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Paul B. Baltes; Jacqui Smith

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Lifespan Psychology: From Developmental Contextualism to Developmental Biocultural Co-constructivism

Paul B. Baltes and Jacqui Smith
Max Planck Institute for Human Development

Lifespan psychology has always been associated with a family of scripts about development and aging. An initial set of scripts included proposals about developmental contextualism at the macro-level (e.g., age-graded, history-graded, and nonnormative influences). Recent theoretical efforts to link evolutionary and ontogenetic perspectives engendered an additional set of interrelated scripts about the nature and consequences of human development. Proposals about the biocultural architecture of the lifespan highlight its inherent incompleteness and aging-based increase in incompleteness and vulnerability. Age-related differences in the overall allocation of resources (from growth to maintenance and the regulation of loss) as well as the general-purpose mechanisms of selection, optimization, and compensation orchestrate adaptive development and aging within the constraints of the biocultural architecture. We argue that this package of conceptions converges with the notion of developmental biocultural co-constructivism and specifies the zone within which human development can be expressed.

Without downgrading the role of alternative theoretical endeavors and their powerful impact on the developmental sciences (see Elder, 1998; Lerner, 2002; and Magnusson, 1996, for reviews), lifespan researchers like to argue that their theoretical orientations have considerably enriched, if not transformed, the field of developmental psychology (e.g., P. B. Baltes, 1987, 1997; P. B. Baltes, Lindenberger, & Staudinger, 1998; Staudinger & Lindenberger, 2003). In essence, the lifespan orientation was designed not only to highlight that development continues beyond childhood and adolescence but also to bring to the foreground additional content phenomena and principles of determination. When researchers

Requests for reprints should be sent to Paul B. Baltes or Jacqui Smith, Center for Lifespan Psychology, Max Planck Institute for Human Development, Lentzeallee 94, 14195 Berlin, Germany. E-mail: sekbaltes@mpib-berlin.mpg.de or smith@mpib-berlin.mpg.de

view development as being lifelong rather than as restricted to a single age period, topics such as wisdom, intergenerational dynamics, and the influence of changing historical contexts on individual development spring to mind. Consider, for instance, the changes in the directional influence and power of reciprocal socialization when contrasting parents and infants with the counterpart situation in the second half of life, parents and their adult children (Hetherington & Baltes, 1988). Or consider the consequences of the historical increase in average life expectancy, from about 45 years in 1900 to about 80 years in the year 2000. Such dramatic focal changes on social transactions or history-conditioned phenomena are more difficult to identify when the theoretical lens is set for only a single age period, such as childhood.

Historically, there has been a long history of lifespan thinking. One major source dates back to Tetens (1777), who published a monumental work on human development more than 200 years ago. This work explored functional changes in human characteristics across the lifespan and drew attention to the fundamental questions of modifiability of development, including the impact of historical changes (P. B. Baltes et al., 1998; Lindenberger & Baltes, 2000). There have been equally strong voices from the more recent past in North America. In her presidential address to American Psychological Association Division 20 in 1958, for instance, the noted child developmentalist Nancy Bayley captured the sentiments of the mid-20th century: "Psychological theory and research will benefit in many ways if the research is planned, carried out, and interpreted within the frame of reference of the lifespan and the continuous processes of change that characterize all behavior" (Bayley, 1963, p. 137). The West Virginia Conference Series on lifespan developmental psychology, first organized in 1969, was a collective effort to articulate lifespan theory and research and to promote lifespan perspectives within developmental psychology (e.g., Goulet & Baltes, 1970). Although much has been achieved since then in terms of theoretical and methodological advances, there still remain many lacunae and areas to be elaborated.

As an effort toward further elaboration, this article focuses on lifespan proposals and research about the multilevel systems of contextual influences on development and the evolutionary and ontogenetic design of these influences. We begin with a summary of the scripts about developmental contextualism that characterized the beginnings of lifespan psychology. At that time, and in close collaboration with life course sociologists, three classes of interactive contextual biosocial influences were identified: (a) age-graded, (b) history-graded, and (c) non-normative (e.g., P. B. Baltes, Reese, & Lipsitt, 1980). Subsequently, and in line with recent theoretical efforts to refine conceptions of developmental and biocultural contextualism (e.g., P. B. Baltes, 1997; P. B. Baltes & Singer, 2001; S.-C. Li, 2003), a new set of lifespan scripts have evolved. These scripts, which are outlined in later sections of this article, deal with: (a) the overall "architectural" structure of ontogeny and the dynamics between biological and cultural factors; (b) the

differential allocation of resources across the lifespan, from a primary emphasis on growth to maintenance and regulation of loss; and (c) the systemic operation of a set of mechanisms (selection, optimization, compensation) that orchestrate adaptive (successful) development and aging.

We conclude with a consideration of the implications of these scripts for the last phase of life. Because the lens of contemporary lifespan development extends far beyond what was possible in earlier times (e.g., to research on the oldest-old and centenarians; Smith, 2001), a new sociodemographic scenario is emerging: that of the graying of the population. In our view (P. B. Baltes & Smith, 1999, 2003), this novel scenario promises to generate a new situation of history-graded biocultural contextualism. In this last phase of life, psychological functioning may be characterized by aspects of change and constellations of factors that are quite distinct from the causal and processual network that is operative at earlier phases of life.

LIFESPAN SCRIPTS ABOUT THE MACRO-CONTEXTS OF DEVELOPMENT

We begin with an overview of the early efforts of lifespan theorists to identify frameworks for considering contextualism at a macro-level of analysis and the impact of such contexts on the production of commonalities and differences in development (P. B. Baltes et al., 1980). It is important to note that these efforts are consistent with our current view of contextualism (i.e., biocultural contextualism as co-constructivism) in that they refer to the ways in which intrinsic and extrinsic factors are structured across the lifespan. Specifically, the initial lifespan scripts proposed that biological and environmental contexts of development are structured at multiple levels across the lifespan by three classes of influences: (a) age-graded (ontogenetic), (b) history-graded, and (c) non-normative (idiosyncratic) influences (see also P. B. Baltes, Cornelius, & Nesselroade, 1979).

As a whole, the cumulative interactions and co-productions of these classes of contextual influences contribute, on the one hand, to much commonality and continuity in the nature of developmental change. On the other hand, they contribute to interindividual and subgroup differences in status and to differences in the direction and level of intraindividual change over time. For instance, age-graded influences can vary systematically by social class, gender, cohort, or ethnicity. Incidentally, a failure to recognize the inherent individual and group differentiation associated with the three classes of influences was a major source of misunderstanding between sociologists and psychologists (P. B. Baltes & Nesselroade, 1984; Dannefer, 1992; Mayer, 2003).

