Chapter N

SUCCESSFUL AGING
In this chapter, you will learn about:
* The history of the successful aging concept;
* The definition of aging as distinct from disease;
* The distinction between normal and abnormal age differences and successful and unsuccessful aging;
* The constraints imposed by research designs on inferences about aging;
* Individual differences on age dependent variables;
* Age changes on important age dependent measures as indicators of successful aging;
* Models that include other than age-dependent measures as indicators;
* Individual differences related to health and mental well-being in later life;
* The distinction between successful aging (a process) and successful agers (a group of people);
* Measures used to identify individuals considered mentally and physically successful in later life, and influences on those measures.
INTRODUCTION
The organization of this chapter is as follows. We shall begin with an overview of paradigm shifts after World War II that contributed to the development of successful aging and related concepts, and their acceptance not only in the gerontological literature but also by international bodies such as the World Health Organization (WHO). The next section defines aging and includes discussion of issues about the discrimination of aging effects from disease and other sources of variation. Without a clear understanding of distinctions involved, it is impossible to comprehend the scope and limitations of successful aging and its indicators. Conversely, a failure of such comprehension contributed, along with other reasons, to a confusing plethora of successful aging models and measures that do not necessarily overlap. The third section examines the concept of individual differences on age dependent measures and associated models. This section concludes with inferences about the identification of successfully aging persons based on age changes in age dependent measures. The fourth section includes a review and critique of models, measures, and influences that researchers relate to successful aging. The findings show that the models and measures attempt to identify individuals who with favorable mental and physical profiles in later life. Influences on these measures include lifestyle, life events, and psychological and social resources in addition to a relative absence of disease.

HISTORICAL OVERVIEW
There are at least two prototypes for the concept of successful aging, each of which originated over half a century ago. The earliest prototype was the definition of health by the WHO as an optimal state of physical and mental well-being rather than just the absence of disease. This perspective assumes that health consists of an upper and lower half-range of well-being and pathology, respectively, as discussed in the chapter on Mental Well-Being and Mental Disorder. The WHO definition facilitated the development of perspectives on health care that complement the traditional emphasis of health care systems on the remediation or management of acute and chronic diseases. In addition to initiatives on disease prevention, health promotion received a major impetus. Defined as a process of enabling people to increase control over, and to improve, their health, countries such as Canada developed a comprehensive national agenda for health promotion.

A related evolution of ideas occurred in gerontology a few years later. Although generations of gerontologists made explicit the distinction between normal aging and disease, it was not until the 1970s that the ‘normalcy’ of normal aging came under concerted attack. Seminal articles by Rodin (1987), and Rowe and Kahn (1987) reviewed evidence showing that the personal control over health extended beyond morbidity and mortality to affect the course of aging itself. Out of this realization, the concept of successful aging was born.

The second prototype originated in Canada with Murray’s (1951) attempt to measure biological aging. Murray (1951) was probably the first investigator to measure individual differences on age-dependent measures in a quantitative manner, albeit using a methodology that some researchers thought flawed (Costa & McCrae, 1980; Salthouse, 1990). Age dependent measures are those expected to show change over time. Later research that attempted to evaluate individual differences with age using qualitative methodology falls under a rubric termed differential aging (Schroots, 1995).
The first acknowledged use of the term successful aging was by Havighurst (1961) in the first issue of *The Gerontologist* journal. Synonyms for successful aging since that time include healthy aging (MacPherson, 1995), optimal aging (Baltes & Baltes, 1990), aging well (Folts, Ide, Johnson, & Crewe Solomon, 1995), and vital aging (Ouaknine, Csank, & Stones, 1997). All of these terms share a common feature that individuals thought to be aging successfully are ‘doing better’ in later life than people aging unsuccessfully. What ‘doing better’ means and the ways to achieve that condition are issues discussed in this chapter. The term successful aging gained widespread acceptance in scientific and general discourse following an article by Rowe and Kahn (1987) in the journal *Science*. A series of over 100 published studies on the positive aspects of aging ensued during the following decade, culminating in the publication of a general market book titled *Successful Aging* that attracted a large readership (Rowe & Kahn, 1998).

Successful aging is so accepted a concept in the modern era that one sometimes forgets how recent its origins are. Examples such as the WHO’s agenda on healthy aging in the context of disabilities and the establishment of the Canadian Institute for Healthy Aging as a national funding body illustrate how established the concept has become.

**INFERENCES ABOUT AGING**

Birren and Renner (1977) defined aging as ‘regular changes that occur in mature genetically representative organisms living under representative conditions as they advance in chronological age’ (p. 4). This definition circumscribes the concept of aging as distinct from disease and disability. Aging refers to processes discretely associated with the passage of time. Different diseases may first appear at different ages (e.g., the onset of schizophrenia is generally at a young age; heart disease and cancer appear later; Alzheimer’s disease occurs later still), but the causes and symptoms of those diseases are not part of an inevitable progression of chronological aging.

