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A Motivational Theory of Life-Span Development

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Abstract

This article had four goals. First, the authors identified a set of general challenges and questions that a life-span theory of development should address. Second, they presented a comprehensive account of their Motivational Theory of Life-Span Development. They integrated the model of optimization in primary and secondary control and the action-phase model of developmental regulation with their original life-span theory of control to present a comprehensive theory of development. Third, they reviewed the relevant empirical literature testing key propositions of the Motivational Theory of Life-Span Development. Finally, because the conceptual reach of their theory goes far beyond the current empirical base, they pointed out areas that deserve further and more focused empirical inquiry.

Keywords

life-span development; motivation; primary and secondary control; goal engagement and disengagement

Most people have a sense of being actively involved in shaping their lives. They follow developmental paths that are coherent in terms of identifying and effectively pursuing long-term goals and, when necessary, disengaging from goals that are no longer attainable. Even when confronted with setbacks, disappointments, and failures, humans have a remarkable capacity to stay on course and maintain a sense of personal agency.

Our approach to the regulation of life-span development focuses on the impressive adaptive capacity of individuals to optimize development across major changes in the life course. The past 15 years of conceptual and empirical work have shown that a central feature of adaptive capacity is the regulation of motivation. An individual's developmental potential is won or lost by mastering the challenges of regulating motivational processes. This is accomplished by selecting, pursuing, and adapting developmental and personal goals to reflect changes in life-course opportunities, staying ahead of the game by anticipating emergent opportunities for goal pursuits, activating behavioral and motivational strategies of goal engagement, disengaging from goals that have become futile and too costly, and replacing them with more appropriate goals.

In the early 1990s, we set out to capture these phenomena of adaptive regulation of development by proposing a life-span theory of control (J. Heckhausen & Schulz, 1993, 1995; Schulz & Heckhausen, 1996). This theory focused on the role of the individual as an active agent in life-span development, the distinction between primary and secondary control strategies, the proposition that primary control striving holds functional primacy in the motivational system, and the idea of selectivity and compensation as fundamental requirements of optimizing life course development. During the past 15 years, our original life-span theory of control was enriched by advancements in theory and empirical research on goal choice, goal engagement, and goal disengagement. In particular, the Model of Optimization in Primary and Secondary Control (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993) was developed to address how individuals choose goals in accordance with principles of developmental optimization. Moreover, the Action-Phase Model of Developmental Regulation (J. Heckhausen, 1999; J. Heckhausen, Wrosch, & Fleeson, 2001; Wrosch & Heckhausen, 1999) describes the sequential structure of goal-oriented action cycles involving phases of goal selection, goal engagement, and disengagement in developmental regulation across the life course. The Motivational Theory of Life-Span Development presented in this article integrates the original life-span theory of control with these models and thus provides a comprehensive framework for the study of individual agency in life-span development. In a nutshell, our theory identifies the major challenges faced by individuals throughout the life course and the motivational and self-regulatory processes used to meet these challenges. We view the life course as being organized around a sequential series of action cycles that involve goal selection, goal pursuit, and disengagement from goals. Both optimal and nonoptimal strategies for each phase of this cycle are identified along with key transition points and relevant control strategies.

The goals of this article are fourfold. First, we identify a set of general challenges and questions that a life-span theory of development should address. Second, we present a comprehensive account of our Motivational Theory of Life-Span Development and discuss how the theory meets these challenges. Third, we review the relevant empirical literature, testing 15 key propositions of the Motivational Theory of Life-Span Development. Finally, because the conceptual reach of our theory goes far beyond the current empirical base, we identify several additional areas of inquiry to guide future empirical research.

General Challenges and Questions to Be Addressed by Life-Span Developmental Research

In our original life-span theory of control, we identified key issues that need to be addressed by all life-span theories of development (J. Heckhausen & Schulz, 1995; Schulz & Heckhausen, 1996). Here we refine these propositions to lay the foundation for our Motivational Theory of Life-Span Development.

Criteria for Adaptive Development

Any effective theory of life-span development needs to specify which criteria it is using to differentiate desirable and adaptive from undesirable and maladaptive outcomes and patterns of development. Approaches to life-span development and aging vary widely with regard to the kind of criteria they use (Schulz & Heckhausen, 1996). Depending on the focus of the scientific approach, successful development can be gauged through indicators of physiological functioning, such as cardiovascular and pulmonary status (Rowe & Kahn, 1987), cognitive and intellectual performance (Heine, Lehman, Markus, & Kitayama, 1999; Salthouse, 1991; Simonton, 1988), or achievement in physical (Schulz & Curnow, 1988) or artistic domains (Ericsson, Krampe, & Tesch-Römer, 1993; Lehman, 1953; Simonton, 1988). The common characteristic of all these criteria is that they reflect broad measurable standards of functioning or performance upon which members of a given society generally agree.

Moreover, these broad indicators can be applied to individuals at different ages using absolute standards (e.g., world record performance in 100-m dash) or relative standards (e.g., best 100-m dash performance for 60-year-olds) that take into account the specific constraints on the individual (e.g., age, disability, lack of training). Finally, such measurable indicators can also help to assess whether a specific individual shows developmental growth or decline relative to his or her own previous performance.

One difficulty with using single domain-specific standards of adaptation and mastery is that individuals usually cannot afford to invest in only one domain without seriously compromising mastery in other domains of life. Most individuals strike a balance by investing effort and time in multiple common life domains, such as education, work, social relations and family, health, and leisure activities. It is the overall mastery across different domains of life and functioning that defines the individual's overall level of success.

Moreover, one can assess successful adaptation at two levels of analysis: one addressing mastery specific to the individual's current location in a life-course trajectory and the other addressing the totality of mastery attained during the individual's life. For example, pursuing a career as a world-class athlete may maximize mastery in a particular domain during the peak performance period in late adolescence and young adulthood but may seriously compromise the ability to master other domains or one's health at later phases in life. Thus, criteria for adaptive development should be comprehensive in addressing multiple domains of functioning and the totality of mastery across the individual's life span and should take into account the constraints on the individual that limit goal attainment.

Some researchers in life-span development have argued for more subjective and individualized criteria of psychological experience, such as life satisfaction or psychological well-being (Baltes & Baltes, 1990). One variant of this approach is to conceptualize success in terms of *goal attainment*, subjectively defined as the realization of desired outcomes and the avoidance of undesired outcomes (Marsiske, Lang, Baltes, & Baltes, 1995). A related variant of this subjective approach proposes that self-consistency is the ultimate criterion of adaptiveness and consequently views downward adjustments of goals and strivings for goal attainment as equivalent means for achieving self-consistency (Brandtstädter & Rothermund, 2002). The common denominator of these more subjective approaches is the notion that adaptiveness is captured not so much by what a person does or accomplishes but, rather, by how a person perceives his or her accomplishments. These subjective approaches offer some appeal for those who follow a phenomenological orientation, but they come with serious drawbacks. First, subjective criteria are individually determined and thus cannot be used for interindividual comparisons of developmental outcomes. Second, they are subject to the rationalization biases individuals often use when they evaluate their own experiences and accomplishments. Third, subjective approaches fail to take advantage of the fact that there is substantial consensus across cultures about what constitutes success in life (e.g., physical, cognitive, intellectual, affective, and creative functioning; social relations; social status; integrity).

To summarize, an effective life-span developmental theory needs to include criteria for adaptive development that can be assessed in ways that facilitate interindividual comparison, prevent distortion by subjective biases, and build on cross-cultural consensus about what constitutes a successful life.

Individual Agency and Developmental Goals

Most developmental scientists would agree that individual agency plays a crucial role in human development across the life span (Baltes, Lindenberger, & Staudinger, 1998; Brandtstädter, 2006; J. Heckhausen, 1999; Lerner & Busch-Rossnagel, 1981). Indeed, the active and goal-oriented role of individuals in their own development is a central proposition of the widely

accepted organismic model of development (Lerner, 2002; Reese & Overton, 1970; von Bertalanffy, 1968). The importance of agency has been further elaborated in models of intentional self-development, which use action theory to conceptualize the individual's attempts to influence his or her own development (e.g., Brandtstädter, 2006; Brandtstädter, Wentura, & Rothermund, 1999; Heckhausen, 1999).

Humans develop mental representations about desired outcomes of life-course transitions and developmental processes. Often these desired outcomes are strongly influenced by what society has come to identify as a developmental task for a given age period or life-course transition (Havighurst, 1952). These desired outcomes or developmental tasks are adopted by the individual as *developmental goals* toward which to strive and can thus organize the active attempts of individuals to influence their own development. Many developmental researchers therefore focus on goal-related concepts when investigating individual contributions to life-span development. A variety of different terms have been used to characterize these goals, including *personal projects* (Little, 1983; Little, Salmela-Aro, & Phillips, 2007), *life goals* (Nurmi, 1992, 1993), *personal goals* (Brunstein, 1993; Brunstein, Schultheiss, & Maier, 1999; Riediger, Freund, & Baltes, 2005; Salmela-Aro, Aunola, & Nurmi, 2007; Wadsworth & Ford, 1983), *personal strivings* (Emmons, 1986), *personal life tasks* (Cantor & Fleeson, 1991), *goals of intentional self-development* (Brandtstädter, Wentura, & Rothermund, 1999), and *possible selves* (Cross & Markus, 1991; Markus & Nurius, 1986). The empirical research on these goal-related concepts reflects the specific challenges associated with human goal-related striving in the context of the life course.

In general, development-related goal concepts share three characteristics that make them particularly suited for the life-course context. First, developmental goals are directed at developmental processes (e.g., become more independent from my parents) or life-course attainments (e.g., start a career, get married). This implies that the unique action field for developmental goals is the life course with its specific age-graded structure of opportunities and constraints (see the next section). Second, developmental goals comprise desired outcomes at an intermediate level of aggregation (e.g., improve my grades, graduate from college, have a child), between very specific projects (e.g., get an A on the next exam), and broad values (e.g., promote world peace) or motives (e.g., improve my overall mastery). Third (related to the second point), developmental goals typically reach into the intermediate future, 5–10 years ahead, either within the current or next phase of the life course (e.g., within adolescence or from adolescence into early adulthood).

To summarize, an effective life-span developmental theory should view the individual as an active agent in life-span development. Thus, individual agency should be studied by addressing motivational processes involved in goal selection, goal pursuit, and goal disengagement.

Changing Opportunities and Constraints Across the Life Course

Individuals have to adjust to, cope with, and take advantage of the changing opportunities and constraints characteristic of different stages in life. Biological maturation and aging and societal institutions (e.g., education, labor market, retirement) set up a roughly inverted U-shaped curve of control capacity across the life span, with a steep increase during childhood and adolescence, a peak in young adulthood and middle age, and a decline in old age. This general life-course trajectory of first increasing and then decreasing opportunities is overlaid with more domain-specific trajectories of improving and declining opportunities for achieving specific developmental goals. Societal institutions, such as the educational system, vocational career patterns, and welfare systems, structure the life span in terms of critical transitions (e.g., school entry, promotions, retirement) and sequential constraints (e.g., educational qualifications as prerequisites for certain careers). These time-organized opportunity structures present significant regulatory challenges to the individual who must respond in a time- or age-

sensitive way. Moreover, the individual needs to come to terms with diminished chances of attaining important life goals, once the opportunities pass by. In summary, any effective theory of life-span development needs to address the way in which life-course variations in opportunities and constraints are met with individuals' attempts to master their own development.

Selectivity and Compensation as Fundamental Regulatory Challenges

Major approaches to life-span development converge in asserting that the regulatory challenges encountered throughout the life course require that the individual masters two fundamental regulatory challenges: selectivity of resource investment and compensation of failure and loss (Bäckman & Dixon, 1992; Baltes & Baltes, 1990; Baltes et al., 1998; Brandtstädter, 2006; J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993; Salthouse, 1985).

Selectivity of goal investment acknowledges the fact that we cannot strive for all goals at once, or even sequentially. Paul and Margret Baltes's model of selective optimization with compensation championed the idea of selectiveness in life-span development, particularly for successful aging (Baltes, 1987; Baltes & Baltes, 1990). The human potential for controlling the environment is multifaceted but resource- and time-limited; as a result, people have to be selective about which goals to pursue and when they pursue them. This implies that they relinquish goals that overstretch or might undermine their capacity to reach specific long-term goals. For example, giving up on postsecondary education may help an athlete's career in the short run but may compromise his or her potential for effectively influencing his or her environment in the long run. Another more domain-specific example is how individuals exhibit socioemotional selectivity in which social partners they select and maintain at different times of life (Lang, 2001; Lang & Carstensen, 1994; Lang & Heckhausen, 2006), depending on whether the life phase requires access to new information or socioemotional well-being (Carstensen, Isaacowitz, & Charles, 1999).

Compensation of failure and loss is essential for developmental regulation, because humans experience setbacks in their goal striving not only in old age (Salthouse, 1985) but also normatively across the entire life span (Bäckman & Dixon, 1992; J. Heckhausen, 1999). Mastery development is maximized at intermediate levels of difficulty, when failure occurs at about 50% of attempts. Thus, development of mastery cannot thrive unless individuals have effective means of dealing with failure, both in terms of correcting their behavior and in terms of protecting their motivational and emotional resources against the undermining effects of failure (e.g., loss of hope for success, decline in self-esteem, hopelessness). Life-span developmental psychologists have focused on different aspects of compensation, with some primarily addressing attempts to hone action strategies to overcome and undo previous failures (e.g., Bäckman & Dixon, 1992) and others focusing on how individuals prevent or counteract negative affective or self-evaluative consequences of failure. For example, the accommodative tendencies, investigated by Brandtstädter et al. (1999), help the individual adjust goals to what is feasible and protect the individual against self-blame for failure. In sum, an effective life-span developmental theory needs to address processes that help the individual to select appropriate goals in which to invest and to compensate for failures, setbacks, and losses when they occur.

The Motivational Theory of Life-Span Development

In this section, we discuss how the Motivational Theory of Life-Span Development addresses the major challenges raised in the previous section. We subsume under the theoretical umbrella of our Motivational Theory of Life-Span Development the original life-span theory of control (J. Heckhausen & Schulz, 1993, 1995; Schulz & Heckhausen, 1996) and its elaboration in two related process models: the Model of Optimization in Primary and Secondary Control (J.

Heckhausen, 1999; J. Heckhausen & Schulz, 1993), which addresses the control processes involved in goal engagement and goal disengagement, and the Action-Phase Model of Developmental Regulation (J. Heckhausen, 1999; J. Heckhausen et al., 2001; Wrosch & Heckhausen, 1999), which addresses the sequential structure of goal engagement and disengagement across the life course. Our original life-span theory of control put forward propositions about primary control as the criterion of adaptive development and about life-span trajectories of primary and secondary control, which are addressed in the first two following sections. Subsequent sections greatly expand the reach and specificity of the original theory by incorporating empirical findings and conceptual developments (i.e., Optimization in Primary and Secondary Control and the Action Phase Model of Developmental Regulation) that have occurred over the past 15 years.

