Chapter 12. Successful Aging

Module 12.1. Coping with Stress
- The Physiological Response to Stress
- The Life Events Model of Stress
- Cognitive Appraisal of Stressful Events
- Changes in Coping Skills with Age
- Maintaining a Stable Identity and Positive Self-Esteem in Old Age
- Coping and Control over the Life Span

Module 12.2. Examples of Aging Successfully
- Centenarians
  - Health of Centenarians
  - The “Nature or Nurture” of Centenarians
  - The Focus on Avoiding Decline in Successful Aging
- The Compression of Morbidity Hypothesis
  - A New Syllogism
  - Delaying Disability
- Rowe and Kahn’s Successful Aging
  - "Normal or Usual Aging"
  - The Components of Successful Aging
    - Avoiding Disease and Disability
    - Maintaining High Cognitive and Physical Functioning
    - Active Engagement with life
  - An Evaluation of Rowe and Kahn’s Successful Aging
- Exercise! The Key to Successful Aging?
  - Aging Athletes
  - Physical Activity and Health
  - Exercising after 65
  - Physical Activity and the Brain
  - Mental Activity and the Brain
- Aging Successfully Despite Decline
- Selective Optimization with Compensation
- Concluding Comments
Chapter 12. Successful Aging

Module 12.1. Coping with Stress

The Physiological Response to Stress

Part of the task of living and aging successfully is the ability to handle stress. An operational definition for stress is any situation that threatens our sense of well-being or our ability to cope adaptively with obstacles that prevent that from happening. Needless to say, this covers a broad range that includes next week’s exam, a strong disagreement with a good friend, having a flat tire on the way to school or work, a death of a relative, and the fact that our home or apartment continues to look messy. All of these are examples of stress inducing events although they vary considerably in how much stress they may actually cause us. But, even minor stressful events can have a cumulative effect and lead to our experiencing life as highly stressful, even though they could not do so by themselves. If you had one of those days when everything goes wrong and then you have a flat tire on your way to an exam in your organic chemistry class, it may put you over the “edge” in your ability to effectively cope. These smaller sources of stress, which are called hassles, can have such strong cumulative effects that Richard Lazarus, one of the premier investigators in the investigation of the effects of stress, believes that they are the major source of stress threatening our ability to cope effectively with our environments on a day to day basis.

Stressful events in our lives cause both physiological and psychological reactions that can have serious effects on our health because of the way we evolved to respond to stress or threatening events. What is called the fight-or-flight response was very important to our distant ancestors, who, when threatened with life or death from predators, needed the ability to respond immediately with all their strength and ability in order to survive. This was made possible by the sympathetic division of the autonomic nervous system which causes secretions of hormones, called catecholamines from our adrenal gland that readies our bodies for action when we are threatened; our heart race, we breathe harder and faster, blood is diverted to our muscles, our pupils enlarge to allow in more light, all of which aid us in an emergency. These responses must occur very quickly since threats to our survival are often unexpected and immediate, giving us little time to prepare. The fight-or-flight response evolved to be fast, but of short duration since, which allowed our ancestors to escape the danger that threatened them. This system worked very well for short-term threats. However, the pioneering work of Hans Selye clearly showed that if a threat continues over a long period of time, it created a problem.

Hans Selye (1956), who coined the word "stress," investigated stress responses in rats and other small animals, by subjecting them to stressors, such as cold, over long periods of time. He found that the adrenal cortex of animals stressed for long periods, secreted hormones called corticosteroids, which increased the energy sources available and aided the body’s attempts to repair damage done by its heightened arousal. Selye hypothesized that animals went through three stages during prolonged stress. In the first stage, the alarm-reaction, the body's defenses are rapidly mobilized to prepare for the threat, but if the threat continues, the animal enters a second stage of resistance in which the body acts to neutralize or reverse the harmful effects of the stressor. The animal can function fairly well during this second stage, but unfortunately, if the animal is unable to remove itself from danger, it enters a final third stage of exhaustion. In this stage, the animal's physical resources are exhausted, and it becomes susceptible to disease and death. Selye believed that some of the serious diseases of modern society, such as high blood pressure and ulcers, are caused by the excessive unrelenting stress of our modern civilization.

One of the important findings related to Selye's work was that stress can lead to disease by suppressing the immune response, impairing the body's ability to heal itself when it is under stress. In an immune response, the body defends itself from foreign substances through specialized white blood cells called lymphocytes that destroy the invaders and render them harmless (Ader & Cohen, 1993). In one study, participants who reported higher stress were more likely to develop colds compared with control subjects even though both groups of participants had been quarantined in order to control contact with infections unrelated to the study (Cohen, Tyrell, & Smith, 1993). Correlational studies of humans also show evidence of impaired immune responses in medical students under high stress during exams, and in recently divorced or separated men (Kiecolt-Glaser, Garner, Speicher, Penn, Holliday, & Glaser, 1984). Thus, it would appear that our physiological responses to stress make us more susceptible to illness.
The Life Events Model of Stress

Measuring how much stress a person is under is key determining its effects. Hans Selye's work (Selye, 1956) implied that stress was caused major external events in the environment, and that of stress had rather nonspecific effects. These characteristics are incorporated into the Life Events rating scale developed by Thomas Holmes and Richard Rahe (1967). These investigators believed, as Selye did, that there was a connection between stressful events and illness. They had interviewed tuberculosis patients to determine what events had preceded the occurrence of their illness. Although Holmes and Rahe had expected that patients would report negative events, such as a death of someone close or financial difficulties, had caused adverse reactions, many of the events were positive, such as a marriage, pregnancy, or success on the job. The question was, what caused these events to be stressful? Holmes and Rahe reasoned that they were stressful because they required the person to change and change is inherently stressful. As we discussed in Chapter 5, having a child is often called a “blessed event” even though it creates many new demands and considerable changes in the routine of the home and in the relationship between spouses. Positive events such as these, even though welcomed and celebrated, require changes in the old ways of doing things which is stressful. Holmes and Rahe (1967) created the Social Readjustment Rating Scale indicating the amount of stress both positive and negative events are apt to cause in the lives of those people who experience them based on the estimated amount of change they required (Table 12.1).

Support for the life events model came from numerous studies that showed higher scores on the Social Readjustment Rating Scale were associated with increased vulnerability to both physical and mental illnesses (Derogatis & Coons, 1993). However, there are a number of difficulties with the life events approach one of them being that Holmes and Rahe’s scale is dominated by events that clearly have a negative impact, rather than change per se. In addition, it is not altogether clear that positive events, such as marriage which has a mean value of 50, and negative events such as being fired at work, and a mean value of 47, would be equally upsetting even if they both required the same amount of change. Critics charged that negative events had stronger effects. In addition, stress can occur with “nonevents,” such as when an important life event was expected but failed to materialize, such as a job promotion (Wheaton, 1999). There was also the problem concerning the point in the life-span when a stressful event occurs. Losing one’s job is likely to be associated with varying amounts of stress depending on whether it occurs at age 25, 45, or 65, or the death of a parent occurring in childhood, in young adulthood or middle age. Whether the event occurs “off time” in the life

### Table 12.1. Social Readjustment Rating Scale

<table>
<thead>
<tr>
<th>Rank</th>
<th>Life Event</th>
<th>Mean Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Death of spouse</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Divorce</td>
<td>73</td>
</tr>
<tr>
<td>3</td>
<td>Marital separation</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>Jail term</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>Death of close family member</td>
<td>63</td>
</tr>
<tr>
<td>6</td>
<td>Personal injury or illness</td>
<td>53</td>
</tr>
<tr>
<td>7</td>
<td>Marriage</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>Fired at work</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>Marital reconciliation</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>Retirement</td>
<td>45</td>
</tr>
<tr>
<td>11</td>
<td>Change in health of family member</td>
<td>44</td>
</tr>
<tr>
<td>12</td>
<td>Pregnancy</td>
<td>40</td>
</tr>
<tr>
<td>13</td>
<td>Sex difficulties</td>
<td>39</td>
</tr>
<tr>
<td>14</td>
<td>Gain of a new family member</td>
<td>39</td>
</tr>
<tr>
<td>15</td>
<td>Business readjustment</td>
<td>39</td>
</tr>
<tr>
<td>16</td>
<td>Change in financial state</td>
<td>38</td>
</tr>
<tr>
<td>17</td>
<td>Death of close friend</td>
<td>37</td>
</tr>
<tr>
<td>18</td>
<td>Change to different line of work</td>
<td>36</td>
</tr>
<tr>
<td>19</td>
<td>Change in number of arguments with</td>
<td>35</td>
</tr>
<tr>
<td>20</td>
<td>Mortgage or loan for major purchase</td>
<td>31</td>
</tr>
<tr>
<td>21</td>
<td>Foreclosure of mortgage or loan</td>
<td>30</td>
</tr>
<tr>
<td>22</td>
<td>Change in responsibilities at work</td>
<td>29</td>
</tr>
<tr>
<td>23</td>
<td>Son or daughter leaving home</td>
<td>29</td>
</tr>
<tr>
<td>24</td>
<td>Trouble with in-laws</td>
<td>29</td>
</tr>
<tr>
<td>25</td>
<td>Outstanding personal achievement</td>
<td>28</td>
</tr>
<tr>
<td>26</td>
<td>Wife begins or stop work</td>
<td>26</td>
</tr>
<tr>
<td>27</td>
<td>Begin or end school</td>
<td>26</td>
</tr>
<tr>
<td>28</td>
<td>Changes in living conditions</td>
<td>25</td>
</tr>
<tr>
<td>29</td>
<td>Revision of personal habits</td>
<td>24</td>
</tr>
<tr>
<td>30</td>
<td>Trouble with boss</td>
<td>23</td>
</tr>
<tr>
<td>31</td>
<td>Change in work hours or conditions</td>
<td>20</td>
</tr>
<tr>
<td>32</td>
<td>Change in residence</td>
<td>20</td>
</tr>
<tr>
<td>33</td>
<td>Change in schools</td>
<td>20</td>
</tr>
<tr>
<td>34</td>
<td>Change in recreation</td>
<td>19</td>
</tr>
<tr>
<td>35</td>
<td>Change in church activities</td>
<td>19</td>
</tr>
<tr>
<td>36</td>
<td>Change in social activities</td>
<td>18</td>
</tr>
<tr>
<td>37</td>
<td>Mortgage or loan for lesser purchase</td>
<td>17</td>
</tr>
<tr>
<td>38</td>
<td>Change in sleeping habits</td>
<td>16</td>
</tr>
<tr>
<td>39</td>
<td>Change in number of family get-together</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td>Change in eating habits</td>
<td>15</td>
</tr>
<tr>
<td>41</td>
<td>Vacation</td>
<td>13</td>
</tr>
<tr>
<td>42</td>
<td>Christmas</td>
<td>12</td>
</tr>
<tr>
<td>43</td>
<td>Minor violations of the law</td>
<td>11</td>
</tr>
</tbody>
</table>
cycle makes a difference; older patients face cancer with less anger than do younger patients (Lazarus, 1983). The scale is not as helpful for older persons who have passed the time when many of the events are likely to occur but who face serious health issues from chronic illnesses (Orrell & Davies, 1994). That said, many of the very stressful events are more likely to occur in the later third of one’s life.

Finally, it may not be the major stresses listed in the Social Readjustment Rating Scale, but the minor stresses that come from the hassles we encounter in day to day living, such as those we encounter in shopping, keeping the house clean, running short on time, traffic, paying bills, caring for children, getting along at work, and minor physical illnesses (DeLongis, Folkman & Lazarus, 1988). Although the expectation was that daily hassles and life events would be correlated since major changes often produce many new hassles, the actual association is relatively weak. Hassles make their own unique contribution to stress, and they can have cumulative effects to the point that a person may begin to feel great strain (Lazarus, 1983). Lazarus and Folkman (1984) report that how an individual copes with daily hassles is a better predictor of life satisfaction and symptoms of illness than is a measure using major life events. Again it could be argued that older people may face more hassles in their day to day living than those at other ages.

It was also noted that, although daily hassles may make life more stressful, not all events that occur during the day are negative. There are positive experiences called uplifts (Lazarus & Folkman, 1984) that improve our moods and lift our spirits, bring us joy and happiness, and perhaps make it easier for us to carry some of the psychological load of that day. Sharing an intimate moment with a spouse or reading a story that brings giggles of delight from your children can go a long way toward making a “bad day” appear brighter and alleviate some of the negative reactions to stress.

