osteoarthritis pain is specific to movement and thus may be more understandable to caregivers, whereas the pain involved in rheumatoid arthritis (swollen joints and fatigue) is more global and may evoke less sympathetic responses. This fits in very nicely with the trauma literature reviewed above, in which the effects of social disclosure were also moderate by the response of others in the social environment.

There is also evidence that coping may have indirect or mediated effects on outcomes. Billings, Folkman, Acree, & Moskowitz (2000) showed that coping affected positive and negative affect among men who were caregiving for AIDS patients. Social support coping predicted increases in positive affect, which in turn were related to fewer physical symptoms.

Avoidant coping, however, was related to increases in negative affect, which were related to more physical symptoms.

Coping may also be related to the progression of AIDS. One prospective study of a sample of asymptomatic HIV+ men and women also reported that avoidance and passive coping was positively correlated with development of symptoms, while planful coping was negatively related to progression of HIV symptoms (Vassend, Eskild, & Halvorsen, 1997). A cross-sectional study also found that individuals diagnosed with AIDS were lower in planful problem-solving than HIV negative individuals (Krikorian, Kay & Liang, 1995). A Dutch longitudinal study over one year also found that active confrontational coping predicted slower disease progression HIV+ men (Mulder et al., 1995). A follow-up study also showed that individuals who used avoidant coping had a more rapid deterioration of CD4 cell counts over seven years (Mulder, de Vroome, van Griensven, Antoni, & Sandfort, 1999).

While there is at best weak evidence for the relationship between coping and the development of cancer (Garssen & Goodkin, 1999), coping strategies may affect the response to cancer treatments. Women who used confrontive coping reported fewer side effects from chemotherapy than those who used avoidant strategies (Shapiro et al., 1997). A few studies have directly looked at coping and the progression of cancer, primarily breast cancers. A series of British studies showed that women who used active coping styles lived longer, especially in those women with early, nonmetastatic cancer (Greer, 1991; Greer & Morris, 1975; Morris et al., 1981). In contrast, a study of women with breast cancer showed that repressors had elevated

levels of mortality, with a risk ratio of 3.7 (Weihs, Enright, Simmens, & Reiss, 2000). However, Buddeberg et al. (1996) found modest associates between coping and death from breast cancer. Individuals using problem tackling and self-encouragement were less likely to die, while individuals using distrust & pessimism were more likely to die.

Summary. It is not at all surprising that coping skills and strategies should affect disease progression, especially in those diseases such as AIDS and cancer that have very arduous treatment regimens. It makes perfect sense that individuals who are good planful problem solvers are more able to handle these regimens and have better outcomes, whereas avoidant copers have worse outcomes. More sobering, however, is the recognition that a variety of personal and contextual factors may moderate the relationship between coping and health outcomes such as pain. The effectiveness of coping strategies may vary by the stage of the illness, the type of illnesses, and the responsiveness of others in the environment. This suggests that interventions need to be very specifically tailored to individuals, which is often not the case.

Intervention Studies

One of the simplest and most dramatic coping interventions in the literature is a written emotional expression task. In this paradigm, individuals are encouraged to write about stressful episodes, especially traumatic ones. In a review of this literature, Smyth (1998) found that disclosure lead to significantly better health outcomes in a variety of biomedical outcomes, cardiovascular reactivity and risk factors, immune outcomes, physiological functioning, and health behaviors. No studies on neuroendocrine outcomes were included in this review. A drawback of these studies is that they utilize primarily undergraduate populations, and their utility varies as a function of duration of the writing task. While single intervention episodes can have significant effects, these tend to be weaker than interventions with multiple writing episodes, as narratives tend to become more focused and coherent over time. It is also unclear whether this is due to cognitive processing or the reversal of emotional repression. A review by

Esterling, L'Abate, Murray, & Pennebaker (1999) suggests that both mechanisms may be employed, but for different types of outcomes. Both cognitive processing and the reporting of positive emotions are predictive for emotional well-being, but the reversal of emotional repression may be important for neuroendocrine and immune system outcomes.

A large number of 'coping interventions' in the behavioral medicine literature consist of psychoeducational interventions (for a review Compas et al., 1998). The most dramatic and consistent results are seen with pain interventions. In a meta-analysis of 191 studies, Devine (1992) found that statically reliable, albeit modest, effects were found on recovery, post-operative pain, and psychological. Nearly all (79%) of these studies found a shorter length of hospitalization. Interestingly, adding specific coping skills training to standard pain management treatment programs greatly improved pain control (Kole-Snijders et al., 1999).