Primary Control Capacity as Criterion of Adaptive Development

Our Motivational Theory of Life-Span Development proposes that the key criterion for adaptive development is the extent to which the individual realizes control of his or her environment (i.e., primary control) across different domains of life and across the life span (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1995, 1999b; Schulz & Heckhausen, 1996). To further elaborate this proposition, we adapted a conceptual distinction, first made by Rothbaum, Weisz, and Snyder (1982), between primary and secondary control processes. According to Rothbaum et al., *primary control* processes are conceptualized as directed at changing the world to bring the environment into line with one's wishes. In contrast, *secondary control* processes are defined as changing the self to bring oneself into line with environmental forces. The two processes together are proposed to optimize an individual's sense of control, even when circumstances constrain the individual's capacity to control the environment.

Using Rothbaum et al.'s (1982) basic distinction between primary and secondary control, our life-span theory of control specified their functional relations more explicitly and formulated their implications for life-span development. According to our life-span theory of control, the motivational system is set up to *maximize primary control* capacity across life domains and lifetime (J. Heckhausen & Schulz, 1993, 1995, 1999b; Schulz & Heckhausen, 1996, 1997). From a functionalist and evolutionary psychology perspective, primary control striving is essential for mastering the challenges associated with maximizing inclusive fitness, such as foraging for food, seeking shelter, competing for mates, and caring for offspring (J. Heckhausen, 2000b; J. Heckhausen & Schulz, 1999b). Moreover, primary control striving is promoted by basic motivational modules that have been favored in mammalian evolution (J. Heckhausen, 2000b): a preference for behavior-event over event-event contingencies (White, 1959), a ubiquitous tendency for novelty exploration (Schneider, 1996), and the asymmetry of emotional responses to positive and negative events (Frijda, 1988). The latter pattern of responses reflects stronger and more prolonged aversive affective responses to negative events when compared with the beneficial affective consequences of positive events, a pattern that effectively promotes primary control striving and avoids "resting on one's laurels." Thus, behavioral evolution has favored mechanisms of motivational self-regulation that maximize primary control striving.

Primary and secondary control processes work together to maximize the overall primary control capacity of an individual. *Primary control capacity* varies across domains and age and reflects individuals' ability to influence important outcomes in their environment. At any given point in the life span, development is adaptive to the extent that it realizes a maximum of primary control, taking into account not only the current ability to control external events but also the future potential for exercising primary control. For example, an expansion of control in one domain, such as gymnastics, would not be optimal if it seriously compromises control in the future because of impaired skeletal growth. The primacy of primary control principle

would require a disengagement from goals with such negative side effects for a person's long-term primary control capacity. In other words, the most adaptive development across the life course is achieved by maximizing primary control in the multiple major domains of functioning (e.g., work, family, health, leisure) and across the different phases of the life span.

The life-span theory of control identifies the function of *secondary control* more specifically than did Rothbaum et al. (1982). According to our model, secondary control strategies address internal, most notably motivational, processes to minimize losses in, maintain, and expand existing levels of primary control. Thus, we conceptualized secondary control strategies as auxiliary motivational processes that support short-term or long-term primary control striving, not as alternatives or even processes opposed to primary control.

The proposition that secondary control processes serve primary control striving proved to be an important point of departure for our theory when compared with the earlier work of Rothbaum et al. (1982). This led us and others (e.g., Bailis, Boerner, Chipperfield, Gitlin, Hall, Light, Isaacovitz, McQuillen, Salmela-Aro, Wahl) following our theoretical framework on to a path quite distinct from investigators who adopted the older view that secondary control processes are solely directed at acceptance, giving up, and fitting in (Morling & Evered, 2006; Morling, Kitayama, & Miyamoto, 2003; Skinner, 2007; Thompson, Sobolow-Shubin, Galbraith, Schwankovsky, & Cruzen, 1993). It is important to note in this context that our conception of primary and secondary control processes was from the beginning focused on *control striving* and thus motivational phenomena, rather than merely at *perceptions of control*, a phenomenon of social cognition that used to be the most commonly addressed aspect of control behavior in the 1980s and early 1990s (see review in Skinner, 1996).

The life-span theory of control views humans universally as motivated by achieving effects in their environment (White, 1959). We set out to investigate how individuals manage to maintain an active agenda of striving for primary control as they encounter great challenges during their life course in terms of both gains and losses in actual control potential. As reported in the section on life-span trajectories of control striving below, primary control striving remains stable and a dominant motivational source throughout adulthood and into older age (J. Heckhausen, 1997).

Life-Span Trajectories of Primary and Secondary Control

Our life-span theory of control proposed hypothetical life-span trajectories of the availability of primary control and use of secondary control strategies (see Figure 1; Schulz & Heckhausen, 1996), based on an analysis of control resources at different times during the life course. As primary control capacity increases, plateaus, and then decreases across the life span, individuals keep trying to maximize overall primary control (J. Heckhausen, 1999). According to the life-span theory of control, the striving for primary control is a constant and universal motivational drive throughout the life course. However, as individuals' capacity for primary control decreases in old age, they typically need to invest more effort in striving for primary control goals and may need to activate secondary control strategies (e.g., anticipate and imagine success, enhance perceptions of personal control) that help them stay committed in spite of the challenges they face. Moreover, as certain primary control goals become unattainable, individuals need to disengage from them in favor of pursuing other more attainable goals. In this process, individuals increasingly resort to secondary control strategies of adjusting expectations, values, and attributions so that losses in primary control are not undermining the individual's motivational resources for primary control striving in general.

The Life Course as a Field of Action

Action-oriented approaches, including our own, view the individual as an active producer of his or her own development (Brandtstädter, 1998; Freund & Baltes, 2002b; J. Heckhausen, 1999; Lerner & Busch-Rossnagel, 1981). For such an agent in his or her own development, the life course is a field of action that has a time-organized structure of opportunities and constraints (J. Heckhausen, 1999).

Our Motivational Theory of Life-Span Development proposes that the individual's attempts to regulate his or her own development is organized in cycles of action around the pursuit of developmental goals (J. Heckhausen, 1999). Developmental goals are the organizing motivational units that enable individuals to take an active role in shaping their own life course and development. Developmental goals are similar to other goals in that they are anticipated end states that exert a directional influence on an individual's behavior.

Not all goals can be pursued at all times of life. In the long-term or macro level of aggregation, biological change and societal age grading of opportunities create a curve of individual control capacity that resembles an inverted U-function. Biological maturation and aging, societal age grading (e.g., going to school, retirement), and social norms about age-appropriate behavior and developmental milestones create a timetable of developmental opportunities, several of which are considered to be normative developmental tasks (Havighurst, 1953). These persist in modern industrial societies, even though for some developmental tasks, particularly regarding the family cycle, normative age-ranges have become somewhat broader (e.g., age of first parenthood), and certain transitions (e.g., moving in with one's romantic partner, marriage, stable employment) have become decoupled (Brueckner & Mayer, 2005).

In spite of these changes, the human life course still offers an age-graded sequence of increasing and decreasing opportunities to pursue and attain important developmental goals, as illustrated in Figure 2. As individuals move through the life course, they encounter emerging, peaking, and declining opportunities to strive for certain developmental goals, such as graduating from school, getting married, becoming established in a career, having and bringing up children, or buying a house. These opportunities can cover narrow (e.g., school graduation) or wide (e.g., becoming a grandparent) time windows in the life course. They overlap with each other in conducive (e.g., marriage, first child) or conflicting (e.g., career, first child) ways (Wiese & Freund, 2000) and can form sequentially organized paths (e.g., education, career). As a whole, these trajectories of opportunity for goal striving provide the individual with a timetable that guides goal choice and pursuit.

It is important to note here that the age-related structuring of the life course itself is subject to historical change (J. Heckhausen & Schulz, 1999a). Age boundaries for key life-course phases, such as education and child bearing, have changed dramatically over the past few centuries. In most industrialized countries today, formal education extends well into the late teen years and early 20s, as opposed to the midteens a century ago, and childbearing typically begins and ends at later ages than it did 2 centuries ago. Within the past 150 years, many societies have added an entirely new life-course phase, retirement, as a result of increased longevity and enhanced social mobility. Overall, the trend historically has been toward increased variability and flexibility in life-course trajectories, although this trend has not undone a fundamental structure in the sequencing of life-course events and transitions (Brueckner & Mayer, 2005). Life-course trajectories will continue to evolve as societies and human populations change in the future (Blossfeld & Huinink, 2000; Hagestad & Neugarten, 1985; Mayer, 2004).

Optimization of Development by Adaptive Goal Choice

In societies with a highly specialized labor force and substantial social mobility, chronological age itself does not automatically propel progression through this timetable of developmental tasks. It is up to the individual to take up the challenge and adopt specific developmental tasks as personal goals (J. Heckhausen, 1999). Only if the individual commits to a specific personal goal for development can developmental tasks be mastered. This also implies that the individual has to determine when the time is right for committing to a certain goal, such as finding one's romantic partner, having a child, or choosing a career. Thus, a theory of developmental regulation needs to include a higher level regulatory process of goal selection that involves specific heuristics to take into account the available opportunities, time constraints, and long-term consequences of investing in a particular primary control goal. In our model of developmental regulation, this metalevel selection process is referred to as *optimization* (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993).

In contrast to other life-span developmental models, such as the dual-process model (Brandstädter & Rothermund, 2002) and the selection optimization and compensation (SOC) model (Baltes & Baltes, 1990; Freund & Baltes, 2000, 2002a, 2002b), our Motivational Theory of Life-Span Development does not propose that specific processes of control striving, assimilation, accommodation, selection, or compensation are adaptive per se. Such processes and strategies are "blind" to the fit of a given goal with opportunities, never mind its potential consequences for other goals. Functionality of a control strategy cannot be determined by the strategy as such, independent of the situation to which it is applied. Instead, the functionality of a given control strategy is determined by its match with the opportunities and possible tradeoffs with other primary control domains and long-term consequences.

Whether a control strategy is adaptive can only be determined by examining whether it will help optimize an individual's multidomain and long-term capacity for primary control. Therefore, adaptive control strategies reflect engagement with goals that can be attained realistically in the current developmental ecology and that do not have excessively detrimental consequences for control striving in other domains or for the attainment of future goals. More specifically, primary control striving for a particular goal is adaptive if three requirements are met: (a) congruence of goal and opportunity, (b) consequences for other domains or long-term development are beneficial or at least not detrimental, and (c) a minimum diversity of goals is preserved. Regarding *goal–opportunity congruence*, individuals need to take into account and use as "adaptive challenges" (J. Heckhausen, 1999) the constraints and opportunities that biological maturation and aging and the societal organization of the life course offer in a given social ecology (J. Heckhausen & Schulz, 1999a). The *management of interdomain and long-term consequences* becomes important when goals in different domains are interrelated in a beneficial or detrimental way. For example, heavy investment in one domain (e.g., career) can deprive other domains (e.g., family) from needed action resources for viable developmental progression. Thus, the choice of and degree of investing in a particular goal must be viewed in the broader context of how this will impact the pursuit of other goals both concurrently and in the future. Finally, *goal diversity* is needed to avoid exclusive dependence on one domain or goal pursuit. A narrowing down of investment in only one domain can expose the individual to developmental dead ends should the chosen goal become threatened or futile (Linville, 1987). Therefore, a certain level of diversity in goal pursuit needs to be maintained, even in older age. These three issues are addressed by what we have proposed to be the three major heuristics involved in the optimization of goal choice: *match goals to opportunities*, *manage interdomain and long-term consequences*, and *maintain diversity of goals*.

Control Strategies Involved in Goal Engagement and Goal Disengagement

In our model of Optimization in Primary and Secondary Control (OPS model), we originally proposed a classification scheme that was built on the two major regulatory challenges of life-span development: *selection* and *compensation* (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993). In a 2 (primary/secondary) \times 2 (selection/compensation) matrix, we differentiated between selective primary and selective secondary control strategies and between compensatory primary and compensatory secondary control strategies. In empirical studies that used the OPS model to investigate adaptation to specific life-course transitions (J. Heckhausen, et al., 2001; Wrosch & Heckhausen, 1999; Wrosch, Schulz, & Heckhausen, 2002), it soon became clear that across these dimensions, control strategies operate together in a goal-engagement mode on the one hand and a goal-disengagement mode on the other hand (J. Heckhausen, 2003; J. Heckhausen & Farruggia, 2003). Table 1 provides an overview of goal-engagement-related and goal-disengagement-related control strategies.

Once a developmental goal is chosen by metamotivational processes of optimization, a specific set of control strategies that comprises *goal engagement* is activated (J. Heckhausen, 1999; Wrosch & Heckhausen, 1999). Typically, goal engagement involves selective primary control and selective secondary control. *Selective primary control* refers to the investment of behavioral resources (i.e., time, effort, skills) into pursuing a goal. *Selective secondary control* serves to enhance and maintain motivational commitment to a chosen goal, particularly when the goal is challenged by unexpected obstacles or attractive alternatives. Selective secondary control strategies include enhanced valuation of the chosen goal and devaluation of nonchosen alternatives, as well as positive illusions about one's control potential for achieving the chosen goal. In addition, *compensatory primary control* may be required when available behavioral resources of the individual are insufficient to attain the goal, and external resources have to be recruited. Specifically, compensatory primary control addresses the recruitment of help or advice from others, the use of technical aids (e.g., assistive devices, such as a wheelchair), or the employment of unusual behavioral means typically not involved in the activity (e.g., lip reading to compensate a hearing disability). Applied to the example of striving for a career promotion, the person who has set this goal for him- or herself will invest more time and effort into work (i.e., selective primary control), imagine the positive consequences and pride that would come with achieving the promotion (i.e., selective secondary control), and seek advice from more senior colleagues on effective strategies to foster career success (i.e., compensatory primary control).

When the individual experiences a loss of control and when the goal becomes unattainable or excessively costly, the individual needs to disengage from the goal (J. Heckhausen & Schulz, 1993; Wrosch, Scheier, Carver, & Schulz, 2003). In contrast to the motivational mindset of goal engagement, goal disengagement involves compensatory secondary control strategies. *Compensatory secondary control* can be attained by deactivating the obsolete goal, thus freeing up resources for the pursuit of other goals that are attainable. In addition, compensatory secondary control includes specific self-protective strategies, such as self-protective causal attribution (avoiding self blame), focusing on successes in other domains, and downward social comparisons, all of which should deflect the potential negative effects of failure experiences on important motivational resources, such as affective balance and self esteem. Converging concepts are proposed by self-regulation and control theory (Carver & Scheier, 1998, 2000), which argues that as much as commitment and confidence are part and parcel of goal engagement, active disengagement involving the reduction of commitment and deflated confidence are required to relinquish goals. Simply withdrawing effort without breaking up the motivational commitment would have maladaptive consequences. Thus disengagement is an active process of restructuring one's goals, rather than merely a passive reflection of failure and loss.