Birren and Renner’s (1977) definition is imprecise about the delineation of ‘genetically representative’ organisms and ‘representative [living] conditions’. Although members of the same species share genetically endowed properties (e.g., humans walk on two legs, have large brains, a propensity for language, etc.) and live somewhat similarly (e.g., most people live in fixed dwellings, with family members, as part of larger communities, etc.), the range of individual differences within a species is broad. Findings that the heterogeneity of individual differences is wider in later than earlier in life have relevance to the topic of this chapter (Nelson & Dannefer, 1992).

**Individual difference distributions**

The distribution of individual differences on a variable frequently approximates a normal distribution. Figure 1 shows such a distribution for changes over a 3-month period on the Cognitive Performance Scale from the Minimum Data Set for Home Care (Morris, Fries, Mehr, Hawes, Phillips, Mor & Lipsitz, 1994). The data are from 1077 home care clients assessed as part of the Resident Assessment Instrument Health Infomatics Project in 2000-1. Although cognitive performance is an age-dependent measure, we would not normally expect substantial changes within a brief 3-month period. However, because home care clients include individuals recovering from illness or deteriorating because of acute and chronic disease, it is hardly surprising that more people show positive or negative changes compared with normal expectations.

---- INSERT FIGURE 1 ABOUT HERE ----
The concept of a *normal expectation* refers to a population of observations and is meaningful only by reference to a distribution of those observations. Normal scores are representative of the overall distribution and reflect an expected level on the variable measured. The term abnormal is the opposite of normal; like a normally expected score, an abnormal score is meaningful only by reference to a distribution of scores. The difference is, however, that abnormal scores include those that are unusual and unexpected. With a normal distribution, abnormal scores fall at each the extreme. With a differently shaped distribution (e.g., a bimodal distribution with a concentration of scores at each extreme), abnormal scores might lie elsewhere.

Terms that connote an evaluation (e.g., successful-unsuccessful, healthy-unhealthy), when assigned to differences between people, are also meaningful only in relation to a distribution of observations. These terms do not necessarily coincide with the distinction between normal and abnormal scores. Abnormal scores include only those that deviate from an expected level. The ranges of scores labeled as favorable or unfavorable depends on value judgments by the person assigning the labels. If we examine more closely the distribution in Figure 1, abnormal scores include those of -2 or less and 2 or more. Scores within these ranges include less than 5 percent of the total sample of scores and, therefore, appear unrepresentative of cognitive change within a home care population during the period studied. Any score indicating cognitive gain is a favorable score and any score indicative of cognitive loss is an unfavorable score. Collectively, the favorable and unfavorable scores account for nearly 25 percent of the distribution.

Because the scores now classified as favorable and unfavorable represent age changes, it might seem reasonable to ask whether they represent short-term trends of successful and unsuccessful cognitive aging, respectively. The answer, as already indicated, is that any change likely reflects worsening or recovery from disease rather than the normally expected effects of aging. Analysis that also used other data from the RAIHIP project supports this inference. When related to assessor ratings of changes in care needs over the three months preceding the second assessment, clients who needed more care had unfavorable cognitive change scores whereas those needing less care had favorable cognitive change scores. These findings suggest that the cognitive changes accompanied changes in overall health.

A somewhat disconcerting implication from these findings is that, even with longitudinal change scores, it is not always feasible to interpret temporal change as unequivocally dependent upon aging effects rather than cyclic changes in disease. Without inclusion of the measure of changes in overall in the preceding analyses, the possibilities for causal inference would have been nebulous. Although the limitations to this example include the frailty of the sample – home care clients receive such care because of disability or disease – difficulties with causal inference are present in research with healthier samples studied over longer periods. Salthouse, Kausler, and Saults (1986) estimated that with many current measurement procedures, intervals of 30 years might be necessary for longitudinal changes to be statistically significant. If so, psychometric considerations limit the power of all but the longest longitudinal studies to detect age change, and the problem remains of how to disentangle effects directly attributable to aging from those of disease and other life changes.

**Individual differences in cross-sectional data**
Many recent studies that addressed the topic of successful aging used cross-sectional or short-term prospective designs that sampled only a single older cohort (Almeida, Norman, Hankey, Jamrozik, & Flicker, 2006; Goffaux, Friesinger, Lambert, Schroyer, Moritz, McCarthy, Henderson, & Hammermeister, 2005; Montross, Depp, Daly, Reichstadt, Golshan, Moore, Sitzer, & Jeste, 2006; Motta, Bennati, Ferlito, Malaguarnera, & Motta, 2005; Phela, Anderson, LaCroix, & Larsen, 2004). However, it is by no means certain that inferences about aging are possible from these designs. The term successful aging (or healthy aging, or optimal aging, etc.) connotes the following:

* The individual difference variable is important;
* The researcher has a means to identify favorable and unfavorable scores;
* The scores are relevant to aging.