**Cognitive Appraisal of Stressful Events**

In analyzing the nature of stress, it became clear that the experience of stress is dependent on more than the mere occurrence of a life event alone. Richard Lazarus (1983) argued that how much stress a particular event will cause depends on how an individual appraises it as a threat. Imagine two different people who are about to be married. The first is looking forward to the ceremony and views it as the chance to be with beloved friends and family to celebrate their marriage and to share the experience in a meaningful ritual. The second is concerned whether everyone who should have been invited received an invitation, whether the food at the reception will be tasty and served on time, and whether the person they are about to marry is really the one they want to live with for the rest of their life. Who do you think will be more stressed on their wedding day? Lazarus has argued that the experience of stress is mediated by a person’s cognitive appraisal of the event, and it becomes stressful to the extent that negative meanings and consequences are attached to it. This is not to say that some events, such as the death of a loved one, may not be stressful in themselves, but they can be considerably modulated by the interpretation we give to them. Lazarus and his associates (Lazarus & Folkman, 1984) view the cognitive appraisal of an event as occurring in two separate steps. The first step, or primary appraisal, is the initial process in which we make the determination whether an event is stressful. Stress reactions can be short-circuited if we consider an event to be unimportant or irrelevant to us, or if we anticipate that it could benefit us. However, to the extent we consider events harmful, threatening or challenging, the more we experience stress. In the second step, or secondary appraisal, we take an inventory of the resources we have available to cope successfully with the stressful event and the possible alternatives available to us in handling the event. Secondary appraisals engage in problem solving to find ways to alleviate the stress the event may be causing us. Resources can be physical, such as having good health and energy to act effectively; social, such as having family and friends we can rely on for help and support; or material, such as money and property. Having adequate resources can go a long way in reducing stress. You may be upset to learn you owe an extra $2,000 dollars in income taxes, but if you have $10,000 in a money market account for a "rainy day," you will be less stressed than if all of your paycheck each week goes to paying your bills. Lazarus believes that appraisals of stressful events are very individualistic and that differences between people are substantial, regardless of group membership based on age, gender, social class or other variables (Lazarus, 1998).

People are seldom passive in the face of stress, and coping is what we call their attempt to manage stress by engaging in behaviors thought to be helpful in reducing it. Two types of coping strategies, problem focused and emotion focused, have been given particular attention. In problem focused coping, a person attempts to directly change the conditions that have given rise to the stressful emotions by acting to either prevent harm from happening, repairing harm that has already been done, or overcoming obstacles that
frustrate goals. In **Emotion focused** coping, a person does not confront the source of the stress directly but instead attempts to manage their emotional reactions to the threat by transforming the emotion itself (Lazarus, 1996; 1998). This can be done by reappraising the situation so that the seriousness of the situation is denied, or by psychologically distancing oneself from the situation that is stressful. In problem focused strategies, changing the external world is key, whereas emotion focused strategies change the internal world of feelings. Although problem focused coping is often the more effective strategy, in stressful situations that cannot be changed emotion focused coping may be more effective (Lazarus, 1996). To continue to try to change that which cannot be changed does not decrease stress and may even increase it (Collins, Baum, & Singer, 1983).

Although the two types of coping can be separated for analytical purposes, Lazarus (1998) asserts that it cannot be done in actual practice since use of one strategy affects the other. For example, a heart attack victim might be extremely frightened that any physical exertion will kill them, but if he can reappraise his situation so that he considers himself “lucky” to have survived (emotion focused) and that he has been given a second chance to improve his physical condition, may be more motivated to enter an exercise regimen which will have concrete health benefits (problem focused). In this case, adopting an emotion focused strategy aided the use of the problem focused strategy. Lazarus believes their integration leads to overall coping effectiveness.

**Changes in Coping Skills with Age**

Aging brings increased threats as well as a change in the nature of the problems one faces. Personal health, as well as the health of significant others, declines, and the loss of friends and relatives becomes more common. In general, research has shown an increased use of emotion focused strategies with age (Lazarus, 1996). Deciphering whether this is an age change or age difference in coping is handicapped by the reliance on the cross-sectional study. One study compared the coping patterns of men and women between the ages of 35 and 45 with a second cohort between the ages of 65 and 75 (Folkman, Lazarus, Pimley, & Novacek, 1987). Differences were found between age-groups, with younger subjects reporting more hassles having to do with finance, work, personal life, family and friends, than older subjects. This was not surprising since all of the younger members in the sample had children in the home, and balancing work, family and finances is more difficult during that phase of the family. Members of the older cohort reported more hassles with environment, social issues (e.g., politics, news events), and health issues. Home maintenance was a particular problem for older persons, even though it accounted for fewer hassles than it did for younger persons. This difference may be due to the decreases in the older person’s ability to carry out the maintenance tasks of living. Two gender differences were consistent across age-groups. Men were more likely to cope by using self-control and keeping their feelings in check, whereas women were more likely to cope by reappraising events as more positive. Interestingly, males and females did not differ in their use of problem focused forms of coping such as confrontive coping or planful problem solving, even though this might be expected based on gender-role stereotypes for men and women. However, there were sizable differences between age-groups found in the greater use of active, interpersonal, problem-focused coping among younger subjects, and more passive, intrapersonal emotion-focused coping among older subjects. When dealing with interpersonal problems, younger persons reported more confrontive coping, seeking of social support, and planful problem solving while older subjects reported a greater use of distancing, accepting responsibility, and positive reappraisal. The differences in coping may reflect how much control each group feels they have in interpersonal settings.

Younger subjects appraised their situations as more changeable and felt they had more control over the circumstances, and these differences may have influenced greater use of confrontive, planful problem solving and social support seeking coping by the younger group, and more passive, intrapersonal emotion-focused coping, such as distancing, accepting responsibility, and making more positive reappraisal in the older group. Lazarus (1996) argues that changes in coping should be viewed in terms of the changing demands, constraints, resources, roles and perspectives rather than as a reflection of a built-in developmental process.

It seems to me that most differences in the coping process in aging can be most simply explained by what younger and older adults have to cope with. As people age, more and more of them develop health problems that sap their energy and time, generate pain, and increasingly limit what they can do. It takes longer to manage their daily hygiene and other routine tasks of living.... Why should these changes in the sources of stress, and coping processes directed at them, be thought of as developmental? It is true that the odds of such changes taking place increase
with age. But they are really not predictable; they occur at different ages and different ways in different people, and are coped with in different ways. I am not convinced of the utility of thinking of these changes as mandated by life stage. It is not age, per se, that should be considered causal here, but the correlates of age—such as loss of health—which require alterations in the pattern of adaptation (Lazarus, 1996, p. 302).

Other investigators have come to similar conclusions. At first blush the greater use of emotion-focused coping strategies by older persons may be considered to be a regressive form of development since they contain elements of denial or distortion as a means of coping with stress (Vaillant, 1977) but it is more complex than that. Investigators in one study (Labouvie-Vief, Hakim-Larson, & Hobart, 1987) found that participants who had higher scores for coping and defense maturity were more likely to show higher scores on their scale of “reversal,” which was composed of defenses thought to be less mature, such as repression, denial, negation, and reaction formation since they deal with one’s perception of the problem rather than solving the problem itself (emotion focused). However, they suggested that the scale could be reinterpreted more positively. A person using **reversal defenses** may not be exercising primitive forms of denial or repression, but engaging in a reflective choice to use more inner-focused emotional control than overt action, reflecting an awareness that some events are better managed by accepting the event and reappraising its significance.

A careful analysis of coping strategies reveals that older adults have a differentiated means of coping and are more likely to select a strategy based on the type of problem they are facing and its emotional salience. For example, Freder Blanchard-Fields and her associates (Blanchard-Fields, Chen, Norris, 1997) compared the following age groups: adolescents (ages 15-17 years), younger adults (ages 20-29 years), adults (ages 30-44 years), middle-aged adults (ages 45-59 years), and older adults (ages 60-79 years) on their choice of problem solving strategies for 24 everyday problems. The problems were evenly distributed between consumer problems, managing a home, and resolving conflicts with a friend. Subjects were asked to rate possible strategies of dealing with each problem on a five point Likert scale. In every problem domain, problem focused strategies were rated higher than emotion focused strategies by all age groups. However, their were differences between age-groups in how they perceived the particular domain of a problem. In dealing with consumer problems, older adults endorsed problem focused strategies more strongly than younger adults, who endorsed emotion focused strategies more highly older adults. The authors point out that consumer problems (shopping, returning merchandise, etc.) are straightforward and middle-aged and older adults have an advantage in greater past experience as consumers. In the home management domain, middle-aged and older adults rated problem focused strategies higher than did adolescents, but in contrast to their ratings of consumer problems, emotion focused strategies were rated higher by older adults than younger adults. Finally, for problems dealing with interpersonal conflicts, all groups rated problem focused strategies equally high, but older adults rated emotion focused strategies higher than young adults. The findings of this study argue that older adults have a more differentiated style of coping depending on their appraisal of the problem situation, its cause, and the experience and skills needed to solve. This may give them a greater perceived efficacy in coping with problems. Aldwin (1994) reports that older men ranging in age from 45 to 90 stated they no longer got as upset at they used to. They were more accepting that problems will occur but believed they were more able to take them in stride, and hey were unlikely to use interpersonal confrontion or escapism.

Other research using alternative measures of coping are in basic agreement with this interpretation. A study of coping and defense mechanisms in subjects ranging in age from 10 to 70 and older found that older subjects made greater use of coping and defense strategies that involved the cognitive reinterpretation of situations, both by using the experience as an object lesson that one can benefit from and by emphasizing the positive aspects of the experience (Diehl, Coyle, & Labouvie-Vief, 1996). Older subjects were more inclined to withhold inappropriate feelings and thoughts until a more appropriate time for their expression, whereas younger adults and adolescents use coping and defensive strategies that were overtly aggressive, such as turning against the object of the frustration or using more immature defenses such as displacement, projection, regression, or rationalization. These findings support the conclusions of Costa, Zonderman, and McCrae (1991) that older men and women are "more forgiving and willing to meet adversity cheerfully, and less prone to take offense or to vent frustration on others" (p. 282).

Carolyn Aldwin summarizes the changes in coping that occurred with age as follows:
...Problem-focused coping becomes more differentiated and context-specific as coping repertoires increase with age. As adults, hopefully we learn how to differentiate between problems that are essentially uncontrollable, those which will probably resolve themselves, and those for which effort is fruitful. We may become less easily upset (although certainly not always), and may actually engage in less coping, if we have learned which strategies “work” in a given situation. (Aldwin, 1994, p. 239).

Maintaining a Stable Identity and Positive Self-Esteem in Old Age

One of the enigmas of aging is how older adults maintain a stable identity and positive self-esteem in the face of mounting physical, social, and intellectual losses that threaten one's sense of self and one's ability to reach important goals. Although the losses that accompany aging can be easily documented in empirical studies, evidence of their consequent negative effects on identity and self-esteem is lacking. Instead, we find a pattern of stability in adults from middle-age to old age with no declines in self-esteem or happiness until they experience serious health or disability problems. Jochen Brandtstädter and Werner Greve (1994) contend that two interdependent cognitive processes help older people in coping with age-related losses and maintaining positive stable views of the self: assimilation and accommodation. The same cognitive processes that were discussed briefly in Chapter 7.

According to Brandtstädter and Greve, individuals who uses assimilation to cope with losses associated with aging attempt to change the situation, behavior or ways of living to bring them in accordance with their values, aspirations and goals that make up the important dimensions of their self-structure. This can take the form of efforts to correct or compensate for perceived losses and to bring actual and desired selves into closer correspondence. An individual who enters an exercise program to enhance health or fitness, or who joins an organization to increase contacts with friends are both examples of strategies that counteract the losses that occur with age. These tendencies may increase during middle or latter adulthood when losses become more evident, but are still perceived as being reversible.

Accommodative coping processes become more prominent as assimilative actions prove unsuccessful or too costly in efforts to change the situation, and the individual shows a greater inclination to be more flexible in adjusting personal goals. Accommodation reduces the mismatch between actual and desired selves by altering personal goals, aspirations or evaluations for the self so that they correspond with what is possible given the resources of the individual. Jochen Brandtstädter has argued that the threat to the self is greater from the inability to achieve valued goals, than it is from the inability to control a goal that is no longer valued (1992; Brandtstädter & Rothermund, 1994). A person in her 80s who begins hiring one of the neighborhood teenagers to shovel her walk because she believes she is no longer capable of the effort involved and prefers using her resources for other activities would be an example. A woman who has the flexibility to adjust goals to those which are feasible may bring with it distinct psychological benefits and may help to maintain the perception that she continues to maintain control over desired goals rather than feelings of incompetence.

Brandtstädter (1992) suggests that there is a gradual shift from assimilative to accommodative means of coping that occurs with age. To test this hypothesis, Brandtstädter assessed preferences for assimilative and accommodative modes of coping by administering a questionnaire to a cross-section of adults who ranged in age from 30 to 65. The two scales of the questionnaire tenacious goal pursuits and flexible goal adjustment, were thought to reflect the tendencies to use assimilative and accommodative coping, respectively. According to Brandtstädter:

Tenacious individuals cling to goals and commitments even in the face of obstacles or under high risk of failure (e.g., “when faced with obstacles, I usually double my efforts”; “even when a situation seems hopeless, I still try to master it.”) Flexible individuals disengage easily from barren commitments and try to see the best in difficult situations (e.g., “I adapt quite easily to changes in plans and circumstances;” “If I don’t get something I want, I take it with patience”) (Brandtstädter, 1992, pp. 140-141).