This macro-view of intrinsic and extrinsic developmental contexts highlighted the concept of plasticity as a fundamental lifespan script (P. B. Baltes & Schaie,

1976; Gollin, 1981; Lerner, 1984). *Plasticity* was defined as the range of human development that was possible under varying constellations of age-graded, history-graded, and non-normative influences. It can be studied by means of experimental simulations of development in which different learning histories are examined, for instance, by time-compressed designs of cognitive training or methods of testing the limits (P. B. Baltes, Reese, & Nesselroade, 1977; Kliegl, Smith, & Baltes, 1989; Lindenberger & Baltes, 1995). Although lifespan researchers typically argue for the need for complex longitudinal designs and for a creative combination of descriptive with explanatory longitudinal research (e.g., Kruse, Lindenberger, & Baltes, 1993; Magnusson & Casaer, 1993; Schaie, 1965), it is part of the pragmatics of science that natural time takes too long for such idealized designs to be realizable within the active lifetime of a given researcher or research team.

The Multilevel Organization of Context in Lifespan Development

Because of the complexity and plasticity of the conditions shaping the course of human development, the general approach of lifespan psychologists has always been to highlight the *pluralistic* (multidimensional, multilevel), *transactional*, and *dynamic nature of contextual influences* on individual change. Indeed, the course of individual development itself is considered as a changing phenomenon (see also Elder, 1998; Mayer, 2003; Riley, Foner, & Riley, 1999). Thus, when P. B. Baltes and his colleagues (P. B. Baltes et al., 1980; P. B. Baltes et al., 1977) distinguished among three sets of contextual influences—normative age-graded, normative history-graded, and non-normative—their intention was to alert researchers to consider multiple levels of explanation for observed age-related and individual differences and change over time.

Normative age-graded (ontogenetic) influences. Nowadays, few would dispute that age-related factors play a pervasive, cumulative organizational role in the structuring of the biological and environmental contexts of development over the entire lifespan. *Normative* is used here in the statistical sense to indicate that sets of events occur in highly similar ways (timing and duration) for the majority of individuals in a given society or subculture.

There is a long tradition of examining age-graded contexts and systems of influence in the first 20 years of the human lifespan. More conceptual effort is needed, however, to specify the mechanisms and nature of age-graded biological and environmental contexts of developmental change in the period of adulthood and old age. Consider first our knowledge of age-graded biological influences in adulthood: Compared to the first 20 years of life, when much is known about the normative correlations between chronological age and aspects of biological maturity, we have

relatively less-detailed knowledge about temporal sequences and age–biology associations in mid-adulthood and old age. Regarding the second half of life, the value of searching for biological "age markers" is disputed (e.g., McClearn, 1997) and theorists suggest that, although some organs and biological systems show regular functional changes over time, there is no general "program" of aging as such: Stochastic processes contribute to increased interindividual variation with age after young adulthood (e.g., Finch & Kirkwood, 2000; Kirkwood, 2003).

The specification of normative age-graded socialization events, developmental tasks, and ecologies is also a research area ripe for contemporary update (e.g., Havighurst, 1972; Neugarten, 1969; Settersten, 1999). Several recent sociologically oriented reviews suggest that social expectations, ecologies of development, and pathways of age-graded transitions across the life course may be changing (e.g., Ferraro, 2001; Heckhausen & Dweck, 1998; Mayer, 2003; Sampson, Morenoff, & Gannon-Rowley, 2002; Shanahan, 2000). There is much debate whether contemporary societal and environmental contexts have become more or less age-structured and whether variation (diversity) within age stratas and age cohorts has increased (Dannefer & Uhlenberg, 1999; Mayer, 2003; Settersten, 1999).

History-graded influences. History-graded influences also involve biological and environmental contexts and contribute both to short- and long-term changes in developmental trajectories that may differentiate cohorts. From a discipline viewpoint, this is the territory of historians and sociologists (Elder, 1998; Mayer, 2003; Riley et al., 1999). However, insights from developmental biologists would help complete the picture of the biocultural dimension of history-graded influences.

Examples of history-graded influences are economic depression, war, social revolution, major epidemics, technological advances, major educational changes, changes in demographic structure and modernization, and changes in the content and practices of nutrition and other forms of health behavior. Research on birth cohort effects originally made the perhaps strongest case for consideration of historical contextualism (Elder, 1998). More recently, the lens has been extended to larger time dimensions and efforts to specify the causal and processual particulars. In the last 100 years, for instance, modernization has been associated with increasing variation in pathways to adult roles (e.g., Modell & Elder, 2002). Furthermore, cohorts are thought to differ in the level and shape of age trajectories on a wide array of dimensions, including intelligence (Flynn, 1999; Schaie, 1996), morbidity, and longevity (Maier & Vaupel, 2003; Vaupel et al., 1998).

Research on cohort differences is often used to support arguments that historical change brings improvement and progress. In this tradition, work on cognitive performance in late adulthood from studies in Sweden (e.g., Bäckman, Small, Wahlin, & Larsson, 2000) and Schaie's (1996) Seattle Longitudinal Study suggests that today's 70-year-olds are comparable to 65-year-olds who lived 30 years ago (see

also Helmuth, 2003). The functional health of older adults also has improved (Manton, Stallard, & Corder, 1997). However, historical change may have negative consequences as well. For example, despite general positive shifts in cohort competencies of the intellect, Schaie (1996) reported negative cohort differences in performance on tasks assessing numerical ability: Younger birth cohorts exhibit lower numerical proficiency than older cohorts. Elbert (2003) suggested there may be negative consequences on the functional architecture of the brain associated with wars and other forms of violence or drug-related epidemics. Research on history-graded influences on the nature of individual development is reaching new heights and thereby strengthening proposals about the biocultural co-construction of ontogeny (P. B. Baltes & Singer, 2001; S.-C. Li, 2003).

Non-normative influences. The third set of influences reflects the unique individual–idiosyncratic biological and environmental events that are not clearly tied to ontogenetic or historical time. Typically, but not necessarily, they are statistically infrequent in a population and have no universal temporal and spatial sequence, yet they can have significant influences on the development of an individual (e.g., Bandura, 1982; Brim & Ryff, 1980). Examples include winning a lottery, chance personal encounters, career changes, relocation, serious accidents or illness, extended unemployment, divorce, unexpected death of significant others, migration, and being a victim of serious crime or warlike conditions.

The impact of non-normative events is thought to be especially powerful because such events disrupt the sequence and rhythm of the expected life cycle and so generate conditions of uncertainty (e.g., Diehl, 1999; Wrosch & Freund, 2001). Some, but not all, of these conditions are only minimally amenable to personal or social control and to long-term modification and therefore represent extreme situations of challenge. In individuals' life narratives, such events can be perceived as critical "turning points" (e.g., McAdams, 2001). The extent to which a non-normative life event will have long-lasting implications for life change likely depends on when it occurs across the life course and what type of change the event entailed in terms of social roles, functional status, and sense of identity. In our assessment, research on non-normative life events has been especially powerful if the focus was on the operation of multiple or conjoint life events and life situations in which developmental reserves were overtaxed or tested at limits (P. B. Baltes et al., 1998; Staudinger, Marsiske, & Baltes, 1993).