Whether the individual difference variable is important and the researcher is able to identify favorable and unfavorable scores relate to values and technical expertise, respectively. Whether the scores are relevant to aging (i.e., as distinct from the aged) is a matter of logic and inference. An inference that the main sources of variability within cross-sectional cohort data relate to aging is usually an unfounded hypothesis Stones, Kozma, and Hannah (1990).

Figure 2 illustrates this argument with hypothetical data from five individuals at two age levels. If the variable measured were important to success and only data at the Old age level were available, the reader would conclude that individuals C and D were aging successfully compared with individuals A and B. If the reader also had access to data at the Young age level, the conclusion would be different. Individuals A and C show positive age changes whereas B and D show negative age changes. Consequently, the use of cross-sectional data in this example resulted in incorrect inferences about successful aging because of failure to account for the effects of individual differences present at a younger age.

Stones, Kozma, and Hannah (1990) reasoned that only by making strong assumptions about individual differences at a younger age could researchers justifiably interpret scores in later life as individual differences in age change. The hypothetical data in Figure 3 illustrates the assumption, which is that variability in scores at a younger age is negligible compared with the variability in later life. Consequently, the scores at the Old age level in Figure 3 provide unequivocal estimates of age changes because of an absence of individual differences at a younger age. Inferences about whether the age changes reflect aging effects or other influences (e.g., disease, disability) are uncertain with the data provided. Although Stones and colleagues claimed that unipedal balance (i.e., the time a person was able to stand on one foot) satisfied the criterion of minimal variability in young adulthood, most age dependent measures show substantial variability at all ages and do not satisfy the assumption specified.

This section illustrated some problems in disentangling the effects of aging from those of disease and other sources of variation in longitudinal data, and in inferring age change with cross-sectional data. The reader should be skeptical about the relevance to aging of studies that claim to measure successful aging with cross-sectional data.

INDIVIDUAL DIFFERENCES ON AGE DEPENDENT MEASURES
Research on individual differences between humans has a history that dates from the 19th century beginnings of psychology as the scientific study of behavior. A longstanding belief in the more recent discipline of gerontology is that older people are more heterogeneous than are younger people (Baltes & Willis, 1977; Nelson & Dannefer, 1992). The reasons for this belief include findings of greater diversity among older than younger people on those age-dependent measures that typically decline with age (e.g., many cognitive and physical functions).

Not all measures show this trend of greater heterogeneity in later than in earlier life. Schaie (1977) proposed three basic models that encapsulate the age trends studied by gerontologists. Possibly the second but certainly the third of these models anticipates a wider range of individual differences in older that younger people:

* The **stability model** assumes an absence of aging effects (e.g., on personality);
* The **irreversible decrement model** assumes ongoing and irreversible aging effects (e.g., on cellular aging);
* The **decrement with compensation model** assumes age deterioration but also the possibility for its remediation (e.g., in cognition, physical fitness).

The models discussed in this section include the irreversible decrement and decrement with compensation models cited by Schaie (1977). These are both process models that attempt to explain the reasons for individual differences in aging. Before discussion of these models, however, the section begins with a typological model that describes individual differences in various life domains. Also discussed in this section are life course and hierarchical models that attempt to provide integrated perspectives on individual differences in aging. The section ends with conclusions about common features of the models and implications about successful and unsuccessful aging.

**Typological models**

Individual differences in aging may not be comparable across different domains of life. In fact, most researchers in gerontology conduct their research largely within the confines of a particular life domain. Birren and Renner (1977) described three domains of biological aging, psychological aging, and social aging.

Biological aging encompasses the vital life-limiting organ systems. Persons with a biological age older than their chronological age should have a shorter remaining life expectancy compared with their chronological age peers. Goffaux, Friesinger, Lambert, Schroyer, Moritz, McCarthy, Henderson, and Hammermeister (2005) confirmed this prediction using a biological age index developed with healthy volunteers aged 70-95 years. This index proved to be a stronger predictor than chronological age of 3-year mortality and functional outcomes after first coronary artery bypass grafting surgery. However, a problem with measures of biological aging identified by Costa and McCrae (1980) is that many include items indicative of disease in addition to age dependent measures. Consequently, the authenticity of findings on the prediction of health outcomes is suspect if the biological age measures include content related to disease (Mitnikski, Graham, Mogiliner, & Rockwood, 2002).

Psychological aging refers to the adaptive capabilities of individuals to deal with a changing environment compared with chronological age peers. It includes learning, memory, intelligence, motivations and emotions, and clearly depends on the conditions of the cardiovascular and central nervous systems. The concept of psychological aging has similarities and limitations
similar to that of functional age as discussed in Chapter 7 on Cognitive and Physical Performance.

Social aging refers to roles and social habits. Because many social expectations are normative with age, it is reasonable to ask whether a given individual behaves socially in ways that are younger, similar, or older compared with chronological age peers. Cultural forces can also augment late life diversity.

