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5

Elective Affinities and Uninvited Agonies

Mapping Emotion with Significant Others onto Health

Carol D. Ryff, Burton H. Singer, Edgar Wing, & Gayle Dienberg Love

Goethe's *Elective Affinities*, written in 1809, is a love story that celebrates themes of the romantic era: individuality, immediacy, passion. Love itself was hardly a novel topic, given centuries of prior literature and poetry on matters of the heart (see Singer, 1984a, 1984b). What was unique was Goethe's depiction of powerful longing for another in the context of a society characterized by strict marital customs. The novel pulled love out of the romantic haze, so to speak, and brought it into the prosaic routines of the country gentry. It challenged a view of human relationships governed by social convention and, instead, portrayed love selected by the heart; hence, he called his work *elective* affinities. He did not overlook, however, the complexity, pain, and turmoil that frequently accompany such a passionate response to another. Our phrase, *uninvited agonies*, draws attention to love's counterpoint and, more generally, to the observation that significant human relationships, lived out over the long term, frequently include a panoply of positive and negative emotions.

The purpose of this chapter is to probe the emotional features, both good and bad, of significant human relationships and to consider their import for human health. We draw on multiple data sources to probe connections among the quality of social relationships and various health outcomes. These include a national survey, which is valuable for assessing population profiles on the positive and negative emotions that are associated with key social relationships. Such survey data elaborate the range of variability in people's evaluations of the quality of their ties to significant others. In addition, the survey findings point to preliminary linkages between the presence of good (or poor) relationships and various measures of self-reported health.

This inquiry emerges from and extends a large body of literature that documents positive ties between social support and health (Berkman & Breslow, 1983; House, Landis, & Umberson, 1988; Seeman, 1996; Seeman, Berkman, Blazer, & Rowe, 1994; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Such research has frequently emphasized the structural features of social relationships, such as the size and proximity of one's social network (e.g., whether one is married or living alone, whether one has close confidantes, number of close friends or relatives, and frequency of contact with them). Less explicit concern has been given to the emotional texture and depth of such social relations, although questions are sometimes asked about levels of emotional support (e.g., Berkman, Leo-Summers, & Horwitz, 1992; Blumenthal et al., 1987; Glass & Maddox, 1992). The emotions that comprise such support are rarely elaborated. However, when probing more specific emotions, Seeman and Syme (1987) found that those who scored highest on "feeling loved" had the lowest levels of coronary artery disease.

To emphasize the need for greater attention to *emotion* in social relationships, we examine the record of emotional dynamics in the lives of three famous couples. These capture the lived experiences of connection to others and, in so doing, underscore the importance of tracking cumulative, indeed chronic, aspects of emotional experience with others. It is this cumulation of enduring love and affection, or bitterness and torment, that we suggest is consequential for health. These observations are then brought back to the empirical realm via life histories of relational data collected in the Wisconsin Longitudinal Study (WLS), a large cohort of men and women who have been studied from their senior year of high school to their late fifties. Our aim is to create relationship pathways of the WLS respondents, which combine information about the quality of early ties with parents (mother and father) and the quality of emotional ties to significant others in adulthood. For a subsample of respondents, we then link these cumulative relationship profiles to aspects of biology, which are viewed as possible intervening mechanisms between relational life histories and health outcomes. Our specific focus is on allostatic load, a measure of the physiological wear and tear on organ systems and tissues (Seeman, Singer, Rowe, Horowitz, & McEwen, 1997). Consistent with our aim of advancing knowledge of positive human health (Ryff & Singer, 1998a), we give particular emphasis to the role of emotionally rich, gratifying human relationships in keeping allostatic load low. The larger aim is to begin mapping linkages from long-term social relationship quality through biological mechanisms to unfolding profiles of morbidity and mortality.

Quality of Social Relations in the U.S. Population

In 1995, the MacArthur Research Network for Successful Midlife Development conducted a survey (known as MIDUS) based on a national probability sample of English-speaking adults aged 25 to 74, who resided in the 48 contiguous states. Data were collected by telephone interviews and self-administered questionnaires. The response rates for these different parts of the study were 68% and 87%. The data summarized here, pertaining to quality of social relationships (e.g., spouse, family, friends), involve 1,880 respondents on whom complete data are available.

Two evaluative aspects of social relationships are examined. The first pertains to the assessment of positive relations with others, one of six dimensions of psychological well-being formulated by Ryff (1989a). This global evaluation of the quality of one's ties to others is then augmented with assessments about the positive and negative aspects of three specific relationships: spouse, other family relationships, and friends.

Global Evaluation of Positive Relations with Others

Conceptual formulations in clinical and developmental psychology and the mental health literature converge in their depiction of psychological well-being as a multifaceted phenomenon (Ryff, 1985). Among the diverse components that comprise optimal human functioning, the most universally agreed-upon feature is that of having quality relations with others (Ryff & Singer, 1998a). While the particular ways in which good relationships are expressed may vary across cultures, it is universally true that all people everywhere deem connections with others as a core feature of optimal human existence.

Positive relations with others, as an aspect of well-being, has been operationalized with structured self-report scales, which probe the extent to which individuals feel that they experience warm, trusting, meaningful ties with others (Ryff, 1989a). This component of well-being, along with five other dimensions of positive functioning, was assessed in MIDUS, the MacArthur national survey. The six dimensions have been shown to be factorially distinct not only from each other but from other frequently used indicators of well-being (Ryff & Keyes, 1995). In MIDUS, the well-being dimensions were measured with three-item scales, which correlated from .70 to .89 with their longer parent scales and had internal consistency coefficients ranging from .39 to .59. The lower alpha coefficients followed from the decision to select short-form items that reflected the multifactorial structure of each parent scale, rather than selecting those that maximized internal consistency (see Ryff & Keyes, 1995).

Shown in figure 5.1 are mean-level scores for each of the six scales of well-being, plotted separately for three age groups of men and women. The general life-course story is that some aspects of well-being show incremental patterns with age (autonomy, environmental mastery), others show decremental patterns (purpose in life, personal growth), and still others show little age variation (self-acceptance, positive relations—only for women). Such patterns have replicative consistency across multiple studies (Ryff, 1989a, 1991; Ryff & Keyes, 1995; Ryff & Singer, 1998b). Of particular significance for the present inquiry is the finding that positive relations with others shows stable age profiles for women from young adulthood through midlife into old age, while for men the pattern is one of slight age increment, particularly from midlife to old age, perhaps tied to the Jungian notion that as men age, they become more aware of their affiliative needs and capacities (Jung, 1933). What is more striking, however, is the notable difference in overall levels of positive relations with others: men consistently score

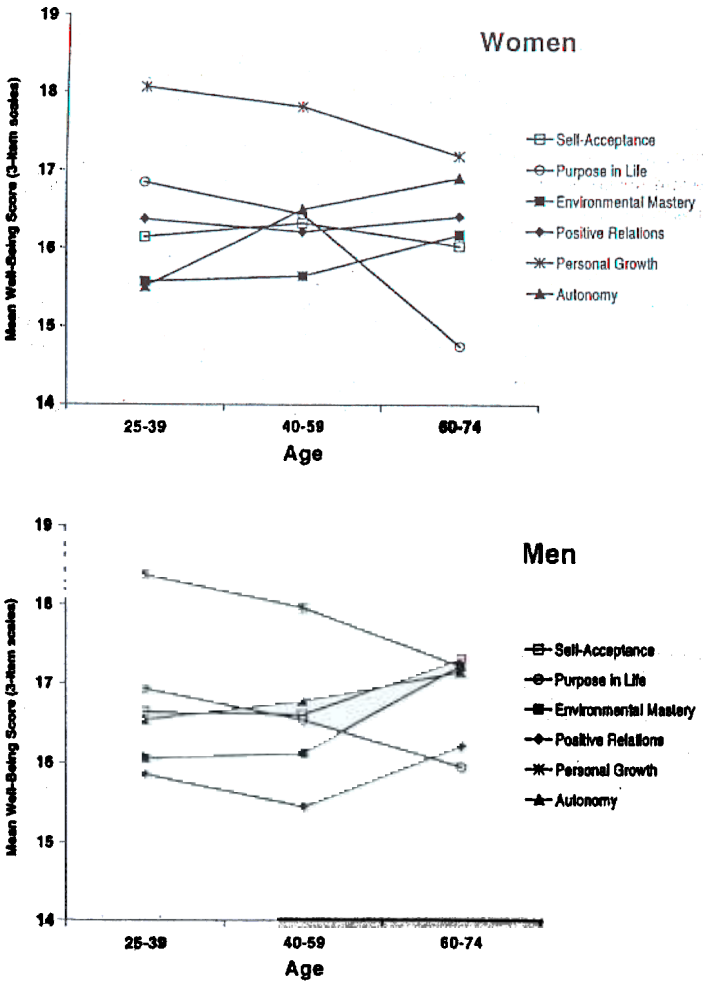


Figure 5.1 Age and gender differences in psychological well-being.

lower on this aspect of well-being than women, a finding that has been replicated with numerous samples with diverse socioeconomic and cultural groups (Ryff & Singer, 1998b). Further, positive relations with others is, for men, the lowest rated of all of their six dimensions of well-being.

Such a finding might suggest that the relational realm has less priority and importance for men compared to women, with perhaps other features of well-being (e.g., environmental mastery, autonomy) being more central to men. However, a

prior study of "lay conceptions" of well-being (Ryff, 1989b) showed that both men and women gave highest priority to having quality relations with others in their spontaneously generated definitions of well-being. Taken together, these findings indicate that men may have less of the comparably valued relational goods than do women. If such quality relations are, indeed, linked with health, these gender differences may have significant consequences. The nearly eight-year differential in life expectancy between men and women (Spirduso, 1995) adds poignancy to the task of tracking gender differences in the connection between quality relations and health.

Specific Social Relationships and Health

The MIDUS national survey also probed the quality of specific social relationships, such as with one's spouse, with other family members, and with friends. Questions were asked about the positive and negative aspects of each of these relationships. For example, with regard to spousal relations, respondents were asked, "How much does your spouse really care about you?" "How much does he or she understand the way you really feel about things?" "How much can you open up if you need to talk about your worries?" Six positive items were included, and their internal consistency (coefficient alpha) was .91. Sample items to assess negative aspects of respondents' spousal relations were: "How often does he or she argue with you?" "How often does he or she get on your nerves?" Internal consistency (alpha) for these six items was .88. Similar questions were asked about respondents' evaluations of their ties to other family members (i.e., children, parents) as well as ties to friends. Four items each were asked about the positive and negative aspects of relationships with family and friends. Alpha coefficients showed high internal consistency (range = .79–.91).

Reports of the quality of these relationships are linked to three aspects of self-reported health: *symptoms* that the respondent had experienced over the last 30 days (measured as number times frequency), the number of *chronic conditions* (diagnosed by a physician) they reported during the last 12 months, and a general *subjective evaluation of their overall health*. Findings are first examined with regard to links between specific relationship items and health variables and then for aggregated relationship profiles and their ties to health.