Action-Phase Model of Developmental Regulation

How do cycles of goal engagement and disengagement with developmental goals unfold over a lifetime? As individuals move along the age axis of the life span, opportunities to strive for specific goals emerge, peak, decline, and disappear (e.g., graduate from school, establish a long-term partnership, have a child; J. Heckhausen & Farruggia, 2003). Striving for primary control requires a repeated adaptation of one's goal selections and control strivings to the objectively available opportunities and constraints in the given developmental ecology. The patterns of goal engagement and disengagement, along with their respective control strategies, should mirror these changes.

Congruence of changes in opportunities and phases of goal engagement and disengagement—Figure 3 illustrates this adaptive congruence between opportunities and goal engagement and disengagement. The figure displays the rising, peaking, and falling trajectory of opportunities to reach a certain goal (e.g., having a child). The figure also shows the expected trajectory of goal engagement required to attain a goal. The increasing trajectory of opportunities to attain an important developmental goal (see Figure 3, light grey area) prompts the individual to consider adopting it as a personal goal for development and thus puts the process of optimized goal choice into action (see Figure 3, first segment on left). In cases where the individual postpones goal selection and goal pursuit to nonoptimal times when opportunities have peaked and started to decline, higher levels of goal engagement (see Figure 3, dark grey area indicating a high peak) are required to safeguard goal attainment in the face of diminishing opportunities.

Figure 4 links goal cycles with appropriate control strategies (J. Heckhausen, 1999). During goal choice and before passing the decisional Rubicon (H. Heckhausen, 1991), optimization heuristics of matching opportunities, considering consequences, and maintaining diversity are activated. Once the Rubicon is passed, the person moves into a goal-engagement phase, which involves the investment of selective primary and selective secondary control. As the person gets closer to the point where opportunities become severely constrained (e.g., biological deadline), goal engagement becomes more urgent and intense, which should be reflected in increased use of selective primary and secondary control and compensatory primary control strategies (see Figure 4, “urgent goal engagement” segment to the left of the “deadline” transition). As opportunities for goal attainment decrease, they may reach a point where goal attainment becomes close to impossible and/or very costly, thus rendering further striving for the goal highly dysfunctional in terms of individual resource allocation. This is the point of a developmental deadline. Once the deadline has been passed without attaining the goal, the individual needs to disengage from the goal and use compensatory secondary strategies to protect his or her motivational resources for future goal pursuits (see Figure 4, segment to the right of vertical “deadline”).

Developmental deadlines are important markers in this process and guide individuals' decisions for goal disengagement but also exert an urgency influence before being passed. The informational advantage of anticipating a deadline can be substantial. Without it, individuals could stumble into situations of uncontrollability and futile goal investment that leads to depressive symptomatology (Klinger, 1977; Nesse, 2000). That said, developmental deadlines provide a formidable challenge to individuals' developmental regulation because they require the individual to shift from an urgent and intense engagement with a goal before hitting the deadline to disengagement and self-protection after passing the deadline. Individuals who fail to disengage from the futile goal after passing the deadline run the risk of wasteful investment of resources, frustration, opportunity costs of not pursuing other feasible goals, and depression.

Although we emphasize deadline-related goals in our model, it applies equally well to any situation where goal opportunities shift over time. For example, a student who chooses to

pursue a major that in the course of the freshman year proves too difficult for his or her intellectual capacities would be well advised to change the major to a field of study that better matches his or her specific intellectual talents.

The regulatory challenge in these cases lies in identifying when goal pursuit is maladaptive while it is still ongoing and the individual is fully engaged. In such situations, it seems necessary that nonbiased, reality-oriented monitoring processes operate in the background, allowing the individual to disengage from goals that are no longer feasible or desirable. In fact, there is evidence that such monitoring processes occur, influenced by the cognitive and emotional concomitants of difficulty with goal pursuit. For example, individuals who confront goal failure or perceive insufficient progress toward an important goal are likely to experience emotional distress (Carver & Scheier, 1990, 1998; Higgins, 1987; D. Watson, Clark, & Tellegen, 1988) and/or a decline in positive affect (J. Heckhausen, Carmody, Haase, & Poulin, 2008; Nesse, 2000). Further, the undesirable change in affect arising from difficulty with goal pursuits, can affect goal-directed behaviors and even lead to its termination.

In such circumstances of deteriorating affect during unsuccessful goal engagement, theories of personality functioning and self-regulation have proposed that people typically step outside their goal-pursuing focus and reevaluate the situation (e.g., Carver & Scheier, 1998). These monitoring and goal-reevaluation processes have to occur under a volitional mindset, which typically shields an individual against information that could interfere with goal attainment (Achtziger & Gollwitzer, 2008; Gollwitzer, Heckhausen, & Steller, 1990). Therefore, individuals may have to switch into a motivational (in other words, a more reality-oriented mindset) to more objectively evaluate the probability of successful goal attainment. Such a shift from a volitional mindset directed at the implementation of goal pursuit to a motivational mindset that deliberates the validity of one's goal choice may occur when failure in goal progress has become hard to ignore (i.e., multiple failures, high costs) and the associated increase in negative affect or decrease in positive affect reaches a certain threshold (Carver & Scheier, 1998). In addition, a shift from a volitional to a motivational mindset may occur without the experience of goal failure or negative affect. For example, people may consciously decide to reassess at specified intervals (e.g., 6 months after starting goal pursuit) or after certain occasions (e.g., after trying different strategies) the rationality of continued goal pursuit. For example, the student who chooses a very challenging major might plan to reassess the rationality of this decision after the first semester or after testing his or her capacity in a difficult course.

Goal disengagement can also occur as a result of deliberate evaluations of the consequences of continued goal pursuit on a person's overall development. As discussed earlier, optimization processes cause one to consider the impact of goal pursuit on multiple domains of life and long-term developmental outcomes. Thus, goal engagement is driven not only by self-assessments of progress toward goal attainment but also by the effects of goal pursuit on other important life domains. For example, a person may conclude that achieving a particular goal (e.g., making more time for leisure activity) is well within reach, but the costs of achieving it are too high in terms of their impact on other life domains (family life or career).

Discrete action phases orchestrate control strategies—To conceptualize the adaptive progress of the individual through these changes in goal engagement, a sequentially organized model of action-phases is needed. Such a model exists in general motivational psychology, the Rubicon model of action phases, which divides the action cycle into several phases, each with different functions and accordingly adapted motivational mindsets (Achtziger & Gollwitzer, 2008; Gollwitzer et al., 1990; H. Heckhausen, 1991; H. Heckhausen & Gollwitzer, 1987). Using the Rubicon model as a starting point, we developed an action-phase model of developmental regulation, which expands the Rubicon model in several ways

(J. Heckhausen, 1999). First, our model adds another major transition into the action cycle, the transition from predeadline to postdeadline. Second, our model assumes an adaptive congruence of action phases with changes in situational opportunities for goal attainment. Third, our model includes expectations about specific optimization and control strategies involved in the phases of goal choice, goal engagement, urgent goal engagement, and goal disengagement. Fourth, our model includes the postactional phase of either meeting the deadline or failing to meet it. Finally, the model is specifically developed to address long-term goal pursuit in the context of life-span development, but it can also be applied to nondevelopmental action cycles.

The three key ideas of our action-phase model (shared with the Rubicon model) are the following: (a) Shifts between action phases, that is from goal choice to goal engagement and from goal engagement to goal disengagement, are not gradual but discrete and radical. (b) In each action phase, multiple control strategies are orchestrated to maximize the effectiveness with which the motivational function of the respective action phase is realized. (c) Within each action phase a specific motivational mindset shapes characteristics of information processing to optimize the effectiveness of the respective action phase. As part of the motivational mindset, perceptions of control shift also. Specifically, the phases of the action cycle and the control strategies involved in each phase are represented in Figure 4. The following two sections address the two major transitions in the action-phase model of developmental regulation, from optimized goal choice to goal engagement (*Rubicon*) and from goal engagement to goal disengagement (*deadline*).

Decisional Rubicon: From goal selection to goal engagement—The first shift, in this case from deliberation of goal options to engagement with a chosen goal, occurs when the decision to engage with a certain goal has been made, and thus the decisional Rubicon (H. Heckhausen, 1991) has been crossed. During the phase of optimization (see Figure 4, left segment) preceding the decision on goal choice, the individual should take into account the availability of opportunities for the various goal options in her/his age-specific developmental ecology (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1999a). Regarding controllability, personal expectations should be cautious and realistic, rather than enhanced or pessimistic. In this way, the biological and societal conditions prevalent at the age and social position of the individual have a major influence on which goals are selected.

Once the decisional Rubicon is crossed, the motivational system shifts from a mindset of deliberation to a mindset of implementation (Achtziger & Gollwitzer, 2008; Gollwitzer, 1990; Gollwitzer et al., 1990). The deliberative mindset is relatively impartial, broad, and unbiased, so that decisions are likely to be more realistic and adapted to actual controllability. In contrast, the postdecisional mindset of implementation does not allow for questioning the decision but narrowly focuses on the implementation of the planned action. The deliberative and implemental mindsets contrast with regard to memory for deliberation versus implementation-relevant information, the breadth of attentional focus (i.e., broad before and narrow after the Rubicon), openness to new information, and perceived control (Gollwitzer, 1990).¹ Regarding the latter, control perceptions are realistic in the predecisional phase but enhanced after goal commitment, so that the commitment to goal pursuit is strengthened (Gollwitzer & Kinney, 1989; Taylor & Gollwitzer, 1995). Numerous experimental studies have demonstrated such shifts from deliberative to implemental mindsets (Achtziger & Gollwitzer, 2008).

¹Brandstädter and colleagues, in their dual-process model, proposed a convergent distinction between assimilative and accommodative mindsets involving automatic modes of information processing that are functionally adapted to the assimilative orientation to goal pursuit versus the accommodative orientation to goal adjustment and disengagement (Brandstädter & Rothermund, 2002; Brandstädter, et al., 1999; Rothermund, 1998).

Developmental deadline and constraints: From engagement to disengagement

—The second shift in the action-phase model of developmental regulation is the one associated with a radical decline in opportunities for goal attainment, namely the *developmental deadline*. Developmental deadlines influence behavior not only after they have been passed but also before that point is reached. Individuals approaching a deadline anticipate a steep decline in goal opportunities and feel an ever more urgent need to invest effort to attain the goal before time runs out.

The situation changes radically once the deadline has been passed. After the deadline has been passed without success, further goal engagement becomes dysfunctional. In fact, a radical shift from goal engagement to disengagement is the most adaptive response to deadline-related decline in opportunities. This shift to disengagement is analogous to a lion chasing its prey; at first the lion goes full speed (urgent goal engagement), but when the prey turns out to be too fast and the gap between them widens, the lion will not gradually slow down but rather stop in his tracks and turn around. It is active disengagement in terms of withdrawal of effort and breaking of commitment that achieves this rapid and radical shift from goal engagement to disengagement (Wrosch, Scheier, Miller, Schulz, & Carver, 2003). In addition, human agents hold mental representations of the self and the capacity of one's own agency, both of which can be compromised by experiences of failure, loss of control, or giving up a goal. Therefore, self-protective strategies of control (e.g., avoiding self-blame by attributing failure to external factors, comparing with less fortunate others) need to be activated to minimize the long-term damage that failure could have on motivational resources (e.g., self-esteem and hope for success in future actions).

Empirical Evidence for Major Propositions of the Motivational Theory of Life-Span Development

The conceptual framework of the Motivational Theory of Life-Span Development as outlined above comprises a set of 15 specific propositions about adaptive developmental regulation that can be investigated empirically. These propositions address and can be grouped into four topics: (a) the adaptiveness of primary control; (b) life-span trajectories of primary and secondary control; (c) optimization of goal choice and appropriate use of control strategies; and (d) action phases of goal choice, goal engagement, goal disengagement, and new goal engagement (also referred to as “reengagement”). For each topic, specific propositions are stated and the relevant evidence is summarized. Each individual study considered is briefly described in Table 2, which also uses the structure of 15 propositions grouped into four topics.

Adaptiveness of Primary Control

The life-span theory of control proposes that the motivational system is set up to maximize primary control across life domains and lifetime (J. Heckhausen & Schulz, 1993, 1995, 1999b; Schulz & Heckhausen, 1996, 1997). This proposition comprises two hypotheses regarding (a) behavioral preference and (b) objective and subjective benefits of primary control that help maintain the preference.

(1) Preference for primary control striving is universal: Proposition 1 (see Table 2)

—This proposition is well supported in humans as young as neonates (DeCasper & Carstens, 1981; Papousek, 1967; J. S. Watson, 1972; J. S. Watson & Ramey, 1972; White, 1959) and for animals of various species (White, 1959). Infants could learn head movements that were associated with external events, such as acoustic signals and milk reinforcement, and even when fully satiated, they were found to continue head movements and greeted the occurrence of the milk bottle with pleasure (Papousek, 1967). Chimpanzees favored objects that could be moved or emitted sounds or light (Welker, 1956); monkeys persisted for hours in trying to

solve mechanical puzzles such as complicated door latches (Harlow, 1953); and both children and rats preferred rewards that they produced by their own behavior to the same object that was noncontingent to their behavior (Singh, 1970).

(2) Primary control striving has benefits—The proposed adaptiveness of primary control implies that primary control striving has benefits for the individual both objectively and subjectively (Proposition 2; see Table 2). Primary control has benefits in many everyday situations when goals are readily attainable and controllability is high, as well as in more critical situations when the individual's control capacity is challenged. Several of the studies reported in Table 2 addressed older adults' control efforts when dealing with functional constraints resulting from health problems (Wrosch & Schulz, 2008; Wrosch et al., 2002; Wrosch, Schulz, Miller, Lupien, & Dunne, 2007) and particularly from disability such as visual impairment (Wahl, Becker, & Burmedi, 2004) and multiple sclerosis (Pakenham, 1999). The beneficial effects of primary control directed at improving or maintaining health and/or functional capacities is shown for a broad array of outcomes ranging from reductions in depressive symptomatology (e.g., Pakenham, 1999; Wrosch et al., 2002; Wrosch, Miller, et al., 2007) to improved patterns of diurnal cortisol secretion (Wrosch, Miller, et al., 2007), positive affect (Wahl et al., 2004), and chronic and functional health problems (Fiksenbaum, Greenglass, & Eaton, 2006; Wrosch & Schulz, 2008) and lower mortality risk (Gitlin, Hauck, Winter, Dennis, & Schulz, 2006). Particularly compelling is a study on primary control enhancing interventions with older adults prone to fall (Gitlin, Winter, et al., 2006) showing major benefits in terms of greatly reduced difficulties with everyday activities and fear of falling and improved self efficacy. Another line of research shows the benefits of primary control striving in the transition to adulthood: Primary control striving benefits both objective outcomes in terms of earning coveted vocational training positions (Haase, Heckhausen, & Köller, 2008) and subjective transition outcomes, such as positive affect (Haase, Heckhausen, & Köller, 2008).