The life paths of aging people may be more diverse if culture is in transition because of ethnic mixing, changing population structures, and shifting values. Modern Western societies tolerate and encourage individuality, and are relatively open to intercultural and interethnic exchanges. Meintel and Perissini (1993) provided an example, showing that aged migrant women, who lived for many years in Montreal, could decide to live alone, in conformity with dominant values of modernity in Canadian urban society, but against norms and values of their own group. In addition, people today live longer and in better health than in earlier times. New social rules that emphasize activity coexist with earlier rules for an orderly disengagement of older people from active living. Consequently, the context of modernity provides a bouillon de culture that may accentuate variations between people as they age, giving them both new and old paths to chose from in later life.

Process models

Irreversible decrement
Irreversible decrement models need not assume a rate of aging that is constant across all members within a species. The effects of caloric restriction provide an example. Researchers in the 1930s found that moderate caloric restriction initiated after weaning and continued thereafter resulted in higher longevity, a youthful appearance, and prolonged retention of abilities in rats (McCay & Crowell, 1934). Such restriction amounted to a 25-40 percent reduction in caloric intake while maintaining the provision of essential nutrients and vitamins. Studies of other species, including non-human primates, found similar effects (Roberts, Pi-Sunyer, Kuller, Lane, Ellison, Prior, & Shapses, 2001). One interpretation of these findings is that caloric restriction postpones or prevents pathological deterioration in the cardiovascular, renal, and central nervous systems (Lee, Blair, Allison, Folsom, Harris, Manson & Wing, 2001). Salthouse (1990) discussed the distinction between the postponement of pathology and effects on rate of aging. He likened this distinction to peeling an onion: with all the layers of pathology accounted for, would aging explain any further variability at all?

Decrement with compensation
The decrement with compensation model suggests that although aging effects have adverse implications for functional capability, compensatory mechanisms may postpone or reduce the amount of decrement. Consequently, the extent of variation in individual differences in an older cohort includes differences present at a younger age plus further variation contingent upon the use and effectiveness of the compensatory mechanisms used by different people within the cohort. Bäckman and Dixon (1992) provide an integrated theory of compensation that discusses its origins, mechanisms, forms, and consequences.

Bäckman and Dixon (1992) suggest that the origins of compensation arise from a mismatch between demands and skill. Given expectations that are compatible with performance at
younger ages, possible resolutions if demands exceed performance in later life include changes in behavior and modification to expectations.

First, a person can compensate by attempting to raise the level of skill to match the demand. Possible mechanisms include increased practice, the use of latent aspects of skill, or finding an alternative skill. Stones and Kozma (1995) illustrated these three forms of compensation with examples from sport. Martina Navratilova humiliated upcoming tennis staff Steffi Graff in the 1987 Wimbledon final with her left-handed sliced serve to the backhand. During the off-season, Steffi’s coach recruited the help of hired hand who ‘lay endless serves against Steffi’s backhand until she could whack them back in her sleep (and while wide awake)’ (Frayne, 1990, p. 97). This extra practice enabled Steffi to drill powerful backhands against Martina and win Wimbledon in 1988 and 1989. Prizefighter Sam Longford was well aware that ‘the legs go first’ in aging boxers. Consequently, he substituted the latent skill of slugging for fancy dodging and legwork in attempt to win fights by an early knockout. When aged fifty-years-old and partly blind in 1929, he compensated for poor eyes and wobbly legs in the simplest way: ‘Both my eyes were bad then but I could see a bit. So when I got in there, this fella started swingin’ that left hand and I blocked it, and he swung again, and I blocked it. An’ then I knocked him out.’ (Frayne, 1990, p. 241). Finally, many athletes who retire from direct competition use their expertise in vocations such as coaching, management, or media activity related to sport. These people compensate by substituting alternative skills related to their former profession.

Second, aging athletes like everyone else may lower their expectations to meet declining performance. Even the legendary Muhammad Ali compensated in this way when fighting to regain the world heavyweight boxing championship from Leon Spinks, who was 12 years his junior, in 1978. Whereas the young Ali and his fans demanded that he win with flair and flourish, the old Ali was content simply to win.

Bäckman and Dixon (1992) made three further proposals in their theory. First, compensation only occurs in the presence of a mismatch between demand and skill. Second, a person faced with such a mismatch does not necessarily engage in compensatory behavior. Third, the behavior by an older person compensating for declining skill may be different from that by a younger person with intact skill. Salthouse (1984) provided examples of such behavioral differences between younger and older typists even when performing at comparable levels of skill.

Baltes and Baltes (1990) proposed an elaboration of the decrement with compensation model that included, in addition to these elements, the hypothesis of selective optimization. They suggested that older people restrict their lives to fewer domains of functioning because of age decrements in adaptive capabilities. Within the domains selected to be of high priority for continued engagement, they attempt to optimize those capabilities that can enrich and augment the chosen life course. Baltes and Baltes (1990) suggest that compensation occurs if behavioral capabilities fall below a level required for adequate functioning.