Changing Salience of Contextual Influences Over the Lifespan

Together, these three closely intertwined and co-constructive systems of influence, mediated through the developing individual and institutional structures and networks, have a cumulative effect producing regularities and individual differ-

ences in life pathways. None of these classes of biologically and environmentally based influences operates independently from the other. Such a focus on contextualism makes explicit the lack of full predictability of human development as well as the boundedness that individuals experience as they engage in efforts to construct and manage their lives (e.g., Brandtstädter & Lerner, 1999).

The combinational profile of the effects of various types of contextual influences may also differ by age (or historical) period. In this vein, P. B. Baltes et al. (1980) speculated about the relative salience of age-graded, history-graded, and non-normative influences at varying points in the lifespan. They hypothesized that age-graded influences are primarily important in child development and, perhaps to a lesser extent, in the transition to old age, whereas history-graded and non-normative influences become an increasingly dominant force of influence from young adulthood onward. The primacy of age-graded influences in childhood has long been supported by nomothetic developmental functions in such domains as cognitive and physical growth that are rather robust across cultures and historical time. The notion that age-graded influences might weaken with age, especially beyond the chronological age of average life expectancy, is consistent with evolutionary-based biological theories of aging (e.g., P. B. Baltes, 1997; Kirkwood, 2002). The reasoning is that evolutionary-based genetic control over the postreproductive phase of life has not been selected. It is also consistent with sociological theories that point to the relative absence of social roles for the majority of older adults in a population and the comparative insignificance of older adults post-retirement from the workforce for the organization of society (Rosow, 1985; Uhlenberg, 1988).

Evidence on the relative impact of normative history-graded influences over the entire life course was scarce in 1980 and is still limited. The effect of the timing of historical events in the lives of individuals most probably depends on the type of event, the extent to which it represents situations of gain or loss for individuals at different ages both in the short and long term, and the capacity of individuals to change at different ages (e.g., Elder, 1998; Wrosch & Freund, 2001).

P. B. Baltes et al. (1980) proposed that non-normative events take on an increasing salience in determining development after early adulthood. In part, this proposal was linked to the idea that the organizing role of age-graded biological and environmental factors declines in old age. Furthermore, it is likely that age-related losses in developmental reserve capacity play a crucial role. Together with the shifting valence of contextual influences across the lifespan, the proposal that non-normative influences gain in salience is in accord with findings that change in late adulthood is associated with losses in controllability, reduced potential to recover, and increased constraints on the possibilities of adopting alternative life pathways or compensatory measures (P. B. Baltes & Smith, 2003; Heckhausen, Dixon, & Baltes, 1989; Smith, 2003).

A LIFESPAN SCRIPT ABOUT BIOLOGY–CULTURE DYNAMICS

During recent years, we have developed a new set of lifespan scripts to make explicit the "causal" dynamics of lifespan development and strengthen our insights into the mechanisms of biocultural co-construction (e.g., P. B. Baltes, 1997). To begin, we describe an overarching script about the architecture of ontogeny, the landscape of human development. This overarching framework links basic principles of developmental biology to proposals about mechanisms and contexts of psychological development and aging and specifies the general forms and directional outcome of the linkage over time. Figure 1 summarizes the three central principles of this overarching framework. These principles, we argue, need to be considered as we attempt to understand the interactive system of age-graded, history-graded, and non-normative influences.

First, as depicted in the left panel of Figure 1, it is proposed that biological plasticity and genetic fidelity decrease as individuals reach the higher ages of the life course. This lifespan trajectory reflects the fact that biological evolution was oriented not toward optimizing old age but rather to optimizing reproductive fitness in early adulthood (e.g., Finch, 1990). As a consequence, the human genome in older age groups is more likely to be characterized by deleterious genetic expressions and reduced genetic fidelity. The outcome: Biogenetic plasticity decreases with age, although it continues to operate.

The second principle (middle panel of Figure 1) asserts that for human development to extend into the higher ages, new steps in the level and kind of cultural evolution and cultural resources are essential. To extend average life expectancy,

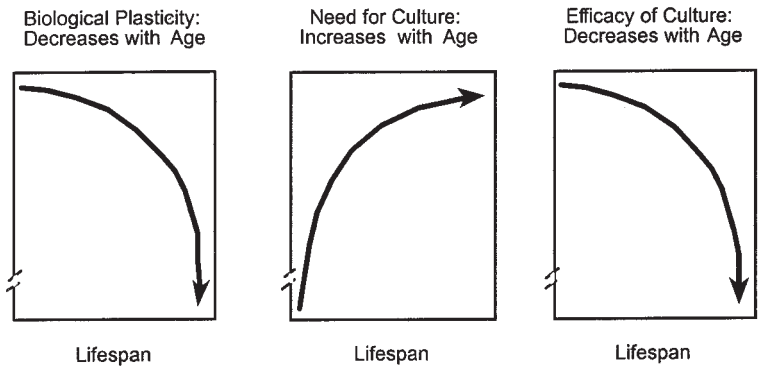

FIGURE 1 Biocultural architecture of life course: Schematic representation of three meta-principles that co-regulate human ontogeny. Together, these principles describe the dynamics between biology and culture across the life course that characterize an aging-associated increase in the incompleteness and vulnerability of individuals and populations as they age (modified from P. B. Baltes, 1997).

for instance, it takes more and more culture-based resources and practice to exploit the biogenetic potential that is inherent in the human genome. Thus, the material, technological, psychological, and social aspects of cultural evolution, not genetic evolution, are the driving force in recent quantitative and qualitative expansions of the life course (see also Durham, 1991).

The dilemma of modern times is in the lifespan function shown in the right panel of Figure 1. The efficacy of culture to exploit the genome and to compensate, if necessary, for the biological losses associated with aging decreases toward the end of the life course. The older the individual, the less improvement or repair is achieved given the same cultural input or intervention. In old age, for instance, it takes much more time and practice to reach the same cognitive output. Moreover, as individuals reach asymptotic performance in functions, further improvement is more difficult to achieve (P. B. Baltes et al., 1998).

This triangulated theoretical script of age-associated change in the biocultural architecture of the life course should be kept in mind when it comes to speculations about the future of adult development and aging in a population where more and more individuals will reach advanced old age. Of course, the script shown in Figure 1 characterizes a dynamic and evolving framework, and new science may change the constellation. For instance, the curves of three trajectories may be elongated to higher ages on the *x*-axis. Nevertheless, the direction of the age-related change, especially in the Fourth Age, will reflect the biocultural incompleteness of the architecture and its associated vulnerability and reduced potential.

A LIFESPAN SCRIPT ABOUT THE ALLOCATION OF RESOURCES: FROM GROWTH TO MAINTENANCE AND REGULATION OF LOSS

Another lifespan script proposed in recent years complements the overarching proposals about the biocultural dynamics and the operation of lifespan contexts (P. B. Baltes, 1997; Staudinger et al., 1993). This script outlines changes across the lifespan in the systemic configuration of three general functions of development: (a) growth; (b) maintenance, including repair and recovery; and (c) regulation of loss. It suggests that with increasing age individuals need to invest more and more of their internal and external resources into maintenance and management of loss as opposed to growth in order to assure adaptive efficacy and success. This systemic change sets boundary conditions for the operation and outcomes of developmental contexts.