Brandstädter’s hypothesis of a shift from assimilative to accommodative coping styles with age was supported by increasing scores for flexible goal adjustment and decreasing scores for tenacious goal pursuits (Figure 12.1). Brandstädter (1992) is quick to point out that the age-related shift is not a form of resignation or apathy that is forced by a realization of the older person’s inability to control important sources of reward,
but rather it functions more in the way of preserving a sense of control and optimism. If goals that can no longer be attained are replaced by others that can, the individual’s sense of control is preserved.

In accommodative coping, older persons adopt goals that are have more lenient standards of evaluation. Older persons who compare themselves with what could have been accomplished when they were younger are doomed to feel frustrated but those who adopt standards in accordance with what are assumed to be those for their age group, have a greater chance of feeling successful. These processes were found by Jan Heckhausen and Orville Brim (1997) in their study of the changes in social comparison with age. They hypothesized that older people maximize their emotional and motivational resources through downward social comparisons in which they compare themselves to persons who are seen as inferior, often referred to as “others my age.” Older persons who believe they have fewer problems and are functioning at a higher level than others their age are inclined to view the losses they have experienced, as less threatening, and thus, feel more satisfied with their “success.” Interestingly, the use of downward social comparisons can aid an older people’s life satisfaction if they harbor strong negative stereotypes of aging, because they magnify the differences, allowing them to see themselves as exceptionally healthy and active compared with “others” their age. Heckhausen and Brim call this kind of downward social comparison based on biased, negative views of a group social downgrading. Heckhausen and Brim investigated its prevalence in a cross-sectional study of over 2,000 adults from 18 years to 65 years and older. They asked the participants in their study to rate the seriousness of problems in 12 different domains in terms of how serious it was for “you personally” or for “most people your age.” They found that social downgrading was prevalent across the life-span. People rated their the problems as less serious for themselves but more serious for other people. In addition, the amount of social downgrading evident was related to how much a person felt threatened by a particular problem domain; the more they were personally threatened, the more it was perceived to be a serious problem for others their age.

In line with this interpretation was the finding from the Berlin Aging Study in which personal health comparisons with others became increasingly positive with age, even though the individual viewed his or her own health as increasingly negative (Baltes, Ineke, Wilms, Borchelt, & Little, 1999). In other words, although the individual feels he or she is becoming less healthy, they believe people their age are even less so. According to the authors:

“...With increasing age, the experienced decline in health over time worsens, but the comparison with persons the same age improves. Based on the results of our age-dynamic regressions it can be assumed that these internal processes of comparison become increasingly detached from objective reality (p. 424).” The expectation is that the difference would become greater the older the participant, and this is what happened. The self-ratings of health for 70-year-olds were more objectively accurate than those of 90-year-olds. Although it is based on an inaccurate subjective assessment of aging social downgrading is intuitively appealing, and it is likely to be a common phenomenon in those who successfully adapt to the losses that come with aging.

Older individuals may also maintain positive self esteem by making complimentary comparisons of their present selves with more negative impressions of their younger selves. Michael Ross and Anne Wilson
Coping and Control over the Life Span

In chapter 10 we introduced Julian Rotter’s conception of a personal sense of control. Rotter’s initial measure of control was a single bipolar scale (internal vs. external) that was global, since it was assessed across all domains. More recent research has led to the recognition that the concept may be multidimensional, and that internal and external control should be measured in each domain separately (Levenson, 1981). Studies using separate measures for internal and external control have found greater stability for beliefs of internal control with age than for beliefs about external control, and that older persons with stronger beliefs in internal control tend to be happier, healthier, more intelligent and better adjusted (Lachman, 1986b). Neal Krause and Benjamin Shaw (2000) compared global and domain-specific measures of control in their ability to predict mortality. They asked elderly participants over age 65 to identify which of 8 roles they played in life were most important to them and to rank order the top three. They then asked questions that assessed the older person’s feelings of control for each of the top three roles. The results showed that only perceived control for the most important role predicted decreased risk for dying; neither the 2nd or 3rd most important roles or a global measure of control were related. It appears that the perception of the ability to maintain control over a limited segment of one’s life is a key ingredient in the well-being of elderly individuals.

People’s beliefs about their power to control events does not generalize across all domains of their lives, and some domains, such as health, are considered harder to control than others (Lachman, 1986a). Margie Lachman (1991) compared the responses of 200 adults in four age ranges (20-39, 40-59, 60-75, 76-89) on four different domains of functioning: intellectual, health, interpersonal, and political. She found few differences across age groups in the perception of control in political and interpersonal domains, perhaps because the experience of older individuals in voting and interacting with others encourages a perception of maintaining control in these domains. However, the perception of control over health and cognitive functioning were quite different across the age groups tested. Perceptions of internal and external control in these domains were similar for young adults and middle-aged subjects but older subjects showed small declines in perceptions of internal control and much larger increases in their perception of external control.

Why do older adults perceive greater external control in the domains of health and cognition? In the first case, it has been hypothesized that older people are more likely to think that external forces control their health for two reasons. First, they may have experienced illnesses over which they had little personal control, and secondly, physiological changes in the immune system make them more susceptible to the negative effects from stressors, which causes them to be more vulnerable to illness and challenges their belief; that they alone can control their health (Rodin, 1986a; 1986b). One example of an illness in old age that challenges people’s perceptions of their ability to control their lives is stroke. In one study of elderly stroke patients, it was found that even though they continued to describe themselves as friendly, hopeful, calm, and caring after the stroke, they also saw themselves as being in less control, less capable and less independent (Ellis-Hill & Horn, 2000).

Similar arguments hold for changes in control beliefs in cognition. Occasional lapses in memory that are often noticed by older individuals may lead them to assume they reflect biological changes that they cannot control. A later study by Lachman and Weaver (1998) measured control beliefs in a cross-section of adults in three age ranges (25 to 39, 40 to 59, and 60 to 75) across a larger set of domains confirmed many of the findings of Lachman’s 1991 study and added others. In this study, older subjects perceived less control over their children and their sex-lives, but they saw increased control over their work, their finances and their marriages. Possibly, the living of a life teaches a person that they have less control over their children and their sex-life than they once thought, but their efforts made at work, in arranging their finances, and in their marriages taught them that they have more control over these domains as they grew older. Interestingly, Lachman and Weaver (1998) found the group of older adults reported the highest level of control of their lives overall, as well as the highest level of perceived constraints to their control. Experience can be a good teacher, and in the process of living their lives, they learned they could control more of what happens than they realized, while at the same time becoming aware of the obstacles and constraints that limit their control. Wisdom is in knowing the difference.
A person’s perception of control is an important part of dealing with stress since it has been assumed that persons who have strong beliefs in their self-efficacy are more capable of dealing effectively with stress and other challenges (Bandura, 1981). Conversely, perception of little or no control is associated with feelings of helplessness and depression (Seligman, 1975). Although beliefs about control are important at any age, it may have special importance for the elderly. For example, a feeling of control is related to engaging in vigorous exercise and better health, using more effective memory strategies and reporting fewer memory problems. In addition, people who have a higher sense of control report being happier and having a more optimistic view of adulthood (Lachman, 2005). Taking action is key to the good effects for health and those who have a strong belief in the ability to affect their health are more likely to seek information and participate in activities that will produce positive health benefits (Shupe, 1985). This may explain why greater expressed positive affect was found to be correlated with later onset of frailty in older Mexican-Americans (Ostir, Ottenbacher, & Markides, 2004). Danner, Snowdon, and Friesen (2001) found positive emotional content expressed in autobiographies written by novice nuns when they were in their early 20s was correlated with an increased lifespan of approximately 10 years in old age. These correlations are intriguing but more research is needed to assess whether positive affect is directly involved or correlated with some other factor.
Module 12.2. Examples of Aging Successfully

It was an amazing sight: Tom Spear stood in front of millions of television viewers, comparing his golf swing with Phil Dohahue’s. Mr. Spear’s stroke itself was impressive enough; featuring an accurate short game, he shot an 84 to win a 55-and-over tournament in his home city of Calgary in Alberta Canada. But what really caused viewers to gasp was not Mr. Spear’s long game, but rather his long life. Mr. Spear is 102 years old, but looks a healthy 70 or 75. He plays golf, he walks for exercise, he lives independently, and takes care of his own home. How can this man, who remembers practically every day of his upbringing that started in the Northwest Territories in 1896, still be this lively and active? (Perls & Silver, 1999, p. 109).

Centenarians

In the mid-1980s at an annual meeting of the American Association for the Advancement of Science, gerontologists Matilda White Riley and Richard Suzman chaired a session they titled the “oldest-old,” a variant of Bernice Neugarten’s category of “old-old” (Suzman, Manton, & Wills, 1992). Since the early 90s, the interest in this segment of the population has mushroomed, along with the increases in the numbers of people in this age group. Those over 85 is one of the fastest growing segments of the population of the United States, and, in recent years, it has increased 1100 percent compared to the 300 percent increase for those under 65 (Anderson, 1998). One segment of the population over age 85, centenarians, has been given considerable attention, and the results of studies examining this venerable group have suggested that they may have some unusual characteristics in addition to their three digit ages.

Gerontologist are interested in centenarians for the same reasons as the lay public; that is the study of centenarians may give us clues to successful aging. It is extraordinary to think how centenarians have experienced a fascinating panorama of history in the 100 years they have lived. They have witnessed American society move from a largely agrarian culture, replete with horse drawn wagons, to the highly technological increasingly computerized culture of the 21st century. They have experienced huge social changes created by two world wars, a world wide depression, the rising civil and women’s rights movements of the 60s and 70s, and the globalization of the markets in the 90s, and global terrorism after the turn of the century. But no one has yet identified the “secrets” for centenarians’ long life-spans, except for “choosing” your parents carefully. In fact, investigators have found the lives of centenarians to be quite varied. They have diverse diets and habits, and engage in practices that would seem to decrease their chances of living long lives. Jeanne Calment, the modern record holder for longevity at age 122, smoked until she reached 100, a practice uniformly discouraged because it is directly related to premature death. Centenarians come from all levels of income and education and are present in all ethnic and racial groups. Although many are remarkably healthy, their physical status varies considerably. Most centenarians live in nursing homes, but, a significant proportion, 15 percent, live independently in their own homes and another 35 percent live with their families (Perls & Magery, 1999).

Because of gender differences in mortality it should come as no surprise that the number of women who survive to 100 is greater than it is for men; approximately 9 women to every 1 man (Perls & Silver, 1999). The Census Bureau estimated that there were 72,000 Americans who were centenarians in 1990 and that this number will increase to 324,000 in 2030 and 834,00 in 2050 (U. S. Bureau of the Census, 1999). This means that contact with a person 100 years old or older will become an increasingly common experience in our futures.

About one in 10,000 persons reaches their 100th birthday, making centenarians a highly select group. One of the interesting findings that has come out of the research with centenarians is that mortality after age 85 actually declines slightly. It is not known why, but the conjecture is that those who live to be that old may be self-selected for hardiness compared with those who die at earlier ages (Hayflick, 1994). Most centenarians are quite impressive in the active, involved and vital lives they lead, demonstrating that very advanced old age does not necessarily imply debilitating physical and mental illness (Perls & Silver, 1999). Instead of a picture of frailty and physical degeneration, centenarians are often quite remarkable, as the above brief description of Tom Spear attests.

Health of Centenarians

The New England Centenarian Study, begun in 1994 in the Boston area, showed that centenarians
remained functionally independent most of their lives, with little physical or mental impairment and low rates of illness and hospitalization before age 92 (Hitt, Young-Xu, Silver, & Perls, 1999). Thomas Perls and Margery Silver (1999) believe that centenarians have not survived the diseases associated with aging, but have actually avoided them, expressing this conclusion as “The older you get, the healthier you’ve been”. About 95 percent of centenarians remained physically and cognitively healthy into their ninth decade, their incidence of cancer is less than would be normally expected, and diabetes is almost nonexistent. Perls (2004) attributes their good health to being less susceptible to disease until much later in life. Instead of a picture of lives in decline, they generally experienced a lifetime of excellent health, with only a minor portion of it spent in illness before succumbing to a quick decline and death at the end of their lives.