Figure 5.2 summarizes, separately for married men and women, the frequency distribution of responses to the question: "How often does your spouse argue with you?" The modal response, which accounted for about half of men and slightly less of women, was "rarely." About 40% of men and 35% of women said "sometimes," with another 10% of women and slightly less of men reporting that their spouse argued "often" with them. At the other extreme, about 7% of men and 10% of women say their spouse "never" argues with them. The smaller percentages, when extrapolated to the larger U.S. population (of which this sample is representative) account for large numbers of people existing at the ends of these distributions. The line graph superimposed over the bars indicates the average report of health symptoms (number times frequency, see right vertical axis) for individuals in each response group. The graph shows that women overall report

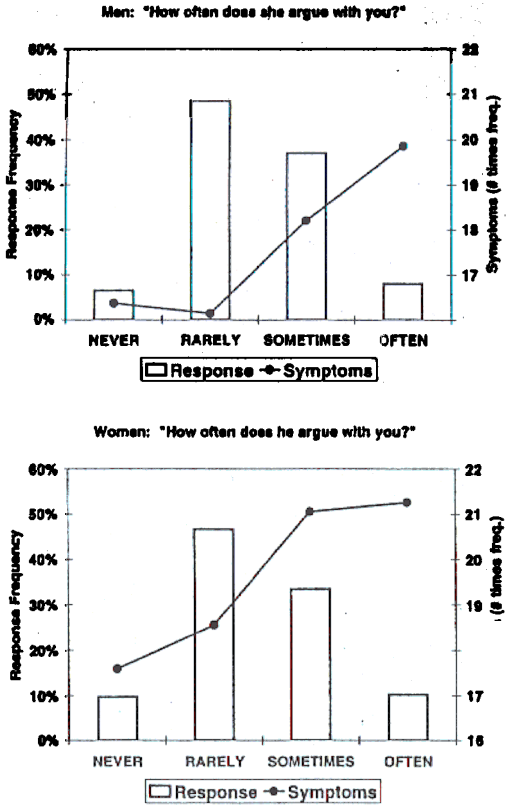


Figure 5.2 Negative spousal item (response distribution) and health symptoms.

higher levels of symptoms, but for both genders, there is an incremental pattern of symptoms following increments in frequency of arguing with spouse. Highest levels of symptoms for men are evident among those who say their wife argues often with them, while for women, highest symptom levels are evident for those who say their husband argues with them sometimes or often.

Figure 5.3 shows the response distributions for a positive spousal item: "How much does he or she understand the way you feel about things?" About 55% of men, but only 40% of women say "a lot." Slightly more than 40% of women and slightly less than 40% of men say "some," while about 7% of women and only 2% of men say "not at all." Again, superimposed over these response groups are reported levels of symptoms (number times frequency). Those who indicated that their spouse does not understand them much, or at all, have the highest levels of health symptoms (with women again reporting higher levels overall). The lowest

levels of health symptoms for both men and women are reported for those who say their spouse understands them a lot.

Figure 5.4 again shows responses for "How often does he or she argue with you?" but now superimposed on the distribution are average numbers of chronic conditions reported by respondents. The data for men show that those who are at the extremes (i.e., they *never* argue with their wives, or they do so *often*) report the highest levels of chronic conditions. The former may comprise husbands who suffer from emotionally repressed anger or frustration, thereby connecting to the literature on emotional inhibition (e.g., suppressed anger or hostility) and its links to disease (Pennebaker & Traue, 1993) as well as to studies that show gender differences in patterns of emotional expression or inhibition and health symptoms (Malatesta & Culver, 1993). The data for women show a more linear pattern, which links frequency of arguing with reported chronic conditions, although they

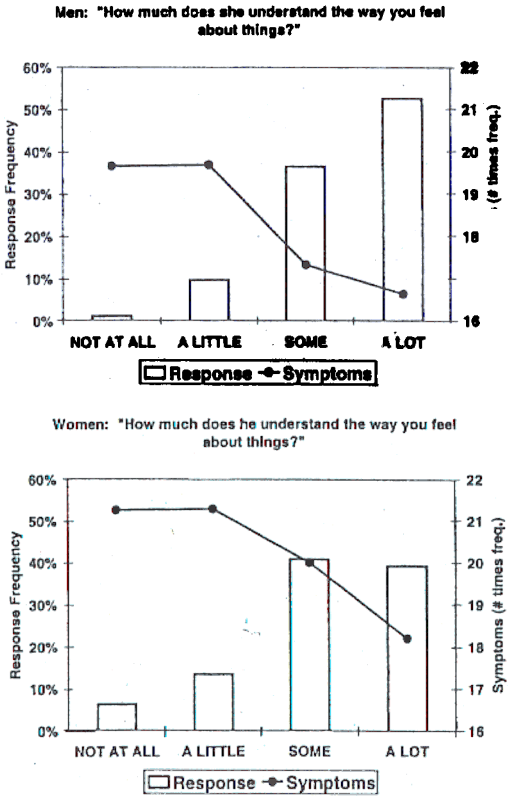


Figure 5.3 Positive spousal item (response distribution) and health symptoms.

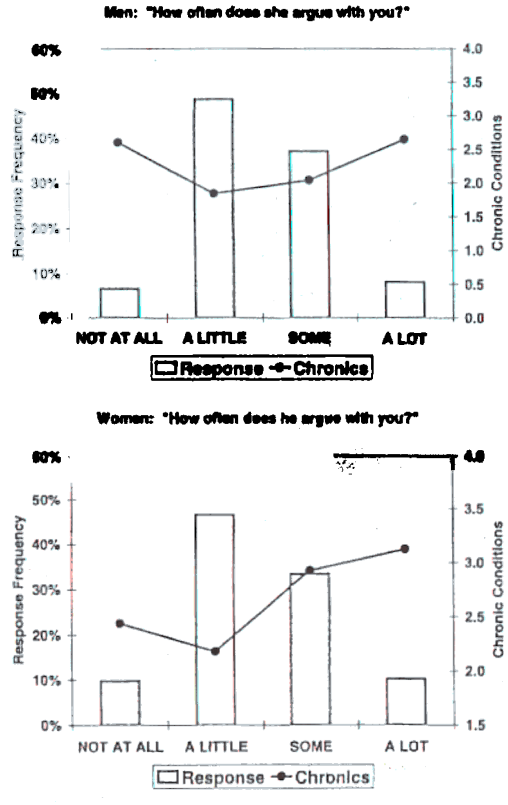


Figure 5.4 Negative spousal item (response distribution) and chronic conditions.

also show a slight increment among wives who say they never argue with their husbands.

Figure 5.5 summarizes the data on reported chronic conditions vis-à-vis a positive item: "How much does he or she appreciate you?" Happily, most married respondents say their spouse appreciates them a lot, although more so for men (about 70%) than women (about 55%). What is notably clear, for both genders, is that reported levels of chronic conditions are incrementally lower as husbands and wives report feeling ever more appreciated by their spouses.

The above data offer a preliminary look at the link between social relationships and health via responses to single questions (negative or positive) about a specific social tie (spouse) and a particular aspect of health (symptoms or chronic conditions). The next two figures provide a more comprehensive perspective; they incorporate the idea of cumulative relational impact by creating composite indices,

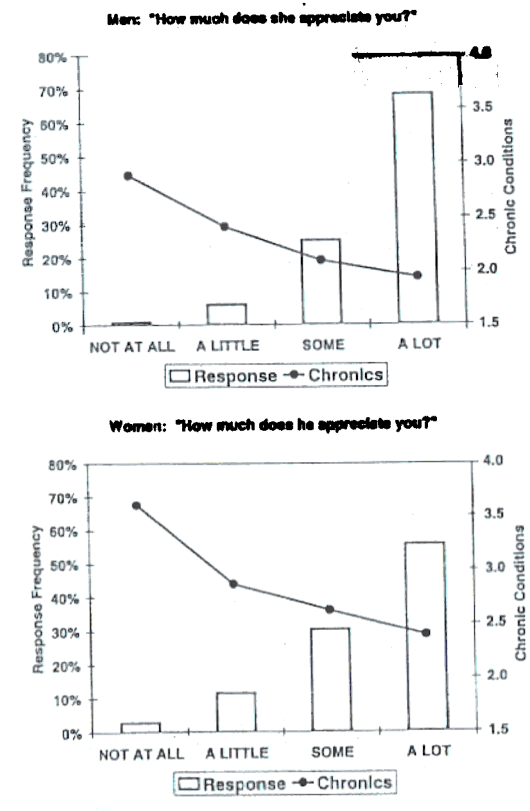
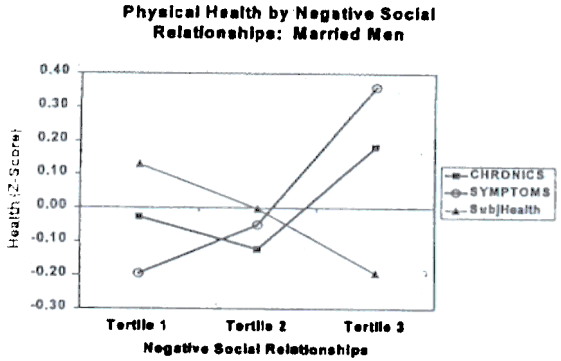


Figure 5.5 Positive spousal item (response distribution) and chronic conditions.

which were summed across positive versus negative items of relational quality and summed over three types of social relationships (spouse, nonspousal family relationships, friends). The sample is then divided into tertiles of relationship quality for this composite measure. Figure 5.6 summarizes the data—separately for married men and women in MIDUS—for the three measures of health (chronic conditions, physical symptoms, subjective health ratings) among those in the low, middle, and high tertiles on the composite negative relationship measure. The health measures are plotted as standardized z-scores. For men, those in the highest tertiles of negative social relationship ratings have significantly higher levels of chronic conditions (F (2, 1074) = 7.6, $p < .001$), higher number of health symptoms (F (2, 1028) = 27.9, $p < .001$), and significantly lower levels of subjective health ratings (F (2, 1069) = 9.3, $p < .001$) than those in the lowest tertile. Those in the middle tertile are also significantly different from those in the highest tertile on



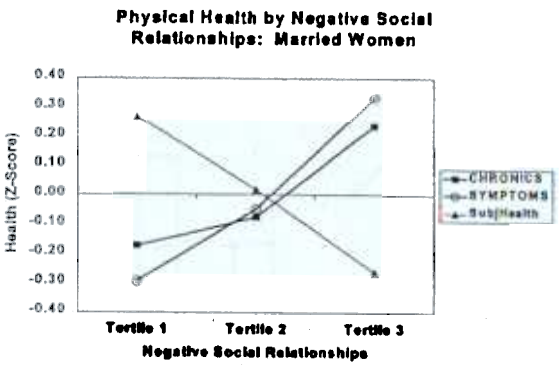


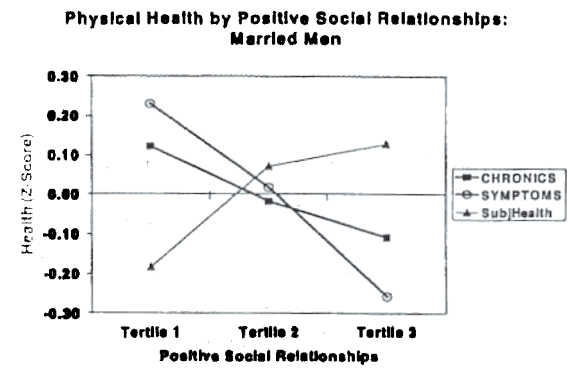
Figure 5.6 Cumulative relational profiles (negative items for spouse, family, friends) and reported health.

two of the three health measures (symptoms, subjective health). For women, the patterns are similar: those in the highest tertile of negative relations have significantly higher levels of chronic conditions (F (2, 924) = 14.9, $p < .001$), higher numbers of health symptoms (F (2, 864) = 31.3, $p < .001$), and significantly lower levels of subjective health (F (2, 916) = 23.2, $p < .001$) than those both in the middle and high tertile groups. Those in the middle group are also significantly different from those in the high group on all three health measures.