Life-Span Trajectories of Primary and Secondary Control

The life span viewed as an action field for the individual involves major changes in the capacity to exert primary control that are based on fundamental biological and social changes in available resources (e.g., strength, vitality, income, social status, social roles). To be effective agents in their own development, individuals need to be aware of these changes of control capacity across the life span (Proposition 3) and adjust their control striving accordingly (Proposition 4).

(3) Adults expect to lose primary control capacity with increasing age—Adults at various ages expect increasing developmental losses and decreasing gains in psychological functioning across adulthood and particularly in advanced older age (J. Heckhausen, Dixon, & Baltes, 1989). These gains and losses at older ages are expected to be less controllable (J. Heckhausen & Baltes, 1991), and older adults perceive developmental change (Lang & Heckhausen, 2001) and life regrets (Wrosch & Heckhausen, 2002) to be less controllable than do young adults. In a large survey of adults ranging widely in age, perceived personal mastery and perceived constraints to control were separately assessed and showed a stable sense of personal mastery across age groups but increasing constraints to control in older adults (Lachman & Firth, 2004).

(4) Primary control striving is stable and secondary control striving increases across adulthood—Findings regarding age differences in primary control striving are mixed, reflecting stable (J. Heckhausen, 1997), increasing (Wrosch, Heckhausen, & Lachman, 2000), and decreasing (Brandtstädter & Renner, 1990) age-related trajectories. General measures of primary control striving appear to reflect either decreases (Brandtstädter & Renner, 1990), stability (J. Heckhausen, 1997), or increases across age (Wrosch et al., 2000). These

mixed results may reflect different measurement strategies, with decreases found for an assessment of tenaciousness in goal striving that comprises both positively and negatively worded items (Brandtstädter & Renner, 1990) and increases found for self-reports of persistence in goal striving (Wrosch et al., 2000). The scale developed based on our theory and addressing self-report of behavior involved in persistent goal engagement (e.g., increasing effort when facing obstacles) yielded stable life-course trajectories. Another complicating factor is that aspirations may also vary with age. For example, in one study, downward adjustment of aspirations was coupled with increased persistence (Wrosch et al., 2000). Thus, people may downwardly adjust their goals, which may facilitate more vigorous striving for those goals. Future research should investigate under which conditions in life people perceive their primary control strivings to be more or less persistent and resilient to challenges, as well as how primary control pursuit and goal adjustments work together.

Regarding secondary control striving, the available evidence consistently shows increases with age (Brandtstädter & Renner, 1990; J. Heckhausen, 1997; Wrosch, Bauer, & Scheier, 2005; Wrosch & Heckhausen, 1999, 2002; Wrosch et al., 2000; Wrosch, Scheier, Miller, et al., 2003). Older adults report using more goal disengagement, more downward goal adjustment, and more reinterpretations of events and failures that allow the individual to protect the self and its motivational resources.

Optimization of Goal Choice and Use of Control Strategies

The model of optimization in primary and secondary control (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993) proposes a set of three heuristics that individuals should use for optimizing their choice of goals in such a way as to maximize primary control capacity across the life span. First, the chosen goal, and accordingly goal engagement and disengagement, should reflect congruence with opportunities for control; second, the goal choice should consider consequences for other goal pursuits; and third, the choice should help to maintain diversity of goal pursuits (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993; Schulz & Heckhausen, 1996). Empirical evidence pertaining to these propositions is unevenly distributed. The two propositions about opportunity congruence of goal engagement and goal disengagement have been widely studied, whereas the other heuristics have received little attention in the empirical literature.

(5) Optimization heuristics have effects on outcomes via their regulatory role for using primary and secondary control strategies—Preliminary evidence from two studies (Haase, Heckhausen, & Wrosch, 2008; J. Heckhausen, Schulz, & Wrosch, 1998) indicates that the optimization heuristics of age appropriateness, considering consequences for other goal pursuits, and maintaining goal diversity influence subjective well-being as a function of their effect on specific control strategies involved in goal engagement and goal disengagement. This suggests that the optimization heuristics activated control strategies, which in turn affected outcomes. More research using fine-grained longitudinal studies is needed to examine how optimization strategies forecast adaptive control striving and consequent outcomes.

(6) People choose to engage with a goal when the opportunities for goal attainment are favorable—There is an abundance of studies that address whether individuals choose goals that are congruent with the control opportunities he or she encounters at a given age or life circumstance. A first group of studies examines age-graded differences in choice of developmental or life goals. These studies show that individuals select goals in accordance with age-related changes in control potential across the life span and between different domains of life (Cross & Markus, 1991; Ebner, Freund, & Baltes, 2006; J. Heckhausen, 1997; J. Heckhausen, et al., 2001; Nurmi, 1992; Rothermund & Brandtstädter,

2003; Salmela-Aro, Nurmi, Saisto, & Halmesmäki, 2001; Sheldon & Kasser, 2001; Wrosch & Heckhausen, 1999). In general, goals aiming at developmental gains are more common among younger adults, whereas older adults increasingly report goals directed at preventing losses (Ebner et al., 2006; J. Heckhausen, 1997; Ogilvie, Rose, & Heppen, 2001). Investigations of the domain-specificity of goal choices in different adult age groups has well established that midlife adults avoid career-related goals when major gains in this domain are no longer attainable (Cross & Markus, 1991; Heckhausen, 1997; Nurmi, 1992) and focus on health-related goals when losses in this domain have become an urgent threat to their control capacity (Cross & Markus, 1991; Heckhausen, 1997; Rothermund & Brandtstädter, 2003). Moreover, individuals at various ages have been shown to closely calibrate their goal choices and aspirations to their current control potential in specific domains, as, for example, when German high-school graduates apply to vocational training positions (J. Heckhausen & Tomasik, 2002; Nagy, Köller, & Heckhausen, 2005), American high-school seniors express more certainty about educational and vocational goals than about family-related and material goals (Chang, Chen, Greenberger, Dooley, & Heckhausen, 2006), and older adults adjust their selective and compensatory primary control engagement to their physical health and advanced old age (Haynes, Heckhausen, Chipperfield, Newall, & Perry, in press; Menec, Chipperfield, & Perry, 1999; Rothermund & Brandtstädter, 2003; Wahl, Schilling, & Becker, 2007).

Finally, several studies have demonstrated that individuals not only choose goals that match their control capacity but also that such choices have benefits for the individual. A case in point is the engagement with educational goals in the post-high-school transition in the United States (J. Heckhausen & Chang, in press), which leads to superior developmental outcomes, both in terms of subjective well-being and educational attainments. Convergent evidence comes from a study of middle-tier school (i.e., *Realschule*) graduates in Germany striving for vocational training positions (Haase, Heckhausen, & Köller, 2008; Nagy et al., 2005). Finally, older adults who are actively engaged in dealing with ongoing and reversible health problems experience fewer health declines and fewer depressive symptoms (Wrosch & Schulz, 2008; Wrosch et al., 2002; Wrosch, Schulz, et al., 2007). Similarly, Gitlin, Hauck, Dennis, and Schulz (2007) found among African Americans that primary control striving for maintaining everyday activities helps to protect those who struggle with severe functional difficulties from developing depression. The same research group also showed that physical and occupational therapy interventions enhancing the primary control of older adults with functional difficulties significantly improved the participants' chances of survival (Gitlin, Hauck, Winter, et al., 2006; Gitlin, Winter, et al., 2006).

(7) Goal disengagement: People choose to disengage from a goal when the opportunities for goal attainment are unfavorable—Several studies show that individuals disengage from goals that are no longer attainable because of losses in control capacity related to aging, age-related societal opportunities, or illness and disability. Specifically, at older ages during the life span, adults disengage from gain-oriented goals and focus on loss-avoidance goals (Ebner et al., 2006; Heckhausen, 1997). Moreover, older adults avoid certain domains of life that have earlier age peaks in opportunity (e.g., child-bearing, partnership, work, finances) when they report personal developmental goals (Heckhausen, 1997; Heckhausen et al., 2001; Wrosch & Heckhausen, 1999) or ascribe less importance to keeping up with young adult levels of performance (Rothermund & Brandtstädter, 2003). With spinal cord injuries, adults at various ages have been found to degrade the importance of goals in domains that are seriously compromised by the disability (e.g., bearing children, having a career; Weitenkamp et al., 2000). When suffering serious illness or disability (Menec et al., 1999) and at very advanced ages (Rothermund & Brandtstaädter, 2003), older adults even disengage from efforts to avoid further losses in health and everyday functioning.

An abundance of studies shows that such disengagements from unattainable goals benefit the well-being and/or mental and physical health of the individual. Individuals who experience a loss of control due to unfortunate life circumstance, aging, or illness and disability can buffer the negative effects of this loss on subjective well-being, mental health, self-esteem, and perceived personal control by disengaging from relevant goals. When experiencing loss of control (e.g., decreased fertility at midlife, college major is too difficult), individuals at various ages can maintain their subjective well-being (e.g., less burn-out, higher perceived control, less depression) by disengaging from the goals that are rendered unattainable (Brandtstädter & Rothermund, 1994; Carver, La Voie, Kuhl, & Ganellen, 1988; de Rijk, Le Blance, Schaufeli, & de Jonge, 1998; J. Heckhausen, et al., 2001; Thompson et al., 2006; Wallace & Bergeman, 1997; Wrosch et al., 2005; Wrosch & Heckhausen, 1999; Wrosch, Miller, Scheier, & Brun de Pontet, 2007; Wrosch, Scheier, Miller, et al., 2003). For instance, late-midlife adults who disengage from important goals, such as bearing a child or finding a romantic partner, during a time of life associated with steep declines in opportunities for these goals benefit in their subjective well-being and mental health compared with individuals who do not disengage from these goals (Heckhausen et al., 2001; Wrosch & Heckhausen, 1999). Analogously, for experiences of control loss that are due to chronic illness and/or disability (e.g., macular degeneration, multiple sclerosis, HIV), individuals who disengage from goals that have become futile because of the disability or illness can protect themselves from mental health problems (e.g., satisfaction with life, mood, depression; Boerner, 2004; Evers, Kraaimaat, van Lankveld, Jongen, & al., 2001; Rothermund & Brandtstädter, 2003; Thompson, Nanni, & Levine, 1994) and even promote better health outcomes (Evers et al., 2001). There is even evidence that a dispositional ability to disengage from unattainable goals can benefit biological functioning and physical health (e.g., cortisol secretion, systemic inflammation, symptoms of illness; Miller & Wrosch, 2007; Wrosch, Miller, et al., 2007).

(8) When choosing a goal, the beneficial and detrimental consequence for other goals are taken into account—Some studies have started addressing this optimization heuristic. For example, compared with younger adults, older adults chose goals more frequently that facilitate attaining other goals (Riediger et al., 2005). For young and older adults, intergoal facilitation is beneficial for goal engagement, and between-goal interference is detrimental to well-being. In addition, experimental research suggests that individuals activate overriding higher order goals automatically if they are being tempted to engage in goals that are incongruent with their higher order goals (Fishbach, Friedman, & Kruglanski, 2003). Consistent with these findings, other research has demonstrated that an activation of important life goals is associated with an inhibition of alternative life goals, particularly among individuals who are highly committed to their goals (Shah, Friedman, & Kruglanski, 2002). This line of research suggests that individuals possess implicit dispositions toward avoiding short-term temptations in favor of long-term goals, which predict adaptive behavioral responses aimed at achieving self-relevant long-term goals (Fishbach & Shah, 2006).

(9) When choosing a goal, people try to maintain activity in diverse areas of life—This optimization heuristic has so far been largely neglected in empirical research. However, Kumashiro, Rusbult, and Finkel (2008) reported evidence in support of this proposition by showing that individuals seek equilibrium between goals in different key areas of life, namely personal and relational concerns. Their research demonstrated that after having been overly dedicated to one life domain, individuals reduce their motivation to make further progress in that domain and instead pursue goals in alternative domains that have been neglected.

Action Phases of Goal Choice, Goal Engagement, Goal Disengagement, and New Goal Engagement

The action-phase model of developmental regulation specifies how cycles of goal engagement and disengagement sequentially unfold over the life course and in coordination with waxing and waning opportunities to attain important life goals. The model makes specific predictions about discrete shifts from goal choice to goal engagement (Proposition 10) and from goal engagement to goal disengagement (Proposition 12), about the use of primary and secondary control strategies in action phases of goal engagement (Proposition 11) and disengagement (Proposition 13), about the facilitative role of alternative goal pursuits for goal disengagement (Proposition 14), and about functionally adapted mindsets for each phase (Proposition 15). Empirical evidence for these more recent developments of our theory is still scarce, particularly with regard to the shifts between action phases.

(10) When people make a goal choice, their mode of functioning shifts to goal engagement—This phenomenon has so far not been addressed by empirical research in the area of life-span development. However, in motivational research, shifts from choosing (deliberation) to acting (implementation) have been demonstrated extensively within the theoretical framework of the Rubicon model (Achtziger & Gollwitzer, 2008; Beckmann & Gollwitzer, 1987; Gollwitzer, 1990; H. Heckhausen & Gollwitzer, 1987).

(11) Secondary control strategies enhance the effectiveness of primary control strategies during goal engagement—The three studies addressing this issue have suggested that secondary control strategies can help maximize primary control striving. It is interesting to note that this beneficial effect of secondary control strategies on primary control striving can play out in diverse scenarios. First, secondary control strategies can help to turn a success experience into a motivational resource for primary control striving (Hall, Perry, Ruthig, Hladkyj, & Chipperfield, 2006). Second, selective secondary control strategies can buffer the negative effects of major stressful life events on goal engagement (Poulin & Heckhausen, 2007). Finally, even compensatory secondary control strategies can support primary control striving, as in the case of Parkinson's disease patients who controlled their emotional response to the illness and adjusted their self-concept, which, according to McQuillen, Licht, and Licht's (2003) findings enabled them to successfully work on keeping illness-related restrictions to their activities at a minimum.

(12) When people find a certain goal pursuit futile or too costly, they shift to goal disengagement—This phenomenon has so far rarely been addressed by empirical research. A notable exception is a study by Babb et al. (in press) that used hypothetical vignettes about peer-related challenges that became increasingly uncontrollable. Older children responded with switching to adjustment, whereas younger children and children with attention-deficit/hyperactivity disorder tended to stick to primary control in spite of its apparent futility.