Life course models
Schroots (1995) proposed a differential aging model that provides a metaphor for theory development distinct from gerontological models of the aged, age, or aging, which respectively focus upon late life, age differences, and age change. The differential aging model uses an individual difference metaphor that has consistency with other models that distinguish age-
intrinsic processes from the effects of long-term disuse, age-correlated illness, and terminal change (Birren & Cunningham, 1985). These models attribute increasing heterogeneity with age to the multiplicity of processes that can affect functioning in older people.
Schroots interpretations of differential aging borrow more from Allport’s historical idiography than Lewin’s contemporaneous social psychology. His structural model, termed the branching model, traces critical transitions in personal life histories. Branch points (or choice points) are identified throughout the life span, such that the choice of one alternative over another impacts on subsequent branchings by opening some life paths and closing others. The branch points appear similar what Gidden (1991) termed ‘fateful moments’, defined as ‘moments at which consequential decisions have to be made or courses of action initiated’ (p. 243).

The model anticipates increasing heterogeneity with age because the number of states that a person could occupy increases with age. Limitations to life course models include the use of biographical data in attempt to substantiate the models. Most scientific models attempt to predict contemporaneous or future events. Biographical data uses present recollections about the past to explain the present, which raises questions about selective bias in memory and interpretation.

Hierarchical models

Types of aging models discriminate between effects of different origin but that relate to age or aging. The term used to denote change attributable only to age in this model is an age intrinsic effect, with normative and other effects associated with age subsumed by the term age extrinsic (e.g., disease, disability, lifestyle). Such models assume a hierarchical framework to describe the cumulative effects of age intrinsic and extrinsic factors. They also maintain consistency with an enduring preoccupation in gerontology to separate aging effects from normative influences and life course differences that affect capabilities as people age.

The hierarchical model described by Stones, Kozma, and Hannah (1990) includes the four levels shown in Table 8.1. Primary aging includes two levels termed by Rowe and Kahn (1987) as successful and usual aging. Successful aging refers to changes owing only to the passage of time (i.e., age intrinsic change). Usual aging refers to non-pathological changes commonly observed within a population but brought about by lifestyle or life situation. Examples include the loss in endurance fitness with age, which Smith and Gilligan (1983) estimated to be 50 percent because of age and 50 percent because of disuse of endurance capabilities. The third level of secondary aging refers to changes because of chronic disease. The fourth level of tertiary aging has relevance to impending mortality. It refers to a dramatic decrease in functional capability as a person approaches death (i.e., called terminal drop) (Small & Bäckman, 2000).

<table>
<thead>
<tr>
<th>Classification</th>
<th>Sub-classification</th>
<th>Also know as</th>
<th>Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary aging</td>
<td>Successful aging</td>
<td>Healthy aging;</td>
<td>Passage of time</td>
</tr>
<tr>
<td></td>
<td>Usual aging</td>
<td>Well aging</td>
<td>Life events, lifestyle</td>
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<tr>
<td>Secondary aging</td>
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<td></td>
<td>Disease/disability</td>
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<tr>
<td>Tertiary aging</td>
<td></td>
<td>Terminal drop</td>
<td>Impending mortality</td>
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Adapted from Stones, Kozma, and Hannah (1990)

This model has heuristic value because it organizes individual differences within a simple hierarchical framework. The hierarchy descends from individuals showing only age
intrinsic decrement (i.e., successfully aging according to the model), through individuals with usual aging decrements because of life course factors (e.g., life conditions, life events, lifestyle), through individuals with chronic illness and disability, to individuals close to death. Limitations to the model include a failure to take account of prior individual differences and a fuzzy separation between category boundaries in empirical paradigms.

An earlier section of this chapter discussed the relevance of individual differences earlier in life to the interpretation of later life individual differences. The conclusions reached apply to the types of aging model. Consider first an individual difference measure relevant to the model that contains only age dependent variables (i.e., not items on pathology). It is by no means certain that older individuals lower on the model's hierarchy would have lower scores on the measure than age peers located above them. Individual differences that predate the time of assessment could easily result in someone with chronic illness that is not fully incapacitating scoring at a higher level than would persons with only age intrinsic changes or usual aging effects if the person with chronic illness had the higher level of capability in earlier life. Second, even if the measure contains content on chronic pathology in addition to age dependent variables, a similar argument could apply to functions unaffected by that pathology (e.g., people with arthritis are likely to have scores on cognitive measures similar to those without the condition). Evidence that gifted individuals continue to perform at high levels despite chronic illness does not preclude the execution of skillful performance.

* Beethoven continued to compose music after becoming deaf;
* Monet continued to paint his vibrant water lilies despite cataracts that affected his visual clarity and color perception;
* Writer William Carlos produced some of his major works after suffering a stroke and major clinical depression (Whitbourne, 2001). Such evidence suggests that chronic illness does not preclude the execution of skillful performance.

