CHAPTER ONE

Psychosocial Resources: Functions, Origins, and Links to Mental and Physical Health

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Contents

Abstract

Psychosocial resources are individual differences and social relationships that have beneficial effects on mental and physical health outcomes. The exact processes whereby psychosocial resources beneficially affect well-being and physical health outcomes have, until recently, been largely unknown. We examine chronic negative and positive affect, approach versus avoidant coping processes, and neural responses to threat as likely mediators. These, in turn, regulate

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psychological, autonomic, neuroendocrine, and immune responses, the likely proximal factors that lead to differential health outcomes. The origins of psychosocial resources are in the early environment, genetic predispositions, and their interaction. We conclude with consideration of whether psychosocial resources can be taught and a discussion of issues remaining to be addressed by future research.

Personality and social psychologists have long studied individual differences in psychosocial resources, including personality traits and social relationships, and their contributions to psychological well-being (e.g., Antonovsky, 1979; Hobfoll, 1989; Taylor, 1983). In the past two decades, it has become evident that many of these same individual differences and relationships contribute to physical health outcomes as well (e.g., Adler, Marmot, McEwen, & Stewart, 1999). In this review, we consider what individual differences and social relationships may reasonably be thought of as psychosocial resources by examining the evidence that they contribute to mental and physical health. Because several of these resources have been studied for nearly 30 years, we draw on reviews and meta-analyses of the literature wherever possible. We next explore possible pathways whereby psychosocial resources have effects on psychological and physical health, including chronic positive or negative affect; approach/active coping; neural activation of brain regions involved in stress regulation; and effects on cardiovascular, endocrine, and immune functioning. We then examine the origins of psychosocial resources in the early environment, genetic predispositions, and their interaction. Together, these findings converge on a multilevel integrative model that ties together observations from the societal level to the molecular level (Fig. 1.1). Finally, we discuss prospects for improving psychosocial resources and address some as yet unresolved issues.

1. Psychological and Social Resources: What Are They?

In this section, we review optimism, mastery/perceived control, self-related resources, social support, and, more briefly, several other individual differences and social factors that have been tied to beneficial mental and physical health outcomes. As will be seen in the later section, these positive resources are somewhat intercorrelated (at ~0.35–0.55) but are also sufficiently independent to warrant independent consideration.

1.1. Optimism

One of the most widely studied psychosocial resources is optimism. Optimism reflects the extent to which people hold favorable expectations about the future (Scheier & Carver, 1992). As a dispositional variable, it reflects

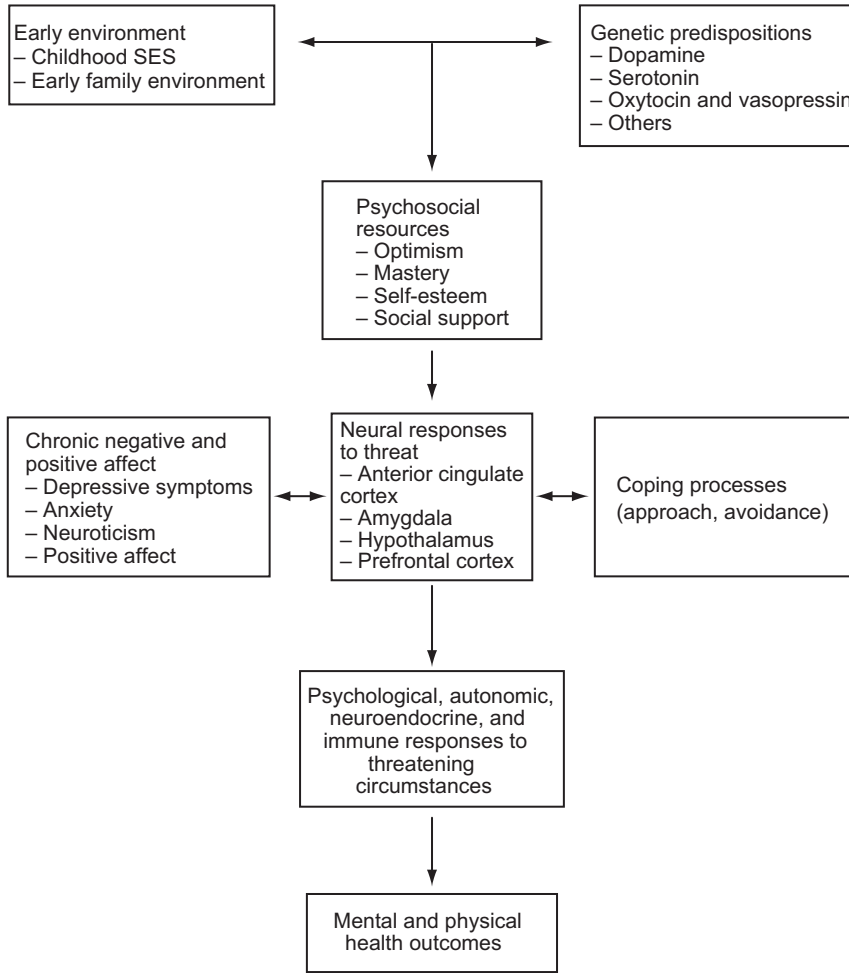

Figure 1.1 A model of the development and deployment of psychosocial resources.

generalized favorable expectations across a broad array of outcomes. Situational optimism reflects favorable expectations in a specific situation; it may or may not be correlated with dispositional optimism, as studies comparing dispositional optimism with measures of situation-specific expectancies often find weak or negligible relations between the two (see Armor & Taylor, 1998 for a review).

1.1.1. Dispositional optimism

The groundbreaking work on dispositional optimism was conducted by Scheier and Carver (1992). To assess dispositional optimism, Scheier, Carver, and Bridges (1994) developed a scale, the LOT-R, that measures

optimism as a pervasive individual difference and includes such items as "In uncertain times I usually expect the best" and the reverse-coded, "If something can go wrong for me, it will."

Controlling for previous well-being, higher levels of optimism are related prospectively to better well-being, especially in times of adversity (for a review, see Carver, Scheier, & Segerstrom, 2010). For example, in a study that speaks to the role of optimism as a resource, Brissette, Scheier, and Carver (2002) had beginning college students complete measures of optimism, perceived stress, depression, and social stress at the start of the college year and again at the end of the first semester. At the end of the semester, optimists reported less stress and depression and more social support, suggesting that their optimistic expectations helped them weather this difficult transition.

Optimism has also been related to better physical health outcomes. It is protective against coronary heart disease in older men (Kubzansky, Sparrow, Vokonas, & Kawachi, 2001), unpleasant side effects of cancer treatments (De Moor et al., 2006), cancer mortality among the elderly (Schulz, Bookwala, Knapp, Scheier, & Williamson, 1996), pain (Geers, Wellman, Helfer, Fowler, & France, 2008; Rosenberger, Kerns, Jokl, & Ickovics, 2009), loss of pulmonary function (Kubzansky et al., 2002), and illness-related disruption of social and recreational activities in breast cancer patients (Carver, Lehman, & Antoni, 2003), among other beneficial health-related outcomes (see Carver et al., 2010, for a review). Optimism has also been tied to a longer life (Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004; but see Tomakowsky, Lumley, Markowitz, & Frank, 2001).

Exactly how optimism achieves these effects has been examined, and the fostering of active approach-oriented coping efforts has been implicated in several studies (e.g., Scheier, Weintraub, & Carver, 1986). For example, in a study with coronary artery bypass patients, Scheier et al. (1989) found that optimists' use of more problem-focused coping and less use of denial led to a faster rate of recovery during hospitalization and a faster rate of returning to normal activities after discharge. Optimism also predicted postsurgical quality of life 6 months later. In the college student study noted above (Brissette et al., 2002), the reasons why optimists managed the stress of college better included the fact that the optimists were more likely than pessimists to seek out social contact with others and to positively reinterpret the stressful circumstances they encountered. Active coping has been found to mediate the relation of optimism to better adjustment in stressful circumstances (Brissette et al., 2002; Carver et al., 1993). Optimists also use more emotional approach coping (Stanton, Danoff-Burg, Cameron, & Ellis, 1994; Stanton, Sullivan, & Austenfeld, 2009), especially in dealing with uncontrollable stressors (Carver et al., 2010).

Other potential mechanisms linking optimism to mental and physical health outcomes include the fact that optimism is reliably associated with a

stronger sense of personal control (Ruthig & Chipperfield, 2006), a more positive mood, and better health behaviors (Carver et al., 2010). Optimism is related to more social resources as well, such that optimists have better social connections than pessimists; social connections, in turn, appear to increase optimism (Carver et al., 2010), so there is a reciprocal relation between these variables. Optimism has been tied to lower physiological responses to stress (Carver et al., 2010), which may account, in part, for its relation to better physical health outcomes. Optimism has also been tied to better immune functioning, in part via its association with a more positive mood (Segerstrom & Sephton, 2010).

1.1.2. Situational optimism

The literature on situational optimism has addressed primarily the outcomes of goal pursuit and performance, rather than mental and physical health outcomes. On the whole, optimistic expectations have been found to facilitate performance and progress toward goals (Armor & Taylor, 1998). An important theme that the dispositional versus situational optimism literature highlights, accordingly, is the continuity between research on everyday pursuit of goals and research on coping with stress. That is, studies of dispositional optimism often concern how people cope with stressful events, and so outcomes assessed are typically psychological distress and health-related outcomes. In contrast, the situational optimism literature more commonly examines goal-oriented motivation and performance, and so those studies tend to emphasize achievement-related outcomes (Armor & Taylor, 1998). This distinction between goal setting and attainment and stress reduction may be somewhat arbitrary because, in fact, parallels between the two literatures are evident and may be instructive: Both literatures make compelling cases that optimistic expectations about one's outcomes facilitate adaptive problem-solving activity and approach-oriented activities. For example, in one study (Solberg Nes, Evans, & Segerstrom, 2009), dispositional optimism predicted staying in school via enhanced motivation and better psychological adjustment; academic optimism, that is, specific optimism related to the academic environment, predicted staying in school via its effect on grade-point average, as well as via motivation and adjustment.

Is there a downside to optimism? Whether unrealistic optimism is beneficial has been widely explored in the situational optimism literature, specifically, whether it incurs potential risks, such as disappointment or unrealistic goal setting (e.g., Weinstein, 1982). A review by Armor and Taylor (1998) concluded that these risks may not be as common or as problematic as originally expected. Although people who are unrealistically optimistic may fall short of their overly optimistic expectations, it appears that they, nonetheless, achieve more than they would have, had they maintained more pessimistic assessments (e.g., Armor & Taylor, 2003).

A second concern has centered on whether optimism blinds people to realistic risks to which they should be attentive. On the whole, this concern may also be less worrisome than first thought. For example, in three experimental studies with diverse methods, Aspinwall and Brunhart (2000) found that optimistic beliefs were linked to greater, not lesser, processing of health risk-related information, as the level of self-relevant threat increased (see also Geers, Wellman, Seligman, Wuyek, & Neff, 2010). Taylor et al. (1992) found that gay men who were unrealistically optimistic about their ability to stave off AIDS engaged in more health-promoting behaviors and utilized more active coping than those who were less optimistic (see also Reed, Kemeny, Taylor, Wang, & Visscher, 1994). It may be that optimists are more confident than pessimists that their efforts to control or reduce their risk will be successful and, thus, may be more likely to engage in these efforts (Carver et al., 2010). As will be seen, there is neural evidence consistent with this hypothesis as well. However, not all research suggests benefits of unrealistic optimism (see Luo & Isaacowitz, 2007), and so the evidence on this issue remains mixed.