The incidence of Alzheimer’s disease in centenarians has been of particular interest to investigators because based on its incidence in younger cohorts, the expectation is that at their age, most centenarians should be suffering from the disease, but the results show they are actually less likely to be affected than predicted (Perls, 1995). This was demonstrated in the New England Centenarian Study in which 69 subjects were given neuropsychological evaluations to diagnose the likelihood of Alzheimer’s disease. A second neuropathological evaluation for the disease was completed on those who had died and had consented to a postmortem study of their brains (Silver, Newell, Hyman, Growdon, Hedley-Whyte, & Perls, 1998). Because the New England Centenarian Study is a population study that attempts to identify all centenarians living in the Boston area, it provides a good estimate of the prevalence of Alzheimer’s among centenarians. Although only 11 of the centenarians were found to have no dementia, postmortem evaluations of the brains of 6 subjects that died since the study began did not meet the criteria for a diagnosis for Alzheimer’s disease. Instead, dementia appeared to be caused by other physical and mental disease entities such as vascular changes in the brain that caused insufficient blood flow or depression, both of which are likely to be reversible. In a similar study of Danish centenarians, 37 percent of the participants showed no signs of dementia and 62 percent of those with dementia had diseases or cardiovascular problems that put them at greater risk (Andersen-Ranberg, Vasgaard, & Jeune, 2001). These results are contrary to the general belief that Alzheimer’s disease is inevitable if one lives long enough.

Men who are centenarians seem to have an advantage over women or younger men in having greater biological and cognitive reserves. This has resulted in the curious finding that the average man in his late nineties may be more cognitively intact than a man or woman in their 80s (Perls, Morris, Ooi, & Lipsitz, 1993; See Figure 10.2). The selective survival hypothesis is given as an explanation for this curious result. In its simplest form, the hypothesis assumes that those who survive to very advanced ages are a select group of more vigorous and healthy individuals than those who die at earlier ages. Thus, when the two groups are compared, the greater selectivity in the older groups shows them as being more competent. This difference explains the gender crossover effect, when men appear to become much more cognitively and physically robust than women especially during the 80s. Among centenarians, 15 percent of the 100-year-olds are men, but the proportion of men climbs to 40 percent in the 105-year-old group (Perls, 2004). Figure 10.2 shows the crossover effect for cognitive abilities. Interestingly, the selective survival hypothesis does not seem to apply for women who appear to be less physically and mentally fit than men at these ages, nor do they show an advantage over women who are younger. Why selective survival would operate for men but not women is unknown.

The “Nature or Nurture” of Centenarians

Figure 10.2. Cognitive abilities of elderly men and women (Source: Perls, 1995, p. 77).
Raymond and Ruth Pearl first proposed that a relation existed between a person’s genetics and his/her longevity more than 60 years ago when they discovered that having long-lived parents and grandparents increased the likelihood of living to an advanced old age (Pearl, 1934). Making an assertion that genes are responsible for behavioral traits based on kinship can be hazardous since people who share similar genes often share similar environments. Studies of aging in identical and fraternal twins are more informative since they make it possible to calculate a measure of heritability, or the amount of variation in a trait that can be accounted for by genes. Results of twin studies are in line with Pearls’ hypothesis. Monozygotic twins who possess the same genes show a greater similarity in the length of their life span than do dizygotic twins (Hrubec & Neel, 1981; Jarvik, Falke, Kallmann, & Lorge, 1960). An influential study of 600 pairs of Danish twins born between 1870 and 1980 were compared in longevity (McGue, Vaupel, Holm, & Harvald, 1993), and the results showed monozygotic twins were similar in age at death, but this was not true for dizygotic twins. The average difference in age at death was 14.1 years for monozygotic twins, 18.5 years for dizygotic twins, and 19.2 years for two random individuals. These average difference between pairs of identical twins may seem quite large, but it must be remembered that this sample was studied from birth, and deaths were the result of other causes in addition to those related to aging. The estimate of heritability of longevity was moderate at .333, which suggests that approximately 33 percent of the variation in length of life spans is a function of the genes a person inherits, but this also suggests an even greater proportion of the variation in length of life span is accounted for by environmental influences. However, this conclusions about heritability and life span should be made cautiously. The study may not have been a good test of genes and their relation to longevity because the investigators looked at all deaths regardless of whether they occurred early or late in the life cycle. We might expect that deaths that occurred early may have been more coincidental to life span than deaths that occurred later in the life span.

Tom Perls, the principal investigator in the New England Centenarian Study, believes the advantages in mortality and physical health of centenarians is based on their genetics (Perls, 1995). For example, Catherine McCaig, is a 103-year-old subject in the New England Centenarian Study. She has four siblings who lived past 100 and a 97-year-old sister, and seven centenarian cousins. The odds of such cases occurring by chance are very small, and the fact that so many centenarians are related suggests the number of genes that directly affect aging processes is small. The results of the New England Centenarian Study show that centenarian siblings were more than four times as likely to live to 90 years of age (Perls, Bubrick, Wager, Vijg, & Kruglyak, 1998). Since siblings share environmental similarities that may have an effect on their aging, caution should be exercised in drawing conclusions about genetic differences. Although the environment cannot be ruled out as a factor in the long lives of centenarians, if it were of primary importance, the expectation is that the longevity of their spouses who share their environments would be similarly affected; yet, the life-spans of their spouses are average (Perls & Silver, 1999). If the genetic hypothesis proves to be valid, studies examining the family clusters of extremely old individuals suggest that number of genes responsible for the long life of centenarians must be limited in number, otherwise the chances of so many siblings living long lives would be highly unlikely if there were a large number of genes involved.

How genes might affect the aging of centenarians is unknown, but one possible explanation is that they cause centenarians to age more slowly than others. A comparison of female centenarians with others in their cohort who had died at earlier ages revealed that centenarians were more likely to have given birth to a child in their forties, and one woman was 53 years old when she gave birth to her last child (Perls, Alpert, & Fretts, 1997). A later genealogical study of longevity in the Amish has also revealed a relationship between age of mother at last birth and length of their lifespan (McCardle et al., 2006), and also found a relationship of longevity of men and the number of children they fathered. Although it is difficult to determine whether this reflects better health in the individuals it suggests the possibility that their biological clocks tick more slowly than they do in other persons.

The general good health of centenarians may at first lead us to think that they were the fortunate few that lived lives relatively free of stress, but this does not seem to be the case. Centenarians experience the stresses and strains of living that everyone else does, but their response may be different because of their good fortune in inheriting or developing personalities that allow them to handle stress more easily. One consistent pattern found by Perls et al., 1993 was an outgoing personality. Extraversion was found to be associated with high morale in centenarians, but not for elders in their nineties or below. The investigators proposed that centenarians are more inclined to take the opportunity to socialize with others and to tell stories, which raises their morale. Similar results with respect to personality have been found in the subjects in the Swedish
Centenarian Study whose personality profiles indicated they were more capable, responsible, less prone to anxiety and more easy-going than average (Samuelsson, Alfredson, Hagberg, Anonymous, Nordbeck, Brun, Gustafsson, & Risberg, 1997). Having positive personality characteristics may be the reason why centenarians in the New England Centenarian Study were often “people magnets.” They drew people to them easily and quickly and were seldom alone.

Besides having the positive trait of extraversion, centenarians are unlikely to possess negative personality traits. Perls and Silver (1999) in the New England Centenarian Study found their female subjects scored lower on the neuroticism scale of the NEO Five-Factor Inventory of personality. This scale measures negative reactivity to the environment indicative of the negative emotions such as anger, fear, guilt and depression that can be debilitating. These investigators found centenarians to be upbeat and frequently used humor to place a positive tilt on their circumstances. This was evident in the response of 102 year-old to cameramen and reporters who descended upon her home interested in her thoughts on longevity. When she was asked what she thought her neighbors would think about all the attention she was given. She replied: “They’ll think I died (p. 72).” The developing picture of centenarians is that they are adaptable to what life brings them, capable of shifting to other activities or interests when the debilitating aspects of age encourages them to change, and are able to maintain an optimistic view of life. Living to 100 years is a remarkable feat and bound to draw the interest of those around them, but the positive personality characteristics of centenarians appears to draw people close to them, whether it be family or nonrelatives who were impressed enough to visit them regularly; a very good environment indeed, in which to grow old.

**The Focus on Avoiding Decline in Successful Aging**

Successful aging has been a concern of gerontology from its beginning, but an obvious problem has been to define what “successful” means. A simple measure of success in the case of centenarians is how long they have lived, the assumption being that a longer life is associated with living it well. The study of centenarians emphasizes the importance of avoiding or adapting to the major stressors in aging such as disease, disability, physical and mental decline in living long.

The desire to avoid the frailties of old age and the inevitable decline in physical and mental competence that comes with aging is a major issue in successful aging, and a common story told throughout human history. In the Greek myth, Tithonus had the misfortune to fall in love above his station with Eos, the goddess of the dawn. Gods do not age and die, and although they swore eternal love for each other it only lasted until Tithonus began to age and lost the good looks of his youth, whereupon Eos grew disenchanted and put Tithonus away in a chamber where he could not be seen. The inherent problem of aging is that losses occur in our physical, social and psychological worlds as we grow older; losses that we cannot overcome. Jonathon Swift expressed this enigma elegantly: “Every man desires to live long, but no man would be old.”

The issue of decline is of such importance, that there has been renewed interest in measuring the actual amount of mental and physical decline that occurs with normal aging and how much of that can be avoided. A significant source of data has been the Baltimore Longitudinal Study of Aging, which was begun by Nathan Shock in 1958. Its participants, numbering well over 2,000, undergo a series of biological and psychological tests every two years of their lives and will continue to do so until their deaths. Investigations, such as this one and others, revealed greater heterogeneity among the elderly and the existence of greater latent potential in improving and maintaining competencies in the old than was expected, and they encouraged a more positive view of how much decline can be avoided. Studies such as these led many to question whether old age was necessarily synonymous with disease, declining competencies and disability. James Fries’ compression of morbidity hypothesis in successful aging faces this issue head on.

**The Compression of Morbidity Hypothesis**

A cartoon given to me by one of my colleagues exemplifies the fears we have about growing old because of its association with physical decline. It shows two old men in wheel chairs with blankets covering their legs. They are thin, bald, emaciated and their faces are lined from aging. The one is turned to the other and is saying “To think I gave up smoking, drinking and carousing with women for this?” The idea being, of course, that if you live long you will spend those last years frail, sick, and incapacitated, and that the longer you live, the more years you will spend that way. Many fear that the advances in medical technology of the last 50 years have not increased our active life-spans, but instead, have prolonged the length or our dying. Will
efforts toward increasing longer life spans lead to more years spent in disability? The work of James Fries on
the compression of morbidity suggests it may not.

The explanation of compression of morbidity hypothesis is dependent on the distinction between
maximum life-span and average life expectancy. There is good evidence that maximum life-span has not
changed for at least 100,000 years, but that life-expectancy, especially from birth, has increased a great deal.
This is because maximum life-span is based the ultimate biological potential of the human species to survive in
its environment, whereas life expectancy is an estimate of actual survival based on the presence of risk factors
for an individual in a specific environment. Human biology has not changed in recent time, but risks for
survival have become fewer.

The compression of morbidity hypothesis formulated by James Fries (Fries, 1980; 1990; 1989; Fries &
Crapo, 1981) asserts that morbidty, as defined as the period from the onset of chronic infirmity until death,
the most dreaded portion of aging, can be decreased in duration, if it can be postponed until later ages. The
reason why is that the length of our lives are limited by our physiological potential inherent in the maximum
life-span. If the point of when morbidity begins is postponed, it becomes compressed as it approaches the limit
determined by the maximum life-span. This also has the benefit of increasing the proportion of time in the life-
cycle spent in vitality. James Fries has expressed this idea in the form of a syllogism.

A New Syllogism
The human life-span is fixed
The age at first infirmity will increase.
Therefore, the duration of infirmity will decrease. (Fries & Crapo, 1981, p. 7).

The effects of the syllogism are represented graphically in Figure 12.2. In the figure, the first time line
represents our present circumstances with respect to age and morbidity. It begins sometime in our 50s or 60s
and continues until our deaths at age 75. Age 75 is the approximate mean life-expectancy for both genders in
the U.S. The next two time lines represent two possible scenarios for the future. In Scenario I, average life-
expectancy increases from approximately age 75 to 80, but age of morbidity is unchanged, resulting in an
increased number of years spent in chronic disability. In Scenario II Average life-expectancy also increases to
age 80 but in this case, age of morbidity is postponed for a greater number of years than life-expectancy is
extended. Thus, morbidity is compressed. His ideas are
mindful of the motto adopted by the Gerontological Society of American: “Adding life to years, not just more years to
life.”

Fries does not rule out the possibility that life-
expectancy will increase, but that compression of morbidity
will occur because the average age at first chronic infirmity
will increase faster than increases in life expectancy. Fries
finds evidence for this in the changes people made in their
life their lifestyles, and improved medical interventions
during the 1970s, that led to sizeable decreases in morbidity,
while at the time, increases in life expectancy were quite
small or non-existent (Fries, 1989). For example, people
who stop smoking live longer, but it is not equal to the
number of years they will live without the chronic respiratory
problems. In addition, the compression of morbidity
provides a death benefit. If Fries is correct, and illness and
disability will occur later in life, the increasing vulnerability
of our organs at later ages will allow us to suffer a swift
decline ending in quick death rather than an extended period of suffering. In many ways this describes the life
trajectories of centenarians.