(13) Self-protective and goal-disengaging compensatory secondary strategies are combined during goal disengagement—Several studies have showed that compensatory secondary control strategies that involve self-protective cognitions have beneficial effects on objective and subjective outcomes. Downward social comparisons and causal attributions avoiding self-blame protected older adults from regret-related despair (Bauer, Wrosch, & Jobin, 2008). Downward social comparison in older adults with low personal-control perceptions were associated with fewer hospitalizations and lower mortality (Bailis, Chipperfield, & Perry, 2005). Attributions that avoid self-blame for outcomes perceived as uncontrollable (Tykocinski & Steinberg, 2005) were found to predict better well-being (Mendola, Tennen, Affleck, McCann, & Fitzgerald, 1990). One study experimentally enhanced self-protective secondary control by instructing subjects to compare themselves with

others who are worse off or attribute negative outcomes to causes outside the self. These interventions were effective in reducing regret-related despair, thereby avoiding adverse consequences for physical health (Wrosch, Bauer, Miller, & Lupien, 2007).

(14) Goal disengagement is easier when an alternate goal can be pursued—

Under conditions of control loss or severe constraints to the individual's control, individuals should disengage from a futile goal. Disengagement will be facilitated if an alternative goal is attainable that could profit from the resources freed up by disengagement (Proposition 3; see Table 2). This proposition reflects the idea that goal disengagement is particularly adaptive if it frees up resources for alternative primary control pursuits. Experimental and field studies with young (Aspinwall & Richter, 1999; Wrosch, Scheier, Miller, et al., 2003) and older adults (Duke, Leventhal, Brownlee, & Leventhal, 2002; Wrosch, Scheier, Miller, et al., 2003) indicated that the availability of alternative or substitute goals facilitates disengagement from unattainable or uncontrollable goals. In addition, there is evidence that the selection and pursuit of new goals has beneficial affective and health effects, particularly among people who are engaged in the pursuit of unattainable goals (Wrosch, Scheier, Carver, & Schulz, 2003; Wrosch, Miller, et al., 2007). Such beneficial effects of alternative goals extend to the experience of older adults' life regrets: Among older adults, having multiple goals for the future was associated with reduced levels of regret intensity, whereas for younger adults, having many goals was related to intensified regret experiences (Wrosch et al., 2005).

(15) Information processing is biased to support the function of either goal engagement or goal disengagement—

Several studies have tested the hypothesis that information processing is functionally adapted to an action phase of goal engagement versus goal disengagement. Three of these studies addressed goal striving and control behavior before and after passing a developmental deadline and supported the predictions that during phases of goal engagement, information processing (specifically visual fixation and incidental memory) favoring goal pursuit is dominant (Light & Isaacowitz, 2006; Wrosch & Heckhausen, 1999) and that during phases of goal disengagement, information favoring goal pursuit is inhibited (Light & Isaacowitz, 2006) and less well recalled (J. Heckhausen, et al., 2001). Related research was conducted in the theoretical context of the dual-process model of self-development (Brandstädter, 2006; Brandstädter & Rothermund, 2002). Under conditions of uncontrollability, individuals adhere to an accommodative mindset that renders positive, self-protective, and goal-irrelevant information more salient (Rothermund, 2006). In contrast, under conditions of controllable threats, sensitivity to danger (Brandstädter, Voss, & Rothermund, 2004) and pain signals (Rothermund, Brandstädter, Meiniger, & Anton, 2002) are enhanced. In addition, research in the general area (i.e., outside of developmental psychology) of self-regulation and mental control shows that goal commitment is associated with cognitive inhibitory processes that protect goal pursuit from distracting influences from alternative goals (Kuhl, 1985), which is beneficial for goal pursuit and attainment (Kuhl & Weiß, 1994; Shah et al., 2002).

Summary

The empirical evidence strongly supports the ubiquitous preference for primary control when it is available and the benefits from primary control striving. Regarding the theoretically predicted trajectories of primary and secondary control, the evidence also shows that adults at various ages perceive life-span changes in primary control capacity; more specifically, they expect declines with increasing age and particularly in advanced older age. Empirical evidence regarding primary control striving is somewhat complicated by the fact that although control striving remains active, individuals adjust their goals to changing opportunities. In other words, individuals attempt to make the most of their control capacity at any given time in life.

Regarding secondary control striving and particularly goal disengagement and self-protection, evidence consistently shows increased use at older ages.

Optimization of goal choice was supported by findings showing that individuals engage in goal pursuit when opportunities are favorable and disengage from goals when opportunities are unfavorable. However, few studies addressed the proposition that goal choice would be informed by considering consequences for other goal pursuits, and only one study to date has shown that individuals attempt to maintain diversity in their goal pursuits. Additional research is needed on how optimization heuristics influence the activation of control strategies.

Finally, regarding the propositions based on the action-phase model of developmental regulation, empirical research has begun to address questions regarding the effective use of control strategies for goal engagement and for goal disengagement, action-phase-specific mindsets, and the processes involved in the shift from one phase to the other (i.e., from goal choice to goal engagement and from goal engagement to goal disengagement). Evidence to date supports many of the propositions of the action-phase model regarding the role of motivational and volitional processes guiding control behavior and during goal engagement and disengagement cycles.

Productive Areas for Research

Although many of the major propositions of our Motivational Theory of Life-Span Development are now supported by empirical research, there remain several additional unresolved questions that should be addressed in future research. We present suggestions for exploring the rich array of research ideas encompassed by our theory.

Optimization, Goal Selection, and Reselection

The regulatory metastrategies involved in optimized goal choice have only rarely been addressed in the empirical literature (Haase, Heckhausen, & Wrosch, 2009). We proposed that major heuristics for making adaptive choices of goals are goal–opportunity matching, management of consequences (or trade-offs) between goals, and goal diversity (J. Heckhausen, 1999; J. Heckhausen & Schulz, 1993). These principles of adaptive goal choice are to some extent part of the societal regulation of the life course, in that constraints and incentives are available at the appropriate times. That way, not everyone has to consciously apply the heuristics to regulating his or her developmental future. However, sometimes these three heuristics (i.e., age-appropriate goal–opportunity matching, management of consequences, goal diversity) lead to conflicting goal choices. Under which conditions can we expect individuals to ignore or counteract a given heuristic of optimization? For example, when is it adaptive for an individual to choose goals that are not well supported by opportunity systems (e.g., off-time goals)? Moreover, when can individuals afford to focus on only one goal, counteracting the heuristic of diversity in goal choice? According to our theory, such narrow and exclusive investment can be successful only if the individual has unusually abundant resources for the chosen goal, high individual talent, and a supportive social context (J. Heckhausen, 1999; Schulz & Heckhausen, 1996). It would be fascinating to retrace the life histories of goal selection and pursuit in highly specialized experts who strive for world-class levels of performance. A related question concerns when and how highly specialized individuals abandon their primary goal pursuits.

Another related set of questions concerns negative trade-offs between areas of goal investment. Being successful in pursuing specific goals can be seductive and lead an individual to invest too much energy, time, and effort in a limited set of goals to the exclusion of others. How do individuals gauge the costs of lost opportunities? Is the dominant pattern of goal engagement over time one of capitalizing on success and following a canalized path into specialized goal

investment? Or alternatively, do people follow the logic of diminished returns, thus investing in formerly neglected goal domains as soon as a certain level of accomplishment is achieved in their primary domain (Kumashiro et al., 2008; Lindenberg, 1996)?

Research should also address the response to repeated failures in the pursuit of a cherished goal. When do individuals give up on a failure-ridden goal domain and pursue alternative but closely related goals? In this context, the issue of fundamental goal areas becomes critical, within which substitutions are possible. Different research traditions in motivational psychology (Deci & Ryan, 2000; J. Heckhausen & Heckhausen, 2008; Ryan & Deci, 2000; Skinner & Wellborn, 1994) and life-course sociology (Lindenberg, 1996; Steverink & Lindenberg, 2006) identify slightly different but converging sets of basic needs or motives that guide behavior. Striving for control and mastery, for positive and meaningful relations with other people, and for influencing others or at least not being dominated by others (autonomy) appear to be commonly accepted as fundamental needs or (implicit) motives for human productivity and well-being (J. Heckhausen & Heckhausen, 2008).

Finally, shifts between goals, particularly between goals from different content domains, are very challenging. Future research could ask which goal commitments require discrete and intentional shifts in commitment or engagement and which involve gradual reorganizations and reevaluations of preferences. It may be difficult to intentionally downgrade the importance of a self-relevant goal and reengage with a different goal, because this might require some kind of self-deception (Brandstädter, 2000). Perhaps shifts that involve goals central to identity and therefore require an orchestrated investment of resources are more amenable to intentional reengagement.

Development of Optimization and Control Processes in Childhood and Adolescence

Coping and self-regulatory processes are subject to developmental growth during childhood and adolescence (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Compas & Worsham, 1991; J. Heckhausen & Heckhausen, 2008; J. Heckhausen & Schulz, 1995; Rudolph, Dennig, & Weisz, 1995). Research in this area has been infused with several theoretical models on how to slice the phenomena of coping and self-regulation into categories of behavior distinguished by their degree of intentionality and engagement versus disengagement (Compas et al., 2001), whether they address the basic human need of competence, relatedness, or autonomy (Skinner & Wellborn, 1994), whether they are directed at the situation, one's own behavior or one's emotion (Eisenberg, Fabes, & Guthrie, 1997), or whether they involve primary control or secondary control processes (J. Heckhausen & Heckhausen, 2008; Rudolph et al., 1995).

Recent research shows that overall, children and adolescents who are goal engaged and use problem-focused coping attain better psychological adjustment (Compas et al., 2001). In contrast, disengagement and emotion-focused coping is associated with poorer psychological adjustment. However, a few studies suggest that engagement and problem-focused coping is maladaptive with uncontrollable stressors (e.g., parental conflict, sexual abuse) and that disengagement under such circumstances is associated with better adjustment (Compas, 1987; Forsythe & Compas, 1987; Rudolph et al., 1995). Converging evidence comes from studies on children's coping when undergoing medical procedures or experiencing illnesses that they could not control (Rudolph et al., 1995; Saile & Huelsebusch, 2006; Thurber & Weisz, 1997b; Weisz, McCabe, & Dennig, 1994) or being stuck at summer camp when suffering from homesickness (Thurber & Weisz, 1997a, 1997b). Together, these studies suggest that with increasing age during mid childhood and adolescence, youth become increasingly competent in deciding when primary control striving is useful and when it is futile. Moreover, when primary control potential is low (e.g., when you are homesick at an overnight camp), older

adolescents are more skilled than younger youths in the use self-protective secondary control strategies.

Future research should investigate how developmental advances in cognitive capacities and emotional self-regulation enable children and adolescents to identify the control potential for a given goal and to activate the relevant control strategies of goal engagement or disengagement accordingly. For example, do the mental processes involved in optimization (goal choice) require anticipation of positive and negative consequences, the representation of counterfactual scenarios (what if I do this, what if I do that?), and thus a cognitive maturity built on formal operations (Band, 1990)? Moreover, is the development of control strategies universal, or can we expect significant individual differences? One study of children's coping with chronic headaches suggests that 10-year-olds already show individual differences in choosing control strategies to match the controllability of challenges (Saile & Huelsebusch, 2006). Those children who failed to adjust their control behavior to the actual degree of controllability in everyday challenges (e.g., studying for an exam; being nonathletic and never chosen for a team) also used maladaptive strategies of coping with their headaches.

Ideally, one would conduct longitudinal studies to track the unfolding of general developmental progress in self-regulation and control strivings. Such longitudinal studies could also investigate the developmental origins and trajectories of individual differences in control-related behavior. For example, individuals may develop patterns of primary control striving that reflect very high or even excessive persistence when facing insurmountable obstacles, whereas others are more amenable to disengage. Similarly, unusually low thresholds for goal disengagement can also develop as a consequence of developmentally inappropriate parental demands on children's performance (J. Heckhausen & Heckhausen, 2008). A good example for longitudinal research in this area is the study by Wrosch and Miller (2009), which showed that among adolescents, the capacity for goal disengagement is enhanced after phases of depressive symptoms and that this very capacity to disengage seems to act as protection against later depressive symptomatology.

The secondary control strategies that are directed at either enhancing volitional commitment or compensating for failure and protecting motivational resources pose particular cognitive challenges, because they require that the individual takes a metastance toward his or her own motivational and emotional state of mind and generates means to influence it in ways that maximize motivational resources. Examples are self-protective causal attributions, avoidance of self-blame, self-enhancing social comparison, and devaluing an unattainable goal ("sour grapes"). The level of cognitive sophistication required for such strategies makes them elusive in childhood and "defers" their elaboration to adolescence (J. Heckhausen & Heckhausen, 2008; J. Heckhausen & Schulz, 1995). Do they all develop in parallel, or do they supersede each other? Do cultures or families differ with regard to which strategies they prefer (e.g., devalue unattainable goal) and which they shun (downward social comparison)?

Finally, children have to learn to orchestrate primary and secondary control strategies so that a switch from goal choice to goal engagement is made most efficiently; similarly, they must learn to switch from goal engagement to goal disengagement, which requires concerted efforts to deactivate ongoing primary control striving and counteract motivational commitments, as well as handling threats to self-esteem and hopefulness. In sum, the development of optimization and control strategies opens a fascinating field of research that is far from exhausted. In particular, the development of secondary control strategies and the management of interphase transitions between goal engagement and disengagement are ripe for future investigation.

Social Relationships and Developmental Agency

In recent years, researchers have begun to investigate primary and secondary control behavior in the context of social relationships (Smith et al., 2000). Perceived interpersonal control was found to be a key determinant of satisfaction with relationship quality in mother–daughter relationships (Martini, Grusec, & Bernardini, 2001; Smith et al., 2000). Specifically tailored control strategies for dealing with interpersonal conflict in later life were found to be effective in securing retreating lines of defense and ranged from protecting relationship harmony to (merely) protecting one’s emotional balance (Sorkin & Rook, 2004).

Social relations can themselves become important instruments for individual agents trying to regulate their own development, particularly when the existing societal context does not prescribe or support a chosen goal. For example, if a youth decides to forgo college and pursue a self-designed career as a rock musician, societal institutions typically do not facilitate this engagement. In this situation, goal pursuit can be facilitated if the individual is able to rely on a social network of like-minded others who can provide support as well as model means and ends.

An individual’s network of social relationships is probably one of the most flexible, dynamic, and at the same time robust contexts that shapes development (Lang & Heckhausen, 2005, 2006). Some social relationships are defined by the social context (e.g., coworkers, classmates), whereas others are the result of more or less intentional selection of social relationships (e.g., marital partner; Lang, 2001). Broader and longer-term adjustments of social networks in accordance with individuals’ changing motives have been reported in several studies, consistent with propositions of socioemotional selectivity theory (Carstensen et al., 1999). With increasing age, older adults selectively maintain close emotional relationships and discontinue weaker ties that would have more instrumental value (Lang & Carstensen, 1994). Proactive molding of one’s social network by selectively keeping social ties to some select people and dropping ties to others may well be most effective for bringing about transactional influences between the individual agent and his or her social context (J. Heckhausen & Heckhausen, 2008). By selecting social partners who are also committed to one’s preferred goals and by influencing one’s social relationships accordingly, one can set oneself up for a successful trajectory. Alternatively, selecting social partners who adhere to conflicting goals can have detrimental consequences. One exemplar study investigated the career goals and social relationships of Finnish high-school graduates during the transition into work life (Jokisaari & Nurmi, 2005). Social ties with peers of higher socioeconomic status were associated with full-time employment 1 year after graduating from school. Also, social relations that were seen as a hindrance to one’s goals were associated with lower quality jobs 1 year after high school.