Because optimists are more persistent than pessimists in pursuing their goals, this can lead to other potential costs. Specifically, optimists can experience short-term physiological costs in reactivity because of their enhanced striving. When optimists' expectations are not met, they may experience more stress and more compromised immune functioning as a result of their unsuccessful efforts to attain goals (Segerstrom, 2001), including suppressed immune responses (Segerstrom, 2006). More typically, though, optimism enables people to deploy coping skills more effectively and, thereby, reduces stress.

People seem to have an intuitive wisdom about their optimistic expectations, especially when those expectations might be somewhat positively biased, and they behave in such a way as to minimize personal costs of misplaced optimism. First, people are not indiscriminately optimistic. For example, as they move closer to the outcomes they seek, their optimistic expectations become more tempered, presumably because the reality of potentially falling short becomes more evident (e.g., Gilovich, Kerr, & Medvec, 1993; Shepperd, Ouellette, & Fernandez, 1996). Second, human beings have substantial interpretive abilities so that outcomes that fall short may be recast to be consistent with initial expectations (Armor & Taylor, 1998). Although overly optimistic expectations are rarely completely fulfilled, optimistic predictions tend to yield favorable evaluations of outcomes (e.g., Sherman, 1980). This might be achieved, for example, by shifting one's standard of evaluation or by "getting what you want by revising what you had" (Conway & Ross, 1984). People tend to be more unrealistically optimistic about outcomes that are not easily verified, as opposed to outcomes can be easily verified. Thus, for example, desired outcomes that are more subjective may generate more unrealistic optimism than those that can

be objectively measured (Armor & Taylor, 1998). Moreover, although expectations often tend in the direction of an optimistic bias, they are not out of touch with reality; they show relative, if not absolute, accuracy.

In conclusion, the association of dispositional optimism with beneficial outcomes is paralleled in research on situational optimism (Armor & Taylor, 1998) and may be underpinned by some of the same mechanisms, such as active coping, despite the focus on different outcomes.

1.2. Mastery/psychological control

The belief that one can master or exert control over the environment has long been considered adaptive, both for pursuing personal goals and for helping people to cope with threat or stress (e.g., Poortvliet, Janssen, Van Yperen, & Van de Vliert, 2007; Thompson, 1981). Mastery or psychological control involves the belief that one can determine one's own behavior, influence one's environment, and bring about desired outcomes. Like optimism, mastery may be dispositional or situational in nature. As a dispositional factor, mastery is typically assessed by the Pearlin Mastery Scale (Pearlin & Schooler, 1978), which includes such items as, "I can do just about anything I really set my mind to" and the reverse-coded, "I have little control over the things that happen to me." On the situational level, mastery/control is typically assessed or manipulated as the perception that one's efforts will enable progress toward or achievement of desired outcomes. Perceived control is conceptually related to self-efficacy, which is the more narrow perception that one can take a specific action necessary to bring about a specific outcome in a specific situation (Bandura, 1977) and to the concept of perceived behavioral control (Ajzen, 2002); perceived behavioral control combines beliefs in mastery/controllability and beliefs about self-efficacy, but is typically treated as a unitary concept (Ajzen, 2002).

Across a broad array of situations using a variety of methodologies, the belief that one can control stressful events has been tied to emotional well-being, successful adjustment to a stressful event, good health behaviors, good performance on cognitive tasks, and good mental health (Gale, Batty, & Deary, 2008; Thompson & Spacapan, 1991). For example, a considerable literature has identified a sense of mastery as a protective factor against depression in response to threat or stress (e.g., Badger, 2001; Dunkle, Roberts, & Haug, 2001; Jang, Haley, Small, & Mortimer, 2002; Pearlin, Lieberman, Menaghan, & Mullan, 1981).

On the physical health side, a sense of control or mastery has been linked to a lower risk of mortality, primarily due to cardiovascular disease (Surtees, Wainwright, Luben, Khaw, & Day, 2006) and to lower levels of cardiovascular risk factors (Mausbach et al., 2008; Paquet, Dube, Gauvin, Kestens, & Daniel, 2010). Perceptions of self-efficacy have been tied to lower

physiological and psychological stress responses and to better mood (Nierop, Wirtz, Bratsikas, Zimmermann, & Ehlert, 2008).

Control may be especially important for vulnerable people, such as children, the elderly, and medical patients who are at risk for exacerbation of health problems (Wrosch, Schulz, Miller, Lupien, & Dunne, 2007). Because control may be difficult for people who already have little opportunity to exert it, anything that enhances perceptions of control may particularly benefit such people. For example, a study by Jeon and Dunkle (2010) found that among older adults, who typically experience a reduced sense of mastery relative to younger people, those higher in sense of mastery were less likely to experience depressive symptoms over time and, thus, mastery acted as a protective resource.

An important aspect of psychological control is the fact that people often generate feelings of control spontaneously to help them cope. For example, medical patients with chronic or advancing disease often generate perceptions that they can control aspects of their illness, such as its symptoms, course, and treatment (Taylor, 1983). Generally speaking, these perceptions are adaptive (Helgeson, 1992; Michela, 1987; Taylor, Lichtman, & Wood, 1984), even when they are not completely realistic (Taylor, 1983). For example, cancer patients' beliefs that they have control over aspects of their disease or care seem to reflect a capacity to adapt, rather than a vulnerability to distress (Henselmans et al., 2010; Wrosch et al., 2007).

Paralleling the dispositional–situational distinction in research on optimism, studies of situational control or mastery often focus on goal achievement in specific situations. For example, behavioral intentions and perceptions of behavioral control are strong predictors of subsequent behavior and link attitudes to actions (Ajzen, 2001). A large literature on implicit theories of learning (Dweck, in press) indicates that beliefs that one can modify one's personal attributes are very important to achievement. The belief that abilities are malleable and controllable is important not only for guiding activities toward goals but especially for confronting challenges and setbacks (Dweck, in press). An experimental study revealed a related pattern (Pham, Taylor, & Seeman, 2001). College student participants were exposed to an experimental priming manipulation that made salient the unpredictable/uncontrollable aspects of college, the predictable/controllable aspects of college, or neutral features of the college environment. They later completed a thought-listing task about college. Participants who had been exposed to the predictable/controllable manipulation made more references to the future and more references to personal goals in their thought-listing protocols than those in the neutral or the uncontrollable condition.

The perception of control is not a panacea for all aversive situations. People who desire control may especially benefit from interventions that emphasize it (Thompson, Cheek, & Graham, 1988), but control can be

aversive when it gives people more responsibility than they want (Chipperfield & Perry, 2006). Providing too much information or too many choices may be stressful and exacerbate, rather than ameliorate, distress (e.g., Iyengar, 2010; Schwartz, 2004; Thompson et al., 1988). Nonetheless, on the whole, control is a beneficial psychosocial resource.

What are the avenues by which control beneficially affects mental and physical health? They appear to parallel some of the same mechanisms found for optimism. That is, feelings of control or mastery lead people to make active coping efforts. Beliefs in control can also alter physiological responses to stress. For example, in the Pham et al. (2001) study described earlier, participants who had been primed to think of college as predictable and controllable had lower systolic blood pressure and heart rate reactivity in response to the experimental task, compared with those in the neutral condition and the unpredictable condition.

1.3. Self-related resources

Self-related resources, such as self-esteem and the self-concept, have been widely examined for their effects on well-being and health.

1.3.1. Self-esteem

Like optimism and mastery, self-esteem has been studied as a disposition and as a factor that can vary by situation or life domain (Campbell, 1990; Crocker & Knight, 2005). When studied as a disposition, the Rosenberg Self-Esteem Scale (Rosenberg, 1965) is often administered, which includes such items as, "I feel that I have a number of good qualities" and the reverse-coded, "All in all, I am inclined to feel that I am a failure."

The relation of self-esteem to well-being is virtually definitional, and conventional definitions of mental health maintain that feeling good about oneself is a central component (see Taylor & Brown, 1988). Empirical evidence supports this idea. For example, using two large longitudinal datasets including more than 4000 people aged 18–96 years, Orth, Robins, Trzesniewski, Maes, and Schmitt (2009) found that low self-esteem predicted subsequent depressive symptoms (whereas depressive symptoms did not predict subsequent low self-esteem). The pattern was consistent across all age groups, for several measures of depression, and after controlling for content overlap between the measures. Using two large longitudinal datasets, with repeated measures on people ages 15–21 and 18–21, Trzesniewski, Donnellan, Moffitt, Robins, Poulton, and Caspi (2006) again found that low self-esteem predicted subsequent levels of depression, but not the reverse. Low self-esteem in adolescence was also predictive of poorer mental and physical health, worse economic prospects, and a higher likelihood of engagement in criminal behavior during adulthood, relative to high self-esteem; these effects were not explained by

depression or SES. Thus, low self-esteem appears to be a risk factor for psychological distress at all ages during adult life (Orth et al., 2009). For the most part, self-esteem seems to be more protective at lower levels of stress; at high levels of stress, stress itself can overwhelm the benefits of self-esteem (Whisman & Kwon, 1993). Even when self-regard is somewhat overly positive, it can have mental health benefits (Kwan, Love, Ryff, & Essex, 2003; Taylor et al., 2003a).

Self-esteem may exert its effects on health outcomes by some of the same routes as optimism and mastery. For example, people with high self-esteem have been found to use less avoidant and more approach-oriented coping (Aspinwall & Taylor, 1992). Similar to the findings for mastery (Dweck, in press), Crocker and colleagues (e.g., Niiya, Brook, & Crocker, 2010) found that people who believe that they can improve their personal qualities are more resilient in response to failure than people who do not. Low self-esteem is a potent predictor of psychological and biological reactivity to stress (Pruessner, Lord, Meaney, & Lupien, 2004) and thus can compromise well-being; these effects may be mediated by social bonds (Stinson et al., 2008).

1.3.2. Ego strength

Related to self-esteem is a cluster of personality qualities called ego strength, including dependability, trust, and lack of impulsivity (Deary, Batty, Pattie, & Gale, 2008). This cluster appears to have health benefits. For example, in a longitudinal investigation (Friedman et al., 1995), researchers studied adults who had first been interviewed as children in 1921–1922. Those who were high in ego strength as children lived longer as adults. One reason is that the people with high ego strength were less likely to smoke and use alcohol to excess, and so one route that may link ego strength to health outcomes is better health habits (Friedman et al., 1995; Temcheff et al., 2010).

1.3.3. Self-concept

The self-concept is not inherently a psychosocial resource but, rather, represents the beliefs that people hold about their personal attributes. Nonetheless, there are aspects of the self-concept that may act as psychosocial resources. For example, people who hold multiple roles and have multiple areas in their lives that are sources of reward are better buffered against setbacks than people who do not (Chrouser Ahrens & Ryff, 2006; Linville, 1987; Waldron, Weiss, & Hughes, 1998). The self-concept represents areas of vulnerability as well as resilience. Within the self-concept, certain domains are central, such as the work role or the marriage role, whereas others may be more peripheral, such as one's sense of self as a decent tennis player. Threats to core areas of the self engage defensive processing of personally relevant risk-related information, whereas threats

to more peripheral areas of the self may lead people to refocus their efforts on other self-relevant life domains (Sherman & Cohen, 2006).

1.3.4. Self-affirmation

An extensive literature has examined whether manipulating self-related resources improves well-being, health, and coping with stress (Sherman & Cohen, 2006). Much of this work is guided by the theory of self-affirmation (Steele, 1988), which asserts that the goal of the self system is to protect a positive self-image; when self integrity is threatened, people respond to restore self-worth. People may affirm alternative self resources, as by reflecting on important aspects of life irrelevant to the threat or by engaging in an activity that makes personal values salient, such as religion, the importance of friends and family, or artistic endeavors. In a typical self-affirmation study, people rank order their values and then are instructed to focus on a value that ranks high for them versus one that is less important (low self-affirmation), and they are then are exposed to tasks or information that threaten the self.