Figure 5.7 provides the counterpoint data, when married respondents report on the positive aspects of the social relationships with spouse, family, and friends. These data show strong patterns for both genders: those in the highest tertile of positive relationships have significantly lower levels of chronic conditions (men: F (2, 1071) = 5.1, $p < .001$; women: F (2, 927) = 8.6, $p < .001$), fewer health symptoms (men: F (2, 1027) = 21.6, $p < .001$; women: F (2, 866) = 17.9, $p < .001$),

and higher levels of subjective health (men: F (2, 1066) = 10.1, $p < .001$; women: F (2,919) = 26.0, $p < .001$) than those with lower-quality relations.

Taken together, these findings indicate that both the presence of the good and the absence of the bad in social relationships are linked with better self-reported health profiles. Such data converge with prior survey and epidemiological studies that link social relationships to health and/or mortality (Berkman & Breslow, 1983; House, Landis, & Umberson, 1988; Seeman, 1996; Seeman, Berkman, Blazer, & Rowe, 1994; Seeman & Syme, 1987; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). What they add, however, is more detail about positive and negative aspects of the emotional features of social relationships. That is, prior studies have tended to focus on simply relationship counts (number of significant others) or the instrumental features of social relationships (i.e., what others do for the respondent). While emotion is sometimes probed, questions have been general (e.g., "Do you receive emotional



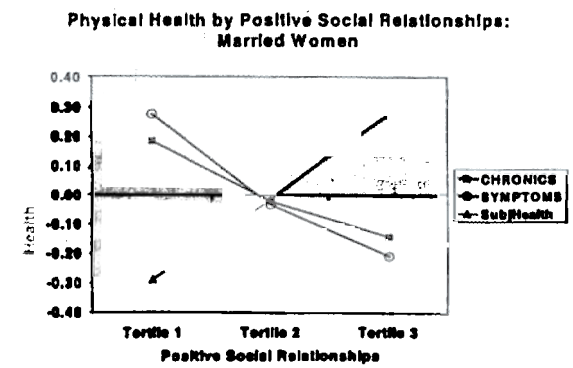


Figure 5.7 Cumulative relational profiles (positive items for spouse, family, friends) and reported health.

support from your spouse?") or have asked only about single emotions (e.g., "Do you feel loved?"). More differentiated dimensions of emotional interaction (e.g., understanding, opening up, criticizing, arguing) are infrequently probed. Certainly, the extensive literature on adult attachment (Cassidy & Shaver, 1999; Hazan & Shaver, 1994) and intimacy and close relationships (Barnes & Sternberg, 1997; Berscheid & Reis, 1998; Hatfield & Rapson, 1993) addresses these more emotional features of significant social relationships, but these studies rarely intersect with scientific agendas that link social relationships to health (see Ryff & Singer, 2000).

The preceding cross-sectional findings, and others like them, offer little insight about *how* such relationship patterns unfold or persist over time. Also, the dynamics between relational assessments and health (what causes what?), including possible reciprocities between the two, cannot be discerned. Further, issues of cumulative relationship impact over time cannot be assessed. To push forward questions regarding the long-term persistence of positive relations, or the chronicity of negative interaction, we will briefly consider the long-term relationships of three famous couples. These examples illustrate ideas of cumulative emotional experience in key relationships. These works also add texture and detail about the lived experience of emotional connection to others, which, in turn, has import for refinement of extant survey instruments.

Cumulative Emotional Experience in Three Famous Couples

Famous people can provide valuable examples regarding the texture of one's emotional life with a significant other. One reason pertains to the depth of the historical record about such lives, that is, fame is frequently accompanied by the compiling of extensive personal documents (diaries, letter, essays) in the form of biographies or autobiographies. These afford an invaluable inside look at relationship dynamics played out in real time. A second reason for exploring famous lives is that they frequently embody strong emotion. Indeed, the powerful yearnings of the artist, poet, writer, or musician frequently fuel the creative products from which their fame ensues. These features—detailed historical records and strong emotional expression—were the basis for selecting the following three couples.

Enduring Anguish: Leo and Sonya Tolstoy

The Tolstoys provide a remarkable look inside a stormy marriage, as both wrote copiously in their diaries from the beginning of their relationship through the next 48 years. William Shirer describes this long portrayal of feelings in his book, *Love and Hatred: The Stormy Marriage of Leo and Sonya Tolstoy* (1994). Both Leo and Sonya (fig. 5.8) were strong-willed, fiercely independent individuals, and even as their relationship began, there were signs of trouble. A week before their wedding, Leo shared with his betrothed his diaries, which included details of his passionate love for a peasant woman with whom he had an illegitimate child. Sonya was shattered. A fortnight after her marriage to Leo, she wrote in her diary: "Ever since yesterday, when he told me he didn't trust my love, I have been feel-

Figure 5.8 Leo Tolstoy (top), and Sonya Tolstoy (bottom). Photographs from Shirer, 1994.

ing truly terrible. . . . He loves to torment me and see me weep. . . . What is he doing to me? Little by little I shall withdraw completely from him and poison his life" (Shirer, 1994, p. 26; all quotations in this section are from this work).

One month after the birth of their first child, Leo's diary entry read: "Her character gets worse . . . with her grumbling and spiteful taunts . . . her unfairness and quiet egotism frighten and torment me. . . . I've looked through her diary—suppressed anger with me glows beneath words of tenderness. . . . If this is so, it's all a mistake on her part—it's terrible—I'm terribly depressed" (pp. 28–29). Leo was deeply troubled that Sonya was not nursing the child. Later, in the fall of that year, she wrote, "He wants to wipe me off the face of the earth because I'm not doing my duty. . . . How can one love an insect which never stops stinging? I am left alone morning, afternoon, and night. I am to satisfy his pleasure and nurse his child. I am a piece of household furniture. I am a woman" (p. 30).

The Tolstoys went on to have a very large family together: Sonya had 16 pregnancies, 3 of which were miscarriages; of the 13 remaining children, 10 survived into adulthood. "Yasnaya Polyana" was their home for 48 years, and it was there that Leo Tolstoy wrote *War and Peace*, *Anna Karenina*, and other famous works. During these years, Sonya not only had many children, she provided carefully written copies of his manuscripts; she copied somewhere around 21,000 pages of text. Recurrent depressions and tumultuous emotions characterized many of their years together. About 20 years after their wedding, Sonya's diary entry read: "Today he shouted at the top of his voice that his dearest wish was to leave his family. I shall carry the memory of that heartfelt heartrending cry of his to the grave. I pray for death, for without his love I cannot survive. . . . I cannot sleep in the bed he has abandoned. Lord help me, I long to take my life. . . . the clock is striking four" (p. 91). His diary two years later included these thoughts upon joining his family for tea: he found them all "so repulsive, pathetic, and degrading to listen to, especially the poor, mentally sick Tanya" (his name for Sonya) that he took to bed. He concluded, "it would have been better for me to have had no children at all" (p. 109).

Around age 50, Leo wrote about his tormented mind and soul in *Confession*, a book about his own midlife crisis. This was the period of life when he renounced his wealth and property, and he began dressing as a peasant and working with them in the fields. He took on a deeply religious and moral stance, even preaching abstinence to the Russian peasants. Sonya vented considerable anger about the hypocrisy of this position, as she found herself constantly pregnant with his children. Much was recorded by both husband and wife about their sensual attraction to each other, which was accompanied by feelings of depravity for succumbing to their desires. Leo's novella, *The Kreutzer Sonata*, published in 1889, offered a harsh diatribe against women, marriage, marital love, sex, and having children. Sonya was humiliated by it. During this time, she began having terrible nightmares, attempted to leave home, and even tried to kill herself. The loss of two of her younger children to scarlet fever during these years affected her deeply, and another child died of pneumonia in 1906. From those years until Leo's death in 1910, their marital relationship disintegrated into an unbearable hell for both of them.

The photo in figure 5.9 was taken on their 48th wedding anniversay. Leo wrote in his diary that he felt ashamed to be photographed as a loving couple. Growing

old, they became two enemies, who spied on each other and read each other's diaries. Sonya was tormented by his relationship with a young man named Chertkov, to whom Leo was secretly arranging to leave his literary treasure. In October 1910, she wrote, "Everyday there are fresh blows that scorch my heart, shorten my life, and torment me unendurably" (p. 327). Leo, at age 82, with a heart condition, found life with her so unbearable that he arranged an escape from their home in the middle of the night. He boarded a train and traveled third class as far as the small town of Astapovo. By this point, he was wheezing and coughing up blood and had to be moved onto a table at the train station. On learning of his escape, Sonya tried to drown herself twice, but she was rescued by her children. The sadness of their final days is captured by the photo in figure 5.10, which is Sonya standing on tiptoe outside the Astapovo train station, trying to catch a glimpse of her dying husband, who did not want to see her. Sonya died nine years later.

Thus, the Tolstoys represent a marriage of marked emotional negativity, which not only cumulated but escalated over time. This relational torment seems to have been linked primarily with mental, rather than physical, health difficulties.

Figure 5.9 Last photograph taken of Leo and Sonya Tolstory (from Shirer, 1994).

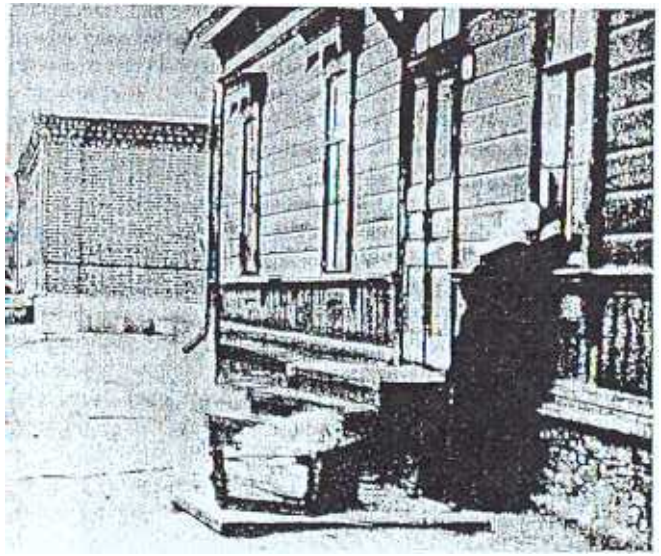


Figure 5.10 Sonya Tolstoy standing on tiptoe outside the stationmaster's house at Astapovo (from Shirer, 1994).