With the phrase *adaptive function of growth* we refer to behaviors involved in reaching higher levels of functioning or adaptive capacity. Under the heading of *maintenance* we classify behaviors that ensure stability in levels of functioning in the face of a new contextual challenge or a loss in potential. Finally, regarding

regulation or management of loss, we mean behaviors that organize functioning at lower levels when maintenance or recovery is no longer possible. In childhood, resources are primarily allocated to growth. During adulthood, the predominant allocation is toward maintenance. In old age, more and more resources are directed toward regulation or management of loss. Such a characterization of the lifespan, of course, is an oversimplification, because individual, functional (domain), contextual, and historical differences need to be taken into account. This lifespan script is about relative probability and prevalence.

The lifespan trajectories of resource investment into growth, maintenance, and regulation of loss have implications for the dynamics involved in the systemic and integrative coordination of these three functions. In this regard, it is not surprising that researchers of adult development have strong interests in topics such as goals and selection among goals as well as compensation for losses and the seemingly counterintuitive idea that conditions of deficit can breed advances through innovative efforts (P. B. Baltes et al., 1998; Cantor & Fleeson, 1994; Dixon & Bäckman, 1995; Eccles & Wigfield, 2002; Freund & Baltes, 2002; Uttal & Perlmutter, 1989). Such perspectives have led us to work on a general theory of adaptive development and the management of gains and losses, which we describe next.

A LIFESPAN SCRIPT OF ADAPTIVE DEVELOPMENT AND AGING: ORCHESTRATING SELECTION, OPTIMIZATION, AND COMPENSATION

During the last 10 years, we have worked on a general theory of adaptive (successful) development and aging (selective optimization with compensation [SOC]; P. B. Baltes, 1997; P. B. Baltes & Baltes, 1990; P. B. Baltes, Freund, & Li, in press; Freund & Baltes, 2002) that is consistent with the general scripts of lifespan development we have outlined. This is not the only theory that would fit this overall frame; however, it is a theory that was explicitly developed to suit this purpose.

Basic Framework of SOC

The theory was originally developed to describe successful aging and was called *selective optimization with compensation* (P. B. Baltes & Baltes, 1990). It involved proposals about the operation and coordination of three components: (a) selection of goals or outcomes, (b) optimization of means to reach these goals, and (c) compensation through the use of substantive means. These SOC components were subsequently construed as a general-purpose mechanism of development and adaptive functioning across the lifespan (P. B. Baltes, 1997). There are

other similar approaches, most notably those of Brandtstädter (1998), Heckhausen and Schulz (1995), and Carstensen (1995).

Selection at the most general level refers to a development-enhancing process that in developmental biology is called *canalization* (Waddington, 1966). This selection process refers to a specification and narrowing down of a range of alternative outcome-oriented pathways that the scope of biocultural plasticity would permit in principle. It is a prerequisite for advances. However, selection may also be necessary when resources such as time, energy, and capacity are limited. To accommodate these two instantiations of selection and their different connotations, two forms of selection—elective and loss-based—have been differentiated (Freund & Baltes, 2002).

Optimization in the general sense refers to the acquisition, application, coordination, and maintenance of internal and external resources (means) involved in attaining higher levels of functioning. The relevant means are many, ranging from genetic expressions to health behavior, practice, cognitive skills, social support, education, and cognitive status.

Compensation, like optimization, refers to means; however, *compensatory means* serve to counteract losses in specific means previously used for goal attainment by using alternative (substitutive) means to maintain functioning. One example of compensation is the use of hearing aids to counteract hearing loss and the greater reliance on visual cues to compensate for declining speed of language processing in old age (Thompson, 1995).

Aside from the intended fit with the general lifespan scripts just described, two central motives were behind our proposal of SOC as a general psychological theory of behavior development: (a) to account for the realization of development in general and (b) to specify how individuals can effectively manage the overall lifespan changes in biological, psychological, and social conditions that form opportunities and constraints on levels and trajectories of development. In the sense of biocultural co-constructivism, the biogenetic and cultural contexts provide constraints and affordances (including interindividual differences in such constraints and affordances), and it is within these constraints that SOC operates.

In general, SOC component processes are considered to be universal. SOC-related behaviors, however, have the potential for a high degree of individual "phenotypic" specificity (P. B. Baltes & Baltes, 1990; Freund & Baltes, 2002). When expressed in the phenotypic sense, they show intra- and interindividual variability. Therefore, plasticity and its variable expression as a function of biocultural constraints is a cornerstone of SOC theory (P. B. Baltes & Singer, 2001; Lerner, 2002; S.-C. Li, 2003). Moreover, considering the triangulation of aspects of growth, maintenance, and loss, SOC can be viewed as an effective way to allocate and reallocate resources among these three functions.

In principle, SOC theory can be incorporated into many different theoretical perspectives, including behavioral-learning, biobehavioral, cognitive, action–theoreti-

cal (one of our preferred schemes), and social psychology (M. M. Baltes & Carstensen, 1996; Freund & Baltes, 2002; Marsiske, Lang, Baltes, & Baltes, 1995). Furthermore—and this reflects the many levels of consciousness and automaticity as well as external constraints that human behavior entails—SOC processes can vary along the dimensions active–passive, conscious–nonconscious, and internal–external. Along such lines, the SOC model can be applied to a variety of domains of functioning (e.g., social, cognitive, physical) and to different levels of analysis. For instance, the focus can be on a specific behavioral domain (e.g., working memory) or on personal functioning in a more general sense (e.g., subjective well-being or lifestyle). The focus can also entail how an institution, such as a school or nursing home, allocates its resources and staff behaviors to target aspects of growth, maintenance, or regulation of loss (M. M. Baltes, 1996).

A recent study conducted by Gignac, Cott, and Badley (2002) demonstrates the simultaneous occurrence of SOC as a general process and SOC as an individualized strategy of life management. Observational methods were used to study older patients afflicted with osteoarthritis and their strategies of management. The results showed that most participants made at least one adaptation that reflected either selection (e.g., restrict activity), optimization (e.g., practice movement), or compensation (e.g., use assistive devices). The fact that virtually all study participants did so reflects the universal aspect of SOC. Gignac et al. also reported large interindividual variability in the specific SOC behaviors expressed. This finding underscores the many variations that individuals can pursue as they produce their special ways of identifying and orchestrating ways of selecting, optimizing, and compensating.

Select Findings: Age Differences in SOC and Outcomes

Theory-guided research addressing questions about the application of SOC is just beginning. SOC-related behaviors can be assessed using self-report and observation methods and in experimental studies involving, for instance, the methodology of dual or multiple tasks. In this section, we summarize first findings from studies using a range of different methods. The outcomes carry a promissory spirit. First, there is evidence that the rank order and self-reported use of the SOC components change with age; second, there is evidence that people who engage in SOC behaviors show more adaptive outcomes.