We have just begun to explore the ways in which proactive shaping of one’s social relationships influences future developmental ecologies and, thus, a sustained developmental path of the individual (Lang & Heckhausen, 2005, 2006). These efforts suggest that future research on the motivational processes involved in social relationships will greatly contribute to our understanding of successful development.

Cultural Differences in Reliance on Secondary Control

There has been a longstanding debate about culture-related differences in control behavior (Azuma, 1984; Gould, 1999; J. Heckhausen & Schulz, 1999b; Schulz & Heckhausen, 1999; Weisz, Rothbaum, & Blackburn, 1984). In particular, the proposition regarding the functional primacy of primary control as a universal characteristic of human (and beyond that, vertebrate) behavior, was rejected by some researchers in the field of culture-comparative psychology (Morling & Evered, 2006). However, the first cross-cultural comparison using a Turkish

translation of the OPS scales indicated similar patterns of endorsement for control strategies between Turkish and European adults at various age levels (Ucanok, 2002). More recently, a study using a Chinese translation of the OPS scales with large samples of mainland Chinese students and young adults showed that among mainland Chinese students, primary control striving for academic goals was strongly endorsed and did not drop significantly, even after experiencing a major failure or setback at the university entrance exam (Wong, Li, & Shen, 2006). Accepting failure did not appear to appeal to these Chinese youths. On the contrary, compensatory secondary control strategies and, in particular, goal disengagement were used to a very small extent compared with samples from Western industrial countries studied in other research.

The argument about the cultural relativity of primary control striving boils down to the proposition that individuals from interdependent cultures are more oriented toward others in their community or immediate social group when choosing goals (Markus & Kitayama, 2003; Morling & Evered, 2006). This does not conflict with the Motivational Theory of Life-Span Development, which makes no assumptions about the individualistic versus collectivistic generation of goals for primary control. The issue of how goals are selected is one of optimization. A promising question for further research is whether interdependent cultures use additional, more community-oriented heuristics to select goals.

A related issue is whether in a certain culture some specific threats to primary control are viewed as accessible to primary control, as opposed to secondary control in some other cultures. In a study comparing preferred control strategies in Thai and American children, Thai children were found to prefer secondary control when adult authority figures were involved or when being separated from a friend (McCarty et al., 1999). American children, by contrast, favored secondary control in case of physical injury. Thus, there is not simply a main effect of culture on preferred control strategy, but culture and stressor characteristics interact to determine preferences for primary or secondary control.

Our theory does propose cultural differences in the way goals are pursued and disengaged from (Schulz & Heckhausen, 1999), particularly with regard to secondary control strategies, both selective and compensatory, that involve the self. With a lesser focus on independent and self-centered aspects of agency (Markus & Kitayama, 2003), East Asian and other cultural groups around the globe may be less dependent on using secondary control strategies for keeping self-esteem and self-concept at high levels. Evidence supporting this idea comes from a study showing less use of self-protective secondary control strategies among Japanese and East Asian Canadians compared with European Canadians (Tweed, White, & Lehman, 2004) and from Wong et al.'s (2006) study of mainland Chinese people showing resilience in primary control striving, even after major setbacks and little use of self-protective strategies.

We need to learn more about the dynamics of different primary and secondary control strategies in different cultural contexts and how different degrees of interdependent versus independent socialization affect usage of specific control strategies (Ashman, Shiomura, & Levy, 2006; Cheng, 2000). For example, goal disengagement in interdependent cultures may require that others who are involved in goal pursuit are persuaded of the necessity to disengage, just as it requires self-protection for individuals socialized in independent cultures.

Individual Agency, Social Change, and Migration

The modern world with its rapid changes, increased interdependence of national economies, easy access to international travel, and stark contrasts between different societies' control potential brings about new challenges and opportunities for individual agency. For basic research, these globalization-related societal developments afford opportunities to study the interface of individual and society in a dynamic adjustment process. There are two major sets

of questions resulting from processes of increased international interdependence and exchange. First, what are the effects of social change on individual agency and control striving within specific national states and their societies? Second, how does the control potential in different societies affect individuals' decisions to leave a given societal setting and seek a more favorable one? Regarding the first question, international life-course sociological research programs have identified the consequences of globalization processes as rendering life-course planning and particularly career-planning more difficult, because long-term career paths are becoming de-standardized,² less predictable, and thus long-term consequences of individual decisions have become less transparent (Blossfeld et al., 2007; Buchholz et al., in press). However, the degree to which these changes in globalization affect different parts of the population in different countries depends on the subgroup (e.g., young adults, women, preretirement employees) and the welfare policies of a given society. In general, youths and young adults who have not yet established their status in the labor market are more severely affected by the loss in predictability of life courses (Blossfeld, Mills, Klijzing, & Kurz, 2005). Women who have interrupted their careers for family care (e.g., caring for a child or ill parent) also experience major discontinuity and uncertainty (Blossfeld & Hofmeister, 2006). In contrast to these groups, men with established vocational careers in midlife are least affected (Blossfeld, Mills, & Bernardi, 2006). For people close to or in retirement, the impact of the globalized economy has led to early retirement plans and unemployment imposed by employers and instigated by general economic crisis, thus reducing primary control capacity of the individual. The severity of these consequences for older employees depends on the retirement provisions of the particular welfare state (Blossfeld, Buchholz, & Hofäcker, 2006). In fact, for all subgroups of society, the severity and specifics of the globalization effects are filtered by the specific characteristics of the national labor market, the educational and retirement system, and the role of the family. Thus, in some countries (e.g., Scandinavian countries) the negative effects of increased uncertainty in the labor market are buffered, and in others (e.g., Great Britain, the United States) the impact is direct and mostly unmitigated by state-run welfare systems or family networks (Hofäcker, Buchholz, & Blossfeld, in press).

What are the consequences of globalization for adaptive control striving for individual agents? If career paths become more unstable, there may be more opportunities for upward mobility of individuals and therewith an increase in primary control capacity. However, a situation with less societal structuring of opportunities also means that individuals have to rely more on their personal and social capital, and that is unevenly distributed across the social strata (J. Heckhausen, in press). Higher educational attainment in particular should play an even greater role in a more thoroughly globalized economy in determining the potential for attaining or maintaining high social status. Disadvantaged groups with low personal and social capital, such as youths, older adults, and women with interrupted careers, are more vulnerable to becoming marginalized and relegated to precarious forms of employment (Bynner & Parsons, 2002).

It is difficult to predict how social class affects self-regulatory processes in the context of globalization-related social change. On the one hand, under circumstances of social marginalization and particularly low levels of individual resources (e.g., long-term unemployment), it is essential that an individual identifies those goals that are attainable and aggressively pursues them. On the other hand, it can be argued that a minimum of social resources is needed to pursue any developmental goal and that severe resource constraints essentially relegate the individual to pursue short-term survival goals. Among individuals with sufficient resources to regulate their developmental trajectories, one would predict that a keen

²Brueckner and Mayer (2005), however, argued that a strongly standardized life course was the exception rather than the rule in modern societies anyway and that destandardization of life-course patterns is overstated by many life-course sociologists and actually mostly restricted to the sequencing of family relative to education and career events.

ability to analyze opportunities to optimize goal choices is particularly important during periods of social change. Under conditions of social change, it is essential to master optimization of goal choice in terms of recognizing negative shifts in opportunities and adjusting goal engagement and disengagement accordingly. This may become even more important for individuals with relatively few resources, such as those at the lower end of the social ladder (Tomasik, Silbereisen, & Heckhausen, in press).

Regarding the second set of questions, individuals can decide to leave their current social and geographical setting and migrate to a country with different opportunities for individual agency and upward mobility. As discussed above, even in a globalized world economy, countries and their societal systems differ with regard to the degree of primary control they offer to members of different social groups. Recent research on subjective well-being across the globe has revealed that the degree of free individual choice is a dominant factor in determining the degree of perceived happiness in a country. Specifically, results from representative national surveys carried out between 1981 and 2007 in 52 countries show that happiness is associated with the perception of increased free choice in a given country, and that, in turn, is closely linked to positive economic development, democratization, and increasing social tolerance in a given country (Inglehart, Foa, Peterson, & Welzel, 2008). It would be interesting to investigate whether streams of migration follow country differentials in the extent to which an individual can exert free choices and has control over the short- and long-term outcomes of his or her actions, including the influence on his or her own development and life course.

Evidence-Based Interventions

Our theory is well suited to serve as a conceptual foundation for intervention. The challenges of optimally adapting one's control behavior to the changes in control opportunities across the life span are tremendous, and it is not surprising that many individuals fall short of optimized control behavior at least some of the time. Thus, intervention programs have the potential of helping individuals optimize control behaviors to the specific challenges posed by a particular stressor.

Specifically, guidance and training may be particularly needed with regard to the following aspects of control striving and developmental regulation: optimized goal choice, orchestrated goal engagement (with selective secondary control), willingness to accept and request help from others (compensatory primary control), disengagement from unattainable goals, and compensatory secondary control strategies directed at protecting motivational resources (e.g., self-protective causal attribution).

Research has begun to develop and test intervention strategies for some of these control-related challenges. For example, Weisz, Southam-Gerow, Gordis, and Connor-Smith (2003) developed a primary and secondary control enhancement training to treat mild to moderate child depression and found that children undergoing treatment were significantly improved to the point of being in the normal range of depressive symptoms both immediately after the treatment and 9 months later.

Regarding youths with academic problems, work is underway to investigate the effectiveness of interventions addressing goal setting and the use of primary and secondary control strategies. Educational psychologists working with control-theoretical models have identified particularly vulnerable college students who have little flexibility to adjust goals and use compensatory secondary control strategies but hold high ambitions and strong primary control strivings (Hall et al., 2006). Such students profit significantly, in terms of their motivation for schoolwork and their grades, from training aimed at promoting compensatory secondary control, combined with attributional retraining (i.e., attribute failure to insufficient effort instead of lacking ability; Hall, Perry, Chipperfield, Clifton, & Haynes, 2006). Moreover, to combat failure and dropping

out among college students, this group of researchers has developed and successfully used intervention techniques that focus on retraining the causal attributions for failure such that effort investment is fostered (Perry, Hechter, Menec, & Weinberg, 1993). Ongoing longitudinal work expands this approach to interventions targeting unrealistic goal setting in college students by instructing them on how to disengage from unattainable academic ambitions and reengage with academic goals that match the students' abilities and interests (J. Heckhausen & Hall, 2006).

An important field for control-related interventions is the management of disability and caregiving among older adults. Gitlin et al. have developed multidisciplinary interventions (e.g., occupational therapy, physiotherapy) to prevent falls among frail elderly that are individually tailored to the abilities and circumstances of a given individual (Gitlin, Hauck, et al., 2006; Gitlin, Winter, et al., 2006). These interventions work by mobilizing and improving the remaining physical strengths (i.e., selective primary control) and by instructing the older person to use technical aids and the assistance of others (i.e., compensatory primary control). Many caregiving interventions are based on enhancing caregivers' ability to exert primary control over stressors, such as patient disruptive behaviors, by teaching them rudimentary behavior-modification skills, as well as enhancing their primary and secondary control by coaching them when to seek help from others or accept the fact that some stressors, such as the suffering of the patient, are fundamentally uncontrollable. Because of the multidimensional nature of caregiving challenges, the most effective intervention programs typically enhance both primary and secondary control in multiple domains (Belle et al., 2006). To date, the primary emphasis in intervention studies with caregivers has been on enhancing primary control, with relatively little attention being paid to strategies that involve teaching caregivers which goals are unattainable and giving them the means for disengaging from those goals without feeling guilty. The relatively modest effects reported in the literature may in part be due to the overemphasis on primary control; significant additional benefit may be achieved by focusing as well on training secondary control strategies.

Summary and Conclusion

The Motivational Theory of Life-Span Development focuses on the impressive adaptive capacity of individuals to optimize development across major changes in the life course. Conceptual and empirical work in the past 15 years has shown that this adaptive capacity relies on self-regulation of motivational processes. The challenges individuals face as they develop from infants to adolescents, to adults, and into older age are challenges of selecting, adapting, and pursuing developmental and personal goals to reflect changing life-course opportunities. These motivational self-regulatory skills involve anticipating emergent opportunities for goal pursuit, activating behavioral and motivational strategies of goal engagement, disengaging from goals that have become futile and/or too costly, and replacing them with more feasible and timely goals.

A life-span developmental theory should address the following general challenges and questions: (a) Criteria of adaptive development should be assessed in ways that facilitate interindividual comparison, prevent distortion by subjective biases, and build on cross-cultural consensus about what constitutes a successful life; (b) investigate how the individual as an active agent in development selects and pursues goals and disengages from them; (c) examine the relation between life-course variations in opportunities and individuals' engagement and disengagement with developmental and personal goals; (d) study the heuristics that help the individual to select appropriate goals to invest in, and to compensate for failures, setbacks, and losses when they occur.

Our Motivational Theory of Life-Span Development addresses each of these four challenges and enabled us to derive 15 specific and empirically testable propositions about motivation and control-related behavior and cognition that can be grouped into four major topics: (a) adaptiveness of primary control; (b) life-span trajectories of primary and secondary control; (c) optimization of goal choice and accordant use of control strategies; and (d) action phases of goal choice, goal engagement, goal disengagement, and goal reengagement.

Although many of the major propositions of our Motivational Theory of Life-Span Development are now supported by empirical research, there remain several additional questions that should be addressed in future research. Among these research challenges are the following: How do individuals get from one goal cycle to the next (e.g., substitute goal, alternative domain), and what role do optimization heuristics play in this regard? How do goal selection and control processes develop in childhood and adolescence? What is the role of control processes in social relationships and interpersonal interactions? How can individual agents support their primary control pursuits by selecting and shaping their social networks? Are there differences across different cultures in the use of heuristics of goal choice and the employment of secondary control strategies, particularly as they pertain to self-reinforcement and self-protection? What are the effects of social change on individual agency and control striving within specific countries and societies? What is the role of control potential in individuals' decisions to migrate from one country and society to the other? What are effective intervention programs that combine training in the use of primary and secondary control strategies among populations such as depressed children, struggling college students, and overburdened caregivers for older adults?