Perhaps the most dramatic of interventions studies was conducted by Fawzy and his colleagues (Fawzy, Cousins et al., 1990; Fawzy, Kemeny et al., 1990; Fawzy et al., 1993; Fawzy & Fawzy, 1994), who did specific coping skills interventions with melanoma patients. This was a six-week structured program with multiple components, including health education, psychological support, and training in both problem-solving and stress management. Short-term, the experimental subjects were more likely to use active behavior coping than the controls, and also had more positive affect. Differences in immune functioning were evident between the two groups at the six months assessment. Specifically, experimental subjects had a greater percentage of large granular lymphocytes, more NK cells, and better NK cytotoxicity. While coping strategies were not directly associated with immune cell changes, they were correlated with

affect, which in turn was associated with immune functioning. This supports our supposition that the effects of coping on biomedical outcomes may be mediated through affect. At a five-year follow-up, a third of the control group had died, compared to less than 10% of the experimental group. Longer survival was associated with more active coping at baseline.

Towards a Theoretical Model

As mentioned earlier, the literature on coping and health outcomes is difficult to disentangle, primarily because so little of it is guided by specific theories. In an early study, Aldwin and Revenson (1987) suggested that there are two possible models, direct effects and moderated effects. Escape/avoidant coping appeared to have primarily direct affects, that is, it tends to increase psychological symptoms, regardless of the stressfulness of the event. In contrast, problem-focused coping was more likely to have moderating or buffering effects. However, the current literature suggests that there are five possible models of the relationship between coping and health outcomes, which are illustrated in Figure 1.

(1) Direct Effects. Most of the studies reviewed in this chapter examined only the direct effects of coping on outcome. That is, with notable exceptions, most used a simple correlational paradigm to examine whether coping strategies were related to outcomes.

(2) Moderated Effects. Relatively few studies examined whether coping moderates or buffers the effects of stress; the few that did were hampered either by very small sample sizes or poorly constructed statistical analyses.

(3) Mediated Effects. A number of studies suggested that the effects of coping were mediated through other variables, especially affect. That is, coping related to outcome variables only to the extent that it modified affect.

(4) Contextual Effects. A number of studies also suggested that the effects of coping, especially emotional expression, were moderated by the reaction of other individuals in the context.

(5) Spurious Effects. A handful of studies suggested that the effect of coping on outcomes was spurious; that is, once controlling for personality, the relationship between coping and health outcomes disappeared. This was primarily true for studies with self-reported health outcomes which used coping styles measures.

It appears from the literature reviewed here that different models apply to different types of outcome measures. Given the relatively few studies in each of these different areas, definitive conclusions cannot be drawn; rather, these hypotheses are offered as a useful heuristic that may guide future research. Table 1 represents our attempt to summarize this literature, and indicates which models were supported for different coping strategies by outcomes. Given the wide variety of coping measures used, we chose to roughly group strategies into instrumental action, avoidance (including escapism, wishful thinking, and self-isolation), meaning making, cognitive reframing, self-blame, and social support (which includes emotional expression and disclosure). We did try to differentiate between process and styles measures, although the distinction was not always clear from the studies. Unless otherwise noted, the direct effects of instrumental action, cognitive reframing, and meaning making are assumed to decrease or be associated with lower levels of health problems (indicated by a downward arrow), while avoidant and self-blame

strategies are assumed to increase or be associated with higher levels of health problems (indicated by an upward arrow). Tests for other types of models are indicated simply with an X. Question marks indicate contradictory or inconsistent findings.

As indicated in Table 1, studies of coping with trauma consistently show that instrumental action and meaning making are associated with lower levels of PTSD, while avoidant coping strategies are associated with higher levels. The effects of social support, generally in the form of disclosure, depend upon the context: if the social network is supportive and responds positively, disclosure works well, but if the network is unsupportive, the individual may be worse off than if s/he had not disclosed their experience with trauma. Similarly, self-blame may be associated with poorer outcomes, but if self-blame allows an individual to maintain at least an illusion of controllability, than self-blame may be associated with positive effects. For example, if a rape victim blames herself for approaching strangers in a car, then theoretically at least she should be able to avoid such situations in the future and therefore decrease her risk of another attack. It is surprising that apparently no studies of coping with trauma examined any of the more complex models, such as moderated, mediated, or, for that matter, spurious.

All of the self-reported symptoms studies reviewed here examined coping with ordinary stressors, not with trauma. Given the common findings of increased physical symptoms with trauma, is very surprising that none of the coping studies Nonetheless, the results are similar to those found with PTSD. Instrumental action is generally associated with fewer symptoms, and avoidant styles with higher symptoms. As with trauma, however, the effects of social support appear to be contextual. The one study that examined a mediated model found contradictory

pathways: emotional expression increased coworker conflict, but also increased family support. Thus, it would appear that the effect is actually contextual -- that is, emotional expression in the workplace may increase stress and therefore increase symptoms, but venting to family and friends may increase support and therefore decrease symptoms. It is not surprising that studies using coping styles find that the effect drops out once personality factors such as anxiety are controlled.