As a developmental construct, we expect SOC to be an evolving system so that the behavioral repertoire associated with SOC reaches a peak somewhere in midlife. On the level of self-report, and as shown in Figure 2, initial findings support such a developmental gradient (Freund & Baltes, 2002). Young, middle-aged, and older adults answered a self-report instrument developed to assess preferred use of SOC strategies. Middle-aged adults reported the highest frequency of using all SOC components. In earlier and later phases of life, the SOC system seems less

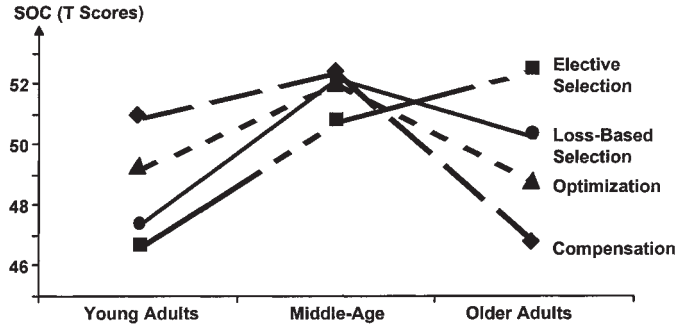

FIGURE 2 Age-group mean differences in four components of selective optimization with compensation (SOC; elective selection, loss-based selection, optimization, compensation): middle-aged adults reported the highest and perhaps most integrated endorsement of SOC (adapted from Freund & Baltes, 2002).

fully activated and coordinated. However, the age-related profiles carry meaning. For instance, the finding that older adults reported frequent use of elective selection corresponds to the view that aging individuals have fewer resources available and orient themselves increasingly toward fewer select goals (e.g., M. M. Baltes & Carstensen, 1996; P. B. Baltes & Baltes, 1990). Similarly, in young adulthood the task of life planning in a focused and concerted manner needs practice and refinement (e.g., Smith, 1999). Desires and volitions are less orchestrated.

The evidence available so far also suggests that the reported and observed use of SOC is associated with positive developmental outcomes. Where examined, the pattern of outcome correlations is robust against controlling for a number of rival predictors of positive development such as personality (e.g., the Big Five) and motivational constructs (e.g., tenacious goal pursuit and flexible goal adjustment). In samples ranging in age from 14 to 100+ years, it was found that adults who reported engaging in selection, optimization, and compensation when pursuing personal goals also reported higher levels of well-being (e.g., frequency of experiencing positive emotions, having a purpose in life, life satisfaction; Freund & Baltes, 1998, 2002; Wiese, Freund, & Baltes, 2000, 2002). In young adults, the evidence also includes reported success in dual-career partnerships and vocational advances (B. B. Baltes & Heydens-Gahir, 2003) as well as study behavior in college students (Wiese & Schmitz, 2002). In addition, Bajor and Baltes (2003) found that effective supervisors in work settings obtain better job performance ratings if they are seen to use strategies of SOC.

SOC and Dual-Task Research

SOC is a systemic theory. To deal with issues of biocultural co-construction and developmental contextualism, it is supposed to offer a window on coping with multiple contexts and multiple behavior demands. Rarely does human develop-

ment involve a single task domain and a single context. Concurrent performances, such as being good at school and at sports, are more difficult than engaging in each of the tasks separately. SOC theory suggests that developmental researchers may want to use experimental paradigms developed for the study of dual- or multitask performance to better understand the developmental dynamics that individuals face as they regulate themselves in a complex time and context environment (Freund & Baltes, 2002; Krampe & Baltes, 2003; Lerner, Freund, de Stefanis, & Habermas, 2001; Lindenberger, Marsiske, & Baltes, 2000; see also various chapters in Staudinger & Lindenberger, 2003).

Experimental research on age differences in performance in dual tasks provides one concrete instantiation of predictions from SOC theory. For instance, when the dual task is to memorize a word list while walking fast or maintaining balance on a moving platform, the expectation is that, compared with young adults, older adults are more likely to prioritize walking or balance, because falling would be a more serious problem than not remembering a word in a list. This expectation that older adults show greater dual-task costs has been supported by findings from dual-task studies involving memorizing and walking carried out by K. Z. H. Li, Lindenberger, Freund, and Baltes (2001) and Lindenberger et al. (2000). Furthermore, older adults were effective in using compensatory skills to maintain a higher level of performance. Rapp, Krampe, and Baltes (2003) and Bondar, Krampe, and Baltes (2003) have reported similar findings from studies in which cognitive information processing and motor balance were competing tasks. These aging-associated effects of the differential use of SOC in favor of motor over cognitive performance are stronger when the behavioral system is tested at its limits (i.e., when the tasks were made more and more difficult).

SOC theory predicts that SOC behaviors have trait- and statelike characteristics. That this is so was shown in a study conducted by Bondar et al. (2003) involving motor and cognitive behavior. When it came to motor behavior and its high risk value, older adults showed preferential SOC behavior that was rather rigid. They did not reallocate resources when asked to do so. Regarding cognitive behavior, however, this was more easily possible. In light of the significance of maintaining motor function and balance, this asymmetrical allocation seems adaptive despite its apparent rigidity.

Differential allocation of resources can take many forms. Considering a different combination of tasks, namely, talking while walking, Kemper, Herman, and Lian (2003) demonstrated that older and younger adults differ in their compensatory strategies when task demands exceed their resources. Whereas young adults reduced the length and grammatical complexity of their spoken sentences, older adults reduced the rate of speech when they simultaneously had to walk. By speaking more slowly, older adults were able to preserve their speaking even under taxing dual-task conditions.

Taken together, these initial self-report and observational as well as experimental studies lend support to the perspective of the SOC theory of adaptive de-

velopment. The replicated pattern of results suggests that individuals are better able to manage the tasks of life when they engage in selecting, optimizing, and compensating. Thus, SOC functions like a development-enhancing and loss-preventing general-purpose mechanism. As a general theory of adaptive development, it characterizes a system of strategies that permits individuals to master the general tasks of life, including those that result from the general lifespan scripts outlined earlier.

CONCLUSIONS

In this article, we have outlined a general frame for constructing developmental theory that is consistent with an overall biocultural architecture of human development. Our intent is to provide a frame that organizes the field as a whole. This organization proceeds from the general to the more specific across several levels of analysis. Our hope is that further explication of microgenetic and domain-specific processes are possible within this overarching meta-framework.

In this section, we mention one more theoretical conundrum that awaits new insights. It deals with the question whether development and aging can be viewed as part of the same framework or whether it is useful to treat these concepts as different entities. In general, our preference is to treat them from the same vantage point, or at least assume that they operate in conjunction—for instance, as an ongoing dynamic between gains and losses (P. B. Baltes, 1987). However, the recent explication of the biocultural architecture of ontogeny (P. B. Baltes, 1997) with its associated lifespan scripts highlights the possibility that there is much discontinuity between the causes and mechanisms of behavioral development at different stages of the lifespan. Given this, together with accumulating evidence about major losses of functioning in the Fourth Age, the oldest-old (P. B. Baltes & Smith, 1999, 2003), some might well ask whether the application of lifespan proposals about developmental processes to the end of life remains a tenable position.