The accuracy of Fries’ prediction depends on whether the premises of his syllogism are true. Based
on the first premise that the human life-span is fixed, Fries (1980; Fries & Crapo, 1981) predicted that gains in
life-expectancy would show smaller increases at advanced ages as it came closer to the biological limiting
factor of maximum life-span, and that the life-expectancy gap between males and females would narrow since
average life-expectancy for women was closer to the human limit of maximum life-span. There is evidence that this may be happening. From 1979 to 1996 life-expectancy for males at 65 increased 1.49 years, but for females it increased much less, 0.56 years (Anderson, 1998). These figures are in line with the compression of morbidity hypothesis.

There is more doubt and controversy over the second premise in Fries' syllogism, that the age of first infirmity or morbidity can be delayed. How would this occur? Fries asserts that much of disease, physical disability, and impairment is a function of the lifestyle lived, and that morbidity can be delayed if alternative healthy lifestyles are adopted. Moreover, changes in lifestyle are not costly, do not depend on technology, and are readily available to anyone who chooses to make them. There is evidence that is also occurring in American society through the adoption of healthier lifestyles since the early 1960s. Tobacco use is down, there has been a decrease in the use of animal fats and oils, air pollution is down, the use of seat belts has increased (automobile accidents are responsible for considerable disability regardless of age) and the number of Americans engaging in regular exercise has also increased (Fries, 1989). These changes in lifestyles and health habits are in part responsible for increases in life-expectancy, but according to Fries they have had a much greater effect on postponing morbidity.

**Delaying Disability**

The compression of morbidity hypothesis implies that disability rates of older people can be delayed until later in the life-span. Is there evidence that this is possible? Yes. A research group including James Fries examined how lifestyle affects the development of disability (Vita, Terry, Hubert, & Fries, 1998). The data gathered were part of the University of Pennsylvania Study that followed almost 1,800 alumni who attended classes in 1939 and 1940. They were later surveyed in 1962, at the average age of 43, and then annually since 1986. The basic hypothesis of the study was that people with lower health risks will have less disability with increasing age. The risk factors sampled were smoking, being overweight, and exercise patterns. The last analysis of the data was completed when the average age of the subjects was 75 years. The results showed marked differences in the degree of disability between groups that differed in risk factors. The amount of disability was less at any given age in the low risk group, and the onset of minimal disability in this group was postponed by more than 7 years as compared with the high risk group.

Fries and his associates also examined the converse hypothesis of the above study, which is, do those individuals who have adopted active lifestyles lower their risks for disability in later life? The study known as the Precursors of Arthritis Study followed 451 members of a runners’ club and compared them with 330 community controls that were matched for age on a number of measurements designed to assess disability (Fries, Singh, Morfeld, Hubert, Lane, & Brown, 1994). The study, which began in 1984 when the subjects ranged in age from 50 to 72 years, showed that runners had less disability than controls and that the differences between the groups in the amount of cumulative disability steadily increased over the last 13 years of observations until the exercise group showed one-half of the disability of the control group. In this study, postponement of minimal disability was delayed approximately 8.7 years in the exercising group (Fries, 1999).

A second source of data on the question of compressing morbidity comes from studies that have compared disability rates of different cohorts older Americans based on their responses to national surveys about their disabilities and functional problems they have in day to day living. Two studies have found declines in reported disability despite differences in subject populations and methodologies. The first report, completed by Ken Manton and his associates (Manton, Corder, & Stallard, 1997), was based on data from the National Long-Term Care Study which surveyed approximately 20,000 subjects. These investigators examined rates of disabilities among people 65 and older between 1982 and 1994 that were based both on their difficulty with “activities of daily living,” such as eating, dressing, or bathing, and on difficulty “instrumental activities of daily living,” such as cooking or doing the laundry. The rate of disability in 1982 was 24.9 percent, but 12 years later, a later age cohort showed a surprising decline to 21.3 percent. This decline in disability meant that approximately 1.4 million fewer people were disabled than would have been expected based on the disability rate of 1982. In addition, the rate of decline appears to be accelerating in that the rate of decline was greater during the period from 1989 to 1994 than in the period from 1982 to 1989. Possible reasons for the improved levels of function are better nutrition, better public hygiene, and lifestyle changes, many of which are associated with higher levels of education. The investigators calculated that such changes in disability will lead to approximately 400,000 fewer persons being institutionalized in their life times, giving a savings of $17.3 billion dollars in nursing home expenses in 1994, to say nothing of psychological and
human costs. Manton and his colleague Burton Singer (Singer & Manton, 1998) have suggested that further declines in disability will continue until 2070 because decreases in risk factors for disability in current younger cohorts, many of which are linked to increased education. If this prediction is accurate, it will have a considerable positive effect on the health service needs of the elderly and the number of dollars needed to adequately care for an increasingly older population.

A second investigation carried out by Vicki Freedman and Linda Martin (1998) used data from the United States Census Bureau’s Survey of Income and Program Participation. In this study, disability was measured by a subject’s reported difficulty in four areas: seeing words in a newspaper, lifting and carrying 10 pounds, climbing a flight of stairs, and walking a quarter of a mile. Although the measures for disability and the subjects surveyed were different from the Manton et al. (1997) study, these investigators found approximately the same large levels of decline in chronic disability from 1984 to 1993 (Figure 12.3). Interestingly, the largest improvements in functioning were found in the oldest age group, those 80 and older. A comparison of the two cohorts showed the percentage of persons with greater than a high school education increased from 25.5 percent to 33.6 percent. This increase in education is likely to be associated with changes in lifestyles that have beneficial effects on the incidence of disability. However, even after education and other compositional differences in the population are controlled for, there are still significant declines in disability that are a function of improved physiological capability that are unaccounted for by the variables measured. Future studies are needed to determine the basis for the improvement found.

Rowe and Kahn’s Successful Aging

James Fries’ compression of morbidity hypothesis focused on the length of life free of the limitations that accompany aging as defining successful aging. However, it is limited in what successful aging means in the social and intellectual realms. Since the appearance of Fries’ initial book in 1981, there has been an increasing impetus from the establishments such as the John D. and Catherine T. MacArthur Foundation which began in 1984, which sought to bring together scholars for the purpose of establishing a "new gerontology" that would gather knowledge that would improve the lives of older Americans (Rowe & Kahn, 1998). In the 1980s and 90s, the MacArthur Foundation and the National Institute supported research programs that demonstrated that the loss of function could be reversed, and that lifestyle was an important predictor of functional status in old age. This led to an optimism that successful aging, identified by a retardation in diseases associated with aging and continued optimal physical and intellectual functioning, was possible. Two of the strongest proponents of this perspective were John Rowe, who was president of Mount Sinai Hospital and School of Medicine in New York, and Robert Kahn, professor emeritus of psychology and public health at the University of Michigan.

"Normal or Usual Aging"

In a seminal article written for the journal Science in 1987, John Rowe and Robert Kahn proposed that a distinction should be made between aging that is "usual" or “normal,” and aging that is "successful." Normal aging is what happens to most disease-free older persons as they age. For most people, body organs gradually lose their ability to efficiently carry out their intended functions, and risk factors, such as high levels of blood fats, high levels of blood sugar, and hypertension accumulate and increase the chances for contracting chronic illnesses and disabilities at later ages (Rowe & Kahn, 1998). For Rowe and Kahn the consequence of identifying aging with the “normal” changes that occur for most older individuals was to view increases in blood pressure and blood glucose, and decreases in cognitive functioning as changes that were intrinsic to
aging itself (Rowe & Kahn, 1997). The unfortunate consequence of this was that although individuals in this "normal" group showed no symptoms of disease, their current lifestyles actually places them at substantial risk and increase vulnerability for disease and disability over time. Since these aging consequences were considered the result of aging "normally," treatment was thought to be largely ineffective, and the signs of impending future problems as people aged were largely ignored. Rowe and Kahn believed this perspective to be misguided since the expected decline in physical and mental functions did not apply to everyone. Within the population of older people there is considerable heterogeneity, and there are individuals who show minimal or no physiological and intellectual loss. Rowe and Kahn argue that these people, in contrast to the “normal” elderly, have “aged successfully.” Their book, published in 1998, summarizes the results of investigations of factors in successful aging and their conclusion on how to age and maintain optimal functioning.

### The Components of Successful Aging

It is clear that successful aging as envisioned by Rowe and Kahn (1997; 1998) is more than simply the absence of disease. For them, successful aging involves the integration of three components: avoiding disease and disability; maintaining high cognitive and physical function; and an active engagement with life (Figure 12.4). Although each of these three components are important in their own right, successful aging is defined by the presence of all three interacting in concert with one another to incur optimal benefits. This makes sense because it would be difficult to be actively engaged with life without mental or physical competencies. To some extent, there is an hierarchical arrangement of the components, in that the absence of disease is necessary for the maintenance of mental and physical function, which in turn supports an active and engaged life.

#### Avoiding Disease and Disability

To age successfully it is not enough to be free of disease and disability, but the risk factors associated with disease and disability must be avoided as well. Many of the future ailments of old age are presaged by such signs as high body fat, high blood pressure, and abnormal blood sugar levels, which can be avoided by lifestyle changes such as diet and exercise. Rowe and Kahn argue that heredity is less important as a factor in aging successfully without disease than had been previously thought, and that the changes people make in their behaviors and lifestyles are more important in avoiding illness with age than genetics. They base their belief on research from long-term studies such as the Swedish Adoption/Twin Study of Aging that included over 300 pairs of aging twins (Rowe & Kahn 1997), which found that heritability declined for such things as heart disease with age. This can be interpreted to mean that as one grows older, the risk factors for this disease are less related to one’s genes than to environmental differences, and they point out that interventions such as weight loss and exercise programs, can overcome the effects of “bad genetics.” Rowe and Kahn stress that we have more control over our health than we had imagined.

#### Maintaining High Cognitive and Physical Functioning

Maintaining maximal functionality in our ability to continue learning and to perform common everyday tasks is as essential to successful aging as avoiding disease. A person who becomes easily confused or forgetful is unlikely to be fully and actively engaged in rewarding activities. Rowe and Kahn (1997) identify a number of factors that have been found to be related to high cognitive functioning. First, level of education is related to high levels of cognitive ability in later life, although the reasons why are not well understood. Perhaps education reflects biological differences in brain circuitry that help to maintain long term mental functioning or it may be an environmental effect based on behavioral differences that education has instilled that encourages life-long intellectual activities. In general, their advice in maintaining high cognitive...
and physical function is "use it or lose it." Second, Rowe and Kahn assert that physical activity affects brain chemistry in beneficial ways and is an important part of a regimen for successful aging. Third, a people’s beliefs in their own self-efficacy, that they can competently carry out activities and act effectively in their environments leads to realized high mental functioning. Finally, cardiovascular fitness, indicated by measures such as peak pulmonary flow rate, helps to maintain cognitive functioning by providing the brain with needed nutrients.

**Active Engagement with Life**

There are two factors related to Rowe and Kahn’s third component for successful aging of being actively engaged in life: maintaining interpersonal relationships and maintaining productive activities. Research has shown that having close friends and family is associated with longevity, whereas social isolation has been found to be related to morbidity and mortality. This occurs because our relationships with others provide us with socio-emotional support through expressions of affection, respect or esteem, which communicate to us that we are valued by others. In addition, close relationships often provide instrumental support, which involves the direct assistance in carrying out the necessary day to day tasks of living one's life. These two forms of support can have positive effects on health and help to alleviate stress. Instrumental support, however, can be a double-edged sword if too much assistance is given so as to lower self confidence and motivation of an older person seeking to be independent. Rowe and Kahn broadly define productive activities as any activity that creates goods or services regardless of whether a person is paid for them. This would include hobbies and volunteer work. Elderly persons who are active and productive are viewed more positively by themselves and others and appear to live rich and rewarding lives. They are more likely to be better educated, show higher levels of cognitive and physical functioning and have strong beliefs in self-efficacy and the mastery of their environments.

**An Evaluation of Rowe and Kahn’s Successful Aging**

In many ways, Rowe and Kahn’s model of successful aging is an expanded version of the older activity theory proposed by Lemon, Bengston, and Peterson (1972), in that the three components of successful aging revolve around the importance of higher rates of activity in people who are aging, although Rowe and Kahn place a greater emphasis on social activity. A longitudinal study exploring the relation between physical and social everyday activities and successful aging supports such a conclusion (Menec, 2003). The participants included men and women between the ages and 67 and 95 who were interviewed over a six-year interval about their activities and their subsequent benefits. Higher rates of social and productive activities were correlated with reduced mortality and better physical functioning, although solitary activities, such as hobbies, music, theatre, reading and writing provided psychological benefits in a greater sense of happiness. Although this is supportive of Rowe and Kahn, the author points out that the mechanisms that produce the beneficial effects are still in question. Does increased social and physical activity help to maintain a positive self-image, feelings of usefulness and competence, and a stronger sense of control and mastery, or is the reverse true.