The life-span theory of control originally proposed in 1995 has developed and elaborated a comprehensive Motivational Theory of Life-Span Development that comprises a set of specific testable propositions. This conceptual framework has guided much empirical research during the last 15 years, and many of its propositions have received substantial empirical support. However, some propositions remain to be tested, and an abundance of related research questions await empirical inquiry.

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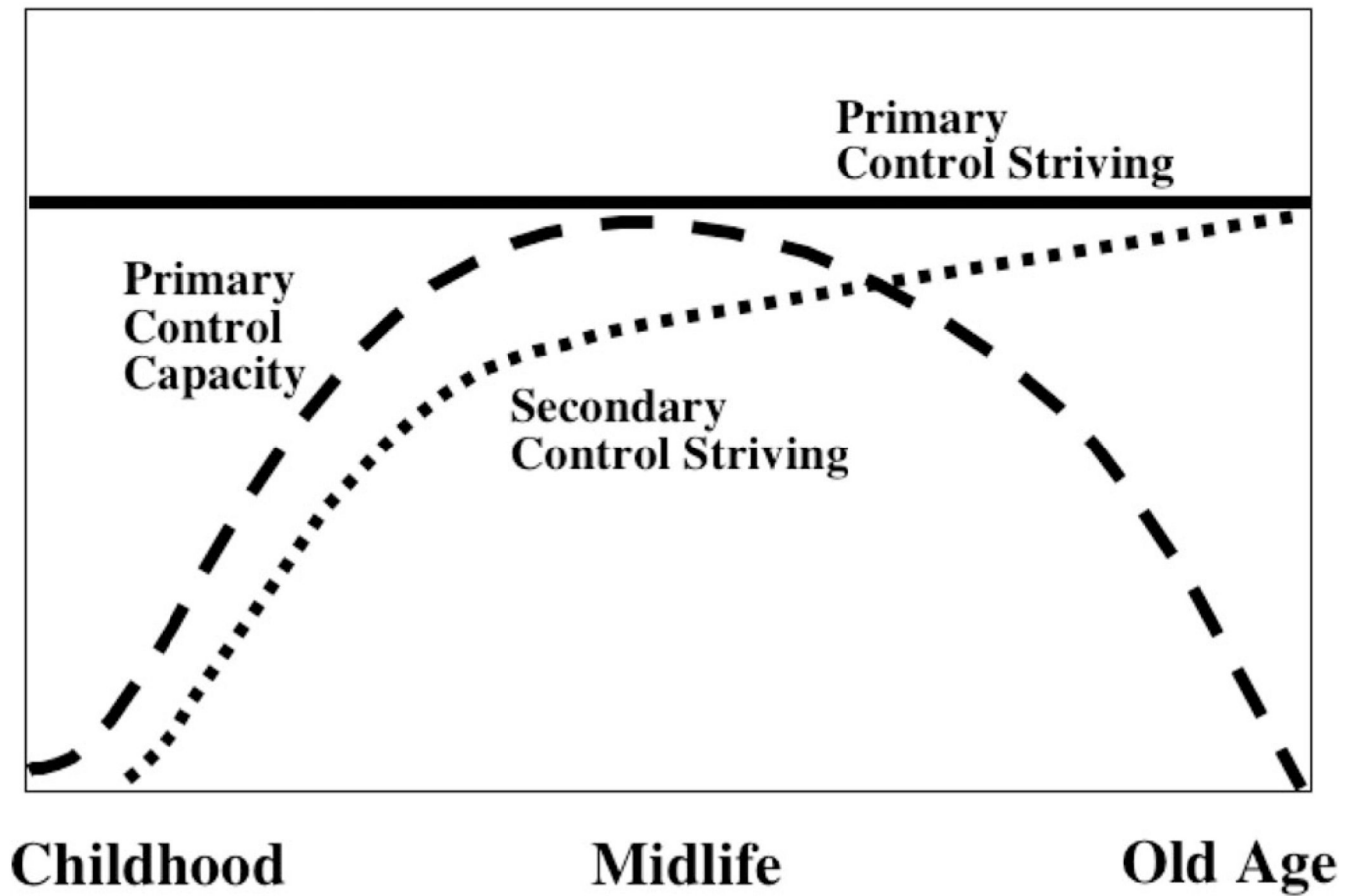


Figure 1.

Hypothetical life-span trajectories for primary control potential and primary and secondary control striving. From *Developmental Regulation in Adulthood: Age-Normative and Sociostructural Constraints as Adaptive Challenges*, by J. Heckhausen, 1999, Figure 3.1., p. 72. Copyright 1999 by Cambridge University Press. Adapted with permission.

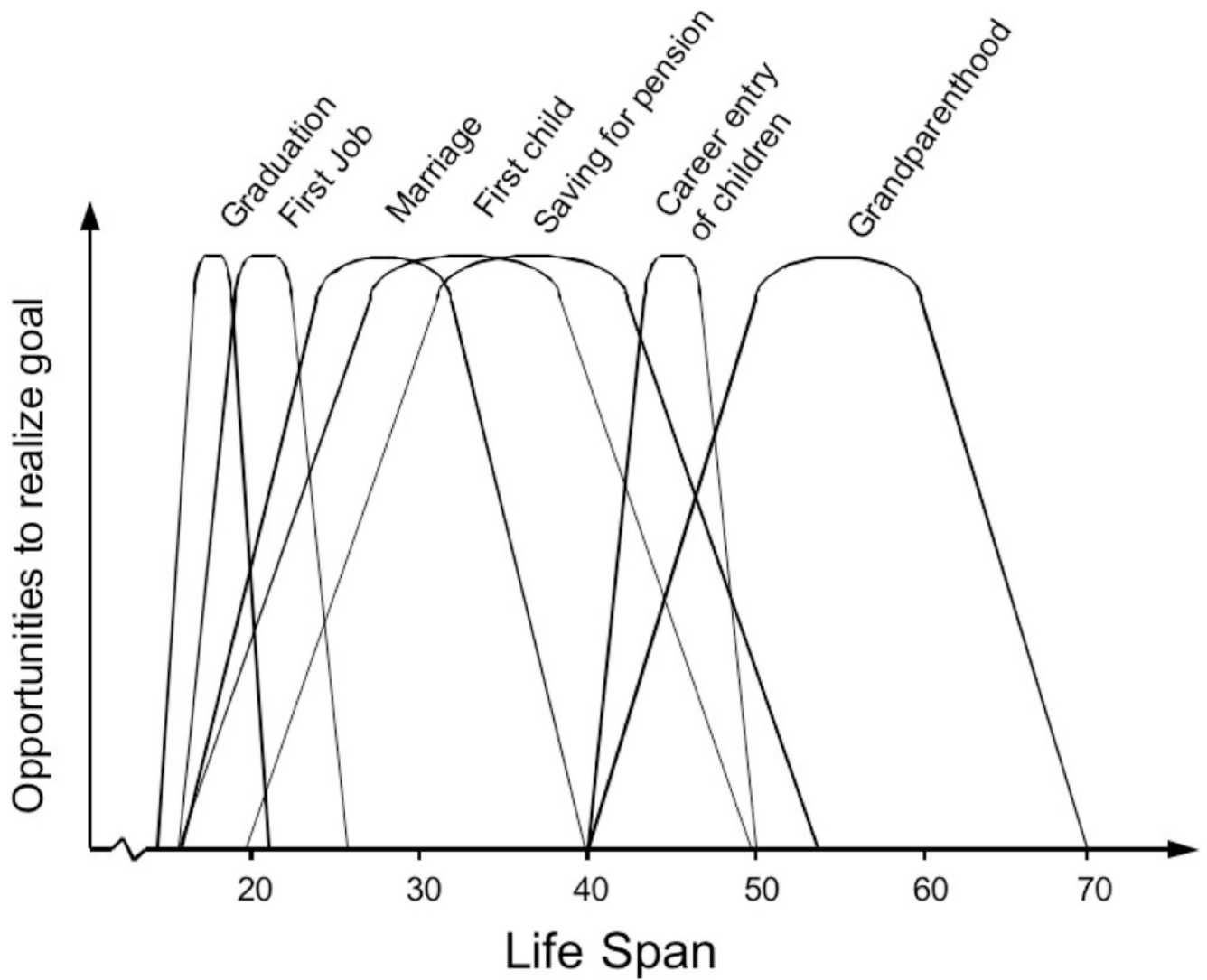


Figure 2. Age-graded sequencing of opportunities to realize various developmental goals. From *Motivational Psychology of Human Development: Developing Motivation and Motivating Development*, by //J. Heckhausen, 2000, Figure 1, p. 215. Copyright 2000 by Elsevier. Adapted with permission.

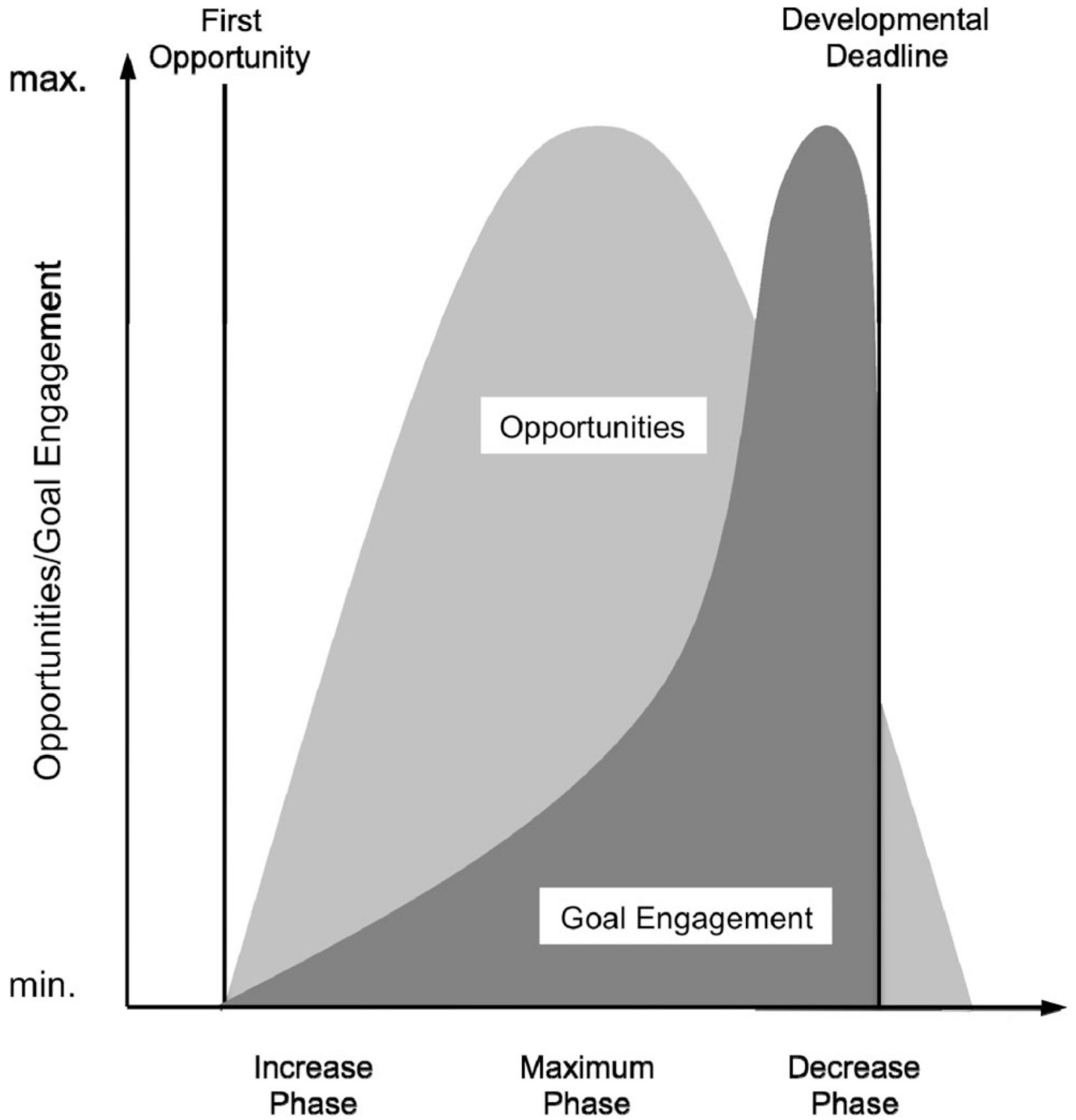


Figure 3. Age-graded opportunity structure and goal engagement for developmental goals. From *Motivational Psychology of Human Development: Developing Motivation and Motivating Development*, by //J. Heckhausen, 2000, Figure 2, p. 215. Copyright 2000 by Elsevier. Adapted with permission.

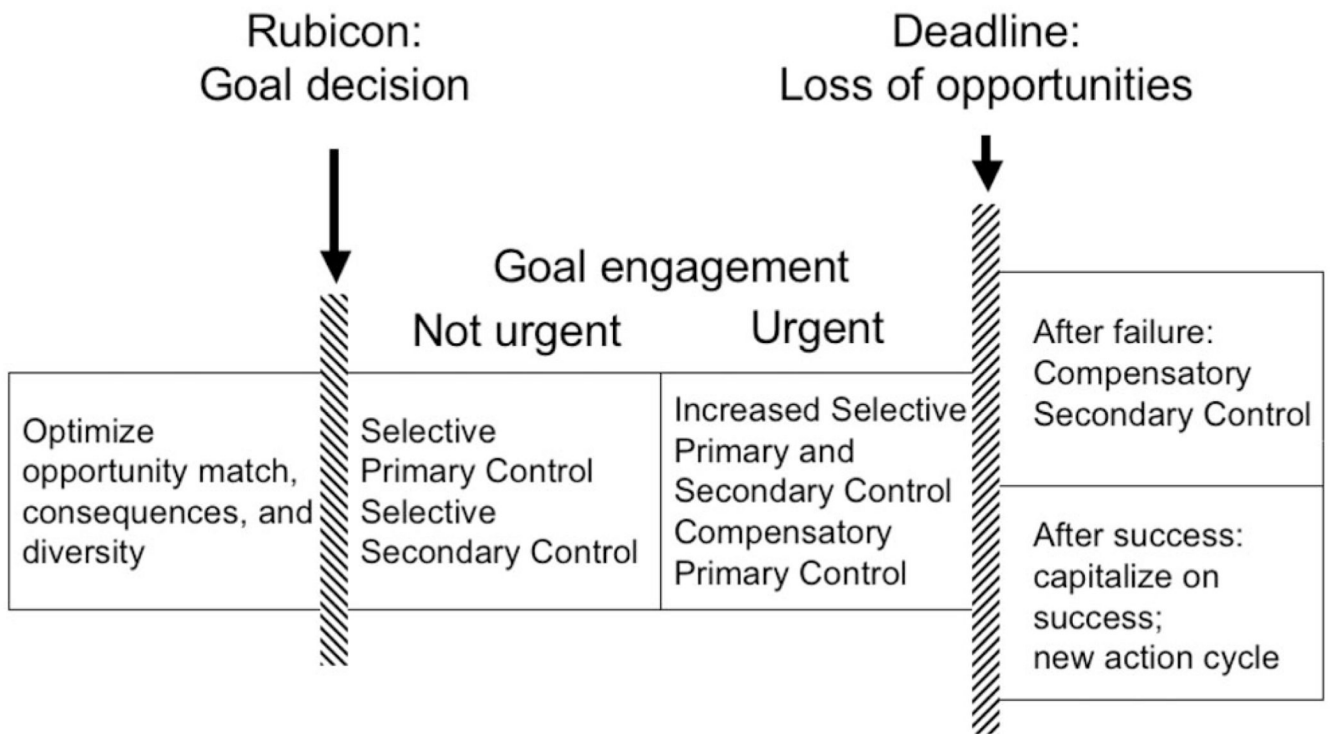


Figure 4. Action-phase model of developmental regulation. From *Developmental Regulation in Adulthood: Age-Normative and Sociostructural Constraints as Adaptive Challenges*, by J. Heckhausen, 1999, Figure 5.1., p. 114. Copyright 1999 by Cambridge University Press. Adapted with permission.