On the mental health side, self-affirmation can reduce ruminative thinking among people exposed to a personal threat, such as failure on an IQ test (Koole, Smeets, van Knippenberg, & Dijksterhuis, 1999), and buffer people biologically against stress. For example, in one study (Creswell et al., 2005), people who had either affirmed an important value or a less important value participated in stressful tasks in the laboratory (the Trier Social Stress Task, involving difficult mental arithmeticand the preparation and delivery of a speech to an unresponsive audience; Kirschbaum, Klauer, Filipp, & Hellhammer, 1995). Those who had self-affirmed in advance showed lower cortisol responses to the tasks. Trait self-esteem and optimism moderated the relation between self-affirmation and psychological distress, such that participants who had dispositional self resources and who had affirmed personal values reported being the least stressed. Sherman, Bunyan, Creswell, and Jaremka (2009) reported that self-affirmation exercises resulted in lower urinary catecholamine levels in response to the stress of exams.

Self-affirmation can also affect physical health-related outcomes. Keough (1998) found that participants who wrote self-affirmation essays over the winter break were less likely to visit health services upon their return to school. Health behaviors may be beneficially affected by self-affirmation as well (Sherman, Nelson, & Steele, 2000). Linking health behavior change campaigns to identity cues related to personally important values can improve the long-term impact of such messages (Dal Cin, MacDonald, Fong, Zanna, & Elton-Marshall, 2006).

An important caveat regarding self-affirmation is that the self-affirmation needs to be in a domain different from that involving the threat. Thus, for example, self-affirmation of values unrelated to a threatening or stressful

event decreases bias and inflexibility, but self-affirmations within the same domain actually backfire, enhancing distress and defensiveness (Sherman & Cohen, 2006). The self-affirmation process also needs to occur prior to a threat to the self in order to reduce defensive responses (Critcher, Dunning, & Armor, 2010).

Otherwise, though, self-affirmation processes can overcome defensive processing of risk-related information, paralleling observations on dispositional optimism. For example, when a health message is threatening, people may scrutinize it closely in a defensive effort to make the message seem less related to their health outcomes (e.g., Ditto & Lopez, 1992; Kunda, 1987). However, if people have affirmed an important self value prior to processing personally relevant risk-related information, they process that information in a more even-handed way (Epton & Harris, 2008; Reed & Aspinwall, 1998; Sherman et al., 2000).

1.4. Other individual difference psychosocial resources

The preceding psychosocial resources of optimism, mastery, and self-esteem are those that have generated the most research and for which the evidentiary basis relating both dispositional and situational assessments to mental and physical health-related outcomes is the strongest. There are, however, other individual difference variables that may reasonably be considered psychosocial resources that we consider briefly here.

1.4.1. Conscientiousness

Conscientiousness is associated with good health and longevity (Kern, Friedman, Martin, Reynolds, & Luong, 2009; Taylor et al., 2009; Terracciano, Löckenhoff, Zonderman, Ferrucci, & Costa, 2008). For example, a study that examined personality ratings for youngsters in 1921–1922 found that children who were highly conscientious were more likely to live to an old age (Friedman et al., 1995). Conscientious people may be more successful in avoiding situations that could harm them, and they also practice good health habits reliably (O'Cleirigh, Ironson, Weiss, & Costa, 2007; O'Connor, Conner, Jones, McMillan, & Ferguson, 2009), although research suggests that the beneficial effects of conscientiousness on longevity cannot be explained entirely by health behaviors (Terracciano et al., 2008).

Historically, conscientiousness has been measured by self-perceptions of competence, a preference for order, dutifulness, achievement striving, self-discipline, and deliberation (e.g., O'Cleirigh et al., 2007); thus, it is possible that conscientiousness as a trait is a marker for skills that contribute to the ability to get things done, including the willingness to persevere on difficult tasks and the capacities to be organized, orderly, and dutiful about completing tasks. As such, the role of conscientiousness in fostering beneficial

mental and physical health outcomes under stressful circumstances may well be underestimated. Conscientious people may be able to avoid many stressful events. Precisely because they are organized, dutiful people, they may never actually encounter certain stressors. For example, if you are conscientious about getting your car in for its regular service, the likelihood that you will be confronted with a more major problem down the road is reduced, as potential problems can be preempted or nipped in the bud. Thus, conscientiousness may be a psychosocial resource that is distinctively preemptive in nature, relative to the other psychosocial measures discussed thus far (Aspinwall & Taylor, 1997).

1.4.2. Extraversion

Extraversion refers to a person's preferences for social settings and a tendency to be outgoing, which are underpinnings of a socially engaged lifestyle (Wilson et al., 2005). Extraversion is generally tied to a positive mood (e.g., Stafford, Ng, Moore, & Bard, 2010) and has been tied to physical health benefits (e.g, Broadbent, Broadbent, Phillpotts, & Wallace, 1984; Cohen et al., 1998; Cohen, Doyle, Turner, Alper, & Skoner, 2003a; Totman, Kiff, Reed, & Craig, 1980) and reduced risk of mortality in old age (Wilson et al., 2005).

1.4.3. Other potential resources

Investigators have alluded to other potential psychosocial resources, including a sense of purpose in one's life, finding meaning in adversity, and a sense of humor (e.g., Chida & Steptoe, 2008). However, these resources have received less research attention, and so their status as psychosocial resources related to psychological and physical health cannot currently be established.

1.5. Social relationships and social support

Human beings' tendencies to come together in group living have historically represented a vital mechanism for protecting against threats, including predation, natural disasters, and attack by other social groups. Whereas most other species are armed with defensive weapons, such as sharp teeth or claws, or defensive resources, such as thick skin, human beings depend critically on one another for survival. Although current research on the protective aspects of social relationships only rarely concerns these historically significant threats, considerable research confirms the beneficial effects of social relationships on mental and physical health. Simply put, people who have or perceive themselves to have strong and close social contacts are less likely to suffer emotional distress, and they have better health and longevity than people without such contacts. As more than 800 studies attest to these benefits, we do not review them further here (for reviews, see House, Landis, & Umberson, 1988; Taylor, 2011; Uchino, 2009).

Social relationships and a common consequence, namely social support, are the best established psychosocial resources for protecting mental and physical health. Social support is defined as the perception or experience that one is loved and cared for by others, esteemed and valued, and part of a social network of mutual assistance and obligations (Wills, 1984). Social support can be provided by a partner, relatives, friends, coworkers, social and community ties, and even pets (Allen, Blascovich, & Mendes, 2002). Early research on social support classified support into several explicit forms. Informational support occurs when one person helps another to understand a stressful event better and determine what resources and coping strategies may be needed to deal with it. Instrumental support involves the provision of tangible assistance, such as financial aid, food, housing, or transportation. Emotional support involves providing warmth and nurturance to another person, and reassuring that person that he or she is a valuable person for whom others care. This commonly employed taxonomy implies that the benefits of social contact are achieved primarily during or following the enactment of social support.

However, many of the benefits of social support accompany the perception that social support is available if needed. The emphasis on perceived social support is well-placed, because to have its beneficial effects, social contact need not be explicitly supportive (e.g., Kim, Sherman, & Taylor, 2009). Perceived support appears to have a dispositional quality and may arise in part from genetic factors (Kessler, Kendler, Heath, Neale, & Eaves, 1992) and from secure attachments formed in the early family environment (see Gallo & Matthews, 2006; Mikulincer & Shaver, 2009; Uchino, 2009). Indeed, there is evidence that extracting or obtaining explicit support from others can sometimes backfire and complicate or exacerbate reactions to stressful events. Explicit support from others may undermine self-esteem, for example, communicating a sense that one is inefficacious (Bolger & Amarel, 2007).

Researchers have examined whether social resources achieve their beneficial effects chiefly during periods of stress or threat (the buffering hypothesis), or whether they are a constant protective feature of the environment. Generally speaking, measures of social integration, which involve tallying up the number of social relationships in which an individual is involved, the number of social roles a person occupies, the frequency of contact with the network, and the number, density, and interconnectedness of relationships show direct associations with mental and physical health benefits, but not necessarily buffering effects during times of stress or threat (Alloway & Bebbington, 1987; Thoits, 1995). The perception that emotional support is available, however, both directly benefits mental and physical health and also buffers people against psychological distress and poor health during threatening or stressful times (Thoits, 1995).

What are the mechanisms by which social support affects mental health? Social support no doubt provides some protection against stress through the

specific benefits that can be provided by others, that is, the functional taxonomy described earlier. Emotional support may be protective primarily through physiological routes. In reviews, Uchino (2006, 2009) concluded that cardiovascular, neuroendocrine, and immune functioning associated with social support exert multiple protective biological effects (see also Taylor, 2011).

1.6. Psychosocial resources as a composite variable

Psychosocial resources are often studied as a composite variable, as they are intercorrelated, although only moderately so. For example, in one study (Taylor et al., 2008), measures of self-esteem, optimism, and mastery were correlated between 0.384 and 0.534, suggesting overlap but a degree of independence. (A second unpublished dataset by the same research laboratory found very similar levels of interrelation.) Like the individual assessments, composite measures have been tied to both mental and physical health-related outcomes. In a meta-analysis of 35 investigations of the relation between positive psychological well-being and mortality, Chida and Steptoe (2008) found that psychosocial resources (including life satisfaction, optimism, and sense of humor) were associated with reduced mortality in healthy population studies, and the effects were particularly strong for cardiovascular disease. In another study, a composite of psychosocial resources including locus of control and self-esteem showed significant associations with young adult health (Murasko, 2007). Using a cluster of psychosocial resources that included optimism, mastery, self-esteem, and social support, Taylor and colleagues found relations with positive mental health profiles, assessed by both paper and pencil and clinical assessments of mental health (Taylor et al., 2003a); they also related this composite measure of psychosocial resources to lower physiological responses to laboratory stress tasks (Taylor, Lerner, Sherman, Sage, & McDowell, 2003b). Using data from a large-scale ($N > 3000$) investigation of cardiovascular risk factors (CARDIA), Taylor and colleagues also related psychosocial resources to better metabolic functioning (a composite variable predicting several chronic disorders including heart disease and diabetes; Lehman, Taylor, Kiefe, & Seeman, 2005), lower C-reactive protein (a marker of inflammation; Taylor, Lehman, Kiefe, & Seeman, 2006), lower blood pressure (Lehman, Taylor, Kiefe, & Seeman, 2009), and lower increases in blood pressure over time (Lehman et al., 2009).

A number of the studies that employed composite measures of psychosocial resources drew on Cognitive Adaptation Theory (Taylor, 1983). This theory maintains that resources such as perceived control and self-esteem are often generated spontaneously in response to threatening events, such as health threats, and aid in the process of coping. Several studies have supported this line of thinking. Pinquart, Fröhlich, and Silbereisen

(2007a), for example, compared adult cancer patients with healthy controls and found higher levels of optimism, purpose in life, and self-esteem in the cancer patients, relative to the healthy controls, with levels of these resources declining to those experienced by healthy adults over time. Results were interpreted as consistent with the prediction that psychosocial resources arise spontaneously to meet the challenge posed by threatening events and decline over time, as the threat declines (Taylor, 1983). Ickovics et al. (2006) followed more than 700 HIV-seropositive women and found that psychosocial resources (in this case, positive affect, optimism over health outcomes, and finding meaning) protected against HIV-related mortality and decline in CD4 lymphocyte counts, a marker prognostic for advancing disease. Among patients treated for coronary artery disease with percutaneous transluminal coronary angioplasty, Helgeson (2003) found that positive self-views, a positive view of the future, and a sense of personal control were associated prospectively with good adjustment to disease, even when initial adjustment was taken into consideration. Helgeson (1992) found that adjustment was better for cardiac patients with a strong sense of personal control, compared to those with little sense of control. Tomich and Helgeson (2006), however, found that perceptions of personal control over illness (but not optimism or self-esteem) were associated with worse physical and mental functioning and benefit-finding among women who subsequently sustained a recurrence. Pinquart, Fröhlich, and Silbereisen (2007b) found that high levels of social support and optimism among cancer patients facing chemotherapy predicted more positive changes and fewer negative changes over time, leading to greater psychological well-being. They concluded that patients with low levels of psychosocial resources are "at risk for finding nothing beneficial in adversity" (p. 907).