Both parties suffered bouts of depression and had suicidal tendencies over the course of their lives together. Leo Tolstoy's ultimate demise was likely quickened by his need to escape his wife's presence when his health was deteriorating. For their historical time, however, both Tolstoys were quite long lived, suggesting the presence of other compensating factors, such as the pluses afforded by their high-class lifestyle (e.g., good nutrition, optimal living conditions) or the emotional strengths derived from other relationships (e.g., children, close ties to others outside their marriage) or simply strong biological constitutions. This combination of factors, which underlay their emotional dynamics and their health, underscores the complexity of the task of linking emotion in social relationships to health.

From Sequestered Illness to the Full Cup of Life: The Brownings

An equally dramatic couple of the positive variety is the story of Elizabeth Barrett and Robert Browning, written about by Julia Markus in *Dared and Done* (1995). The two met in 1845, when young Robert, then in his early thirties, began writing to the invalid poet; she was aged 39. Elizabeth was the daughter of a wealthy British gentleman, who was a widower with nine children. Domestic tyrant that he was, her father allowed none of his adult children to marry. Elizabeth's mother had died when Elizabeth was 21. As a young woman, Elizabeth suffered from lung problems and was given her first prescription of morphine as a teenager to calm down her "irritable restlessness." At the time Robert contacted her, she was

living a life reduced to her upstairs room in the Wimpole Street house of her father. From her couch, she lived, in her words, "only inwardly" while Robert seemed to her to have "drunken from the cup of life full" (Markus, 1995, p. 28; all quotations in this section are from this work).

As the months passed, the reclusive poet agree to receive Robert as a visitor. Through the next year, visits occurred regularly, and Elizabeth experienced a burst of well-being. She wrote, "I had done living, I thought, when you came and sought me out" (p. 35). This woman, with the heart of a romantic poet and the body of an ailing invalid, had lived in one of the most repressive households of the Victorian period. Looking back, she wrote, "A thoroughly morbid and desolate state it was, which I look back now to with the sort of horror with which one would look to one's gravesclothes, if one had been clothed in them by mistake during a trance" (p. 83).

At the age of 40, she walked down the stairs of her father's house and out the door to a nearby chapel, where she and Robert were secretly married; they then left for Europe. In Paris, she wrote that they were "thinking one thought, pulsing with one heart" (p. 81) and described her new life as like "riding an enchanted horse" (p. 81). They settled in Pisa, Italy, where after two miscarriages, she gave birth to a healthy, fair-skinned baby boy on March 9, 1849. She was 43, Robert 37.

Her *Sonnets from the Portuguese* were written around 1850. The best of these have been rendered stale by their popular usage. However, one can imagine how Elizabeth's expressions evoked poignant response from Robert, upon his first reading of these lines:

> How do I love thee?
> Let me count the ways.
> I love thee to the depth and breadth and height
> My soul can reach, when feeling out of sight
> for the end of Being and ideal Grace.

The Brownings shared nearly 20 years together in their beloved Italy before she died, at age 56, from recurrent lung problems. The photos in figure 5.11 are of Robert and Elizabeth shortly before her death. Robert lived for another 28 years and never remarried. While Elizabeth Barrett Browning was far from healthy from childhood onward, the ways in which their love brought vigor and engagement to her reclusive, somber world were unmistakable and remarkable. Theirs is a story of the power of deep connection to awaken the will to experience life fully, when health seemed to have been lost. Escaping to Italy for a new existence, complete with family and writing achievements for both of these talented individuals, did not fully overcome Elizabeth's long-term respiratory ailments nor her difficulties with morphine addiction, which was set in motion by her parents when she was a child. Robert did, nonetheless, take her away from a life described by herself as deathlike, and they shared 20 remarkable years together.

Expressions of Pain: Frida Kahlo and Diego Rivera

Emotional experience, both exhilarating and agonizing, is a well-known catalyst for creative expression. Frida Kahlo's art dramatically illustrates emotion trans-

Figure 5.11 Robert Browning (top), photograph by Alessandri, Rome, 1860, and Elizabeth Barrett Browning (bottom), photograph by Alessandri, Rome, May 27, 1861. Courtesy of the Armstrong Browning Library, Baylor University, Waco, Texas.

Figure 5.12 *Frieda and Diego Rivera* or *Frieda Kahlo and Diego Rivera*, 1931. © 2001 Banco de México Diego Rivera and Frida Kahlo Museums Trust. Av, Cinco de Mayo No. 2, Col. Centro, Del. Cuauhtémoc 06059, México, D. F., México. Reproduction authorized by the National Institute of Fine Arts and Literature, Mexico.

lated to canvas (Kettenmann, 1993). Frida met Diego Rivera, the renowned Mexican artist, in the 1920s, and they married in 1929. He was 21 years her senior. Rivera, established in the art world, recognized her talent and described her as "the first woman in the history of art to treat, with absolute and uncompromising honesty, one might even say with impassive cruelty, those general and specific themes which exclusively affect women" (Kettenmann, 1993, p. 51).

Frida came to this relationship with a history of health problems. As a child, she had had polio, which stunted the growth of her right leg and foot and led to the cruel nickname "Peg-Leg Frida." At the age of 19, she was severely injured in a bus accident, while traveling with her youthful boyfriend. Spinal injuries confined her to bed for months, which was when she began to paint in earnest.

Figure 5.12 is a work painted in 1931. Frida floats beside her corpulent husband, who at the time of their marriage was internationally acclaimed; she was artistically unknown. During the 1930s, while in the United States, Frida had an

abortion for medical reasons related to her fractured pelvis. She became pregnant again and wanted to carry the child to term, but Diego was not interested in having a child. She had another miscarriage, her emotions about which are depicted in *The Flying Bed* (not shown), a painting completed in 1932. Her small body is lying on an enormous bed; the sheets are soaked with blood. She is surrounded by a vast, forlorn, desolate plain. Numberous symbols of the child (fetus, umbilical cord) and Rivera (the orchid he brought her in the hospital) are included.

Diego, a philanderer of monumental proportions, had repeated affairs with other women, including Frida's sister Cristina. A painting in 1935, *A Few Little Pricks*, was linked to a newspaper report of a woman murdered as a result of a man's jealousy. The wounds caused by the brutal male violence may have symbolized Frida's own emotional injuries at the time. In 1939, Frida divorced Rivera and painted *The Two Fridas* (see fig. 5.13), again expressing the emotions surrounding her separation and marital crisis. The person who was respected and loved by Diego was the Mexican Frida in Tehauna costume; the other Frida wore European dress. The hearts of both women are exposed; there is blood dripping

Figure 5.13 *The Two Fridas*, 1939. © 2001 Banco de México Diego Rivera and Frida Kahlo Museums Trust. Av, Cinco de Mayo No. 2, Col. Centro, Del. Cuauhtémoc 06059, México, D. F., México. Reproduction authorized by the National Institute of Fine Arts and Literature, Mexico.

from the freshly severed artery. This was followed by her *Self-Portrait with Cropped Hair* (see fig. 5.14), which was painted in 1940. Her feminine clothes have been replaced with a dark man's suit, and she has cut off her long hair. The verse across the top reads, "See if I loved you, it was for your hair, now you're bald, I don't love you any more." These words of a Mexican song captured Frida's feelings that she was loved by Diego only for her female attributes.

The two artists remarried in 1940, and for the next 14 years, Frida endured continuing physical and emotional pain. Her severe and chronic back problems became a recurrent topic for artistic expression. *The Broken Column* (1944, not shown) reveals the excruciating back brace she was forced to wear. Spinal surgery did not cure this world of pain, also depicted in *Wounded Deer* (fig. 5.15). The physical torment was compounded by the emotional trauma of Diego's continuing affairs with other women. The man, nonetheless, came to dominate her mind and heart, as depicted in her self-portrait entitled *Diego in My Thoughts* (fig. 5.16) and again in 1949 (*Diego and I*, not shown), while he was having an affair with a famous film star. In the latter, she looks mournfully at the viewer, long hair wrapped around her neck, with Diego central in her mind.

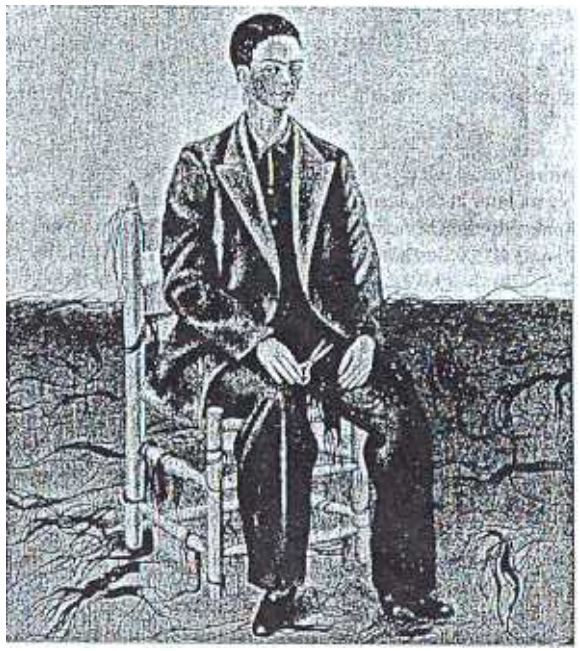


Figure 5.14 *Self-portrait with Cropped Hair*, 1940. © 2001 Banco de México Deigo Rivera and Frida Kahlo Museums Trust. Av, Cinco de Mayo No. 2, Col. Centro, Del. Cuauhtémoc 06059, México, D. F., México. Reproduction authorized by the National Institute of Fine Arts and Literature, Mexico.