Given the vast literature on stress and neuroendocrine function, it is surprising that the results were so inconsistent. While some early studies found that those with "effective defenses" had lower catecholamine levels, it was not clear exactly what this meant, and it was omitted from the table. More recent laboratory studies were just as likely to find no effects of coping styles in general or avoidant styles in particular as they were to find any effects, and none of the field studies found direct effects of coping on neuroendocrine function. However, both the trauma and job loss literatures suggest that the effects may be mediated through affect, although more direct tests are needed.

Given the strength of the animal literature and the theoretical models, it is extremely surprising that stronger effects of coping on neuroendocrine function were not found. At first, our inclination was to attribute this to the problem of timing in field studies. Catecholamines have very rapid responses to stress, it is unlikely that the time periods of the coping behaviors and urine collection adequately overlapped. If the coping resulted in long-term changes in affect, then mediated effects might be seen. However, Stanford's (1993) review of stress and catecholamines suggests an alternative hypothesis. She suggests that, in adapting to stress,

anxiety is associated with high levels of catecholamines, while depression is associated with low levels. Failure to differentiate between the reactions might well lead to the contradictory findings in the literature. In other words, avoidant coping may lead to depression or anxiety, that is, to lower or higher levels of catecholamines. Thus, we hypothesize that the relationship between coping is complex, and mediated not only by level of negative affect but by type as well.

Only a handful of studies have examined coping and biomedical outcomes, and only one was in the context of coping with trauma. Avoidant strategies appear to be associated with higher levels of cardiovascular reactivity, while the effect of repressive style is spurious when controlling for anxiety. Similarly, instrumental action is associated with higher levels of HDL and lower levels of LDL and triglycerides, while avoidance and self-blame shows the opposite pattern. The very early studies on coping and immune outcomes are very difficult to interpret, given poor coping measures, specialized samples, and inconsistent results. Tentatively, instrumental action appears to be associated with higher levels of CD4+ and NKCC, while social support, in the form of emotional venting, was associated with lower levels of NKCC. Clearly there is a huge gap in the literature. More studies needed on the effects of coping on biomedical outcomes, especially in the context of trauma, and more sophisticated models need to be examined than simple direct effects.

Finally, a more extensive literature exists on coping and disease outcomes. The results are much more consistent and give cause for optimism. Nearly every study has found that instrumental action is associated with slower disease progression, fewer side effects of treatment, and fewer symptoms, while avoidant coping shows the opposite pattern. Given the importance

of adherence to medical regimens and dietary restrictions in coping with chronic illnesses, it is not surprising that problem focus coping leads to better outcomes, and avoidant coping to poorer ones. Interestingly, though, Billings et al. (2000) suggests that all of the effects of coping (at least on physical symptoms in AIDS patients) are mediated through affect. Certainly more studies are needed which examine the mediators of coping on disease outcomes, especially vis-à-vis adherence and affect.

The effect of social support on disease outcomes presents a more sobering picture. It is clear that the effects of support are primarily contextual, and have very different effects depending upon the type of illness, reactions to others, and needs of the individual. Clearly, if individuals are severely disabled or relatively socially isolated, provision of positive support may be very beneficial. However, if the primarily caretaker is unresponsive to genuine or creates dependency when support is no needed, then utilization of social support can have harmful effects.

In summary, then, it is clear that much more research is needed in order to understand the effects of coping on physical outcomes, whether in the context of everyday stressors, chronic illness, or trauma. The trauma literature is especially deficient with regard to the effect of coping on biomedical outcomes. While most studies have simply examined direct effects, there are hints in the literature that reality is much more complicated. In particular, it is likely that nearly all of the effects of coping on biomedical and disease outcomes are mediated through affect, and, in the context of chronic illness, to adherence to medical regimes. The effects of social support, however, are highly contextual, and depend upon the needs of the individual and the

responsiveness of others in the environment. Given that nearly all of the theoretical models posit coping as a stress buffer, it is extremely surprising that almost no-one bothers to test this. Despite these gaps, however, the evidence does exist that how individuals cope with problems does have an effect on their physiology, and coping interventions can have sometimes dramatic effects on disease outcomes

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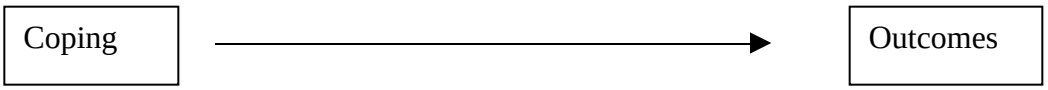
Table 1: Summary of Research on Coping and Health Outcomes