2. Mediators Linking Psychosocial Resources to Mental and Physical Outcomes

It is not immediately obvious why psychosocial resources should have beneficial effects on mental and physical health-related outcomes. Although some social support efforts include tangible assistance and information, why thinking about the benefits of social relationships, contemplating a situation more optimistically, with an enhanced sense of mastery, or mustering self-related resources would facilitate health outcomes requires more explication.

In this section, we address the possibilities that psychosocial resources affect mental and physical health outcomes by means of their associations with emotional states (affect), by promoting approach-oriented coping, and by affecting neural regulation of stress responses and downstream biological

responses to stress. These are not mutually exclusive mechanisms, of course, as all have been implicated in the linkages between psychosocial resources and mental and physical health outcomes.

2.1. Negative and positive affect

All of the psychosocial resources reviewed have an underlying positive emotional tone, and so the question arises as to whether the absence of negative affect, the presence of positive affect, or both explain their benefits.

Psychosocial resources may be (negatively) tied to negative affectivity. People high in negative affectivity/neuroticism express distress, discomfort, and dissatisfaction across a wide range of situations (Gunthert, Cohen, & Armeli, 1999; Watson & Clark, 1984). They are more likely to be depressed (Francis, Fyer, & Clarkin, 1986) and to engage in poor health habits such as excessive drinking (Frances, Franklin, & Flavin, 1986), which may predispose them to higher rates of illness. Neuroticism is associated with an increased risk for arthritis, diabetes, kidney disease, liver disease, stomach problems, gallbladder difficulties, and ulcers (Goodwin, Cox, & Clara, 2006), as well as asthma, arthritis, headaches, coronary artery disease (Friedman & Booth-Kewley, 1987), and greater susceptibility to the common cold following infection (Cohen, Doyle, Turner, Alper, & Skoner, 2003b). Pessimistic and anxious adults have higher blood pressure than more optimistic adults (Räikkönen, Matthews, Flory, Owens, & Gump, 1999) and have higher levels of inflammation (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2003), explained in part by their enhanced likelihood of being obese, hypertensive, and diabetic (Roy et al., 2010). Chronic negative affectivity is also associated with elevated heart rate (Daly, Delaney, Doran, Harmon, & MacLachlan, 2010) and with risk factors for coronary heart disease (Midei & Matthews, 2009). Hemingway and Marmot (1999) found that in 11 of 11 prospective studies, depression and anxiety predicted coronary heart disease in healthy adults, and in 6 of 6 studies, these states predicted disease progression. Negative affectivity has been related to a higher risk of mortality in middle and old age as well (Weiss, Gale, Batty, & Deary, 2009; Wilson et al., 2005).

So robust are the relations between negative affectivity/neuroticism and health outcomes that psychological distress involving the negative emotions of depression, anxiety, and hostility are believed to form the core of a disease-prone personality (Friedman & Booth-Kewley, 1987; Suls & Bunde, 2005). Increased adrenocortical activity may provide a piece of the pathway linking negative affectivity to adverse health outcomes (Polk, Cohen, Doyle, Skoner, & Kirschbaum, 2005). Thus, it is possible that psychosocial resources represent the absence of this toxic set of risk factors.

Researchers have recently examined whether positive emotional states are protective of mental and physical health (Cohen & Pressman, 2006;

Pressman & Cohen, 2005), and so whether positive affective states might explain the relation of psychosocial resources to mental and physical health is also a viable question. Positive and negative affect are correlated but surprisingly independent of each other (Diener & Emmons, 1984), and both positive and negative affect have been shown to have effects on health-related biological processes independent of the other (Ryff et al., 2006; Steptoe, Wardle, & Marmot, 2005). Hence, the importance of positive emotional states may be considered apart from the significance of negative affectivity.

With respect to mental health outcomes, being able to experience positive emotions, even in the context of intensely stressful events, appears to be one way of coping that resilient people draw on (Tugade & Fredrickson, 2004). For example, in one study (Fredrickson, Tugade, Waugh, & Larkin, 2003), being able to experience positive emotions such as gratitude or love following the 9/11 attacks enabled many people to cope with these distressing events and even to experience post traumatic growth. Fredrickson (2004) has suggested that positive emotions enable people to broaden their thought-action repertoire through which they can build additional personal resources (i.e., the broaden-and-build theory of positive emotions).

In terms of physical health outcomes, Pressman and Cohen (2005) reported that trait positive affect is associated with increased longevity, lower morbidity, decreased symptoms and pain, and increased longevity among older community dwelling individuals. A limited amount of research has suggested that positive emotions promote resistance to illness (Cohen, Alper, Doyle, Treanor, & Turner, 2006). People high in trait positive affect perceive their bodies more positively, and they may also experience changes in affect-based physiological processes as well, although the evidence on this point is less clear (Cohen et al., 2006).

In a meta-analysis of 35 studies, Chida and Steptoe (2008) found that positive affect was associated with reduced mortality in healthy populations and with reduced death rates in patients infected with HIV or at risk for cardiovascular disease or renal failure. Several additional (at least partially overlapping) meta-analyses have reported a relation between positive well-being and mortality as well (Howell, Kern, & Lyubomirsky, 2007; Lyubomirsky, King, & Diener, 2005). On the whole, the evidence that positive affect is associated with physical health and longevity in healthy populations is stronger than evidence that it predicts survival in those with extant illness (Pressman & Cohen, 2005). Research attempting to link positive affect to health behaviors has revealed a mixed pattern; some studies show positive relations, others no relations (Diener & Chan, 2011; Steptoe, Dockray, & Wardle, 2009).

Positive emotions affect biological mediators thought to bridge between psychosocial resources and health outcomes: specifically, a positive emotional

style has been tied to lower cortisol levels (Polk et al., 2005), to better immune responses to vaccinations (Marsland, Cohen, Rabin, & Manuck, 2001), and to lower levels of glycosylated hemoglobin in older adults (critical, e.g., in the management of Type I and Type II diabetes; Tsenkova, Love, Singer, & Ryff, 2007). Positive affect has been tied to faster skin barrier recovery (Robles, Brooks, & Pressman, 2009) and to more rapid cardiovascular recovery following laboratory stressors (Fredrickson, Mancuso, Branigan, & Tugade, 2000). Lyubomirsky et al. (2005) reported an effect size of 0.38 between induced positive affect and physiological outcomes including immune functioning and cardiovascular reactivity (see also Howell, Kern, & Lyubomirsky, 2007; Pressman & Cohen, 2005). Well-being has been tied to indicators of better immune functioning (sIgA antibody production), higher pain tolerance, and lower cortisol levels (Howell et al., 2007).

The research on positive affect implies that it may be one factor that underlies the benefits of psychosocial resources, and trait positive affect might even be considered a psychosocial resource in its own right. Pause for this conclusion, however, comes from research on cheerfulness. Cheerful people die somewhat sooner than people who are not cheerful (Friedman et al., 1993). Cheerful people may be more careless about their health and, as a result, encounter health risks (Martin et al., 2002). Related findings have been reported by Pressman and Cohen (2005), such that people with extremely high levels of positive affect, especially in the context of end-stage disease, may show an increased risk for mortality. McCarron, Gunnett, Harrison, Okasha, and Davey Smith (2003) found that hypomania predicted enhanced risk of cardiovascular mortality, and Ritz and Steptoe (2000) reported a relation of extremely positive mood to decreased pulmonary function.

Do negative affectivity and/or positive affect explain the effects of psychosocial resources on health outcomes? To answer this question definitively would require more evidence than currently exists. However, the available evidence suggests that the effects of psychosocial resources are not explained entirely by the absence of negative affectivity or by the presence of positive affect. Although the relation between optimism and self-reported physical symptoms may be explained by the negative relation of optimism to negative affectivity (Smith, Pope et al., 1989), other outcomes such as well-being and health-based outcomes are not as conceptually or operationally confounded with affectivity (see Aspinwall & Brunhart, 2000). Kubzansky et al. (2001) found that optimism protected against nonfatal myocardial infarction and coronary heart disease death even after controlling for depression and anxiety. Scheier, Carver, and Bridges (1994) analyzed data from over 4000 participants and showed that the associations of optimism with depression and coping remained significant even when measures of neuroticism and negative affectivity were controlled. The adaptiveness of control perceptions does not appear to be explained by the absence of negative affectivity either;

rather, perceptions of control appear to play a causal role in reducing anxiety and depression that may surround an illness (Taylor, Helgeson, Reed, & Skokan, 1991). Self-affirmation studies generally find that affirmations of important values do not affect self-reported mood (Fein & Spencer, 1997; Schmeichel & Martens, 2005; Sherman et al., 2000; Spencer, Fein, & Lomore, 2001), and manipulations of mood do not produce self-affirmation effects (Steele, Spencer, & Lynch, 1993).

Positive affect and the absence of negative affect are certainly correlated with psychosocial resources, and they may partially account for the beneficial effects of resources, especially on psychological well-being. However, as the above evidence suggests, psychosocial resources appear to have benefits over and above their associations with affect. Definitive tests are difficult to conduct, however. Controlling for positive and/or negative affect in the calculation of the resources-health relation almost certainly represents a statistical overcorrection. As Suls and Bunde (2005) also point out, it is difficult to appropriately control for the effects of positive and negative emotional states relating resources to illness because the emotional states themselves are likely to reflect the fact of advancing illness. Thus, the significance of affect in the relation of psychosocial resources to mental and physical health outcomes is by no means resolved.

2.2. Coping

Psychosocial resources may be related to mental and physical outcomes via fostering the use of approach-oriented coping strategies. Coping is defined as action-oriented and intrapsychic efforts to manage the demands of the environment. Although a number of coping frameworks have been advanced, one that is gaining traction emphasizes the approach-avoidance continuum (e.g., Solberg Nes & Segerstrom, 2006). Approach-avoidance reflects a core motivational construct (e.g., Davidson, Jackson, & Kalin, 2000) that has been applied across multiple domains within psychology, including both animal and human research, and it can be profitably applied not only to threatening or highly stressful circumstances but also to the activities of everyday life. As such, it may be particularly well suited as a candidate linking both dispositional and situational resources to beneficial outcomes.

Approach-oriented coping involves active efforts, such as problem-solving, seeking social support, and creating outlets for emotional expression. As such, it maps onto the behavioral activation system (BAS; Gray, 1990). Coping through avoidance includes both cognitive and behavioral strategies, such as distracting oneself from stressful circumstances, minimizing threatening events, avoiding thinking about them, and substance use. As such, it maps onto the behavioral inhibition system (BIS). As already reviewed, research ties optimism, mastery, and self-esteem to more active and persistent coping efforts. Approach-related coping has, in turn, been tied to positive psychological states

and to better health outcomes. In particular, positive reappraisal of stressors, social approach, and problem-focused coping can lead to increases in well-being (Billings et al., 2000; Sharkansky et al., 2000). Approach-oriented coping has been tied to a more vigorous cellular immune response at high levels of stress (Stowell, Kiecolt-Glaser, & Glaser, 2001), to lower levels of pro-coagulant activity (Aschbacher et al., 2005), and to lower levels of glycosylated hemoglobin (Tsenkova, Love, Singer, & Ryff, 2008), among other physiological benefits. Coping strategies do not appear to be simple proxies for psychosocial resources. Rather, they appear to explain unique variance in adjustment (Murberg, Bru, & Stephens, 2002).