Since 1990, much research has accumulated that addresses the potential and limits of ontogeny in old age and at the end of life. At present, two viewpoints pervade with regard to the interpretation of findings (e.g., P. B. Baltes, 1997; P. B. Baltes & Smith, 2003; Helmuth, 2003; Lachman, 2001). One is characterized by a spirit of scientific and social-policy optimism. Researchers who adopt this positive viewpoint highlight the history-graded advances in average life expectancy in developed countries together with the increasing opportunities for the majority of individuals in those societies to age successfully. The alternative standpoint tempers this optimism with reference to emergent uncertainties and challenges at the end of life (the Fourth Age). In particular, the positive news about human aging is called into question by findings about the oldest-old that indicate that their levels of physical, cognitive, emotional, and social functioning are much lower than those observed in the young-old. Research from the Berlin Aging Study (BASE) has illustrated this (P. B.

Baltes & Mayer, 1999; see also Smith, Maas, et al., 2002). Despite their optimistic reports on the young-old, BASE researchers uncovered some of the dilemmas and dysfunctionality of very old age. Data on 90- and 100-year-olds clearly show many aging-related losses, especially if the overall profile of aging trajectories is considered (e.g., Isaacowitz & Smith, 2003; Singer, Lindenberger, & Baltes, 2003; Smith & Baltes, 1997, 1998; Smith, Borchelt, Maier, & Jopp, 2002). BASE findings about increased dysfunctions in the oldest-old are the more significant as they apply to small subgroups of "positively" selected survivors; that is, to people who represent those few who survived into very old age and remained able to participate in the study. Thus, if anything, the measures collected in studies like BASE underestimate the actual plight of the oldest-old.

These findings generate concern about prospects for quality of life in very old age. They suggest that the chronic life strains experienced by the majority of the oldest-old gradually reduce the capacity of individuals to respond, adapt, and thrive. Stated otherwise—and in accord with theoretical proposals derived from the biocultural architecture of ontogeny and its associated lifespan scripts (P. B. Baltes, 1997)—there appears to be less continuity between the young-old and the Fourth Age than previously thought.

The lifespan psychological orientation to the study of aging evolved in part from numerous discussions during the 1950s and 1960s about the definition of *development* and the relation between development and aging (e.g., Anderson, 1958; Bayley, 1963; Birren, 1964). At that time, developmental change in early life (defined primarily in terms of growth, increasing organization, and structural differentiation) had been viewed by some as conceptually different from behavioral change associated with aging (described as decline, disorganization, dedifferentiation). Two key conferences, one arranged by researchers of child development (see Harris, 1957) and the other by researchers interested in adulthood and aging (see Birren, 1964), discussed methodological issues and examined prospects for theoretical and considerations of development across the lifespan. During the subsequent decades, the lifespan psychological orientation established a conceptual bridge that contributed to a broadening of the questions posed about the processes and contextual influences on development from conception to death (e.g., P. B. Baltes, 1987, 1997; Hetherington & Baltes, 1988). Perhaps, at the start of a new century, and especially with regard to the end of life (the Fourth Age), it might be worth re-examining the relations between concepts of development and concepts of aging.

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REFERENCES

Anderson, J. E. (1958). A developmental model for aging. *Vita Humana, 1,* 5–18.

Bäckman, L., Small, B. J., Wahlin, A., & Larsson, M. (2000). Cognitive functioning in very old age. In F. I. M. Craik & T. A. Salthouse (Eds.), *The handbook of aging and cognition* (2nd ed., pp. 499–558). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Bajor, J. K., & Baltes, B. B. (2003). The relationship between selective optimization with compensation, conscientiousness, motivation, and performance. *Journal of Vocational Behavior, 63*, 347–367.

Baltes, B. B., & Heydens-Gahir, H. A. (2003). Reduction of work–family conflict through the use of selection, optimization, and compensation behaviors. *Journal of Applied Psychology, 88,* 1005–1018.

Baltes, M. M. (1996). *The many faces of dependency in old age*. Cambridge, England: Cambridge University Press.

Baltes, M. M., & Carstensen, L. L. (1996). The process of successful ageing. *Ageing and Society, 16,* 397–422.

Baltes, P. B. (1987). Theoretical propositions of lifespan developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23,* 611–626.

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *American Psychologist, 52,* 366–380.

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). Cambridge, England: Cambridge University Press.

Baltes, P. B., Cornelius, S. W., & Nesselroade, J. R. (1979). Cohort effects in developmental psychology. In J. R. Nesselroade & P. B. Baltes (Eds.), *Longitudinal research in the study of behavior and development* (pp. 61–87). New York: Academic.

Baltes, P. B., Freund, A. M., & Li, S.-C. (in press). The psychological science of human ageing. In M. Johnson (Ed.), *The Cambridge handbook of age and ageing*. Cambridge, England: Cambridge University Press.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Lifespan theory in developmental psychology. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 1029–1143). New York: Wiley.

Baltes, P. B., & Mayer, K. U. (Eds.). (1999). *The Berlin Aging Study: Aging from 70 to 100*. New York: Cambridge University Press.

Baltes, P. B., & Nesselroade, J. R. (1984). Paradigm lost and paradigm regained: Critique of Dannefer's portrayal of life-span developmental psychology. *American Sociological Review, 49,* 841–846.

Baltes, P. B., Reese, H. W., & Lipsitt, L. P. (1980). Lifespan developmental psychology. *Annual Review of Psychology, 31,* 65–110.

Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1977). *Lifespan developmental psychology: Introduction to research methods*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Baltes, P. B., & Schaie, K. W. (1976). On the plasticity of intelligence in adulthood and old age: Where Horn and Donaldson fail. *American Psychologist, 31,* 720–725.

Baltes, P. B., & Singer, T. (2001). Plasticity and the ageing mind: An exemplar of the bio-cultural orchestration of brain and behaviour. *European Review, 9,* 59–76.

Baltes, P. B., & Smith, J. (1999). Multilevel and systemic analyses of old age: Theoretical and empirical evidence for a fourth age. In V. L. Bengtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 153–173). New York: Springer.

Baltes, P. B., & Smith, J. (2003). New frontiers in the future of aging: From successful aging of the young old to dilemmas of the fourth age. *Gerontology, 49,* 123–135.

Bandura, A. (1982). The psychology of chance encounters and life paths. *American Psychologist, 37,* 747–755.

Bayley, N. (1963). The life span as a frame of reference in psychological research. *Vita Humana, 6,* 125–139.

Birren, J. E. (Ed.). (1964). *Relations of development and aging*. Springfield, IL: Charles C Thomas.

Bondar, A., Krampe, R. T., & Baltes, P. B. (2003). *Balance takes priority over cognition: Can young and older adults deliberately control resource allocation?* Berlin, Germany: Max Planck Institute for Human Development.

Brandtstädter, J. (1998). Action perspectives on human development. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 807–866). New York: Wiley.