Rowe and Kahn’s theory of successful aging is basically a recipe for aging well based on the results of current research, but some of their pronouncements may be premature. Their derogation of genetics in its relation to longevity may be too strong, especially in view of recent research with centenarians that have identified families that have lived far longer than what would be expected based on average life expectancies (Perls, Bubrick, Wager, Vijg, & Kruglyak, 1998). There are also philosophical difficulties with what they choose to define as successful aging. In Rowe and Kahn’s model, the person who ages least would age the most successfully, a kind of perpetual middle-ager. Their advice to keep active to avoid aging is good advice but their stress on it may be excessive. Not everyone is able to maintain or even desires to maintain the active regimen their model requires, and it has been argued that it ignores the influence of gender, race and socioeconomic status on healthy aging (Holstein & Minkler, 2003). Does this mean that these others are aging “badly?” Strawbridge, Wallhagen, and Cohen (2002) argue that it is a mistake to use the term “successful” to describe how people age because it implies winners and losers. Other terms, such as “healthy,” “productive,” or “effective” may be better choices. This heavy emphasis on a physically active and healthy older persons creates a politically correct view of an older person, in which it is inappropriate to recognize characteristics that are not in agreement with this view. Furthermore, Rowe and Kahn’s definition of successful aging may not correlate with how older people see themselves. When elderly persons between ages 65-99 were asked
whether they were aging successfully, 50.3 percent said yes, even though the authors found the percentage would be 18.8 percent if they used Rowe and Kahn’s criteria (Strawbridge, Wallhagen, & Cohen, 2002). Clearly the term successful aging means something different to these older participants.

In response to these criticisms, Rowe and Kahn emphasize that the possibility of aging successfully aging is available to anyone since it is dependent on individual choice and effort rather than inherited biology. Those who choose to adopt healthy lifestyles that promote positive physical, social and intellectual functioning will be rewarded with long, happy, independent lives relatively free of the negative effects associated with "normal aging."

To a large extent, Rowe and Kahn are correct in asserting that much of the negative effects of aging are due to lifestyle choices and behaviors we can control, but they may be overemphasizing how much people can determine whether or not they age successfully. The results of the MacArthur studies show that "successful physical agers" tended to be male, white, affluent, healthier, and better educated (Rowe & Kahn, 1998), characteristics that are not necessarily under a person’s control, but which are related to socioeconomic status. There is considerable evidence that socioeconomic status plays a major role in health and mortality (Adler, Boyce, Chesney, Cohen, Folkman, Kahn, & Syme, 1994; Pappas, Queen, Hadden, & Fisher, 1993).

The downplaying of the role of social and political institutions for the health and well-being of members of society has the unfortunate effect of absolving these institutions of the need to pursue legitimate concerns and responsibilities in encouraging healthy aging (Holstein & Minkler, 2003). Although the effects of social disparities are often thought to diminish with age, evidence suggests they continue to benefit the advantaged group well into old age (Kubzansky, Berkman, Glass, & Seeman, 1998). This makes Rowe and Kahn’s assertion that successful aging is in our own hands through our individual choice of lifestyles questionable at best. Not everyone will have the resources or the environmental supports to age successfully, and this is especially true at lower levels of socioeconomic status. Rowe and Kahn ignore completely the fact that luck may play an important role in how well a person ages. If successful aging is under our individual control, as Rowe and Kahn believe, do we then begin to blame those who are not successful because of their lack of individual effort or persistence? There are those elderly who are less capable either because of physical disability or lack of resources (Scheidt, Humpherys, & Yorgason, 1999). On the face of it, their theory seems to imply that those who have suffered physical disabilities, or who are restricted to a wheelchair before their “time,” have aged unsuccessfully.

Exercise! The Key to Successful Aging?

Research on centenarians and the theories of successful aging emphasize the importance of moderating the effects of physical decline, and maintaining an active, healthy and vigorous lifestyle in old age? Maintaining a regimen of physical activity is becoming the most common suggestion and there is good reason for it. The evidence shows that the normal decline in organ reserves is substantial. We lose strength and stamina, our reflexes slow, our capacity to fill our lungs with oxygen decreases, and our hearts beat slower when under stress. The question is, how much of this decline is inevitable, and how much of the decline is due to "hypokinetic disease," a term used by Herbert De Vries to describe the declines in physical and mental functioning that occur because of inactivity? Decline due to inactivity can occur quickly even in physically fit young men in a study reported by De Vries (1983). The procedure was simple. Well-conditioned young men were subjected to three weeks of forced bed rest, during which physical activity was kept to a minimum. Over this very short interval of time, the subjects lost 26 percent of maximal cardiac output, 30 percent of oxygen consumption, and 30 percent of maximal ventilatory capacity, essentially “aging” almost 30 years.

Aging Athletes

Attitudes about the benefits of exercise were not very positive 30-50 years ago, but that appears to be changing as data becomes available showing that people of all ages benefit from exercise, and that it is especially important for older persons. Part of the reason for these negative beliefs was studies of former athletes that showed early active athletic lifestyles in competitive sports did not predict later health or longevity (Shephard, 1993). In fact, it was found that college graduates who avoided athletics as students benefitted as much from taking up more active lifestyles in middle-age as those who maintained vigorous activity from their college days on (Paffenbarger, Hyde, Wing, Lee, Jung, & Kampert, 1993). On the other hand, men who worked hard to maintain their athletic abilities as they aged are another matter. K. Anders Ericsson (1990)
studied master athletes as a way of studying optimal performance, and it is probably the closest thing we have to an estimate of successful biological aging. Master athletes continue in athletic competitions all the way to the century mark in age. They are highly motivated to perform at their best and have spent long hours in training in order to maintain high levels of athletic performance. In comparing athletes of different ages, Ericsson estimates that the peak performances in sports usually occur between 20 and 30 years of age, but that with continued intense training performance levels can be maintained with small decrements up to 60 to 70 years of age. Training was a very key component in maintaining the performances of these athletes, and rapid declines in abilities occurred when training was reduced or stopped. Although master athletes train much harder and longer than does the average person who is merely serious about keeping fit, they still train less per week than do the outstanding athletes in younger cohorts (6.5 hours vs. 38 hours a week) which probably make them less fit than they could be (Starkes, Weir, Singh, Hodges, & Kerr, 1999). However, developmental differences related to stage of life were key factors in the lesser amounts they train, since much of the master athletes’ time is spent working and attending to family matters. Table 12.2 shows a comparison of records in Olympic events and records in performance of members of the World Association of Veteran Athletes. The table shows fairly competitive performances of athletes into their 60s with these early Olympic records. In addition to comparing men of different ages in athletic events, an alternative way of examining optimal rates of physical decline is to compare measures of physiological capacities of older and younger athletes. Walter Bortz IV and his grandfather Walter Bortz II (1996) examined the performance of master athletes age 35 and older in a variety of competitive events, such as 1500 meter swim, marathon, 100 meter dash and 2500 meter rowing. They compared the performance in these events at a baseline age of 35 with performance at later ages. The results showed a gradual decline from age 35 onward, but performance remained at least 80 percent or better through age 60, with steeper declines beginning at age 65, similar to the declines in athletic events (Table 12.2). Bortz and Bortz (1996) are not sure how much of the decline that becomes steeper after age 60 is due to physiological aging or decreased participation by older athletes. One of their comparisons involved maximum oxygen consumption, because the ability to use and consume oxygen is central to maintaining high performance, and may be a crucial indicator for optimal physical aging. The rate of decline of oxygen consumption for the athletes tested was 0.5 percent a year, which is about half the rate of decline found in studies of people aging normally. This value is lower than what has been previously reported, but if true, a rate of decline of 0.5 percent has important implications as the theoretical rate of decline in

<table>
<thead>
<tr>
<th>Event</th>
<th>100 M.</th>
<th>400 M.</th>
<th>800 M.</th>
<th>1,500 M.</th>
<th>Marathon</th>
<th>High Jump</th>
<th>Shot Put</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympic</td>
<td>9.63</td>
<td>43.49</td>
<td>1:40.91</td>
<td>3:32.07</td>
<td>2:06:32</td>
<td>2.39 m</td>
<td>22.47 m</td>
</tr>
<tr>
<td>Master</td>
<td>9.97</td>
<td>45.68</td>
<td>1:43.36</td>
<td>3:32.45</td>
<td>2:03:59</td>
<td>2:31 m</td>
<td>22.19 m</td>
</tr>
<tr>
<td>Athlete 35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>10.29</td>
<td>47.81</td>
<td>1:48.22</td>
<td>3:42.02</td>
<td>2:08:46</td>
<td>2:28 m</td>
<td>21.41 m</td>
</tr>
<tr>
<td>50</td>
<td>10.88</td>
<td>51.39</td>
<td>1:58.65</td>
<td>4:05.20</td>
<td>2:19:29</td>
<td>1:98 m</td>
<td>18.45 m</td>
</tr>
<tr>
<td>60</td>
<td>11.70</td>
<td>53.88</td>
<td>2:08.56</td>
<td>4:24.00</td>
<td>2:36:30</td>
<td>1:81 m</td>
<td>18.37 m</td>
</tr>
<tr>
<td>70</td>
<td>12.77</td>
<td>59.34</td>
<td>2:20.52</td>
<td>4:52.95</td>
<td>2:54:48</td>
<td>1:59 m</td>
<td>15.89 m</td>
</tr>
<tr>
<td>80</td>
<td>14.35</td>
<td>70.27</td>
<td>2:48.50</td>
<td>5:48.93</td>
<td>3:15:54</td>
<td>1:37 m</td>
<td>13.98 m</td>
</tr>
<tr>
<td>90</td>
<td>17.53</td>
<td>95.04</td>
<td>4:04.85</td>
<td>8:07.17</td>
<td>5:40:01</td>
<td>1:11 m</td>
<td>9.88 m</td>
</tr>
<tr>
<td>100</td>
<td>23.40</td>
<td>2:13.48</td>
<td>5:32.18</td>
<td>11:27.81</td>
<td>8:25:17</td>
<td>5:11 m</td>
<td></td>
</tr>
</tbody>
</table>

Table 12.2. Comparison of Olympic and Master Athlete records. ("List of Olympic records in athletics," 2013; "List of world records in masters athletics," 2013)
successful aging (Bortz & Bortz, 1996), because the rate of decline of 0.5 percent is the rate found for declines in a variety of other physiological measures and approximates the rate of decline in cognitive performance (Schaie, 1994). The optimistic picture of maintained physical abilities in aging athletes has made the investigation of the relationship between exercise and health of great interest to gerontologists.

Physical Activity and Health

There have been numerous studies of the positive effects on exercise on health, so many that it is more instructive to provide a summary of the findings provided in the 1996 Surgeon Generals Report (Box 12.2). The report was a comprehensive review of the available scientific evidence on the relation between physical activity and health status, and the conclusions of the scientist’s who wrote it. The authors of the report believe physical activity to be moderately beneficial to the health of most people, and that those who have lower levels of mental and physical health may show even greater gains. Although many of the studies reviewed were correlational the authors believe that it is reasonable to conclude a causal connection exists for a number of reasons: the findings were consistent across a wide range of studies; methodologically stronger studies showed larger associations; changes in health status were related to changes in physical activity; there is evidence of plausible physiological mechanisms that are affected by activity that can account for changes in health; there was evidence of a dose-response gradient in that the amount of exercise was related to the size of the benefit; and finally, the few studies that used experimental designs demonstrated results equivalent to those using correlational designs.

Box 12.2. Conclusions from the Surgeon General’s Report on Physical Activity and Health

Physiologic Responses and Long-Term Adaptations to Exercise
1. Physical activity benefits the cardiovascular and musculoskeletal systems, and the functioning of metabolic, endocrine, and immune systems.
2. Many of the beneficial effects of exercise training—from both endurance and resistance activities—diminish within 2 weeks if physical activity is substantially reduced, and effects disappear within 2 to 8 months if physical activity is not resumed.
3. People of all ages, both male and female, undergo beneficial physiologic adaptations to physical activity.