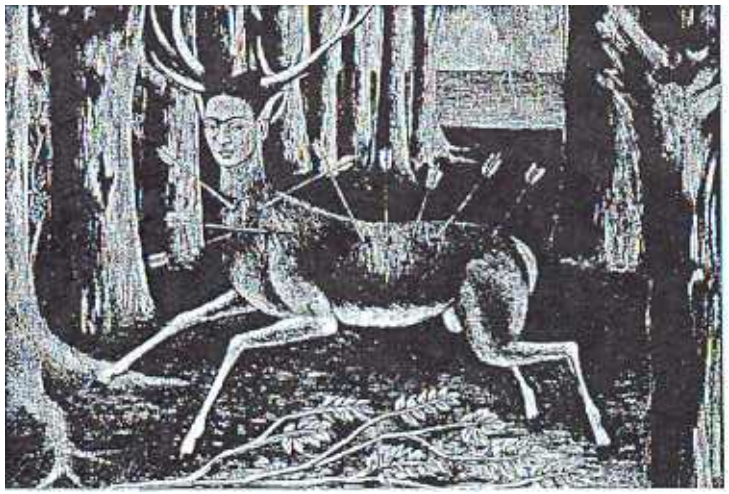


Figure 5.15 *The Wounded Deer* or *The Little Deer* or *I am a Poor Little Deer*, 1946. © 2001 Banco de México Diego Rivera and Frida Kahlo Museums Trust. Av, Cinco de Mayo No. 2, Col. Centro, Del. Cuauhtémoc 06059, México, D. F., México. Reproduction authorized by the National Institute of Fine Arts and Literature, Mexico.

Frida Kahlo died at the age of 47 after 25 years of marriage to Diego Rivera. He died three years later at the age of 71. His health had been markedly less problematic than hers; whether his emotional/relational experiences were also less anguished is unclear. Given the health difficulties she brought to the relationship, Frida Kahlo's early death was certainly not solely attributable to having married a man who caused her great pain. Whether she would have longer withstood her health afflictions had she married a nurturing, loving, and devoted husband is an interesting but unanswerable question.

The lives of these three couples are notably unique, not only for the extremes they represent in terms of relational experiences, but also because each involved individuals of unusual expressive talents (in prose, poetry, art). Their writings and paintings give poignant insight into the nature of the recurring, cumulative emotions they shared, or inflicted, on each other. Unfortunately, limited information is available regarding their specific health trajectories as well as what their early-life relational experiences were about. Despite the missing pieces, these examples point to the importance of understanding emotion, social relational, and health linkages from a life-history perspective (Singer, Ryff, Carr, & Magee, 1998).

The final segment of our chapter returns to the lives of "ordinary" persons who have been studied over a long expanse of time. Our objective is to carry this emphasis on cumulative relational histories to the realm of longitudinal survey data. A second major objective is to explore biological variables, which may constitute

Figure 5.16 *Self-portrait as a Tehuana* or *Diego in My Thoughts* or *Thinking of Diego*, 1943. © 2001 Banco de México Diego Rivera and Frida Kahlo Museums Trust. Av, Cinco de Mayo No. 2, Col Centro, Del. Cuauhtémoc 06059, México, D. F., México. Reproduction authorized by the National Institute of Fine Arts and Literature, Mexico.

mechanisms, or bridges, that connect relational histories to health outcomes (i.e. morbidity, mortality).

Cumulative Relational Profiles and Biological Mechanisms

This section highlights recent empirical findings from a longitudinal study in which we examine relationships among multiple categories of social ties (e.g., spouse, mother, father) and various biological markers that reflect cumulative wear and tear on the body. For each individual, social relationships are represented by profiles, which incorporate information across different phases of life and multiple forms of connection with others (e.g., emotional, intellectual, sexual, recreational).

Our general hypothesis is that persons having larger amounts of negative relational experience relative to positive are also those having biomarkers of excessive wear and tear on multiple physiological systems. If so, these individuals are at elevated risk of later-life cardiovascular disease (CVD) and early decline in physical and cognitive functioning (Seeman, Singer, Rowe, Horwitz, & McEwen, 1997). Persons with profiles that show positive relationships with their parents from early life as well as close engagement with a spouse and friends in midlife are hypothesized to show biomarkers of wear and tear within normal operating range and thereby to be at reduced risk of later-life chronic conditions.

We first describe the sample in which these hypotheses are assessed and then summarize our specific measures of relationships and biological markers. The final section presents the empirical results that link the two realms.

Wisconsin Longitudinal Study (WLS)

The WLS is a long-term survey of a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957. Survey data were collected from the original respondents in 1957, 1975, and 1992–1993. Data have been collected on respondents' family background, starting resources, academic abilities, youthful aspirations, social support, social comparisons, and the timing and sequencing of adult educational and occupational achievements, work events and conditions, family events, and physical and mental health. For a comprehensive overview of WLS and many of the findings from it, see Hauser et al. (1993).

Our specific aim in this chapter is to investigate the relationship between cumulative adversity and advantage—in the realm of social relationships—over the life course and biological indicators implicated in later-life health. For a small subsample of WLS respondents, we have collected new data on the nature of early-life relationships with parents as well as their connections to significant others in adulthood. For these individuals, we have also obtained biological measures previously shown to predict later-life cardiovascular disease and decline in physical and cognitive function (Seeman et al., 1997). This inquiry is part of a broader agenda designed to link cumulative adversity and advantage across multiple life domains—including but not restricted to social relationships—to health outcomes, both mental and physical (Ryff & Singer, 1998a; Singer & Ryff, 1997; Singer, Ryff, Carr, & Magee, 1998).

Our biological subsample was selected to maximize variation in prior profiles of adversity and advantage as well as psychological well-being. This variation was designed to provide favorable circumstances for demonstrating a priori hypothesized differences in biomarker levels. The underlying philosophy was that clear, interpretable differences in biomarker distributions as a function of adversity and advantage profiles (relational and otherwise) would demonstrate the utility of conducting similar assessments on more extensive and representative samples. Specifically, we contacted sample members within geographic proximity to the location of the biological data collection and, to the extent possible, sought to maximize diversity with regard to levels of psychological well-being as well as levels of prior adversity (e.g., childhood poverty, growing up with an alcoholic parent, low occupational status in adulthood) or advantage (e.g., high socioeconomic status (SES) parents, upward occupational mobility).

Each person completed a social relationship questionnaire, which is described in detail below. They also participated in a physical health examination and contributed blood and urine samples, from which laboratory assays provided the requisite biomarker measurements. The social relationship measures focus on emotional features of key social ties, which were expected to be associated with the frequency with which biomarkers were (or were not) in normal operating ranges.

Relationship Measures

Caring, supportive, and affectionate relationships between parents and children are hypothesized to be important components of cumulative advantage profiles, which ultimately are linked with good physical and mental health in later life. Conversely, the experience of uncaring and even abusive interactions with one or both parents is anticipated to be a defining feature of a negative social relationship pathway, which would be associated with physiological indicators operating outside of normal ranges in later life.

Table 5.1 lists the 12 "caring" items in the Parental Bonding scale (Parker, Tupling, & Brown, 1979), which are the basis for discriminating in the parent-child bond between genuine caring and warmth and indifference and rejection. The WLS respondents were asked about their relationships with their mother and father separately, specifically, "When you were growing up, how much did she (he) behave in each of the following ways?" Response options were: never, a little, some, or a lot. With the exception of possibly two items (no. 5, no. 12), these questions probe explicitly emotional, affectional, caring features of one's relationship to mother and father.

Shifting attention to midlife relationships, four aspects of connection to a spouse or significant other are hypothesized to contribute to cumulative relationship profiles that should, in turn, be associated with later-life physiological indicators of wear and tear on the body. We assessed different aspects of intimacy by using four subscales of the PAIR (Personal Assessment of Intimacy in Relationships) Inventory

Table 5.1 Parental Bonding Scale

(+)	1. She (he) spoke to me with a warm and friendly voice.
(+)	2. She (he) was affectionate to me.
(–)	3. She (he) seemed emotionally cold to me.
(+)	4. She (he) appeared to understand my problems and worries.
(+)	5. She (he) helped me as much as I needed.
(+)	6. She (he) enjoyed talking things over with me.
(+)	7. She (he) frequently smiled at me.
(+)	8. She (he) seemed to understand what I needed or wanted.
(–)	9. She (he) made me feel I wasn't wanted.
(+)	10. She (he) could make me feel better when I was upset.
(+)	11. She (he) communicated with me very much.
(+)	12. She (he) took an active interest in my habits and school activities.

(+) Positively scored item
(–) Negatively scored item
Mother caring alpha = .95
Father caring alpha = .75

(Schaefer & Olson, 1981). The emotional and sexual subscales were included because of their focus on the most intimate forms of connection between two people. The intellectual and recreational subscales emphasize mutually enjoyed experiences, companionship, and the scope of shared communication. We did not use the social subscale of the PAIR because it concentrates on the mutual friends of the couple. Similarly, the conventionality subscale was deleted in our pathway constructions because it focused on efforts to create a good impression. Neither of these latter subscales were explicitly tapping feelings and connections between marital partners.

The PAIR seeks to (a) identify the degree to which each partner presently feels intimate in each specific relational area considered and (b) identify the degree to which each partner would like to be intimate. The items comprising the emotional, sexual, intellectual, and recreational subscales are listed in table 5.2. For

Table 5.2 Personal Assessment of Intimacy in Relationships (PAIR) Subscale Statements

Emotional (alpha = .89)

(–) I often feel distant from my partner.
(+) My partner can really understand my hurts and joys.
(–) I feel neglected at times by my partner.
(+) My partner listens to me when I need someone to talk to.
(+) I can state my feelings without him/her getting defensive.
(–) I sometimes feel lonely when we're together.

Sexual (alpha = .85)

(+) I am satisfied with our sex life.
(–) I feel our sexual activity is just routine.
(+) I am able to tell my partner when I want sexual intercourse.
(–) I "hold back" my sexual interest because my partner makes me feel uncomfortable.
(+) Sexual expression is an essential part of our relationship.
(–) My partner seems disinterested in sex.

Intellectual (alpha = .87)

(+) My partner helps me clarify my thoughts.
(–) When it comes to having a serious discussion it seems that we have little in common.
(–) I feel "put down" in a serious conversation with my partner.
(–) I feel it is useless to discuss some things with my partner.
(+) We have an endless number of things to talk about.
(–) My partner frequently tries to change my ideas.

Recreational (alpha = .85)

(+) I think that we share some of the same interests.
(–) I share in very few of my partner's interests.
(–) We seldom find time to do fun things together.
(+) We enjoy the same recreational activities.
(+) We enjoy the out-of-doors together.
(+) We like playing together.

(+) Positively scored item
(–) Negatively scored item

each statement, the respondent answers on a five-point scale from strongly agree to strongly disagree.

A more general measure of social relationship quality, the 14-item Positive Relations with Others scale, from Ryff's multidimensional model of well-being (1989a; Ryff & Keyes, 1995), was also utilized. A short-form version (three items) of this instrument that was included in the MIDUS national survey showed strong gender differences. Items for the 14-item scale are presented in table 5.3. Respondents answered on a six-point scale from strongly agree to strongly disagree. A high scorer on positive relations with others is described as having warm, satisfying, trusting relationships with others; being capable of strong empathy, affection, and intimacy; and understanding the give and take of human relationships. A low scorer is described as having few close, trusting relationships with others; finding it difficult to be warm, open, and concerned about others; being isolated and frustrated in interpersonal relationships; and not willing to make compromises to sustain important ties with others.