Although avoidance strategies can be associated with good adjustment to stressful situations in the short term (e.g., a visit to the dentist), in the long term, attempting to avoid thoughts and feelings around chronic persistent stressors leads to elevated psychological distress (see Taylor & Stanton, 2007 for a review). Studies from health psychology suggest that avoidance coping undermines treatment regimen adherence and health behaviors and is associated with the progression of chronic disease and a higher risk of mortality in several patient groups, including cancer patients and those with congestive heart failure (see Taylor & Stanton, 2007 for a review). Avoidance coping is often unsuccessful, with the result that stress-related thoughts and emotions intrude into consciousness. Even mice who engage in avoidance coping when confronted with stress incur health risks (Vegas, Fano, Brain, Alonso, & Azpiroz, 2006).

On the whole, avoidance coping looks more detrimental to mental and physical health outcomes than approach coping is beneficial. However, this may be due, at least in part, to a methodological artifact. Most stress studies focus on negative affect and poor adjustment as outcome variables, rather than on positive outcomes. Positive and negative emotional responses are only modestly correlated, as noted, and so the fact that approach coping primarily predicts positive reactions to circumstances may explain the lesser evidence for its beneficial effects on adjustment.

To summarize, there is good evidence that psychosocial resources foster active, approach-oriented coping, which may account in part or substantially for the beneficial effects those resources have on mental and physical health outcomes.

2.3. Neural mechanisms mediating the effects of psychosocial resources on mental and physical health outcomes

A growing body of evidence focuses on the neural pathways whereby psychosocial resources affect mental and physical health outcomes. This work has been spearheaded by growing understanding of how threatening and stressful circumstances are processed in the brain. The amygdala and the dorsal anterior cingulate cortex (dACC) are associated with threat

detection, serving an "alarm" function that mobilizes other neural regions, such as the lateral prefrontal cortex (LPFC) and the hypothalamus to promote adaptive responses to stress. The amygdala is sensitive to environmental cues signaling danger or novelty (e.g., Hariri, Bookheimer, & Mazziotta, 2000) and predicts how unpleasant negative stimuli are reported to be (Lane et al., 1997). The dACC responds to conflict in incoming information (Carter et al., 2000) and to social distress (Eisenberger, Lieberman, & Williams, 2003).

A neural region that appears critical for regulating the magnitude of threat responses is the ventrolateral prefrontal cortex (VLPFC; Hariri et al., 2000; Ochsner et al., 2004). Activation of the right VLPFC can directly downregulate activation of the amygdala and dACC (Eisenberger et al., 2003; Hariri, Tessitore, Mattay, Fera, & Weinberger, 2002; Lieberman et al., 2006). Thus, RVLPFC regulation of threat responses in the dACC and the amygdala represents a viable candidate for how psychosocial resources may modulate stress responses. Notably, the LPFC is implicated in motivational processes and cognitive activity in service of reward expectancy (Watanabe, 2007), again suggesting overlap between approach-oriented coping associated with psychosocial resources and adaptive goal-directed behavior.

Do psychosocial resources mute perceptions of stress and threat or do they enable people to regulate their responses to threat and stress more effectively? Taylor et al. (2008) examined these two hypotheses regarding the relation of psychosocial resources to patterns of brain activation. The first maintains that psychosocial resources are tied to decreased sensitivity to threat, leading to lower activation of brain regions implicated in stress such as the amygdala. The second is that psychosocial resources are associated with enhanced prefrontal inhibition of stress responses through VLPFC regulation of regions implicated in threat responses, such as the amygdala. In a three-session investigation, participants completed measures of psychosocial resources; they responded to threat cues (pictures of faces conveying negative emotions) in the scanner; and their neuroendocrine responses to stressful laboratory tasks (public speaking, mental arithmetic) were assessed. With respect to the neuroimaging task, in one condition, participants simply observed the threatening faces (observation); in another condition, they labeled the specific emotion that was pictured (threat regulation task); in the third condition, they indicated the gender of the pictured person (control task). Psychosocial resources were associated with greater RVLPF activation and less amygdala activity during a threat regulation task, but not with lower amygdala activity during observation of threat cues. Psychosocial resources were also tied to lower neuroendocrine stress responses, specifically cortisol levels. Mediational analyses indicated that the relation of psychosocial resources to low cortisol reactivity was mediated by lower amygdala activity during the threat regulation task. Thus, it appears that psychosocial resources are associated with lower cortisol responses to stress

by means of regulating threat responses, and not by decreased sensitivity to threat overall. This pattern is consistent with the idea that psychosocial resources lead to active coping efforts and not simply to insensitivity to risk or threat.

Approach coping processes link reliably to patterns of brain activity as well. The BAS, which, as noted, is assumed to underlie approach-related coping, is organized largely by the dopaminergic neurotransmitter system and is associated with striatal dopamine projections to areas in the lateral and orbitofrontal cortices (Rolls, 1996). BAS is associated with goal-directed behavior, a promotion regulatory focus (Amodio, Shah, Sigelman, Brazy, & Harmon-Jones, 2004), and positive emotions (Davidson, Ekman, Saron, Senulis, & Friesen, 1990), consistent with research on approach coping. By contrast, the BIS, which is believed to underlie avoidant coping, is associated with a neural circuit organized by monoamine neurotransmitter systems, including noradrenergic and serotonergic networks and their associated neural structures. The heart of the noradrenergic system is the locus coeruleus, located in the brainstem. In humans and monkeys, the locus coeruleus has modulatory noradrenergic effects on the ACC (Berridge & Waterhouse, 2003). Direct links from avoidant coping to heightened ACC functioning via these pathways have not yet been made, however. Nonetheless, these are also promising neural avenues for understanding the relation of psychosocial resources to health outcomes via their connection to active versus avoidant coping.

Some research has specifically focused on the relation of optimistic future projections to patterns of brain activation. Activity in the rostral ACC is correlated with trait optimism (Sharot, Riccardi, Raio, & Phelps, 2007). Research has also shown enhanced activation in the amygdala and in the rostral ACC when imagining positive future events relative to negative ones (Sharot et al., 2007). These areas are involved in monitoring emotional salience and may mediate the optimistic bias (Sharot et al., 2007). (These same regions show irregularities in depression; Drevets et al., 1997.) Thus, the integration of emotional and autobiographical information may enable the projection of positive future events, leading to optimism about the future.

In several instances, we have noted parallels between coping with stress and goal pursuit. Accordingly, one might expect to see that patterns of brain activation that are commonly seen in conjunction with personal goal striving and pursuit would also be seen when psychosocial resources are minimizing or reducing responses to stress or threat. D'Argembeau et al. (2009) identified the ventromedial prefrontal cortex and posterior cingulate cortex as brain regions distinctively activated by imagining personal future events, relative to nonpersonal future events. These regions overlap with activations that engage self-knowledge, and thus, the VMPFC and PCC

may be implicated in mental representations generated with respect to personal goals. To the extent that goal striving and the deployment of psychosocial resources for coping with stressful events overlap, one might expect to see similar patterns in coping with stress.

When thinking about personal goals and striving to meet them are salient, one tends to see patterns of activation in reward centers of the brain. Active coping with stress might well lead to similar activation in reward centers. There is some evidence for this in the extraversion literature. Extraversion is associated with activation in the ventral striatum, amygdala, and other reward-sensitive regions, areas that are innervated by dopamine (Depue & Collins, 1999). These areas appear to be critical to the processing of incentives (e.g., Breiter, Aharon, Kahneman, Dale, & Shizgal, 2001; Knutson, Fong, Adams, Varner, & Hommer, 2001; Kringelbach, O'Doherty, Rolls, & Andrews, 2003; O'Doherty, Deichman, Critchley, & Dolan, 2002), although there is some question as to whether these areas are engaged primarily in response to the receipt of rewards, the anticipation of rewards, or both (Cohen et al., 2005; Knutson & Bhanji, 2006).

Recent research has related social support processes to patterns of brain activation. For example, functional neuroimaging studies have related maternal affection and romantic attachment to regions in the brain associated with reward-seeking, including the caudate putamen and ventral tegmentum, as well as parts of the dorsolateral and VLPFC (Aron et al., 2005; Bartels & Zeki, 2004). Coan, Schaefer, and Davidson (2006) manipulated hand holding from either a spouse or a stranger during anticipation of electric shock and found downregulation of areas associated with threat, compared to no hand holding, especially when holding the hand of one's spouse; regions implicated included the ventral ACC, the dorsolateral prefrontal cortex, the caudate, the superior colliculus, the posterior cingulate, the post central gyrus, and the supramarginal gyrus. Addressing the role of chronic perceptions of social support, a three-session study (Eisenberger, Taylor, Gable, Hilmert, & Lieberman, 2007) found that people who interacted regularly with supportive individuals (assessed over 9 days via experience sampling methodology) showed diminished dACC reactivity to social rejection in an fMRI laboratory task and diminished cortisol reactivity during laboratory stressors. Individual differences in dACC activity mediated the relation between social support and cortisol reactivity. Thus, social support may influence downstream biological stress responses by modulating neurocognitive reactivity to social stressors, which in turn attenuates neuroendocrine stress responses.

To summarize, pathways involving (a) VLPFC regulation of threat responses, (b) activation of brain regions involved in behavioral activation generally and goal pursuit more specifically, and (c) activation in reward centers in the brain represent promising avenues for understanding brain

mechanisms underlying the deployment of psychosocial resources for managing stressful and challenging events.

2.4. Biological mediators

Psychosocial resources and their concomitant patterns of activation in the brain ultimately play out in physiological, neuroendocrine, and immunologic stress responses. Researchers since the 1930s (Cannon, 1932) have maintained that the links between threatening events and adverse health outcomes involve the body's physiological stress regulatory systems, commonly referred to as the "fight or flight" response. When a person experiences a threat, the body is rapidly mobilized to attack the threat or to flee from it. This arousal is mediated primarily by the sympathetic nervous system and the hypothalamic–pituitary–adrenal (HPA) axis.

Specifically, stress engages sympathetic arousal, which stimulates the medulla of the adrenal glands, which, in turn, secrete the catecholamines epinephrine and norepinephrine. Sympathetic arousal leads to increased blood pressure, heart rate, sweating, and constriction of peripheral blood vessels, among other changes. In addition, the catecholamines impact a variety of tissues in the body and modulate the immune system. Stress also activates the hypothalamus, which releases corticotropin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH), which, in turn, stimulates the adrenal cortex to release glucocorticoids. Of these, cortisol has been most heavily studied. It acts to conserve sources of carbohydrates and affects inflammation in the case of an injury. It also provides the feedback mechanism to restore the body to its steady state following stress. Levels of cortisol are, accordingly, often used in experimental studies as a neuroendocrine indicator of how much stress a person has experienced.

The neural threat detectors described in the previous section set in motion a cascade of responses via projections to the hypothalamus and LPFC (Davis, 1989; LeDoux, 1996). Studies have shown connections between neural structures critical to threat detection and the hypothalamus, which is the origin of downstream sympathetic and HPA responses to threat. Specifically, the amygdala has dense projections to the hypothalamus (Ghashghaei & Barbas, 2002), and the ACC projects to the paraventricular nucleus of the hypothalamus (Risold, Thompson, & Swanson, 1997), the specific region of the hypothalamus that triggers the cascade of events ultimately leading to cortisol release. Stimulation of both the amygdala and the ACC has been associated with increases in blood pressure and cortisol levels in both animals and humans (Frankel, Jenkins, & Wright, 1978; Setekleiv, Skaug, & Kaada, 1961).