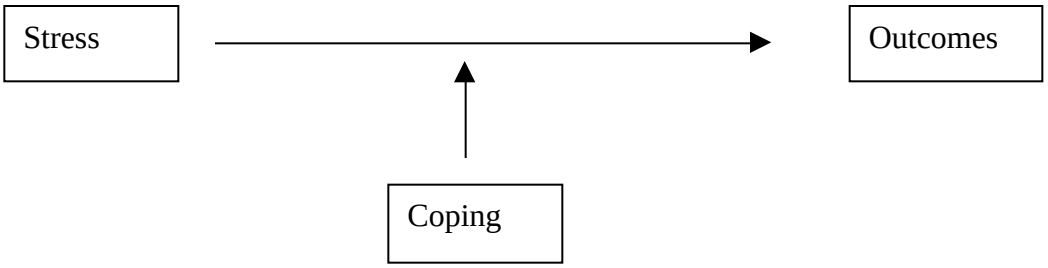
Outcome	Coping	Direct	Moderated	Mediated	Contextual	Spurious
PTSD	Instrumental	↓				
	Avoidant	↑				
	Meaning Making	↓				
	Social Support				X	
	Self Blame				X	
Self-Reported Symptoms	Instrumental	↓				
	Avoidant	↑				
	Social Support			X →	X	
	Coping Styles					X
Neuroendocrine (catecholamines & cortisol)	Cognitive Reframing	↓				
	Avoidant Style	?		X		
Cardiovascular Reactivity	Repressive Style					X
	Avoidant	↑				
Lipids (HDL/LDL)	Instrumental	↑↓				
	Avoidant	↓↑				
	Self Blame	↓↑				
Immune (CD4+ & NKCC)	Instrumental	↑	?			
	Social Support	↓				
Disease Outcomes	Instrumental	↑		X		
	Avoidant	↓		X		
	Social Support			X	X	

Figure 1: Hypothesized Relationships Between Coping and Health Outcomes

DIRECT EFFECTS MODEL

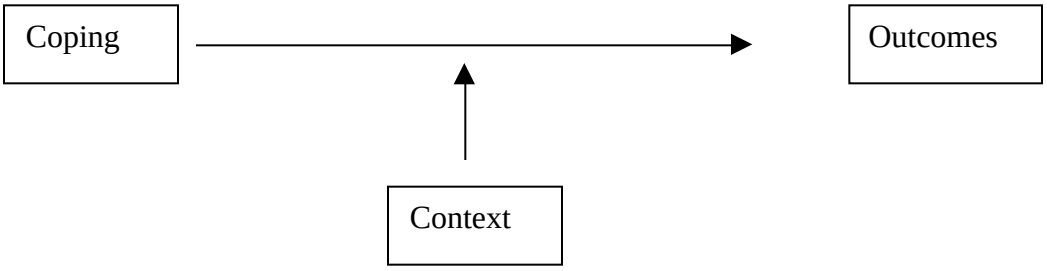


MODERATED EFFECTS MODEL

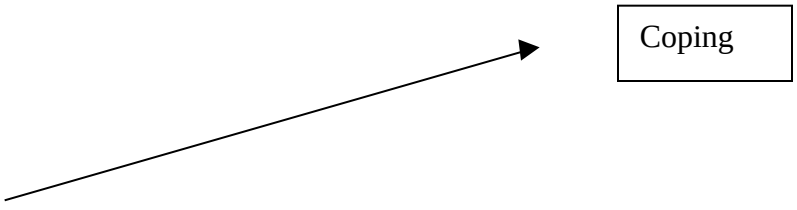


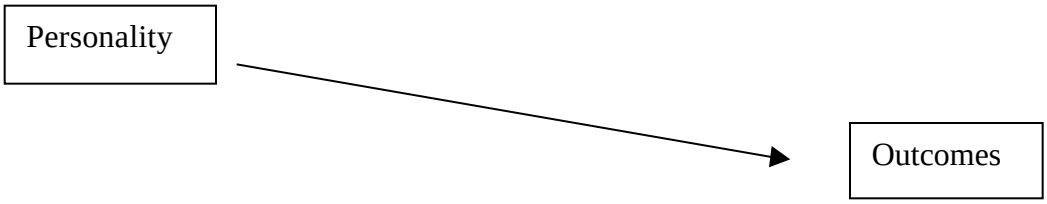
MEDIATED EFFECTS MODEL

CONTEXTUAL EFFECTS MODEL



SPURIOUS EFFECTS MODEL




Personality
Outcomes