The category boundary at the top of the hierarchy - the distinction between successful and usual aging - is not easy to separate empirically. Examples include the effects of physical activity on speed of response, which many researchers consider to index of the speed of processing within the central nervous system. Spirduso (1980) reported that lifelong physical activity contributes to an apparent postponement of the age effect on reaction time. She found that older racquet sport players had reaction times comparable to those of younger racquet sport players but faster than the reaction times of non-athletic age peers. Although such findings might suggest a slowing in cardiovascular and central nervous system aging brought about by physical activity, other authors cited the generalized effects of continued practice in sports that require fast reactions (Stones & Kozma, 1988). The former interpretation suggests an effect of physical activity on age intrinsic change; the latter may suggest an effect of extended practice (i.e., a form of compensation) that falls under the rubric of age extrinsic effects.

Lower down the hierarchy, the distinction between usual and secondary aging is often fuzzier than implied by the model. Clinical diagnosis involves a dichotomous decision that classifies an individual either as exhibiting a pathological condition or as normal. However, clinical symptoms precede diagnosis and sometimes by a considerable time.
Reisberg, Ferris, Leon, and Cook (1982) illustrated both a continuum of cognitive decline and a diagnostic dichotomy in their stage model of Alzheimer's disease. The early stages include forgetfulness and confusion that, in the majority of cases, are insufficient in scope and severity to meet the criteria required for a diagnosis of Alzheimer's disease. If given an assessment as part of a research project on successful aging, such an individual ought to score low on cognitive testing but fall within the classification scheme as a usually aging person (i.e., assuming the absence of other chronic disease). Only if cognitive decline is moderate rather than mild are a majority of those afflicted diagnosed with Alzheimer's disease. Consequently, individual classified within a usual aging category include those without pathology and those with early but undiagnosed pathology. Similar considerations apply to individual differences in the emotive domain, where older individuals with symptoms of depression may not have a depression diagnosis because the symptom profile in later life does not accord closely with current diagnostic criteria (U.S. Department of Health and Social Services, 1999).

Conclusions
The models discussed in this section encompass perspectives on aging ranging from the biological to the anthropological. They all share common features of attempting to account for individual differences in older cohorts while differentiating aging effects from those of disease. Applications of the models are subject to limitations in inference imposed by research design, as outlined in the preceding section, in addition to specific limitations discussed alongside the description of each model.

Another assumption made by all the models is that individual differences become more heterogeneous as people age. Individuals at both extremes of the distributions lie outside an expected range. However, belonging to these extreme subcategories does not necessarily coincide with an attribution of successful or unsuccessful aging (Salthouse, 1990). The latter connotations depend, among other factors, on the variable under consideration and value judgments by the person assigning the labels.

Perhaps the least controversial inference about successful aging within the contexts of the models described is that:
* People successfully aging include those for whom detrimental age changes on important age dependent variables are lower than normatively expected.

This definition makes neither assumptions about the sources of age change (e.g., intrinsic aging, disuse, disease) nor value judgments about those variables considered important. Baltes and Baltes (1990) suggest that older people select and optimize important variables for personal reasons. However, what this inference accomplishes is to locate the concept of successful aging within a framework receptive to distributions of age changes. An implication is that within the scope of Schaie's (1977) three models of stability, irreversible decrement, and decrement with compensation, variables in the first category (i.e., variables not expected to change with age) are not viable indicators of successful aging.

INDIVIDUAL DIFFERENCES RELATED TO LATER LIFE HEALTH AND WELL-BEING
This section of the chapter includes discussion of other models and indicators that carry the label of successful aging. Despite its popularity, current usage of the term needs
further explanation for three main reasons. The first reason is that different researchers use different values and criteria to identify individuals thought to be aging successfully. Values relate to the choice of variables to demarcate the concept, and criteria to the levels on those variables used to differentiate between persons aging more or less successfully. Findings reviewed in this section will show considerable disarray in both models and indicators, although there is a greater consensus with regard to influences. Consequently, the term successful aging does not convey a consistent meaning across studies.

A second issue concerns pejorative connotations attached to the latent pole of the concept (i.e., unsuccessful aging). There is a danger that individuals already stigmatized as old might be subject to double stigmatization as unsuccessful and old. Dowd (1980) indicated that old people are devalued socially more than people in the middle years of life. A health promotion model that assigns to individuals some responsibility for their own health and well-being (Wallace, 2000) might unfairly stigmatize those classified as unsuccessful and old for deficiencies not of their own making. In contrast, Rowe and Kahn (1998) in the foreword to their book emphasize the positive aspect of aging. They point out that before their 1987 Science article there was a persistent preoccupation in gerontology with disease and disability, and a serious underestimation of the positive implications of lifestyle and psychological resources for the well-being of older people. Their use of the term successful to correct these imbalances was intentional and probably appropriate to the time.

Third, the models and associated measures discussed this section are distinct from those described in the preceding section. The distinction relates to the inclusion and exclusion, respectively, of variables without age dependency as indicators of the concept measured. The models described in this section include measures without age dependency in the array of indicators (i.e., variables not expected to show regular changes with age). The reason for their inclusion is that they have relevance to health and well-being.