These are all normal reactions to stressful or threatening events. However, when these reactions recur repeatedly or chronically, the groundwork

for illness can be laid. Excessive discharge of epinephrine and norepinephrine can lead to suppression of cellular immune function; produce hemodynamic changes such as increased blood pressure and heart rate; provoke variations in normal heart rhythm such as ventricular arrhythmias, which may be a precursor to sudden death; and produce neural and chemical imbalances that can contribute to the development of psychiatric disorders. The catecholamines also have effects on lipid levels and free fatty acids that are important in the development of atherosclerosis. Corticosteroids have immunosuppressive effects that can compromise the functioning of the immune system over the long term. Prolonged cortisol secretion has also been related to the destruction of neurons in the hippocampus, which can lead to problems with verbal functioning, memory, and concentration (Sapolsky, Krey, & McEwen, 1985; Stein-Behrens, Mattson, Chang, Yeh, & Sapolsky, 1994). Pronounced HPA activation is common in depression and may be a causal factor in its development (Connor & Leonard, 1998; Leonard, 2000).

Chronic or repeated activation of these stress regulatory systems can ultimately compromise the functioning of the systems. McEwen (1998) refers to these mounting adverse effects on stress regulatory systems as allostatic load. As physiological systems within the body repeatedly fluctuate to meet the demands imposed by stress, over time, there is a buildup of allostatic load, the physiological costs of chronic exposure to fluctuating or heightened neural and neuroendocrine responses that occur across multiple physiological systems. Biological markers of allostatic load include decreases in cell-mediated immunity, the inability to shut off cortisol in response to stress, low heart rate variability, elevated epinephrine levels, a decrease in hippocampal volume, high plasma fibrinogen, and elevated blood pressure, among other changes. Many of these changes occur normally with age, so, to the extent that they occur earlier in response to chronic stress, allostatic load may be thought of as accelerated aging. Over time, allostatic load is implicated in the accumulation of risk factors, development of several chronic diseases, and a heightened risk of death (Glei, Goldman, Chuang, & Weinstein, 2007; Karlamangla, Singer, & Seeman, 2006).

Chronic and recurring stress can also impair the immune system's ability to respond to hormonal signals that terminate inflammation in response to stress. That is, in response to many stressors, pro-inflammatory cytokines are released, which would normally diminish as stress reduces. However, stress can reduce the ability to suppress production of these pro-inflammatory cytokines (e.g., Miller, Cohen, & Ritchey, 2002). Slavich, Way, Eisenberger, and Taylor (2010) illustrated this pathway. In their study, participants were exposed to social rejection in an fMRI task, which led to elevated activity in the dACC, as has been found in previous studies (Eisenberger et al., 2003). Greater activity in the dACC and the anterior

insula, brain regions that have both been associated with processing rejection-related distress and negative affect, were, in turn, tied to enhanced inflammatory activity. Because chronic inflammation is implicated in many diseases, including depression and coronary artery disease, low-grade inflammation may be an important pathway by which stress responses affect the likelihood of illness. Psychosocial resources can mute these relations (Friedman, Hayney, Love, Singer, & Ryff, 2007).

Finally, chronic or recurrent stress can affect recovery from stress, reflected in the speed and ease with which biological stress regulatory systems can return to their normal functioning. The theory of allostatic load suggests that the inability to recover quickly from a stressful event may be a marker for the cumulative damage that stress has caused. With chronic or repeated stress, both sympathetic activation and HPA activation can last longer and, potentially, widen the window of susceptibility to illness and injury (e.g., Perna & McDowell, 1995).

The accumulating damage that results from chronic or recurring stress interacts with genetic vulnerabilities and with poor health behaviors, such as little exercise, high-fat diet, and smoking, all of which can exacerbate or hasten the accumulation of allostatic load (Ng & Jeffery, 2003). They may also interact with individual differences in reactivity, which are predispositions, determined by genes, prenatal experiences, and/or early life experiences, to be highly reactive to stress in sympathetic, neuroendocrine, and/or immune functioning. People prone to high reactivity may, as a result, be especially vulnerable to stress-related disorders in both the short term and long term (Boyce et al., 1995; Jacobs et al., 2006). Psychosocial resources may reduce the magnitude of responses to stress, their frequency, or both, thus leading to lesser strain on biological stress regulatory systems and lesser accumulation of allostatic load.

What is the evidence linking psychosocial resources to health outcomes via these routes? We have noted several examples in previous sections, and several additional investigations speak to this issue. In a study of the elderly, high self-esteem was associated with lower levels of cortisol and adrenocorticotropin hormone in response to a challenge (Seeman et al., 1995). In a study examining the impact of self-enhancement on physiological responses to stress (Taylor et al., 2003b), people who regarded themselves especially positively showed reduced blood pressure and heart rate, faster cardiovascular recovery, and lower baseline cortisol levels, relative to those who were less self-enhancing. Creswell et al. (2005) found that cortisol responses to laboratory stress tasks were significantly lower if people had self-affirmed an important value prior to going through the tasks. The links from control and mastery to health outcomes may also be mediated by immune responses. For example, among adolescents with asthma, beliefs in personal control are associated with better immune responses related to their disease (Chen, Fisher, Bacharier, & Strunk, 2003).

3. Origins of Psychosocial Resources

The preceding sections have characterized psychosocial resources and indicated some likely pathways by which they exert beneficial effects on mental and physical outcomes. These include affective/emotional routes; active approach-oriented coping; neural activation of brain regions implicated in stress and its regulation; and downstream cardiovascular, neuroendocrine, and immunologic functioning. As noted, these are not mutually exclusive pathways.

Where do these psychosocial resources come from? Understanding their antecedents may be pivotal for intervening to promote successful adjustment and good health. Accordingly, we next turn to origins of psychosocial resources in the early environment, genetic predispositions, and their interaction.

3.1. Early environment

An early family environment marked by harsh or conflict-ridden parenting is reliably associated with deficits in offspring psychosocial resources and with difficulty in managing challenging circumstances (see Repetti, Taylor, & Seeman, 2002 for a review). Research indicates that offspring from harsh family environments may overreact to threatening circumstances, responding aggressively to situations that are only modestly stressful (e.g., Reid & Crisafulli, 1990), but may also respond by tuning out stressful circumstances, as through avoidant coping (Johnson & Pandina, 1991; Valentiner, Holahan, & Moos, 1994). Poor psychosocial resources related to early family environment may appear in latent form in early childhood as internalizing or externalizing behaviors and may contribute to chronic psychological distress (Repetti et al., 2002). Adolescence is a time when the frontal cortex develops more fully, and so it may be a critical period when psychosocial resources begin to coalesce, evolving into optimism, a sense of control, self-esteem, and perceptions of social support. For people from harsh backgrounds, developmental precursors may instead evolve into avoidant coping, pessimism, a low sense of control, a poor sense of self, and low perceived social support, further stabilizing in adulthood as poor psychosocial resources (Repetti et al., 2002). Attachment processes may be implicated in these relations, such that a supportive early family environment fosters a secure attachment, and a harsh family environment fosters an avoidant attachment: these attachment orientations may shape physiological responses to social interactions across the lifespan and, subsequently, affect health (e.g., Gallo & Matthews, 2006).

A harsh family upbringing has been related to higher levels of depression (Repetti et al., 2002); to preclinical risk factors for mental and physical

health disorders, including elevated autonomic and cortisol responses to threatening circumstances (Seeman & McEwen, 1996); to risk factors for mental and physical health disorders, including C-reactive protein (Taylor, Lehman, et al., 2006); and to major mental and physical health disorders (Felitti et al., 1998). Hanson and Chen (2010) reported that a harsh early family environment was associated with greater cortisol output and less sleep in young adults in response to severe stress. They concluded that the childhood environment can have long-term effects on biological responses to daily stress, creating vulnerability to illness. Thus, the existing literature provides a basis for linking a harsh early childhood to the compromised development of psychosocial resources, as well as risk for adverse stress-related mental and physical health outcomes. Several studies provide evidence that psychosocial resources mediate the relation between a harsh early environment and health outcomes, at least in part (Lehman et al., 2005, 2009; Taylor, Lehman, et al., 2006).

Evidence for these links also exists at the neural level. In a task involving the labeling of emotions pictured in faces, Taylor, Eisenberger, Saxbe, Lehman, and Lieberman (2006a) found that young adults who had grown up in supportive families showed expected and relatively modest amygdala reactions to threat cues (fearful/angry faces) and strong activation of the right VLPFC, which was negatively related to amygdala activity; this pattern suggests regulation of limbic response via cortical responses to threatening stimuli. By contrast, young adults from harsh early family environments showed a strong positive correlation between right VLPFC and amygdala activation, suggesting that early family environment may be associated not only with poor psychosocial resources, but with corresponding dysregulation in the neural pathways involved in regulating responses to threat.

3.1.1. Socioeconomic status

In addition to the family environment, there are other aspects of the early life environment that confer risk for poor psychosocial resources and long-term adverse mental and physical health outcomes. Chief among these factors is low childhood SES.

There are well-established socioeconomic and racial disparities in mental and physical health outcomes, such that the higher one moves on the SES ladder, the lower one's risk for psychological distress and for adverse health outcomes (Adler & Rehkopf, 2008). The relation is, for the most part, linear rather than asymptotic, which means that each step up the ladder brings increased resistance to psychological distress, to disease, and to premature mortality. Psychosocial resources are a likely contributor to these disparities.

Early childhood SES is believed to be a pivotal context for the development of psychosocial resources. Research indicates that low childhood SES is tied to perceptions of little control, pessimism, and poor social support, factors that may link SES to poor health (Adler et al., 1999; Finkelstein,

Kubzansky, Capitman, & Goodman, 2007; Gallo, de los Monteros, & Shivpuri, 2009; Repetti et al., 2002; Taylor & Seeman, 1999). For example, there is an SES gradient in pessimism (but not optimism) (Taylor & Seeman, 1999), suggesting that harsh early life experiences contribute to the development of enduring pessimistic expectations (Carver et al., 2010). Among low-SES individuals who do have strong beliefs in personal mastery, mental and physical health outcomes are equivalent to those seen in high-SES groups (Lachman & Weaver, 1998). To a lesser extent, self-esteem shows an SES gradient (Adler et al., 1999). Perceived social support demonstrates a strong SES gradient, such that those of higher SES in childhood and/or adulthood report greater social support resources (Kessler et al., 1992). SES also links to coping style. In one study, exposure to uncontrollable stressors was associated with greater avoidant coping in impoverished women, which was, in turn, associated with an enhanced risk for depression (Rayburn et al., 2005). Lack of social support, which is distributed by SES, also can prompt avoidance oriented coping under stress (Manning, Catley, Harris, Mayo, & Ahluwalia, 2005).

Matthews and colleagues (Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo & Matthews, 2003) have proposed a Reserve Capacity Model, maintaining that psychosocial resources are significantly associated with SES level, such that the higher one is in SES, the greater one's "reserve capacity" to deal with stressful events. In an empirical test of these ideas, women with varying levels of SES monitored their positive and negative psychosocial experiences and emotions across 2 days. Measures of psychosocial resources included perceived control, positive affect, and social strain. Low SES was associated with lower levels of these resources, and low perceived control and social strain contributed to the association between SES and well-being (Gallo et al., 2005, 2009; Matthews, Gallo, & Taylor, 2010). Resources appear to play a role of direct mediation as opposed to moderation (Matthews et al., 2010). Indeed, the evidence for the importance of psychosocial resources as a mediator of the effect of low SES on poor health is stronger than the evidence suggesting that stress mediates this relation (Matthews et al., 2010).