The Effects of Physical Activity on Health and Disease
1. Lower mortality rates for both older and younger adults.
2. Decreased risk of cardiovascular disease mortality in general and of coronary heart disease mortality in particular.
3. Delays the development of high blood pressure.
4. Decreased risk of colon cancer.
5. Lower risk of developing non–insulin-dependent diabetes mellitus.
6. Lower risk of osteoarthritis; maintains muscle strength, joint structure, and joint function.
7. Lower risk of osteoporosis.
8. Strength training and exercise in very old and frail adults may maintain independent living status and reduce the risk of falling.
10. Physical activity appears to relieve symptoms of depression and anxiety and improve mood.
11. Regular physical activity may reduce the risk of developing depression.
12. Reduction in peak oxygen consumption.
13. Reduction in total mortality rate.
14. Possible cognitive benefit with reduction in incidence of demenia.
(Adapted from U.S. Department of Health and Human Services, 1996, pp 7-8; Vogel et al., 2009)
miles per hour, three times a week, for about 35 minutes). The authors recognize that additional benefit could be derived by increasing intensity, frequency or duration of physical activity but believe that in order for a pattern of exercise to be maintained and adopted as “habit” over the course of one’s life, it should not be overly taxing. Many adults who start exercise programs complain that they are difficult to schedule into a busy life, and that a program that takes considerable time and effort is unlikely to be sustained for long. In addition to endurance forms of exercise, it is also recommend that resistance training, in the form of 8-10 strength developing exercises, be performed at least twice per week. This might be in the form of using weights to develop more strength in the major muscle groups of the legs, trunk, arms, and shoulders. Their final recommendation is that women over 40 and men over 50 who embark on a regimen of physical exercise see a physician before they begin. Even though physical exercise shows substantial benefits the authors of the report estimate that 60 percent of Americans are not regularly active, and a quarter of the population is inactive. How much informing the public of the benefits will cause them to change their activity levels is open to question.

Careful studies have found exercise increases longevity, but not by very much. Ralph Paffenbarger and his associates in their study of over 16 thousand Harvard alumni (Paffenbarger, Hyde, Wing, & Hsieh, 1986) found that men showed a decline in mortality that was related to the amount of exercise they engaged in. A comparison of sedentary Harvard alumni with those alumni who expended 2000 or more kilocalories per week walking, climbing stairs, and playing sports, showed an increase in longevity of over two years at age 35-39 years, but this declined to less than a year for those in their mid and late 70s.

### Exercising After 65

Physical and psychological benefits appear to accrue to everyone who exercises, regardless of age, but the beneficial changes can be considerably greater for those who are older. Unfortunately, many persons over 65 have negative attitudes about exercising in old age that create obstacles to their choosing to do so. Some elderly exaggerate the risks because they share the view that many young people have, that older persons are frail, or that exercise is only for young people, and that older persons do not need it. Others do not exercise because they tend to underrate their ability and capacity to engage in rigorous exercise or else exaggerate the benefits of very light, sporadic exercise (Pardini, 1984). Older women who grew up with stricter gender roles are not as likely to associate exercise with health as much men do, but see exercise more as a vehicle for social interactions and improving appearance. Although there is continuing evidence of a difference in men’s and women’s motives for exercising, the differences are small, and both genders are more likely to espouse health benefits as their main motivation for exercising (Shephard, 1994a). Although there is evidence that medical doctors exert a positive influence on whether their patients over 65 engage in exercise, until recently, few doctors advised patients on the importance of exercise in maintaining or improving health. A review of representative studies suggests that efforts to change attitudes about aging, and the encouragement of life-long habits of physical exercise by doctors is very helpful in bringing about greater change (Shephard, 1994a).

As discussed earlier, exercise does not appear to have large effects on longevity if begun late in life. It

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Activity</th>
<th>Approximate duration in minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Volleyball, noncompetitive</td>
<td>43</td>
</tr>
<tr>
<td>Moderate</td>
<td>Walking, moderate pace (3 mph 20 min/mile)</td>
<td>37</td>
</tr>
<tr>
<td>Moderate</td>
<td>Walking, brisk pace (4 mph, 15 min/mile)</td>
<td>32</td>
</tr>
<tr>
<td>Moderate</td>
<td>Table tennis</td>
<td>32</td>
</tr>
<tr>
<td>Moderate</td>
<td>Raking leaves</td>
<td>32</td>
</tr>
<tr>
<td>Moderate</td>
<td>Social dancing</td>
<td>29</td>
</tr>
<tr>
<td>Moderate</td>
<td>Lawn mowing (powered push mower)</td>
<td>29</td>
</tr>
<tr>
<td>Hard</td>
<td>Jogging (5 miles per hour, 12 min/mile)</td>
<td>18</td>
</tr>
<tr>
<td>Hard</td>
<td>Field hockey</td>
<td>16</td>
</tr>
<tr>
<td>Very hard</td>
<td>Running (6 mph, 10 min/mile)</td>
<td>13</td>
</tr>
</tbody>
</table>
may appear to be absurd to recommend exercise for someone 80 or older, since at that age, the length of life is little affected, but there are definite benefits beyond decreases in mortality even at advanced ages that can significantly affect the quality of their lives. Roy Shephard, who has investigated the effects of exercise for over 30 years, put it this way:

If a very old person asks for advice about exercise, the common response is "to be careful." However, if the prognosis of the "careful" individual is nine years of partial dependency and a year of total dependency, there is much to commend a more carefree attitude toward pleasure giving exercise. It may occasionally provoke sudden death, but it also has a favorable effect upon overall longevity, and more importantly it enhances life-quality, particularly by maintaining the individual's independence. Cross-sectional data further suggest that the relative risk of provoking sudden death actually decreases in old age, presumably because physical activity becomes more prudent and less competitive (Shephard, 1994b, p. 119).

The benefits observed in the very old who are active are such things as the halting of osteoporotic changes, improvement in mood, and relief of depression. It is estimated that in an active older person, maximal oxygen transport needed for independent living is maintained until age 90 or 100, rather than the 80 years that is found in inactive older persons (Shephard, 1994b). The effects of a sedentary lifestyle may not be noticeable in middle-age since the margins of safety in organ reserves are substantial, but by age 70, it can make such things as brisk walking an ordeal after only a few minutes because of the reduced ability for oxygen uptake caused by years of inactivity (Bassey, 1997).

Although older persons benefit greatly from activity, the prescription for an exercise regimen for those in their late 70s or older will differ from those of younger persons. The stress of exercise can cause death, but the risk is greatly exaggerated, and engaging in exercise appears to be safe if conducted at appropriate levels, even in patients with advanced cardiovascular disease (Van Camp, 1986). The exercise goal of most older persons is to achieve a state of general good health and physical ability, can be accomplished at lower rates of exertion than would be the case for an individual intending to compete at the level of a Masters-class athlete. This can be achieved at training levels that boost heart rates to 30-45 percent of their reserves (Shephard, 1994b). Lower exertion has benefits in being more practical so that exercise is continued regularly, and lower the risk of physical injury, even though it must be carried out over longer intervals. Helpful indicators of an appropriate level of exercise is the ability to carry on a conversation while engaged, the exercise seems "somewhat hard," and it causes the person to sweat slightly. If the type of exercise takes place outdoors greater caution should be given to weather to avoid the problems related to heat exhaustion or hypothermia that are more likely in older individuals (Shephard, 1994b).

In addition to the benefits to physical health, exercise can help alleviate other problems more commonly found among older persons. One common complaint mentioned in Chapter 7 was poor quality of sleep, which can be due to a variety of causes, though depression is often part of the problem. One carefully done study randomly assigned subjects aged 60 to 84 years who were suffering a major or minor depression to either an exercise condition in which they engaged in high-intensity weight training for 3 days a week for 10 weeks, or to a control condition in which they attended a health education program for 2 days a week for 10 weeks. At the end of the study it was found that those who had engaged in exercise rated the quality of their sleep as significantly improved, and measures of depression showed a reduction that was approximately twice that of controls. Similarly, exercise has also been found to have a tranquilizing effect, which can aid falling asleep. Elderly people are often given sedatives for the purpose of calming them during times of stress, but exercise has a similar tranquilizing effect as meprobamate, a commonly prescribed sleep aid, without the negative side effects, such as slowed reaction time or impairment in motor coordination (De Vries, 1983). This may be especially significant in the treatment of elderly who have more variable responses to drugs.

Physical Activity and the Brain

Most people assume that physical activity will effect physical health, but not realize it is also related to neurological functioning. In the mid-1990s, it was discovered that exercise in lab animals caused the nerve cells of the brain to release proteins, called brain-derived neurotrophic factors (BDNF), which guard the neural cell against injury and promote connections with other cells Brownlee (2006). This led to the hypothesis that exercise in animals might improve their learning ability (van Praag, Christie, Sejnowski, & Gage, 1999). To
test this theory, two groups of 3 month old mice were raised under the same conditions, except that animals in the experimental group had a running wheel in their cage which they could use voluntarily. The investigators found that mice with wheels averaged 4 or 5 km runs per night. After several weeks the performances of two groups were compared on a Morris water maze, in which the animals swim around until they learn the location of a platform under the water. The results showed that the wheeler runners found the platform more quickly and remembered it better than the sedentary mice. A later dissection of their brains showed greater neurogenesis and dendritic growth in the hippocampus of the runners. In a second study by the same research group (van Praag, Shubert, Zhao, & Gage, 2005), old (19 months) and young mice (3 months) that had access to running wheels, were compared to mice without access. Older active mice showed faster learning and retention than sedentary mice, and both young and old mice with wheels showed greater cell generation in the hippocampus than the sedentary mice. Although the effect was strongest in young mice with running wheels, old mice runners did not differ from sedentary young mice in cell generation, a difference usually found between old and young mice under normal conditions. Running appeared to reverse the decline in neurogenesis that comes with aging, by approximately 50%.

Why does exercise stimulate neurogenesis? Neurogenesis occurs in the brain because of the presence of adult stem cells but their development is controlled by bone-morphogenetic protein (BMP). The more active BMP the less neurogenesis occurs. Interestingly, exercise simulates a protein called Noggin, that countermands BMP allowing for more neurogenesis and neuronal rejuvenation which helps to explain the basis for positive cognitive benefits from exercise (Gobeske, Das, Bonaguidi, Weiss, Radulovic, et al. (2009). However, noggin’s positive effect of stimulating neuronal stem cells may not be infinitely positive. A study by Gage and his associates (Mira, Zonaida, Suh, Chichung Lie, Jessberger, et al., 2010), found that when mouse brain cells were treated with large amounts of Noggin in a petri dish would undergo rapid neurogenesis but the effect declines and wears out with time. This suggests there could be too much of a good thing, but there is no evidence that such a level would be reached in if Noggin were induced through voluntary exercise.

The results of studies of exercise intervention with human participants have often been at odds with the animal data. Much of the problem is the lack of control the experimenter can exercise over human subjects. Stanley Colcombe and Arthur Kramer (2003) sought to remedy this situation by examining intervention studies that were longitudinal rather than in cross-sectional and which used random assignment to avoid the self-selection problem in groups. They also chose studies that involved participants 55 years of age and older, who were in supervised exercise programs that incorporated an aerobic component. Their meta-analysis of the results of 18 studies that matched these criteria revealed consistent findings. First of all, the effect of exercise is robust and had an effect on all four of the measures of mental abilities that they examined: speed of response, visual spatial response, controlled processing, and executive control. Interestingly, activity had its greatest effect on the cognitive ability they called executive control processes. Included in executive control processes would be such things as coordination, inhibition, scheduling, planning, and working memory, behaviors that involve more advanced processing. This makes sense, since these advanced processes do not become automatic and require a central executor whenever they are called upon. Exercise was most effective when aerobic training was combined with strength training and lasted longer than 30 minutes. Exercise lasting less than 30 minutes had no significant impact on cognitive functioning. Women seem to benefit more than men, and participants labeled mid-old (66 to 70) benefitted the most, the old-old (71 to 80) were next, and the young-old (66 to 70) benefitted the most. The mean improvement over all tasks was nearly a half a standard deviation, well worth the effort for aging individuals who would like to maintain their mental abilities.

Why does physical exercise have an effect on mental abilities? A clue to the cause comes from a study that used fMRIs to identify there were changes in the brain that were related to increased cardiovascular fitness (Colcombe, 2004). Two groups of older participants (58 to 77 years) were tested: individuals who were already highly fit, and individuals who were aerobically trained over a six-month interval. Both groups showed greater activity in prefrontal and parietal regions of the brain when compared with low fitness individuals. These regions have been found to be involved in cognitive attentional abilities. Whether these changes are due to increased blood flow to the brain or structural differences found in neurogenesis is unknown.

If greater activity benefits neurogenesis in the hippocampal area of mice, it may mean that it can be used to counteract the effect of Alzheimer’s disease which appears to attack the same area. This reasoning was tested in this study of transgenic mice that were given an opportunity for voluntary exercise (Adlard, Perreau,
The mice are genetically predisposed to develop a disease similar to Alzheimer’s including the accumulation of beta amyloid, a protein that forms the plaques indicative of the disease. The mice in the experimental group were equipped with running wheels which they could use a voluntary fashion for approximately 5 months and compared with mice that were sedentary. As in other studies, results showed running was associated with better memory on the Morris water maze problem. But more significantly, when the brains of the mice were dissected at six months of age the runners had 50% less beta amyloid than the sedentary mice. If increased activity has similar effects in humans it suggests that it can be used as an effective weapon in the fight against Alzheimer’s disease.