The use of variables without age dependency has several implications about the meaning of these indicators:

* Such indicators have no direct relevance to aging as a process, with any age changes assumed to arise because of age extrinsic effects;
* The distributions on the measures are important only with respect to the current levels of the scores (e.g., individual differences that pertain to earlier life have only secondary interpretative significance);
* Longitudinal data are unnecessary (i.e., unless the measurement is of change scores);
* The critical criteria for the inclusion of variables include relevance to health and well-being.

These implications suggest that the use of the term aging to describe the concept measured by the indicators is probably a misnomer. Aging refers to a temporal process whereas the indicators measure the state or condition of an individual at a given time. A more appropriate term to describe individuals with favorable scores is that they have successfully aged, irrespective of their chronological age at the time of measurement.
The following definition is consistent with a distinction between the process (aging) and the person’s (i.e., ager’s) state with respect to success in later life:

* Successful agers include individuals with favorable scores on variables considered important to health and well-being.

This definition makes neither a priori assumptions about those variables considered important to health and well-being nor assumptions that individuals with unfavorable scores are poorly adapted. Baltes and Baltes (1990) argue that adaptation in later life includes the selection of activity domains for continued engagement or disengagement. The values of an older person that influence selective optimization or disengagement across life domains may or may not coincide with the choices of variable by a researcher studying successful agers. Influences on the choice of variables by researchers include values associated with different academic disciplines. The models that follow include those that emphasize mental well-being or physical health and autonomy, and mixed models that include measures from multiple life domains.

**Mental well-being models**

Neugarten, Havighurst, and Tobin (1961) advocated the measurement of life satisfaction to index of successful aging. Their model included components of zest versus apathy, resolution and fortitude, congruence between desired and achieved goals, self-concept, and mood tone. They developed multiple measures to assess these constructs. Although these measures had reasonable reliability when measured by internal consistency, subsequent research provided very limited support for the model and measures (Kozma, Stones & McNeil, 1991). Several studies failed to replicate the 5-component structure of the model. The measures showed only moderate correlations with each other, the internal consistencies were lower than initially reported, test-retest reliability was low, and validity estimates against related indexes were moderate.

Neugarten Havighurst, and Tobin (1961) reported that their measure related to marital status and socio-economic status but not to age. The absence of age dependency suggests that their indexes measure successful agers rather than aging.

Ryff’s (1989) model includes six components of self-acceptance, positive relationships with others, autonomy, environmental mastery, and personal growth. Although Ryff and Keyes (1995) replicated this structure of the Scales of Psychological Well-Being using a nationally representative sample with ages of 25 years and older, other research failed to provide such replication. Kafka and Kozma (2002) found three components in Ryff’s measure none of which overlapped with the six components that Ryff identified.

Failures to replicate the structure of complex scales are common in psychometric research. The reason is that a structure developed with data from a given sample may not apply to samples with other characteristics. The more complex the structure, the more frequent are failures of replication. Only scales with simple structures and based on enduring psychometric models tend to show structural stability regardless of sampling (e.g., the 2-component Affect Balance Scale; Bradburn, 1969). An implication is that because complex scale structures are less likely to replicate than simpler structures, models associated with complex scales may be of uncertain validity.
Other models of mental well-being derived from qualitative research. Fisher (1992) interviewed 19 older individuals with the aim to differentiate between life satisfaction and successful aging. The findings suggest that life satisfaction refers to past expectations and current circumstances whereas successful aging refers to coping and maintaining a positive attitude in later life. Knight (1999) found that 14 older people, nominated by their age peers as examples of successful agers, also considered a positive attitude to be the predominant attribute of successful aging. Some respondents considered a positive attitude to be a yardstick of successful aging regardless of physical health status.

Health and autonomy models
Roos and Havens (1991) defined a favorable profile solely in terms of health and functional capability. They measured successful agers aging by residence in community settings (as opposed to a Long Term Care Home), low home care usage, self-rated heath as better than ‘fair’, adequacy in activities of daily living and instrumental activities of daily living, and absence of cognitive impairment. Findings from the Manitoba longitudinal study indicated that 20 percent of over 3500 persons aged 65-84 satisfied these criteria. Longitudinal risks included poor prior health, widowhood, and compromised cognition.

Other researchers measured healthy using perceived health measures. Findings with these measures suggest that perceived health is predictive of mortality, disease, recovery from disease, and mental well-being (Benyamini, Idler, Leventhal, & Leventhal, 2000). Findings in Chapter 1 (Attitudes and Social Issues that Affect Older People) show that perceived health and worries about health show no age dependency.

Mixed models
Mixed models include variables relevant to mental well-being, psychological processes, health and autonomy, and social interaction. The most influential of the mixed model is that of Rowe and Kahn (1987; 1998). This model contains three components: a low risk of disease and disability; high mental and physical functions; active engagement with life. Their 1998 book reviews a multiplicity of findings suggesting practical ways for individuals to become better agers and the benefits of doing so.