3.1.2. Genetic origins of psychosocial resources

In addition to origins in the early environment, there are genetic origins of psychosocial resources. Behavioral genetics studies using twin methodology estimate that approximately 25% of the variance in optimism is genetically based (Plomin et al., 1992); there is moderate genetic influence on self-esteem (e.g., Roy, Neale, & Kendler, 1995); and there is a larger genetic contribution to the perception of available social support (e.g., Kessler et al., 1992). As much as 50% of the variance in experienced loneliness appears to have genetic bases (Boomsma, Willemsen, Dolan, Hawkley, & Cacioppo, 2005). To the best of our knowledge, genetic bases of mastery have not been examined.

Using twin study methodology, behavioral genetics investigations have also estimated the genetic contribution to active and avoidant coping strategies, one of the likely mediators between psychosocial resources and health outcomes. Moderate genetic influences have been found for both (e.g., Kato & Pedersen, 2005; Kendler, Kessler, Heath, Neale, & Eaves, 1991), and both shared and unshared environmental factors appear to contribute to these coping strategies (Mellins, Gatz, & Baker, 1996). However, research is mixed on whether genetic contributions to coping overlap with genetic contributions to dispositional psychosocial resources, such as optimism, self-esteem, and other personality factors (Busjahn, Faulhaber, Freier, & Luft, 1999; Kato & Pedersen, 2005).

At least some of the genetic contribution to effective coping may stem from genetic bases of approach-related behavior underpinned by dopaminergic pathways (Reuter & Hennig, 2005). Activity within the dopamine system appears to be involved in regulating emotional responsivity to stressors (Ebstein et al., 1996; Giorgi et al., 2003; Lakatos et al., 2003; Reuter & Hennig, 2005). The relation of genetic polymorphisms in the dopamine system to executive functioning in the prefrontal cortex (PFC) more generally suggests that psychosocial resources may reduce stress responses via PFC downregulation of activity in brain regions that respond to threat, including the amygdala, dACC, and hypothalamus. As such, the neural pathway implicating cortical regulation of brain regions implicated in stress responses appears, not surprisingly, to be mirrored in genetics research as well.

Psychosocial resources may also operate via the moderation of the expression of genetic contributors to psychological distress. Polymorphisms in the serotonin system have been especially implicated. For example, Hariri et al. (2005) used fMRI to examine the relation of the 5-HTTLPR to amygdala responses to threat-relevant stimuli. They found that people carrying the s allele of the 5-HTTLPR had stronger amygdala responses to fearful stimuli in comparison with those homozygous for the l allele. Studies have shown that this short allele of the serotonin transporter gene is related to trait anxiety (Schinka, Busch, & Robichaux-Keene, 2004); to depression in conjunction with life stress (e.g., Caspi et al., 2003); to neuroticism (Sen et al., 2004); to amygdala hyperactivity to threat in healthy people (Hariri et al., 2005); and (negatively) to extraversion (Gillihan, Farah, Sankoorikal, Breland, & Brodkin, 2007). Polymorphisms in the serotonin transporter gene have also been implicated in ACC function (Canli et al., 2005), and other genes in the serotonin system may also be implicated. The G allele of the serotonin receptor 1A (5-HT1a) gene has been tied to neuroticism and harm avoidance (Strobel, Lesch, Jatzke, Paetzold, & Brocke, 2003). An SNP in the 5-HTR2a receptor gene has been associated with anxiety-related traits and (negatively) with sociability, and the T allele of the 5-HTR2a is associated with higher activity level and

sociability and lower level of anxiety-related traits (Golimbet, Alfimova, & Mitiushina, 2004). The G-1438A polymorphism of the 5-HTR2a receptor gene has been related to introversion and sociality and may thus be related to social support processes (Gillihan et al., 2007).

With respect to social relationships, researchers have suggested that the social pain of rejection or social isolation may overlap with some of the neurocircuitry and genetic contributors to the experience of physical pain (Eisenberger et al., 2003); as such, genes in the opioid system are candidates for contributing to the adverse effects of poor social relationships on health. Evidence consistent with this hypothesis was obtained in a study of behavioral concomitants of the μ-opioid receptor gene (OPMR). Variation in this gene was associated with reactivity to social rejection in an fMRI study (Way, Taylor, & Eisenberger, 2009). Another contributor to poor social relationships is a propensity for aggression and hostility toward others (see Taylor, 2012, for a review). Accordingly, genetic factors that contribute to aggression may also represent a useful point of departure. In a recent study, this intuition was supported. Specifically, Eisenberger, Way, Taylor, Welch, and Lieberman (2007) found that people with the low-expression allele of the monoamine oxidase polymorphism (MAOA) showed heightened socioemotional sensitivity, making them more sensitive to negative social experiences and more likely to respond to these experiences with defensive aggression. Both of these findings suggest that genes involved in oversensitivity to negative social experiences may contribute to disruptions in social support or to difficulty in attracting and keeping social support.

Genes related to the oxytocin and vasopressin systems are likely contributors to social affiliation and social distress. For example, deletion of the gene responsible for making oxytocin prevents mice from developing social memories (Ferguson et al., 2000), and infant oxytocin knockout mice are deficient in social behaviors (Winslow et al., 2000). In humans, the oxytocin receptor gene has been related to social behavior; specifically, carriers of the A allele of rs53576 of the oxytocin receptor gene are at heightened risk for the development of autism (Wu et al., 2005) and, as parents, show less sensitive parenting toward their young children (Bakermans-Kranenburg & van Ijzendoorn, 2008). A recent investigation also found that variants in the oxytocin receptor gene are differentially sensitive to culturally appropriate forms of social support seeking (Kim et al., 2010). Vasopressin (AVP), which is similar in molecular structure to oxytocin and appears to have a greater impact on male than female behavior, may also be implicated in social relationships. One study found that genetic variation in the vasopressin receptor 1A gene (AVPR1A) is related to pair-bonding behavior in men (Walum et al., 2008), and Taylor, Saphire-Bernstein, and Seeman (2010) found that elevated AVP was associated with distress in romantic relationships among men.

Efforts to explore the genetic underpinnings of psychosocial resources are in their infancy. The genes referred to by no means exhaust the bases for

exploring genetic contributions to the development of psychosocial resources or their deployment via coping processes. At present, they represent promising points of departure with a basis in the existing literature. Moreover, the existing literature has yet to examine the cumulative impact of multiple risk-related genes or gene–gene interactions as potential bases for the development and deployment of psychosocial resources.

3.1.3. Gene–environment interactions

The effects of genes related to psychosocial resources are likely to be moderated by environmental factors. Researchers have long suspected that a harsh early family environment may contribute to poor psychosocial resources and to lifespan risk for mental and physical health disorders, not only directly but also via gene–environment interactions (Repetti et al., 2002). The fact that the same family characteristics (a harsh, conflict-ridden or chaotic early family environment) appear to fuel such a diverse array of adverse physical and mental health outcomes suggests that a harsh early family environment may exacerbate preexisting genetically based risks (Repetti et al., 2002). Animal studies have also suggested the likelihood that early environment interacts with genetic predispositions to affect behavioral outcomes. For example, maternal behavior moderates genetic risk for serotonergic dysfunction related to serotonin transport (Bennett et al., 2002) and behavioral concomitants of the s allele of the serotonin transporter gene (5-HTTLPR), specifically impulsivity and social competence (Suomi, 2003). Animal studies of rat behavior have shown the importance of nurturant mothering to the development of normal social behavior (e.g., Francis, Diorio, Liu, & Meaney, 1999; Weaver et al., 2004), and early nurturant experience appears to moderate the effects of at least one gene in the dopamine system (DRD4) on social behavior (Bakermans-Kranenburg & van Ijzendoorn, 2007), in ways that may relate to the development of psychosocial resources (Bakermans-Kranenburg & van Ijzendoorn, 2008). Thus, family environment may exert a moderating effect on genetically based temperamental susceptibilities related to poor psychosocial resources and their adverse mental health outcomes.

These early environmental contributions need not be immutable, however. Regulation of genetic expression by the environment can be an ongoing process. Specifically, a recent empirical study (Taylor, Lehman, et al., 2006) revealed that individuals experiencing a current stressful environment were significantly more likely to have depressive symptomatology if they had the s/s genotype of the 5-HTTLPR; however, those with the s/s genotype were significantly less likely to report depressive symptomatology if they were currently in a supportive environment. That is, the commonly reported effect of the s/s genotype of the 5-HTTLPR on risk for depressive symptomatology was not merely eliminated but actually reversed by a beneficent current environment. Studies such as these suggest that there may be significant

ongoing environmental regulation of genetic contributions to mental and physical health outcomes via deployment of psychosocial resources.

Multilevel integrative efforts to relate genetic and/or familial origins of psychosocial resources and processes to neural mechanisms that link to both emotional and physiological stress responses are in their infancy. But as these early studies suggest, such an approach can help to flesh out the pathways that relate the origins of psychosocial resources to psychological and biological stress responses. Moreover, mapping such pathways may provide useful clues for intervention, an issue to which we next turn.

4. Can People be Taught to Develop Psychosocial Resources?

Much of the preceding review has focused on the dispositional aspects of psychosocial resources, and even social support, which, on the surface, would seem to be highly amenable to intervention, has a surprisingly large dispositional component. Moreover, there are established genetic bases for psychosocial resources as well. The issue arises, then, as to whether these psychosocial resources are malleable and responsive to intervention.

Carver et al. (2010) point out that optimistic expectations can be targeted in cognitive behavioral therapies and may help people develop more positive future expectations. However, as much of cognitive therapy is focused on reducing negative perceptions rather than increasing positive ones, cognitive therapies have not been used to the extent that they could be to develop positive expectations (Riskind, Sarampote, & Mercier, 1996). Seligman's concept of learned optimism also suggests that psychological distress may be alleviated or avoided through multimodal cognitive behavioral procedures that teach people to decrease their negative thoughts and increase the number of positive ones (e.g., Seligman, Schulman, DeRubeis, & Hollon, 1999; Seligman, Schulman, & Tryon, 2007). Optimism may also be a byproduct of other kinds of therapeutic interventions. For example, when people are trained in stress management techniques, which emphasize such skills as positive reframing, they appear to become more optimistic over time (e.g., Antoni et al., 2001).

Principles of mastery and psychological control have also been manipulated in interventions to promote good health habits and to help people cope with stressful events. For example, a broad literature shows how self-efficacy and perceived behavioral control influence a wide variety of health behaviors, including dietary change, exercise, and stopping smoking (Taylor, 2012, for a review). Principles of mastery and psychological control have also been extensively used to intervene with people who are anticipating unpleasant medical procedures, including gastroendoscopic

examinations (Johnson & Leventhal, 1974), childbirth (Leventhal, Leventhal, Schacham, & Easterling, 1989), chemotherapy (Burish & Lyles, 1979), and hysterectomies (Johnson, Christman, & Stitt, 1985), among many others. A review of a large number of such studies concluded that control-based interventions that provide information, instruction, relaxation, and principles of cognitive behavioral change are all successful in reducing anxiety, improving coping, and enabling people to overcome adverse effects of medical procedures more quickly (Ludwick-Rosenthal & Neufeld, 1988). Whether such training generalizes beyond the specific training circumstances, conferring a general sense of mastery that empowers people to take control in other life domains, is unknown.