Brandtstädter, J., & Lerner, R. M. (Eds.). (1999). *Action and self-development: Theory and research through the life span*. Thousand Oaks, CA: Sage.

Brim, O. G., Jr., & Ryff, C. D. (1980). On the properties of life events. In P. B. Baltes & O. G. Brim, Jr. (Eds.), *Lifespan development and behavior* (Vol. 3, pp. 367–388). New York: Academic.

Cantor, N., & Fleeson, W. (1994). Social intelligence and intelligent goal pursuit: A cognitive slice of motivation. In W. D. Spaulding (Ed.), *Nebraska Symposium on Motivation: Integrative views of motivation, cognition, and emotion* (Vol. 41, pp. 125–179). Lincoln: University of Nebraska Press.

Carstensen, L. L. (1995). Evidence for a life-span theory of socioemotional selectivity. *Current Directions in Psychological Science, 4,* 151–156.

Dannefer, D. (1992). On the conceptualization of context in developmental discourse: Four meanings of context and their implications. In D. L. Featherman, R. M. Lerner, & M. Perlmutter (Eds.), *Lifespan development and behavior* (Vol. 11, pp. 83–110). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Dannefer, D., & Uhlenberg, P. (1999). Paths of the life course: A typology. In V. L. Bengtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 306–326). New York: Springer.

Diehl, M. (1999). Self-development in adulthood and aging: The role of critical life events. In C. D. Ryff & V. W. Marshall (Eds.), *The self and society in aging processes* (pp. 150–183). New York: Springer.

Dixon, R. A., & Bäckman, L. (Eds.). (1995). *Compensating for psychological deficits and declines: Managing losses and promoting gains*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Durham, W. H. (1991). *Coevolution: Genes, culture and human diversity*. Stanford, CA: Stanford University Press.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109–132.

Elbert, T. (2003, August). *Significant life events and psychological trauma: Consequences for brain structure and function*. Paper presented at the Conference on Brain, Mind, and Culture: From Interactionism to Biocultural Co-Constructivism, Döllnsee, Germany.

Elder, G. H. (1998). The life-course and human development. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 939–991). New York: Wiley.

Ferraro, K. F. (2001). Aging and role transitions. In R. H. Binstock & L. K. George (Eds.), *Handbook of aging and the social sciences* (5th ed., pp. 313–330). San Diego, CA: Academic.

Finch, C. E. (1990). *Longevity, senescence, and the genome*. Chicago: University of Chicago Press.

Finch, C. E., & Kirkwood, T. B. L. (2000). *Chance, development, and aging*. New York: Oxford University Press.

Flynn, J. R. (1999). Searching for justice: IQ gains over time. *American Psychologist, 54,* 5–20.

Freund, A. M., & Baltes, P. B. (1998). Selection, optimization, and compensation as strategies of life-management: Correlations with subjective indicators of successful aging. *Psychology and Aging, 13,* 531–543.

Freund, A. M., & Baltes, P. B. (2002). Life-management strategies of selection, optimization, and compensation: Measurement by self-report and construct validity. *Journal of Personality and Social Psychology, 82,* 642–662.

Gignac, M. A. M., Cott, C., & Badley, E. M. (2002). Adaptation to disability: Applying selective optimization with compensation to the behaviors of older adults with osteoarthritis. *Psychology and Aging, 17,* 520–524.

Gollin, E. S. (1981). Development and plasticity. In E. S. Gollin (Ed.), *Developmental plasticity: Behavioral and biological aspects of variations in development* (pp. 231–251). New York: Academic.

Goulet, L. R., & Baltes, P. B. (Eds.). (1970). *Lifespan developmental psychology: Research and theory*. New York: Academic.

Harris, D. E. (1957). *The concept of development: An issue in the study of human behavior*. Minneapolis: University of Minnesota Press.

Havighurst, R. J. (1972). *Developmental tasks and education* (3rd ed.). New York: McKay.

Heckhausen, J., Dixon, R. A., & Baltes, P. B. (1989). Gains and losses in development throughout adulthood as perceived by different adult age groups. *Developmental Psychology, 25,* 109–121.

Heckhausen, J., & Dweck, C. S. (Eds.). (1998). *Motivation and self-regulation across the life span*. New York: Cambridge University Press.

Heckhausen, J., & Schulz, R. (1995). A life-span theory of control. *Psychological Review, 102,* 284–304.

Helmuth, L. (2003, February 28). The wisdom of the wizened. *Science, 299,* 1300–1302.

Hetherington, E. M., & Baltes, P. B. (1988). Child psychology and lifespan development. In E. M. Hetherington, R. M. Lerner, & M. Perlmutter (Eds.), *Child development in lifespan perspective* (pp. 1–19). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Isaacowitz, D. M., & Smith, J. (2003). Positive and negative affect in very old age. *Journal of Gerontology: Psychological Sciences, 58B,* P143–P152.

Kemper, S., Herman, R. E., & Lian, C. H. T. (2003). The costs of doing two things at once for young and older adults: Talking while walking, finger tapping, and ignoring speech or noise. *Psychology and Aging, 18*, 181–192.

Kirkwood, T. B. L. (2002). Evolution of ageing. *Mechanisms of Ageing and Development, 123,* 737–745.

Kirkwood, T. B. L. (2003). Age differences in evolutionary selectional benefits. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with lifespan psychology* (pp. 215–241). Dordrecht, The Netherlands: Kluwer.

Kliegl, R., Smith, J., & Baltes, P. B. (1989). Testing-the-limits and the study of adult age differences in cognitive plasticity of a mnemonic skill. *Developmental Psychology, 25,* 247–256.

Krampe, R. T., & Baltes, P. B. (2003). Intelligence as adaptive resource development and resource allocation: A new look through the lenses of SOC and expertise. In R. J. Sternberg & E. L. Grigorenko (Eds.), *Perspectives on the psychology of abilities, competencies, and expertise* (pp. 31–69). New York: Cambridge University Press.

Kruse, A., Lindenberger, U., & Baltes, P. B. (1993). Longitudinal research on human aging: The power of combining real-time, microgenetic, and simulation approaches. In D. Magnusson & P. Casaer (Eds.), *Longitudinal research on individual development: Present status and future perspectives* (pp. 153–193). Cambridge, England: Cambridge University Press.

Lachman, M. E. (2001). *Handbook of midlife development*. New York: Wiley.

Lerner, R. M. (1984). *On the nature of human plasticity*. Cambridge, England: Cambridge University Press.

Lerner, R. M. (2002). *Concepts and theories of human development*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Lerner, R. M., Freund, A. M., de Stefanis, I., & Habermas, T. (2001). The selection, optimization, and compensation model as a frame for understanding developmental regulation in adolescence. *Human Development, 44,* 29–50.

Li, K. Z. H., Lindenberger, U., Freund, A. M., & Baltes, P. B. (2001). Walking while memorizing: Age-related differences in compensatory behavior. *Psychological Science, 12,* 230–237.

Li, S.-C. (2003). Biocultural orchestration of developmental plasticity across levels: The interplay of biology and culture in shaping the mind and behavior across the lifespan. *Psychological Bulletin, 129,* 171–194.