Limitation to the Rowe and Kahn’s (1987) model include the absence of an overall measure of the components. This lack led to low consensus about operational definitions and a proliferation of different operational measures (Montross, Depp, Daly, Reichstadt, Golshan, Moore, Sitzer, & Jeste, 2006; Peel, McLure & Barrett, 2005). Despite the low consensus, a review of recent studies found that a mean of approximately one-third of individuals aged over 60 years satisfied criteria for successful agers, and that the most frequent predictors of unfavorable classifications included age, smoking, disability, arthritis, and diabetes (Depp & Jeste, 2006). Other predictors included physical activity, social contacts, perceived health, depression, and cognitive variability.

There are also concerns about the coherence of the components. Motta, Bennati, Ferlito, Malaguarnera, and Motta (2005) examined more than 600 centenarians. Those with the best health status also showed good mental and physical functions but they were
disengaged from life. It would appear that for centenarians engagement in life was not necessary to maintain health and functional capabilities.

Ouaknine, Csank & Stones (1997) described a model and measure (Csank, Gauron, Knight, Obadia, Ouaknine, & Stones, 1997) of successful agers. The model in Figure 4 includes multiple life domains subsequently used in planning by the International Federation of Aging (IFA). The measure that they termed the Well Aging Assessment Battery (WAAB) used published indexes to assess social support, positive and negative aspects of mental health, health attitudes and behavior, nutrition, activities, cognitive and psychomotor functioning, metamemory, autobiographical memory, balance, planning for the future, and physical ill-health. The WAAB took considerable time to complete, was available only with interviewer facilitation, and appropriate only for individuals without cognitive impairment. Analyses to reduce the length of the battery eventually resulted in the development of the Successful Aging Quiz (SAQ; <http://successfulaging.ca>).

The SAQ is a 70-item self-administered measure of multiple domains. Knight (2005) carried out an extensive psychometric evaluation of the SAQ that included four separate studies. The findings showed comparability across a paper-and-pencil version, computerized assessment, and interviewer assessment. There were four components in the SAQ: (1) negative orientation; (2) positive orientation; (3) activity; (4) health. These components were reliable in terms of both internal consistency and stability over time. The measure showed a valid discrimination between hospital and active community residents, with some items sensitive to changes in status over time. An internet version of the SAQ also provided support for the 4-component structure.

Other studies examined the perceptions of older people about their own successful aging compared with those from mixed models. The findings suggest that most people aged over 60 years rate themselves as aging successfully (Montross, Depp, Daly, Reichstadt, Golshan, Moore, Sitzer, & Jeste, 2006; Phela, Anderson, LaCroix, & Larsen, 2004).

CONCLUSIONS
In this chapter, you have learned:
* The prototypes for current model date from just after World War II. The first known use of the term successful aging was in 1961, but after the late 1980s interest grew dramatically.
* Aging refers to ‘regular changes that occur in mature genetically representative organisms living under representative conditions as they advance in chronological age.’
* The terms ‘successful’ and ‘unsuccessful’ connote values attached to individual differences. The distribution of such differences approximates a normal distribution on many variables.
* The term successful and unsuccessful aging refer to age change scores either observed directly or inferred (often incorrectly) from cross-sectional data. The extremes on such a distribution do not necessarily coincide with successful and unsuccessful aging.
* Age changes may reflect the effects of an aging process, the effects of disease, and other influences.
* Models of individual differences on age dependent variables refer to types of variable (biological, psychological, social), underlying process (irreversible decrement, aging with compensation), and the life course. A hierarchical model distinguishes between age intrinsic changes, the effects of lifestyle and life events, disease, and impending mortality.
* A definition of successful aging is as follows: People successfully aging include those for whom detrimental age changes on important age dependent variables are lower than normatively expected.
* Other models include measures that do not show regular age changes. These models include selection of measures based on relevance to health and well-being.
* Such models identify successful agers rather than successful aging. Successful agers include individuals with favorable scores on variables considered important to health and well-being.
* Models of successful agers include mental health, health and autonomy, and mixed models. The latter include measures of multiple life domains.
* Canadian mixed models include self-assessment using the internet.
* Many authors criticized successful aging/agers for a lack of consensus in definition. However, there is reasonable agreement about predictors.

READINGS

KEYWORDS
Age-dependent measures
Age extrinsic effects
Age intrinsic effects
Branching
Decrement with compensation
Differential aging
Irreversible decrement
Life course model
Hierarchical model
Process models
Stability model
Successful aging
Types of aging model
   Primary aging
   Secondary aging
   Tertiary aging
Typological models
Usual aging
Figure 1: Histogram of Change Scores on the Cognitive Performance Scale in Home Care Clients

Based on data from the Resident Assessment Instrument Health Infomatics Project (2000-1)
Figure 2: Hypothetical Distributions of Scores by Individuals A-D at Different Ages
Figure 3: Hypothetical Scores on a Measure by Individuals A-C at Different Ages
Figure 4: The International Aging Federation’s Model of Vital Aging

Based on Ouaknine, Csank & Stones (1997)