Biological Measures

Allostasis, meaning "stability through change" (Sterling & Eyer, 1988, p. 638), is a concept that emphasizes the dynamism of internal physiology and the fact that healthy functioning requires ongoing adjustments and adaptations of the internal physiologic milieu. Normally functioning physiological systems exhibit fluctuating levels of activity as they respond and adapt to environmental demands. Through allostasis, the autonomic nervous system the hypothalamic-pituitary-adrenal (HPA) axis, and the cardiovascular, metabolic, and immune systems protect the body by responding to internal and external stress.

The long-term, or cumulative, effect of physiological accommodations to stress

Table 5.3 Positive Relations with Others

(+) 1. Most people see me as loving and effectionate.
(–) 2. Maintaining close relationships has been difficult and frustrating for me.
(–) 3. I often feel lonely because I have few close friends with whom to share my concerns.
(+) 4. I enjoy personal and mutual conversation with family members or friends.
(+) 5. It is important to me to be a good listener when close friends talk to me about their problems
(–) 6. I don't have many people who want to listen when I need to talk.
(+) 7. I feel like I get a lot out of my friendships.
(–) 8. It seems to me that most other people have more friends than I do.
(+) 9. People would describe me as a giving person, willing to share my time with others.
(–) 10 I have not experienced many warm and trusting relationships with others.
(–) 11. I often feel like I'm on the outside looking in when it comes to friendships.
(+) 12. I know that I can trust my friends, and they know they can trust me.
(–) 13. I find it difficult to really open up when I talk with others.
(+) 14. My friends and I sympathize with each other's problems.

(+) Positively scored item
(–) Negatively scored item
alpha = .88

represent a price paid by the body to maintain systems within normal operating ranges. We conceptualize this price with the term *allostatic load*. It is a measure of the wear and tear that results from chronic overactivity or underactivity of the stabilizing allostatic systems (McEwen, 1998; McEwen & Stellar, 1993). The first operationalization of allostatic load was designed to summarize levels of physiologic activity across a range of regulatory systems pertinent to disease risks (Seeman et al., 1997). Allostatic load for an individual was defined as the number of indicators from the list in table 5.4 for which an individual's assessed value satisfies the stated inequality.

Cortisol, the catecholamines norepinephrine and epinephrine, and DHEA are mediators of physiological responses to adverse challenge. In particular, 12-hour urinary cortisol excretion is an integrated measure of HPA axis activity, while DHEA-S is a functional HPA axis antagonist, which serves to reset elevated cortisol levels to basal conditions following stressful challenge. Twelve-hour urinary norepinephrine and epinephrine are integrated measures of sympathetic nervous system activity. Blood pressure, waist-hip ratio, total and HDL cholesterol, and glycosilated hemoglobin are viewed as reflecting secondary consequences of stressful challenge. Systolic and diastolic blood pressure are indices of cardiovascular activity. Waist-hip ratio is an index of long-term levels of metabolism and adipose tissue deposition, thought to be influenced by glucocorticoid activity (Despres et al., 1990). Serum high density lipoprotein (HDL) and total cholesterol levels are indices of cardiovascular risk. Total glycosilated hemoglobin is an integrated measure of glucose metabolism over a period of several days.

The allostatic load measure, which is based on counting the number of indices in table 5.4 for which a person's assessed value satisfies the stated inequality, has been shown to be predictive of incident cardiovascular disease and later-life decline in physical functioning and memory loss (Seeman et al., 1997). Recent findings over a 7.5-year period also show that high allostatic load was predictive of subsequent mortality (Seeman, Singer, Wilkinson, & McEwen, 1999). The same protocol that was used to operationalize allostatic load in this initial work was also employed with the WLS biological subsample. We view the full array of biomarkers and their summary via allostatic load scores as intermediate outcomes in

Table 5.4 Indicators of High Allostatic Load

Indicator	Criterion Cutoff
Systolic blood pressure	≥148 mm Hg
Diastolic blood pressure	≥83 mm Hg
Waist-hip ratio	≥0.94
Total cholesterol–HDL ratio	≥5.9
Total glycosilated hemoglobin level	≥7.1%
Urinary cortisol level	≥25.7 μg/g creatine
Urinary norepinephrine level	≥48 μg/g creatine
Urinary epinephrine level	≥5 μg/g creatine
HDL cholesterol level	≤37 μg/dl
DHEA	≤35 mg/dl

a cohort study (Munoz & Gauge, 1998). That is, they are measurements assessed after exposure—to cumulative adversity and advantage—but prior to the clinical appearance of disease. They therefore quantify early biological and/or altered structure/physiological function prior to pronounced declines in physical and cognitive functioning and incident chronic disease.

Constructing Relationship Pathways

Our relational histories are constructed via an incremental process wherein we first examine distributions on the various social relationship measures, then create composite profiles within measures (e.g., put together information about mother and father), and, finally, build pathways across measures. These analyses are presented for the 106 WLS respondents (57 men, 49 women) on whom biological data are currently available (data collection on additional respondents is ongoing).

Scores on Mother Caring and Father Caring from the Parental Bonding Scale can range in each instance from 0 to 36. Table 5.5 shows the five-number summaries suggested by Tukey (1977). We see that fathers are evaluated as substantially less caring than mothers. Indeed, the *upper* quartile of Father Caring (FC) is between the *lower* quartile and median of the Mother Caring (MC) distribution. There are some minor differences in these summaries when male and female respondents are considered separately. Men tend to have slightly higher scores on both FC and MC, with larger disparities between the lower quartile and minimum of the MC distribution.

To examine the relationships with both parents simultaneously, we cross-classify individuals as positive (+) or negative (–) on Father Caring and Mother Caring according to whether their score on the respective scale is above or below the median. These cross-classifications are presented separately for men and women in table 5.6.

For men and women, it is substantially more likely that both parents have the same valence (i.e., –,– or +,+) in their relationship with the respondent, which underscores the theme of cumulative relational experiences. This similarity in valence is somewhat more the case for men's perceptions of their parental relationships than for women's. This can be quantified by the odds ratio in both tables.

Table 5.5 Summaries of Scores on Parental Bonding

Scores	Father Caring (FC)	Mother Caring (MC)
Maximum	32	36
Upper quartile	27	33
Median	23	29
Lower quartile	20	24
Minimum	0	1

Table 5.6 Cross-Classifications on Father Caring and Mother Caring

	Mother Caring (MC)	
Father Caring (FC)		
Women		
	14	9
	7	16
Men		
–	17	7
+	10	21

Odds ratio = # (+,+) # (–,–) / # (–,+) # (+,–)
Odds ratio (women) = 3.56
Odds ratio (men) = 5.1

Both odds ratio are statistically significant ($p < .05$).

Scores on each of the subscales—emotional (E), sexual (S), intellectual (I), and recreational (R)—from the PAIR inventory can range from 6 to 30. We viewed emotional and sexual items as probes of the most personal and intimate aspects of spousal ties and thus combined these subscales in the concatenation E + S. Intellectual and recreational items were viewed as probing more companionate and cognitive forms of spousal connection and thus were combined in the concatenation of subscales I + R. Scores on each of the combined scales could range from 12 to 60.

Our data showed virtually no difference between men and women in their scores on the combined emotional/sexual (E + S) and intellectual/recreational (I + R) scales. The five-number summaries, presented separately for men and women, are shown in table 5.7. These summaries show slightly higher distributions on both combined scales for men compared to women. The differing aspects of spousal intimacy did not show notably different response distributions for either men or women.

We assess consistency of responses on both forms of intimacy by classifying

Table 5.7 Summaries of Scores on Emotional/Sexual (E + S) and Intellectual/Recreational (I + R) Subscales

	Women		Men	
Scores	E + S	I + R	E + S	I + R
Maximum	54	56	60	58
Upper quartile	43	44	48	46
Median	39	39	43	41
Lower quartile	31	28	31	34
Minimum	12	14	12	12

persons as positive (+) or negative (–) on E + S and I + R according to whether they are above or below the median on each scale. This leads to the cross-classifications shown in table 5.8. The data show that it is more common to see concordance between both forms of intimacy than disparity. This is quantitatively expressed by the odds ratio.

Odds ratio = # (+,+) # (–,–) / # (–,+) # (–,–)
Odds ratio (women) = 18.7
Odds ratio (men) = 16.1

Both odds ratios are statistically significant ($p < .01$).

Our construction of relational pathways involved putting together the above assessments from early parental ties and adult spousal connections. We define an individual to be on a negative pathway if s/he scores (–,–) on Father Caring *and* Mother Caring (FC, MC) and/or on emotional/sexual *and* intellectual/recreational (E + S, I + R). Thus, these individuals experienced negative relationships with *both* parents and/or negative interaction with a spouse on *both* combined aspects of intimacy described above. Among men, 21% experienced negative relationships (with both mother and father) only in childhood; another 18% reported negative ties to spouse on all dimensions in adulthood; and the rest (61%) showed some combination of negative relational experience in childhood *and* adulthood. Among women, three respondents showed negative relational experience only in childhood; another two reported negative ties only in adulthood; and the rest (74%) showed some combination of negative relational experience in both periods.

We define an individual to be on a positive pathway if s/he has at least one + on FC or MC, i.e., (+, –), (–, +), or (+,+) *and* at least one + on E + S or I + R. Thus, the positive path requires some positive relational experience with one or both parents in childhood and at least one of the two combined forms of intimacy in adulthood. Again, this pathway underscores the cumulative nature of positive emotional experiences with significant others in childhood and adulthood.

To probe whether these pathways, which were generated on the basis of spe-

Table 5.8 Cross-Classifications on Emotional/Sexual and Intellectual/Recreational Scales

	Intellectual/Recreational (I + R)	
Emotional/Sexual (E + S)		
Women		
	16	3
	6	21
Men		
–	22	6
+	5	22

cific familial relations, show consistency with the more general ratings from the Positive Relations with Others scale (Ryff, 1989a), we divided scores on this measure into tertiles and examined these tertile distributions along the positive and negative relationship pathways. Figure 5.17 shows the percentages of individuals (separately for men and women) in the top (T_1), middle (T_2), and bottom (T_3) tertiles of positive relations with others among individuals classified in the positive (26 men, 22 women) and negative (29 men, 24 women) pathways, as defined above.[1] The figure shows that, for women, there is essentially no difference in the distribution of positive and negative pathways across the three tertiles of positive relations with others. However, for men on the positive pathway, only 12% are in the lowest tertile and 62% are in the highest tertile on the more general relational measures. Conversely, on the negative pathway, 57% of men are in the lowest tertile and only 11% in the highest tertile on positive relations with others. Thus, evaluations of the general quality of one's relationships with others is, for men but not for women, closely linked with the type of pathway classification derived from specific relationship (parents, spouse) assessments. We will return to this distinction in presentation of the allostatic load data below.