Two studies of human participants have found a relationship in Alzheimer’s disease and activity rates. In the first study (Larson et al., 2006), 1740 participants were 65 years of age or older who scored in the upper three quartile’s of a cognitive ability screening instrument. They were followed over a six-year period during which time the incidence of dementia was identified. The results of the study showed that those who exercised more than three times per week had a decreased risk for dementia of 32%. In the second study, patients with Alzheimer’s disease were found to be less intellectually and physically active during early and middle adulthood than a healthy control group (Friedland, 2001). The difference was not related to age, gender, income, or education. Conclusions that can be made from these studies are limited given the correlational nature of the relationship, but they are strongly suggestive of a relationship with activity level.

Finally, the studies on exercise and the positive effects on the brain are in line with the studies reviewed in Chapter 6, in which it was found that exercise seems to maintain or promote telomere length which is associated with better health and perhaps slower aging.

**Mental Activity and the Brain**

If physical exercise is responsible for positive mental benefits in aging would mental exercise per se have a similar effect. Schooler (2007) has argued that individuals who maintain a high degree of Intellectual Flexibility due to environmental demands, are more likely to maintain their mental functioning, and there is evidence that the amount of cognitive activity people engage in decreases their risk of Alzheimer’s disease (Scarmeas, Levy, Tang, Manly, & Stern, 2001; Wang, Karp, Winblad, & Fratiglioni, 2002; Wilson, Mendes de Leon, Barnes, Schneider, Bienias, Evans, & Bennett, 2002). In one the studies elderly Catholic priests, brothers and nuns were asked how often they engaged in such things as watching TV, listening to the radio, reading newspapers and books, or playing games such as cards, checkers or completing crossword puzzles. It was found that over five years of assessment, those who engaged in cognitively stimulating activities decreased their risk of Alzheimer’s disease. The top 10 percent decreasing their risk by about one-half compared with bottom 10 percent. The relation persisted after controlling for education level and occupational attainment which are also related to cognitive activity.

How would cognitive activity prevent of postpone Alzheimer’s Disease? It is unlikely that cognitive activity prevents development of neurofibrillary tangles and neuritic plaques in the brain however it is possible that mental activity helps to maintain the structural and functional organization of the brain so that people are able to function in the face of neurological assault. It may be that being active mentally helps to build up a cognitive reserves that delay the manifestations of the illness (Wilson & Bennett 2003). Because Alzheimer’s can reduce cognitive activity during the preclinical phase of dementia it is important to examine persons over lengthy observational periods when the disease is not thought to be a factor. Verghese and colleagues (2003) followed 469 persons over age 75 who lived in the community and showed no signs of dementia over a 21 year prospective study. They measured participation in 6 cognitive activities and 11 physical activities. The results showed cognitive activities reduced the risk dementia from Alzheimer’s disease as well as dementia from vascular disease and other sources. The risk of dementia was 63 percent lower in the participants in the most mentally active third of the population compared with those in the lowest third. The relationship remained significant even after excluding participants whose dementia was diagnosed during the initial seven year period of enrollment to control for the possible influence of preclinical dementia, and appeared to be independent of both education and intellectual level.

Timothy Salthouse (2006; 2007) has expresses reservations over what has been termed the “use it or lose it” hypothesis, arguing that research in this vein, has not carefully ruled out the self-selection factors of older individuals who are more active, or the temporary effects of intervention that are not long-lasting. However, his criteria for demonstrating the evidence for making a strong conclusion are rather stringent and may be too demanding (see Schooler, 2007). However, he argues that adopting a more active life style in
hopes of warding off decline is not harmful and maybe helpful, so why not?

**Aging Successfully Despite Decline**

Although our discussion of successful aging has so far focused on avoiding decline and maintaining physical and mental functioning by adopting an active, athletic lifestyle, Paul Wong (2000) has argued that more emphasis needs to be given to psychological factors. In his work on the elderly in the Ontario Project, he has found that the ability to discover a sense of personal meaning and integrity is more important for successful aging. For Wong “successful aging is 80 percent attitude, and 20 percent everything else” (Wong, 2000, p. 26), and that this sense of personal meaning was more strongly related to the elderly’s involvement in life, giving of themselves to others, and fostering a positive attitude toward living than it was from maintaining physical abilities. Wong and others believe that attempting to perpetuate middle-aged activities and attitudes well into old age cannot go on forever. Sooner or later, the losses of aging and one’s response to them must be addressed. How well a person adapts to decline to achieve a happy and satisfying life is key to aging successfully.

**Selective Optimization with Compensation**

The model of successful aging advanced by Paul and Margret Baltes, called selective optimization with compensation (1990), addresses the issue of negotiating compromises with declining abilities that come with age in order to continue to live a satisfying life. Like Rowe and Kahn, they see the avoidance of disease and the adoption of healthy lifestyles as an important part of successful aging, but they argue that individuals have to be flexible since no one can predict how much they will be affected by aging. Because of the great variation in people of advanced ages, Baltes’s view of successful aging is more dependent on the specific personal circumstances each individual faces as they age. They are less focused on the question of what is successful aging and more focused on the question of how successful aging is accomplished; a process oriented approach rather than product oriented (Baltes & Carstensen, 1996). Competent functioning of an individual in achieving their personal goals is the hallmark of successful aging, but the specific goals for successful aging cannot be defined a priori since they vary for individuals.

An important concept within the selective optimization model is that of reserve capacity, that older persons’ abilities are unlikely to be fully utilized in their everyday lives, and are capable of new adaptive forms of learning beyond what they may be currently demonstrating (Baltes & Baltes, 1990). Of course, younger individuals also have a reserve capacity since they too are not working at the limits of their ability, but the reserve capacity of an older person is smaller. Older learners show considerable plasticity in new learning but it will not match the reserve capacities of younger individuals. On the other hand, reserve capacities are not fixed but can be strengthened through education, motivational changes, health creating activities, and social supports. It is particularly important for successful aging that reserve capacities be developed during early and middle-age to provide the resources necessary for mastery of tasks in later life. "The greater one's reserve capacities, be they physical, mental, or social reserves, the more likely successful aging will take place” (Baltes & Baltes, 1990, p 20).

The model of successful aging proposed by Baltes and Baltes (1990) is composed of three processes that enable a person to master personal goals: selection, optimization and compensation that makes up its name. Although these general processes are evident at all ages, they have special significance at later ages as a person loses mental, biological and social reserves. The first process of selection is used adaptively by the individual to counteract losses that occur by restricting personal goals to those that are of high priority and motivating, but which can be met within the context of the environment in which he or she lives and within the person’s biological capacity to carry them out. The need for a person to be selective may occur in reaction to changes that occur with age, or in anticipation that future functioning will change. The second process of optimization occurs when individuals act to enrich their general reserves by maximizing the quantity and quality of the experiences that have remained as important personal goals. The final process of compensation becomes necessary when personal goals can no longer be met in the usual way because the capacity to accomplish them is lost, and a new means is adopted to compensate for the deficiency. In contrast to the process of selection, compensation maintains the same goal but uses an alternate means to accomplish it, such as a person who is hard of hearing using a hearing aid. An example given by Baltes and Baltes (1990) will
help to illustrate the processes in action:

For instance, the pianist Rubinstein remarked in a television interview that he conquers weaknesses of aging in his piano playing in the following manner: first, he reduces his repertoire and plays a smaller number of pieces (selection); second, he practices these more often (optimization); and third, he slows down his speed of playing prior to fast movements, thereby producing a contrast that enhances the impression of speed in the fast movements (compensation) (Baltes & Baltes, 1990, p. 26).

B. F. Skinner, one of the 20th centuries most notable psychologists, describes ways that he adjusted to mental decline during his later years that show evidence of the process of selective optimization with compensation in Box 12.1, even though he was unaware of the theory.

---

**Box 12.1. A behaviorist’s response to the stimulus of his aging.**

One of the giants in the study of psychology is B.F. Skinner. In a classic article, (Skinner, 1983) he described some of the techniques he used to counteract the effects of his aging. They are strikingly similar to what Baltes and Baltes have described as selective optimization with compensation.

"...Forgetting is a classical problem. It is most conspicuous in forgetting names because names have so little going for them by way of context. I have convinced myself that names are very seldom wholly forgotten. When I have the time--and I mean something on the order of half an hour--I can almost always recall a name if I have already recalled the occasion for using it. I work with thematic and formal prompts, in the latter case going through the alphabet, testing for the initial letter. But that will not work in introducing your wife to someone whose name you have forgotten. My wife and I use the following strategy: If there is any conceivable chance that she could have met the person, I simply say to her, “Of course, you remember...?” and she grasps the outstretched hand and says, “Yes, of course. How are you?” The acquaintance may not remember meeting my wife, but is not sure of his or her memory either...

Ten minutes before you leave your home for the day you hear a weather report: It will probably rain before you return. It occurs to you to take an umbrella (the sentence means quite literally what it says: The behavior of taking an umbrella occurs to you), but you are not yet able to execute it. Ten minutes later you leave without the umbrella. You can solve that kind of problem by executing as much of the behavior as possible when it occurs to you. Hang the umbrella on the doorknob, or put it through the handle of your briefcase, or in some other way start the process of taking it with you.

Here is a similar intellectual problem: In the middle of the night it occurs to you that you can clarify a passage in the paper you are writing by making a certain change. At your desk the next day you forget to make the change. Again, the solution is to make the change when it occurs to you, using, say, a notepad or tape recorder kept beside your bed. The problem in old age is not so much how to have ideas as how to have them when you can use them. A written or dictated record, consulted from time to time, has the same effect as the umbrella hung on the doorknob. A pocket notebook or recorder helps to maximize one’s intellectual output by recording one’s behavior when it occurs. The practice is helpful at any age but particularly so for the aging scholar. In place of memories, memoranda.

Another symptom of the same failing is to forget what you were going to say. In a conversation you wait politely until someone else finishes, and your clever comment has then vanished. One solution is to keep saying it to yourself; another is appeal to the privilege of old age and interrupt the speaker; another is to make a note (perhaps pretending it is about what the other person is saying). The same problem arises when you are speaking and digress. You finish the digression and cannot remember why you embarked on it or where you were when you did so. The solution is simply not to digress—that is, not to interrupt yourself. A long sentence always raises that kind of problem: The last part is not likely to agree with the first because the first has passed out of reach. The effect is especially clear in speaking a language you do not speak well, where it is always a mistake to embark upon complex sentences. You will do much better if you speak only simple sentences, and the same remedy is available to the aging scholar who is given an impromptu address in his or her own language. Short sentences are also advisable when you are talking to yourself--in other words thinking (Skinner, 1983, p. 240-241).
to react to unforeseen events (compensation).

The theory is in its infancy, and it is unclear whether successful aging necessarily involves all three processes. For example, there are adaptive changes with aging that include only one or a few of these processes. In our previous discussion of socioemotional theory (Chapter 9), the process of restricting social contacts to intimate relationships (selection) to maximize goals of positive interactions seems to be the only process at work. Or another example, a person who enjoys reading, but who has lost much of his or her eyesight, may continue to enjoy this activity by listening to books on tape (compensation). To be sure, there are examples of successful aging when all three processes are active, but the authors are unclear as to whether all three process are needed to be defined as successful aging. It may be that the three processes interact in greater degree over time with further functional losses, but at earlier stages, the processes may act more singly. Regardless of the fate of the theory it is clear that more work needs to address the process of adjusting to decline in successful aging.

Concluding Comments

We started this chapter on successful aging began with how coping strategies are used to mitigate the stresses in our environments and the evidence that older persons become better at choosing a strategy that is more effective, which has implications for aging successfully. However, research on coping is more concerned with how a person reacts to stresses, whereas successful aging is more proactive; the goal is to avoid or at least to postpone the future stresses that are correlated with age and to live one's life happily and productively. It is in line with a growing interest in what is becoming known as Positive Psychology:

At this juncture, the social and behavioral sciences can play an enormously important role. They can articulate a vision of the good life that is empirically sound while being understandable and attractive. They can show what actions lead to well-being, to positive individuals, and to thriving communities. Psychology should be able to help document what kinds of families result in children who flourish, what work settings support the greatest satisfaction among workers, what policies result in the strongest civic engagement, and how people's lives can be most worth living.

Yet psychologists have scant knowledge of what makes life worth living. They have come to understand quite a bit about how people survive and endure under conditions of adversity...However, psychologists know very little about how normal people flourish under more benign conditions. Psychology has, since World War II, become a science largely about healing. It concentrates on repairing damage within a disease model of human functioning. This almost exclusive attention to pathology neglects the fulfilled individual and the thriving community. The aim of positive psychology is to begin to catalyze a change in the focus of psychology from preoccupation only with repairing the worst things in life to also building positive qualities (Seligman & Csikszentmihalyi, 2000, p. 5).

It is perhaps too much to ask that future research in positive psychology will change our vision of aging from one of decline to one of opportunity, but it will surely ameliorate a view of aging that all too often is associated with dread and foreboding. With a population that is beginning to show a burgeoning proportion of those over 65, this change will be timely indeed.