Whether self-esteem can and should be augmented through interventions has been a topic of considerable controversy. Baumeister, Campbell, Krueger, and Vohs (2003) have argued that interventions often do not establish the direction of causality, and even when they do, the effect sizes of self-esteem on beneficial outcomes are small. On the flip side of this argument, Swann, Schneider, and Larsen McClarty (2007) suggest that aspects of self-views beyond global self-worth need to be examined, including the strength of self-views, their certainty, and other metacognitive aspects of self-views. Some of the confusion regarding the value of teaching self-esteem may come from the failure to match specificity between predictor and outcome variables in past research (see Swann et al., 2007 for a review). Swann and colleagues also note that the small effect sizes noted by Baumeister et al. (2003) nonetheless concern outcomes whose social implications are undeniable, including academic performance, marital satisfaction, criminal convictions, and depression. Given the poor quality of life that people with negative self-views experience (Swann et al., 2007), interventions to improve self-esteem may help attenuate those destructive beliefs. However, some of the ambiguity regarding this issue may stem from the fact that, as resources, self-esteem (and, likely, optimism and control as well) need to be maintained (Tesser, 1988), but not necessarily maximized. This means that efforts to build increasing amounts of these resources, especially in nonclinical populations, may not be especially successful: A lot may be good, but even more may not be better.

Many interventions have been implemented with chronically or acutely ill populations in an effort to enhance coping. Some of these, as noted, are cognitive behavioral interventions that appear to have the beneficial side effects of increasing a sense of mastery and optimism and, perhaps, self-esteem (Antoni et al., 2001). Another type of intervention that may have similar effects is enabling people to make meaning from a stressful event. In an intervention with breast and colorectal patients, patients were either given routine care or guided through a multi-session intervention designed to induce the making of meaning. Results indicated that the experimental

group showed significantly higher self-esteem, optimism, and self-efficacy, compared to the control group. Thus, this intervention suggests that the process of making meaning may evoke psychosocial resources (Lee, Cohen, Edgar, Laizner, & Gagnon, 2005).

Self-affirmation represents another promising intervention method. Such exercises have, thus far, been evaluated primarily in short-term circumstances in laboratory settings (Sherman, Nelson, & Steele, 2000), but they might well be employed over the longer term as well. Self-affirmation may mediate the successful impact of interventions designed to encourage the making of meaning from adverse events and emotional approach coping as well (Creswell et al., 2007).

Overall, it may be more successful to target coping strategies for intervention than to target dispositional qualities, such as optimism or self-esteem. As such, coping makes not only a logical and empirically validated mechanism by which psychosocial resources link to better mental and physical health outcomes, but also one that prompts the creation of specific behavioral targets. In addition, the fact that the neural underpinnings of deployment of psychosocial resources and active coping are increasingly being identified leads to the possibility of identifying neural signatures associated with poor psychosocial resources and good psychosocial resources, as well as an additional type of outcome measure, namely whether neural signatures change in response to interventions (e.g., Paquette et al., 2003). To accomplish all of these goals, there remains a need for more intervention studies in which people are randomly assigned to condition to identify whether people can be taught to increase their psychosocial resources, and then followed over time to see if those psychosocial resources have causal effects on mental and physical health-related outcomes.

5. Conclusions and Remaining Issues

A vast amount of literature drawing on many different methods and expertise from many different fields has firmly established the significance of psychosocial resources for mental and physical health outcomes. In so doing, the research literature provides convergence on a multilevel model that integrates observations from the societal level (e.g., SES) to the molecular level. Figure 1.1 summarizes the model that is supported by this work. Although a substantial research literature links psychosocial resources to mental and physical health outcomes, the mediators have remained largely unknown until recently. In this chapter, we reviewed three potential mediators, all of which are likely to be implicated in these relations: chronic negative and positive affect, coping processes including approach versus

avoidant coping, and neural responses to threat in the amygdala, the hypothalamus, the dACC, and the PFC. These brain activations, in turn, regulate psychological, autonomic, neuroendocrine, and immune responses to threat, which play out over time to affect mental and physical health outcomes. Research establishes the origins of psychosocial resources in the early childhood environment, in genetic predispositions, and in their interaction. Specifically, low childhood SES and a harsh early family environment are risk factors for developing inadequate psychosocial resources, and genetic predispositions and gene-by-environment interactions appear to be implicated as well. However, although research has definitively established a role for genetics, the specific genes that are implicated remain to be fully uncovered. Although not all the links have been made yet, this model is a scientifically viable account of how psychosocial resources develop and are deployed over time so as to affect mental and physical health.

Some important issues remain. The best source of evidence for a longitudinal model such as this is large-scale prospective studies that follow a cohort over time through a range of early childhood experiences and SES levels with multiple age-appropriate assessments of psychosocial resources, chronic positive and negative affective states, and approach and avoidance coping, coupled with assessments of neural regulation of stress responses. Assessments of markers deemed to be prognostic for chronic mental and physical health disorders, such as those suggested by the allostatic load model, would need to be assessed as well, to document changes in mental and physical health status over time. This is a tall order in its own right, and it is easier said than done for other reasons. For example, a problem is presented by analyses that control for baseline mental and physical health, especially in middle aged and older samples. Specifically, to the extent that psychosocial resources have already exerted beneficial effects on mental and physical health, controlling for baseline may actually remove much of the effects of psychosocial resources (Diener & Chan, 2011; Suls & Bunde, 2005). This problem may be exacerbated by the fact that childhood is a time when psychosocial resources begin to develop, and so as samples age, controlling for baseline is increasingly likely to reflect the outcome of interest.

A related concern may also lead to underestimation of the importance of psychosocial resources. Much of the literature that has documented the benefits of psychosocial resources on mental and physical health outcomes has focused on the management of stressful events, and stressful events are, by definition, events that occur. Stress that is muted or avoided completely is not studied. It is likely that psychosocial resources function heavily to offset threats and enable people to avoid stressors, perhaps as much or more than to manage them when they occur (Aspinwall & Taylor, 1997). Thus, it is likely that the existing literature underestimates, perhaps substantially, the benefits of psychosocial resources.

A third factor that may make psychosocial resources more significant for health-related outcomes than is currently recognized in the literature concerns the likely effects of these resources on appraisal processes and the ability to recognize and take advantage of opportunities. That is, people who are optimistic, high in mastery, and high in self-esteem may be able to see opportunities available to them to advance their personal interests and goals somewhat more successfully than people who lack these resources. The world is, of course, filled with hazards as well as opportunities, and under some conditions, these same resources may lead people into projects involving unforeseen risks and other liabilities. Nonetheless, an investigation of the ways in which psychosocial resources may further the seeking out of opportunities to realize goals represents a way in which the psychosocial resources literature may draw on the achievement and goal-related literature for potential insights for future research.

Future research may uncover other benefits of psychosocial resources, as understanding of the interaction of psychological and biological systems progresses. For example, intriguing evidence from animal studies suggests that successful coping with stress may actually stimulate hippocampal neurogenesis (Lyons et al., 2010; Parihar, Hattiangady, Kuruba, Shuai, & Shetty, 2009). Other evidence suggests the possibility that psychosocial resources may be reliably related to biological aging, specifically the aging of the immune system (immunosenesence). For example, in one study (O'Donovan et al., 2009), pessimists had shorter telomeres and higher IL-6 concentrations than people low in pessimism (although optimism was not associated with either measure); thus, dispositional pessimism may accelerate the rate of biological aging. Whether other resources or lack of them are related to immunosenesence remains to be seen. Additional research will also document exactly how psychosocial and biological responses to stress relate to each other. This review has implicitly suggested that heightened stress responses are bad, which in normal populations is often true. Yet research suggests a U-shaped function, such that in some clinical populations, unresponsivity of the HPA axis (i.e., hypocortisolism) is a significant adverse biological characteristic, such as patients with PTSD (Lupien, McEwen, Gunnar, & Heim, 2009). The capacity of profound threats and/or accumulating damage to compromise biological stress regulatory systems to the point of nonresponsivity must be acknowledged as well.

There are likely to be important cultural differences both in what constitutes a culturally appropriate resource and in how that resource is deployed. For example, East Asians may rely less on individual resources than European/Americans, such as optimism, control, and self-esteem (e.g., Heine, Lehman, Markus, & Kitayama, 1999), and when they do, experience them differently (e.g., Rothbaum, Weisz, & Snyder, 1982; Yik, Bond, & Paulhus, 1998). By contrast, East Asians may rely more on social resources such as the social group for managing their stressors; yet, rather than

drawing on others for explicit support, that support may be experienced more implicitly (Kim, Sherman, & Taylor, 2009). Other cultural differences are likely to be uncovered as well.

As noted, another issue that the psychosocial resource literature highlights concerns the continuities between coping with stress and goal-directed behavior. Typically, these issues are studied by different groups of researchers addressing different outcomes, with stress researchers focusing on mental and physical health-related outcomes and achievement-oriented researchers focusing on achievement behavior, such as goal-setting and performance. However, the distinction between dispositional and situational assessments of psychosocial resources, and the fact that they parallel these different outcomes, reveals the continuity between coping with stress and goal-oriented behavior. That is, both successful coping with stress and successful progress toward a goal depend critically on active coping and the absence of avoidant coping. Bringing these two literatures together may further clarify their similarities and provide useful insights. For example, the coping literature clearly shows the importance of emotional approach coping (Stanton et al., 2009), yet the achievement literature has focused more on motivation than on other emotional states. The stress and coping literature has also focused heavily on biological effects of stress on the autonomic, endocrine, and immune systems, and such a focus may provide insights as to the neural and neuroendocrine concomitants of achievement-oriented behavior under both challenging and threatening circumstances (Tomaka, Blascovich, Kelsey, & Leitten, 1993). Of interest, there is an inverted U-shape relation between glucocorticoid levels and cognitive performance (Lupien & McEwen, 1997), suggesting that the HPA axis may map onto the often-reported U-shaped relation between anxiety and performance.

Another remaining issue concerns whether unrealistic levels of psychosocial resources are adaptive or not. Although this issue surfaced at several points in the preceding discussion, it is not a focal issue of this review and, thus, cannot be definitively addressed in these conclusions. On the whole, it appears that feelings of mastery and optimism, even when they are somewhat exaggerated in a positive direction, can be adaptive. Self-views that are falsely positive (i.e., self-enhancement) appear to have benefits in some circumstances but may compromise social functioning at the extremes or over time (e.g., Robins & Beer, 2001). Whether exaggerating the degree of social support one perceives to have available has liabilities is unknown but, on the whole, the evidence suggests that perceived social support has strong mental and physical health benefits. The question of the adaptiveness of unrealistic psychosocial resources is, however, a complex issue and merits more than the cursory overview provided here.

What is important to recognize, however, is the fact that psychosocial resources do not appear to uniformly undermine the ability to recognize

personally relevant risks. The evidence for this point is quite strong in the optimism literature and also has some support in the self resources literature. Of note, there is preliminary neural evidence for such a conclusion, as well. That is, a study that directly addressed this issue (Taylor et al., 2008) found that people with high psychosocial resources did not show lower activation of brain regions implicated in threat perceptions but, rather, showed greater activation in regions associated with executive control of those threat responses. This pattern suggests that psychosocial resources confer coping ability at the executive level, rather than undermining the recognition of threats or risk.

Given that psychosocial resources appear to have a profound effect on mental and physical health, the question arises as to how modifiable they are. The fact that they have origins in early childhood and genetic factors might suggest cause for pessimism, but as our review of the intervention literature suggests, these resources can be enhanced. Intervening to help people think more positively about themselves, the world, and the future is one method, and cognitive behavioral interventions more generally appear to affect psychosocial resources for the better. Because psychosocial resources appear to exert so many of their effects through specific approach-oriented coping techniques, these coping techniques themselves represent potential points of intervention. This is an especially valuable focus because coping subsumes the ways that people think and behave in response to stress and, thus, is potentially more modifiable than dispositional resources themselves. Evidence suggests that coping interventions do, indeed, enable people to manage their lives and cope with stress and may feed back into the development of enhanced psychosocial resources (e.g., Antoni et al., 2001; Lee et al., 2005). As such, interventions such as these may ultimately affect mental and physical health beneficially.

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