Linking Allostatic Load to Relationship Pathways

Figure 5.18 shows the overall distribution of allostatic load scores, which is defined as the number of indicators from the list in table 5.4 for which an individual's assessed value satisfies the stated inequality. The study of Seeman et al. (1997) indicates that scores of 3 and above indicate elevated risk of subsequent incident cardiovascular disease and decline in physical functioning and memory loss. Thus, we define high allostatic load to mean a score of ≥3. Low allostatic load is defined as a score of 0–1, and intermediate load is defined as a score of 2. Using these designations, figure 5.19 shows gender-specific distributions of allo-

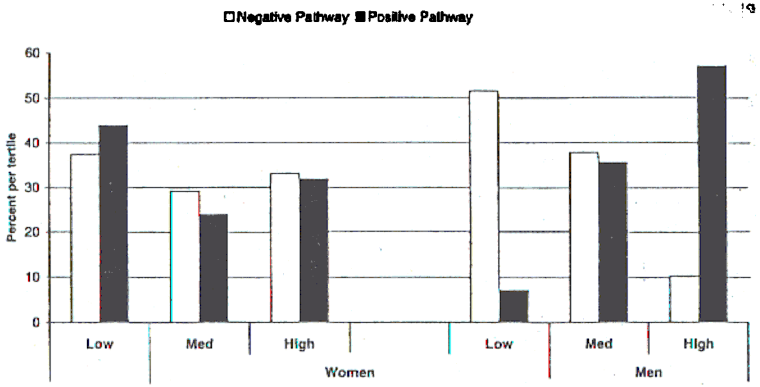


Figure 5.17 Distribution of pathway types among tertiles of positive relations with others.

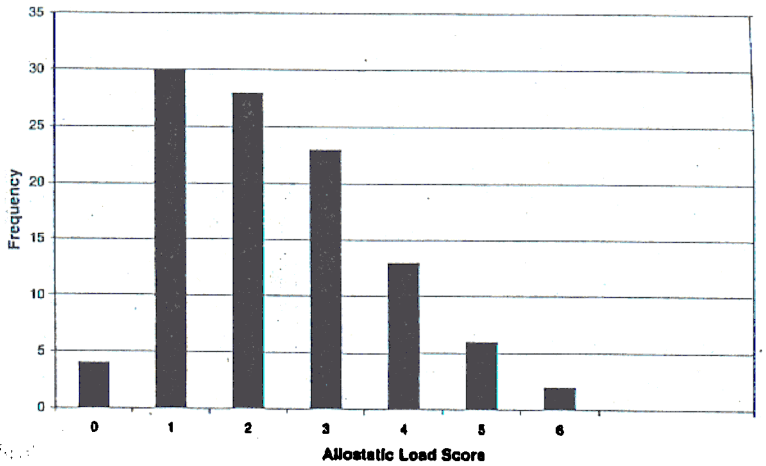


Figure 5.18 Frequency distribution of allostatic load scores.

static load scores. The figure reveals that men have a substantially higher percentage (50.9%) at high load than do women (30.6%).

There are also gender differences in the frequency with which particular components of allostatic load are outside of normal operating range. These are summarized in table 5.9. In addition to biological markers considered individually, it is useful to identify sets of markers that simultaneously contribute to the allosta-

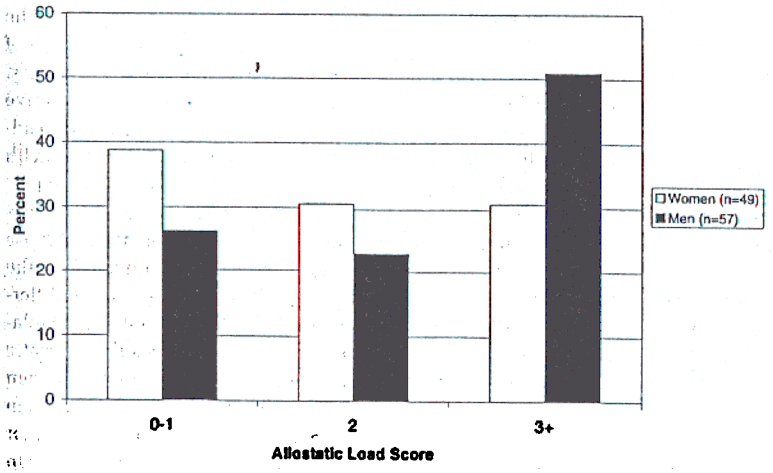


Figure 5.19 Frequency of low (0–1), medium (2), and high (3+) allostatic load by gender.

Table 5.9 Percent Occurrence of Components Satisfying Elevated Risk Criteria for Contribution to Allostatic Load Score

Component	Men	Women
Waist-hip ratio		8.2
HDL cholesterol		12.2
Total cholesterol–HDL ratio		12.2
Systolic blood pressure		16.3
Diastolic blood pressure		18.4
Glycosilated hemoglobin		8.2
Cortisol		67.3
Epinephrine		8.2
Norepinephrine		18.4
DHEA-S		34.7

tic load scores for persons at high load. Among the 15 women with allostatic load scores of ≥3, one-third have cortisol paired with the ratio of total cholesterol over HDL cholesterol outside the normal range; one-third have cortisol paired with norepinephrine; and one-third have cortisol paired with DHEA-S. The latter two groups also include a single woman with cortisol, norepinephrine, and DHEA-S all outside the normal range. Among the 29 men with allostatic load scores of ≥3, 38% have waist-hip ratio together with both systolic and diastolic blood pressure outside the normal range; 41% have waist-hip ratio paired with cortisol; and 38% have waist-hip paired with HDL cholesterol. Taken as a whole, these data suggest that men have more elevated levels of cardiovascular risk factors, while women show a greater prevalence of stress hormones at elevated risk levels.

Using the social relationship pathways defined previously—based on the Parental Bonding and PAIR Inventory scales—figure 5.20 shows the percentage of persons with allostatic load scores of ≥3 along each pathway and gender category. These findings are consistent with our prior hypotheses that higher cumulative adversity—in the realm of social relationships—relative to higher relationship advantage (cumulative positive emotional experiences) should be associated with greater frequency of persons at high allostatic load. This relationship is more pronounced for men than women, likely reflecting women's lower load profiles, overall, compared to men. For both men and women, however, the proportion of those with high allostatic load is significantly greater on the negative compared to the positive pathway at the $p < .05$ level. The 95% confidence interval for the difference in proportions is (.13, .61) for both groups. Returning to the more general relationship measure (positive relations with others), figure 5.21 shows the allostatic load score distributions within each tertile of positive relations, separately, for men and women. As predicted, in the bottom tertile (T_3) of positive relations, most men (58.6%) have high allostatic load and only about 10% have low load. However, for women, the data are in the opposite direction, with the majority of women (55%) in the bottom tertile of positive relations showing low allostatic load and about 15% showing high load. Alternatively, among those in the top tertile (T_1) of positive re-

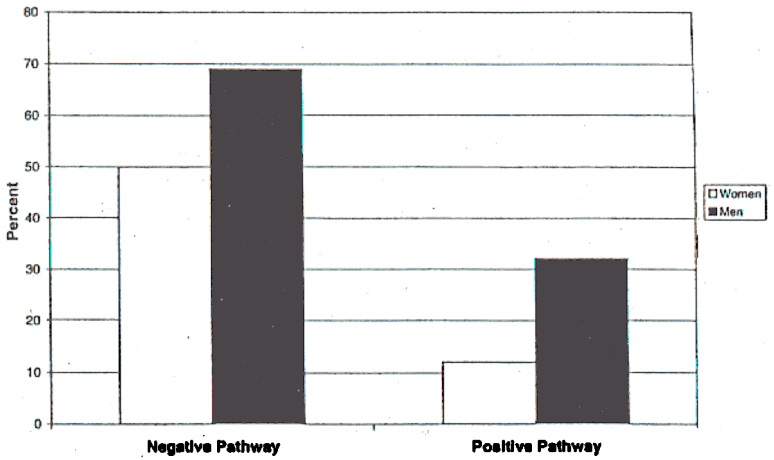


Figure 5.20 Percentage having high allostatic load on negative and positive relationship pathways.

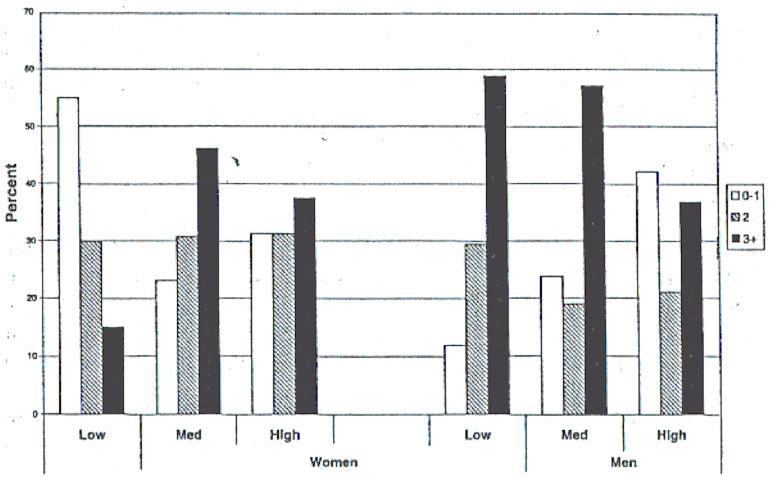


Figure 5.21 Percentage of low (0–1), medium (2), and high (3+) allostatic load within tertiles of positive relations with others.

lations, both genders show mixed allostatic load distributions, thereby showing no clear biomarker benefits of having positive relations with others in general. The contrast of these data with the allostatic load profiles vis-à-vis positive and negative relationship pathways underscores the need to obtain diverse relational assessments focused on not just global sense of connectedness but also on high-quality emotions, intimacy, and affection with key others. Such observations are especially pertinent to building bridges to biology among women, who appear to show differential patterns depending on the type of relational assessment employed.

Integration, Conclusions, and Future Directions

We have covered extensive territory in this chapter, moving from links between social relationships and health in a recent national survey to the cumulative emotional profiles of three famous couples and, finally, to data that link long-term social relationship profiles to biology in a subsample of respondents from a longitudinal study. Our objective in this concluding section is to highlight what we see as the main points from prior sections and to formulate needed directions for future inquiry.

A recurrent theme across the above three sections is the idea of *cumulation*, that is, the notion that the health sequelae of significant social relationships and intervening biological processes, require a long-term perspective that maps the recurring, chronic nature of social emotional experience in multiple key relationships across time. To address this theme, we created composite scores across multiple relationship types (spouse, family, friends) in the national survey data as well as positive and negative emotional pathways with the WLS data. A glimpse inside the emotional worlds of the Tolstoys, Brownings, and Frida Kahlo and Diego Rivera further illustrated cumulative expressions of love and support, or anger, pain, and torment, over years of life together. Finally, the biological marker we invoked, allostatic load, was conceptualized as a measure of cumulative wear and tear on various biological systems.