Lindenberger, U., & Baltes, P. B. (1995). Testing-the-limits and experimental simulation: Two methods to explicate the role of learning in development. *Human Development, 38,* 349–360.

Lindenberger, U., & Baltes, P. B. (2000). Lifespan psychology theory. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 5, pp. 52–57). New York: Oxford University Press.

Lindenberger, U., Marsiske, M., & Baltes, P. B. (2000). Memorizing while walking: Increase in dual-task costs from young adulthood to old age. *Psychology and Aging, 15,* 417–436.

Magnusson, D. (Ed.). (1996). *The lifespan development of individuals: Behavioural, neurobiological, and psychosocial perspectives*. Cambridge, England: Cambridge University Press.

Magnusson, D., & Casaer, P. J. M. (Eds.). (1993). *Longitudinal research on individual development: Present status and future perspectives*. Cambridge, England: Cambridge University Press.

Maier, H., & Vaupel, J. (2003). Age differences in cultural efficacy: Secular trends in longevity. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with lifespan psychology* (pp. 59–78). Boston: Kluwer Academic.

Manton, K. G., Stallard, E., & Corder, L. (1997). Changes in the age dependence of mortality and disability: Cohort and other determinants. *Demography, 34,* 135–157.

Marsiske, M., Lang, F. R., Baltes, P. B., & Baltes, M. M. (1995). Selective optimization with compensation: Life-span perspectives on successful human development. In R. A. Dixon & L. Bäckman (Eds.), *Psychological compensation: Managing losses and promoting gains* (pp. 35–79). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Mayer, K. U. (2003). The sociology of the life course and lifespan psychology: Diverging or converging pathways? In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with lifespan psychology* (pp. 463–481). Dordrecht, The Netherlands: Kluwer.

McAdams, D. P. (2001). The psychology of life stories. *Review of General Psychology, 5,* 100–122.

McClearn, G. E. (1997). Biomarkers of age and aging. *Experimental Gerontology, 32,* 87–94.

Modell, J., & Elder, G. H., Jr. (2002). Children develop in history: So what's new? *Minnesota Symposium on Child Psychology, 32*, 173–205.

Neugarten, B. L. (1969). Continuities and discontinuities of psychological issues into adult life. *Human Development, 12,* 121–130.

Rapp, M., Krampe, R. T., & Baltes, P. B. (2003). *Preservation of skills in Alzheimer's disease: The case of postural control*. Berlin, Germany: Max Planck Institute for Human Development.

Riley, M. W., Foner, A., & Riley, J. W. (1999). The aging and society paradigm. In V. L. Bengtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 327–343). New York: Springer.

Rosow, I. (1985). Status and role change through the life cycle. In R. H. Binstock & E. Shanas (Eds.), *Handbook of aging and the social sciences* (2nd ed., pp. 62–93). New York: Van Nostrand Reinhold.

Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology, 28,* 443–478.

Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin, 64,* 92–107.

Schaie, K. W. (1996). *Intellectual development in adulthood: The Seattle Longitudinal Study*. New York: Cambridge University Press.

Settersten, R. A. (1999). *Lives in time and place: The problems and promises of developmental science*. New York: Baywood.

Shanahan, M. J. (2000). Pathways to adulthood in changing societies: Variability and mechanisms in life course perspective. *Annual Review of Sociology, 26,* 667–692.

Singer, T., Lindenberger, U., & Baltes, P. B. (2003). Plasticity of memory for new learning in very old age: A story of major loss. *Psychology and Aging, 18,* 306–317.

Smith, J. (1999). Life planning: Anticipating future life goals and managing personal development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 223–255). Thousand Oaks, CA: Sage.

Smith, J. (2001). Old age and centenarians. In N. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 10843–10847). Oxford, England: Elsevier.

Smith, J. (2003). The gain–loss dynamic in lifespan development: Implications for change in self and personality during old and very old age. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with lifespan psychology* (pp. 215–241). Dordrecht, The Netherlands: Kluwer.

Smith, J., & Baltes, P. B. (1997). Profiles of psychological functioning in the old and oldest old. *Psychology and Aging, 12,* 458–472.

Smith, J., & Baltes, M. M. (1998). The role of gender in very old age: Profiles of functioning and everyday life patterns. *Psychology and Aging, 13,* 676–695.

Smith, J., Borchelt, M., Maier, H., & Jopp, D. (2002). Health and well-being in old age. *Journal of Social Issues, 58,* 715–732.

Smith, J., Maas, I., Mayer, K. U., Helmchen, H., Steinhagen-Thiessen, E., & Baltes, P. B. (2002). Two-wave longitudinal findings from the Berlin Aging Study: Introduction to a collection of papers. *Journal of Gerontology: Psychological Sciences, 57B,* P471–P473.

Staudinger, U. M., & Lindenberger, U. (Eds.). (2003). *Understanding human development: Dialogues with lifespan psychology*. Dordrecht, The Netherlands: Kluwer.

Staudinger, U. M., Marsiske, M., & Baltes, P. B. (1993). Resilience and levels of reserve capacity in later adulthood: Perspectives from life-span theory. *Development and Psychopathology, 5,* 541–566.

Tetens, J. N. (1777). *Philosophische Versuche über die menschliche Natur und ihre Entwicklung* [Philosophical essays on human nature and its development]. Leipzig, Germany: Weidmanns Erben und Reich.

Thompson, L. A. (1995). Encoding and memory for visible speech and gestures: A comparison between young and older adults. *Psychology and Aging, 10,* 215–228.

Uhlenberg, P. (1988). Aging and the societal significance of cohorts. In J. E. Birren & V. L. Bengtson (Eds.), *Emergent theories of aging* (pp. 405–425). New York: Springer.

Uttal, D. H., & Perlmutter, M. (1989). Toward a broader conceptualization of development: The role of gains and losses across the life span. *Developmental Review, 9,* 101–132.

Vaupel, J. W., Carey, J. R., Christensen, K., Johnson, T. E., Yashin, A. I., Holm, N. V., et al. (1998, May 8). Biodemographic trajectories of longevity. *Science, 280,* 855–860.

Waddington, C. H. (1966). *Principles of development and differentiation*. New York: Macmillan.

Wiese, B. S., Freund, A. M., & Baltes, P. B. (2000). Selection, optimization, and compensation: An action-related approach to work and partnership. *Journal of Vocational Behavior, 57,* 273–300.

Wiese, B. S., Freund, A. M., & Baltes, P. B. (2002). Subjective career success and emotional well-being: Longitudinal predictive power of selection, optimization and compensation. *Journal of Vocational Behavior, 60,* 321–335.

Wiese, B. S., & Schmitz, B. (2002). Studienbezogenes Handeln im Kontext eines entwicklungspsychologischen Meta-Modells [Action regulation at university: Application of a developmental meta-model]. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 34,* 80–94.

Wrosch, C., & Freund, A. M. (2001). Self-regulation of normative and nonnormative developmental challenges. *Human Development, 44,* 264–283.