When the relational and health/biology measures were brought together, we found, first via MIDUS, significant differences in reported chronic conditions, physical symptoms, and subjective health between individuals at the top and bottom tertiles on composite relationship profiles (combined assessments of quality of ties with spouse, other family members, friends). These effects occurred in the predicted directions for positive as well as negative emotional ratings, and the effects were evident for both men and women. Moving to biological markers, which we viewed as mechanisms between social relationships and health outcomes, our preliminary data from the Wisconsin Longitudinal Study then linked positive and negative relationship pathways to allostatic load. Findings provided preliminary support for hypothesized relationships: those on the positive relationship pathway were less likely to have high allostatic load than those on the negative pathway. Taken together, these analyses speak to the merit of linking social relations and health—via a focus on cumulation—across types of emotion, types of relationships, and biological war and tear on the organism.

Prior avenues of research have, either implicitly or explicitly, emphasized the idea of cumulation. The adult attachment literature (Cassidy & Shaver, 1999; Hazan & Shaver, 1994), for example, probes the long-term reach of socioemotional ties between infant and caregiver to the quality of attachment relationships in adulthood. Focusing on physical health outcomes, a study by Russek and Schwartz (1997) found a strong positive link over a 35-year period between college students' reports of having had warm relationships with their parents and midlife health profiles (i.e., fewer diagnosed diseases, such as coronary artery disease, hypertension, duodenal ulcer, and alcoholism). Mental health researchers have also explored cumulative adversity as an antecedent to adult psychological disorders (Turner & Lloyd, 1995), and emotion researchers have explored the long-term health effects of "chronic emotions" (Pennebaker & Traue, 1993). Our prior work (Singer, Ryff, Carr, & Magee, 1998) organizes life-history information in terms of cumulative adversity and advantage, the pathways of which are then connected to psychological resilience.

In this chapter, the aim has been to bring ideas of cumulation to the emotion, social relations, and health nexus—specifically, to provide operational definitions of cumulative emotional experience in significant social relationships and to link them to an empirical formulation of cumulative biological wear and tear. In so doing, we acknowledge that much remains to be done—in many directions—such as expanding the scope of cumulative relational experience. Most adults, for example, spend the largest segment of daily life in the work setting, thus calling attention to the socioemotional climate of the workplace. Employment that involves critical and demeaning versus supportive and appreciative supervisors or rewarding versus draining coworkers may comprise significant realms of chronic emotional experience. Much that constitutes stress, or benefits, of the workplace may, in fact, be socioemotional in nature. Thus, mapping the intersections of emotional experience in work *and* family life is a critically needed future direction for research that connects social relations to health.

The links between positive and negative relationship pathways and allostatic load are also clearly in need of expansion to larger and more representative samples. Moreover, while high allostatic load has been predictive of subsequent cardiovascular disease, decline in physical function, memory loss (Seeman et al., 1997), and, more recently, mortality (Seeman et al., 2001), further studies are needed to replicate these effects and to connect allostatic load to other health outcomes. Such inquiries evoke fundamental questions regarding the nature of the causal relationships among social ties, allostatic load, and health outcomes. Throughout our discussion, we have suggested that emotional experience in social relationships affects health (via allostatic load), but it is also plausible that health conditions affect the quality of social relationships. The health problems of both Elizabeth Barrett Browning and Frida Kahlo were likely influences on the qualities of their marital relationships. Thus, reciprocal effects between relationship dynamics and health conditions (physical and mental) may well be prominent in the unfolding of directional effects. Whatever the nature of causal relationships, much is to be gained from tracking the co-occurrence of particular social relational profiles and attendant allostatic load markers in predicting subsequent morbidity and mortality.

Gender differences have been prominent throughout our findings. At the outset, we saw that men rate the quality of their relationships with others as significantly lower than women—in fact, the social relational realm was the *lowest* of all of their self-rated dimensions of well-being. In building bridges to biology, we also saw that, for men, there was more coherence or consistency between their general ratings of relationship quality (i.e., positive relations with others) and more emotionally specific measures of relationships with mother, father, and spouse. For men, links between these various relational measures and allostatic load were consistently in line with guiding hypotheses: allostatic load was lower for those on positive versus negative relationship pathways.

The data for women were more complicated. Although they rate the relational features of well-being consistently higher than men and while their relationship-specific assessments are tied in meaningful and predictable ways to their self-reported health, the bridges to biology were less consistent. On the one hand, the relationship pathways showed higher allostatic load among those on negative compared to positive paths, although the differences were less marked for women than men. Curiously, women's *general* relational evaluations (i.e., positive relations with others) showed links to allostatic load that were contrary to predictions: more than half of those with the poorest reported relationships had low, not high, allostatic load. Alternatively, among those in the top tertile on general relationships, there was no discernible benefit with regard to increased likelihood of having low allostatic load. These data underscore the importance, at least for women, of distinguishing between measures of social relationships that are global in content from those that are specific to particular emotions and key significant relationships. Further, among those women who showed poor global relational ratings and low allostatic load, we wonder whether the findings might suggest a kind of emotional *disengagement*, that is, a nonreactive response to unsatisfying relationships and, perhaps, to stress, more generally. Assessments of emotional reactivity via new directions in affective neuroscience (Davidson, 1992, 1995) provide avenues to test these ideas.

We note that numerous investigations have also shown gender differences in links between emotional support and neuroendocrine parameters (Seeman, Berkman, Blazer, & Rowe, 1994), endocrinological and immunological correlates of relationship conflict (Kiecolt-Glaser et al., 1997), interrelations of affect and physiology in long-term marriages (Levenson, Carstensen, & Gottman, 1994), and relations between physical symptoms and emotional expression (Malatesta & Culver, 1993). These findings assume ever-greater significance in light of the paucity of major longitudinal studies of women's health, along with the notable differentials in life expectancy between males and females. Clearly, gender will be center stage in the future mapping of the linkages among emotion, social relationships, and health (see Ryff & Singer, 2000).

At the beginning of the chapter, we emphasized the need to advance understanding of the positive aspects of social relationships. Our analyses thus made distinctions between positive and negative emotions in specific social relationships as well as between positive and negative pathways of cumulative emotional experience. These distinctions proved meaningful in establishing connections to self-rated health and to allostatic load. Nonetheless, we see numerous future avenues for sharpening assessment of the positive, with regard to both relational experience and its underlying biology (Ryff & Singer, 1998a, Ryff & Singer, 2000). One important direction emerges from studies of positive affiliation in animals (Carter, 1998; Panksepp, 1998).

Primary emphasis in the neurobiology and physiology of attachment has been given to the caregiver-infant and adult-heterosexual pair bondings. Attachment, viewed as a component of most, if not all, definitions of human love (Hatfield & Rapson, 1993; Sternberg & Barnes, 1988), can be operationalized in animals as selective social or emotional bonds and thus can facilitate observation and experimentation that connects the phenomenon to physiological substrates. At present, brain oxytocin, opioids, and prolactin systems appear to be key participants in experiences of social solidarity, warmth, and nurturance. Oxytocin, in particular, has been shown to increase in response to onset of pair-bonding in adults, maternal attachment, infant attachment, maternal responsivity, positive social behaviors or contacts, onset of sexual behavior, and exploration or approach to novelty (see Carter, 1998; Panksepp, 1998; Uvnäs-Moberg, 1998).

Concerning the cumulative effects of positive social interactions—positive social relationships when extrapolated to humans—it is important to note that the antistress effects of oxytocin become more pronounced after repeated exposure. That is, social bonds lead to repeated exposures to positive social stimuli and, thereby, to repeated release of oxytocin (Uvnäs-Moberg, 1998). In humans, such positive social experiences can be stored in memories, which in themselves may reactivate physiological processes. Thus, psychological processes can reinforce or extend the physical benefits of social relationships. Evidence from animal models further suggests that chronic oxytocin release is capable of producing long-term reductions in blood pressure and heart rate (Petersson, Alster, Lundeberg, & Uvnäs-Moberg, 1996). These findings point to a host of new directions at the human level to link positive emotions in social relationships to neurobiological substrates and, ultimately, to health outcomes.

Advancing these frontiers must, however, be accompanied by gains in how to probe the relevant depths of our significant social relational experiences. While the structured survey items employed here offer promising steps toward more emotionally rich assessment instruments and constitute much-needed additions to social relations construed as the size and proximity of one's network (House et al., 1988), there is room for improvement. More qualitative, idiographically tailored accounts of significant relationship experiences seem particularly promising future directions. The diaries of the Tolstoys and letters of the Brownings speak to the limited nature of strictly structured instruments. Although most persons lack the expressive capacities of those with literary fame, even routine data collection could incorporate such stems as "Today, my spouse made me feel ———" or "Today, time with my child left me feeling ———" or "Today, interactions with my boss (or coworkers) created feelings of ———." Such responses can be coded for emotional valence, strength, and complexity, the cumu-

lative record of which may facilitate a portrait of more meaningful, personally relevant data about the emotional dynamics of daily life and, thereby, provide routes to biology.

Finally, as evidence mounts that social ties to key others are, indeed, consequential for biology and health, then a critical direction for the future is positive relational interventions, such as teaching effective emotion coaching to parents (Gottman, Katz, & Hooven, 1996) or facilitating emotional intelligence (Goleman, 1995) in social life. Fostering emotional know-how in key social relations thus becomes a primary avenue of health promotion. Arguably, the importance of nurturing social ties and maximizing opportunities for valued, emotionally rewarding, and meaningful interactions with significant others may be as consequential for long-term health and well-being as widely promulgated messages regarding proper nutrition and adequate exercise.

Notes

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1. 106 people are in the biology sample, 57 men and 49 women, although only 101 of these people (55 men, 46 women) also have complete data on relationship measures.

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Commentary

Meg Wise

The chapter by Ryff, Singer, Wing, and Love embraces many methods to understand the emotional and social pathways to physiological health. In three distinct sections, the authors report on findings from a national survey, biographical descriptions of emotions in the intimate relationships of three famous couples, and finally, how psychosocial variables might influence allostatic load (wear and tear on biological systems) with data from a longitudinal study. By connecting the social and biophysical sciences with the arts and humanities, Ryff and Singer's methodology echoes the recent conceptual acknowledgment that it is time to correct Descartes's error (Benson, 1996; Damassio, 1994; Ornish, 1998). In other words, the mind, body, heart, and spirit must be interconnected. This insight suggests the benefit of combining logical and intuitive research perspectives for the stereoscopic vision needed to map the complex relationships between emotions and health. Ryff and Singer et al.'s chapter suggests numerous ways—from phenomenology to physiology—to extend the current scientific horizon into the new territory of cross-disciplinary investigation.

The first section of this commentary discusses Ryff and Singer's multimethod research findings in the context of their prior work and as they contribute to the other themes of this volume (gender differences, the role of positive and negative emotions, the cumulation of advantage and adversity, and mechanisms for how emotions and social relationships affect health). A second section systematically addresses these themes to discuss the opportunity for cross-fertilizing the concepts and methods of Ryff and Singer et al. with those of the other investigators in this volume. The final section discusses the implications and possible new directions for this line of research.

Summary and Discussion of the Work

Theoretical Background

In this chapter, Ryff and Singer implement the multidisciplinary research agenda that they introduced in their recent theoretical work, "The Contours of Positive