Table 1**Control Processes Involved in Goal Engagement and in Goal Disengagement**

Control process	Description
Goal engagement	
1. Selective primary control	Invest behavior, effort, time, skills, persistence
2. Selective secondary control	Volitional self-regulation to enhance motivational commitment to chosen goal. Avoid distractions, enhance perceived control, imagine positive incentives of goal attainment
3. Compensatory primary control	Seek out help or unusual means or ways to overcome shortfall of primary control resources
Goal disengagement	
1. Distancing from goal	Devalue chosen goal, downgrade importance of goal, enhance value of conflicting goals
2. Self-protection	Protect motivational resources from negative implications of failure or loss experiences

Table 2

Empirical Evidence Regarding Theoretical Propositions of Motivational Theory of Life Span Development

Theoretical proposition	Citation	Findings ¹
	Primacy of primary control	
1. Primary control striving is preferred	DeCasper and Carstens (1981)	Neonates learn behavior-event contingency and get upset when event becomes noncontingent to own behavior
	Papousek (1967)	4-month-olds persist in behavior-event contingency striving after satiation of consummatory response
	Watson (1972)	Infants smile and vocalize selectively at stimuli appearing contingent to own behavior
	Watson and Ramey (1972)	2-month-olds smile and vocalize at behavior-response contingencies
	White (1959)	Review of several studies on animals and humans: Preference for behavior-event contingency over event-event contingency in chimpanzees, monkeys, rats, and children
2. Primary control striving has benefits	Fiksenbaum, Greenglass, and Eaton (2006)	Older adults: Use of proactive coping associated with less health hassles and disability
	Gitlin, Hauck, Winter, Dennis, Schulz (2006)	Older adults with functional constraints: Primary control strategy use predicted lower mortality risk; primary-control enhancing interventions lowered mortality risk in participants with low and high baseline primary control striving
	Gitlin, Winter, et al. (2006)	Older adults with functional constraints: Primary-control enhancing intervention predicts less difficulty with everyday activities, less fear of falling, greater self-efficacy, more adaptive strategy use
	Haase, Heckhausen, and Köeller (2008)	German high school graduates: Primary control striving and goal engagement predicts obtaining an apprenticeship in girls and positive affect in boys and girls
	J. Heckhausen (1999)	German adults: Primary control striving is associated with higher self-esteem
	Pakenham (1999)	Multiple sclerosis patients' problem-focused coping predicts improved subjective health, depression, social adjustment
	Wahl, Becker, and Burmedi (2004)	Older adults with macular degeneration: Greater use of primary control strategies predict fewer constraints in everyday activities and, as a consequence, better adaptation to vision loss and more positive affect
	Wrosch, Schulz, and Heckhausen (2002)	Caregivers for older adults: Greater use of health-related primary control strategies predict fewer depressive symptoms
	Wrosch, Schulz, et al. (2007)	Older adults with health problems: Greater use of health-related primary control strategies protects against enhanced depressive symptoms and diurnal cortisol secretion

Theoretical proposition	Citation	Findings ¹
	Wrosch and Schulz (2008)	Health-related primary control strategies prevent an increase of chronic and functional health problems over time among older adults who experience daily physical symptoms
Life-span trajectories of primary and secondary control		
3. Adults expect to lose primary control capacity with increasing age	J. Heckhausen and Baltes (1991)	Young, middle-aged, and older adults expect less controllable developmental changes at higher adult age levels
	J. Heckhausen, Dixon, and Baltes (1989)	Young, middle-aged, and older adults expect fewer developmental gains and more losses at higher adult age levels
	Lang and Heckhausen (2001)	Negative correlation between age of adult (young vs. middle-aged vs. older) and perceived control of development
	Lachman and Firth (2004)	25–75-year-old adults (MIDUS): stable sense of personal mastery, older adults perceive greater constraints to control but also greater control of life overall
	Wrosch and Heckhausen (2002)	Younger adults who perceive high control of life regrets experience less intense regret affect; older adults who perceive low control of life regret experience less intense regret
4. Primary control striving is stable and secondary control striving increases across adulthood	Brandtstädter and Renner (1990)	35–65 years: with age decrease in tenacious goal pursuit and increase in flexible goal adjustment
	J. Heckhausen (1997)	Young, middle-aged, and older adults express stable striving for primary control and steadily increasing willingness to adjust goals to realities with increasing age
	Menec, Chipperfield, and Perry (1999)	Adults older than 65 years: Negative correlation between age and primary control strategies
	Wrosch and Heckhausen (1999)	Older compared with younger, separated adults reported fewer partnership goals and more compensatory secondary control striving
	Wrosch, Heckhausen, and Lachman (2000)	25–75-year-old adults (MIDUS): Across adulthood, increasing persistence in goal pursuit and more lowering of aspirations, positive reappraisal lower in younger adults
		Benefits: positive reappraisal more closely associated to better subjective well-being among older adults than among younger adults
	Wrosch and Heckhausen (2002)	Older compared with younger adults reported more avoidance of self-blame for long-term life regrets
	Wrosch, Bauer, and Scheier (2005)	Older compared with younger adults were more disengaged from undoing their life regrets
	Wrosch, Scheier, Miller, Schulz, and Carver (2003)	Study 2: Older compared with younger adults reported higher own capacity for goal disengagement

Optimization of goal choice and use of control strategies

	Theoretical proposition	Citation	Findings ¹
5.	Optimization heuristics have effects on outcomes via their regulatory role for using primary and secondary control strategies	J. Heckhausen, Carmody, Haase, and Poulin (2008)	Preliminary evidence from two studies: Heuristics of optimization influence subjective well-being as a function of their effect on specific control strategies involved in goal engagement and goal disengagement
6.	People choose to engage with a goal when the opportunities for goal attainment are favorable	Chang, Chen, Greenberger, Dooley, and Heckhausen (2006)	High school seniors: Educational and occupational goals have higher priority, earlier expected attainment, more perceived control than family and material goals
		Cross and Markus (1991)	Nomination of feared and hoped-for possible selves. Occupation: young adults > middle-aged adults > older adults. Physical fitness/health: older adults > middle-aged adults > young adults. Education: young adults > middle-aged adults = older adults
		Ebner, Freund, and Baltes (2006)	Growth-oriented goals: young adults > middle-aged adults = older adults. Benefits: young adults' prevention-of-loss goals negatively related with well-being
		Gitlin, Hauck, et al. (2006); Gitlin, Winter, et al. (2006)	70 years and older with functional difficulties: More primary control striving predicts improved survival; primary control enhancing intervention via occupational and physical therapy improved everyday functioning, quality of life, and survival
		Gitlin, Hauck, Dennis, and Schulz (2007)	African American and Caucasian older adults: For African Americans only, the effect of functional difficulties on depression was buffered by the use of control strategies directed at the goal of maintaining everyday activities
		Haase, Heckhausen, and Köeller (2008)	German high school graduates facing urgent search for apprenticeship: Primary control striving and goal engagement for apprenticeship predicts obtaining an apprenticeship in girls and positive affect in boys and girls
		Haynes, Heckhausen, Chipperfield, Newall, and Perry (in press)	Very old adults who use primary control striving or a multi-strategy approach of goal engagement and disengagement where appropriate report better physical and psychological well-being
		J. Heckhausen (1997)	Gain-oriented goals: young adults > middle-aged adults > older adults. Loss-oriented goals: older adults > middle-aged adults > young adults. Work, family, finance goals: young adults > older adults. Health, leisure, community goals: middle-aged adults = older adults > young adults
		J. Heckhausen and Tomasik (2002)	High school seniors calibrate vocational aspirations to school grades
		J. Heckhausen, Wrosch, and Fleeson (2001)	Goal selection and control striving for having a child in childless women in their 30s. Benefits: Childless women in their 30s with higher primary control striving for having a child have fewer depressive symptoms. For childless

Theoretical proposition	Citation	Findings ¹
		women in their 40s, the inverse is true: Higher primary control striving predicts more depressive symptoms
	Menec et al. (1999)	Older adults with better perceived health are more engaged in primary control goals
	Nagy, Köller, and Heckhausen (2005)	Benefits: High-school seniors who worry more about their urgent apprenticeship search also apply to more positions
	Nurmi (1992)	Young adults: Goals regard career entry, education, family building. Middle-aged adults: career development, socializing children. older adults: life purpose
	Ogilvie, Rose, and Heppen (2001)	Gain-oriented (“acquire”) goals: adolescents > middle-aged = older adults. Loss-oriented (“keep”) goals: older adults > adolescents = middle-aged adults
	Rothermund and Brandtstädter (2003)	58–81 years: Increase in active striving to counteract functional impairments until 70 years; for adults older than 70 years decline of such striving
	Salmela-Aro, Nurmi, Saisto, and Halmesmäki (2001)	Pregnant women’s choices for child-birth and family-related goals report decreasing depressive symptoms among early pregnancy, 1 month before childbirth, and 3 months after childbirth; increasing self/personal goals have inverse effect
	Sheldon & Kasser (2001)	Identity goals: young adults > older adults. Generativity goals: older adults > young adults
	Wahl et al. (2004)	Older adult patients with macular degeneration: Compensatory primary control strategies (seeking help) increased shortly after initial diagnosis
	Wrosch, Heckhausen, and Lachman (2000)	Benefits: Young adults’ primary control strivings predict subjective well-being
	Wrosch, Schulz, et al. (2007)	63 years and older: Health-related goal engagement prevents physical symptoms from enhancing depression and maladaptive diurnal patterns of cortisol secretion
	Wrosch and Schulz (2008)	63 years and older: Health-related goal engagement prevents daily physical symptoms from enhancing chronic and functional health problems assessed 2 years later
7. Goal disengagement: People choose to disengage from a goal when the opportunities for goal attainment are unfavorable	Boerner (2004)	Benefits: Disposition for flexible goal adjustment among middle-aged and older adults with vision loss is associated with fewer mental health problems (social dysfunction and depression), particularly among younger adults
	Brandtstädter and Rothermund (1994)	Benefits: Middle-aged adults’ downscaling of domain importance buffers effects of domain-specific control loss on general perceptions of personal control

Theoretical proposition	Citation	Findings ¹
	Carver, La Voie, Kuhl, and Ganellen (1988)	Benefits: College students' dispositional inability to disengage after failure is associated with depression
	Chipperfield et al. (2007)	Older women but not men with serious acute health conditions (heart attack, stroke) report less primary control striving
	de Rijk, Le Blance, Schaufeli, and de Jonge (1998)	Benefits: intensive care unit nurses suffered more burnout when low perceived control and high job demands were coupled with high desire for control
	Ebner et al. (2006)	Loss and maintenance goals: older adults = middle-aged adults > young adults Benefits: Older adults' maintenance-of-functioning goals positively related to well-being
	Evers et al. (2001)	Benefits: multiple sclerosis patients' acceptance of illness and disability associated with improved health status and mood during following year
	Forsythe and Compas (1987)	Benefits: College students' mental health symptoms were predicted by match between perceived control of distressing major and daily events and problem versus emotion-focused coping
	J. Heckhausen (1997)	Loss-oriented goals: older adults > middle-aged adults > young adults. Work, family, finance goals: young adults > older adults
	J. Heckhausen et al. (2001)	Postdeadline women in their 40s and 50s reported fewer child-wish goals, reported fewer control strategies of goal engagement, and showed worse incidental recall of child-related sentences than did predeadline younger women in their 30s. Benefits: Postdeadline women with less primary control striving for child-bearing report fewer depressive symptoms; inverse effect for predeadline women; less incidental recall of child-related sentences among postdeadline women correlates with less negative affect
	Menec et al. (1999)	Older adults with worse perceived health more likely to disengage from health goals
	Miller and Wrosch (2007)	Benefits: Adolescents' dispositional ability to disengagement from unobtainable goals protects against increase in systemic inflammation over course of 1 year
	Rothermund and Brandtstädter (2003)	58 to 81 years: Decrease in compensatory effort to counteract functional impairments after 70 years, with low controllability of impairment downgrading of importance of impaired function. Benefits: Satisfaction with own performance was better maintained among the older participants with perceived functional loss when personal standards were adjusted

Theoretical proposition	Citation	Findings ¹
	Thompson, Nanni, and Levine (1994)	Benefits: HIV-infected men's acceptance of outcomes regarding HIV infection, medical care, and daily life is beneficial only for those who perceive low effectiveness of primary control
	Thompson et al. (2006)	Benefits: Primary control striving for one's own protection against terrorist attacks (i.e., uncontrollable) is associated with higher distress 2 years after September 2001
	Wahl et al. (2004)	Older adult patients with macular degeneration: Compensatory secondary control strategies of goal disengagement were reported after functional loss in instrumental daily activities
	Wallace and Bergemann (1997)	Benefits: Degree of mismatch between older adults' perceived control and desire for control in specific life domains predicts depressive symptoms
	Weitzenkamp et al. (2000)	Middle-aged and older long-term spinal-cord injury patients: Rank work, having children, material possessions, political/civic involvement lower in importance, particularly if having low personal attainment in respective domain; lower correlations compared with noninjured adults between satisfaction in work and health domain with general life satisfaction
	Wrosch and Heckhausen (1999)	Benefits: Goal disengagement from partnership goals predicts longitudinal increase in positive affect in older adults after a separation but detrimental to changes in positive affect in younger adults after a separation
	Wrosch et al. (2000)	Benefits: Older adults' secondary control striving (reappraisal) predicts subjective well-being
	Wrosch, Scheier, Miller, Schulz, and Carver (2003)	Benefits: In Study 1, college students' dispositional ability to disengage is associated with less perceived stress, intrusive thoughts and greater self-mastery and purpose in life. In Study 3, depressive symptoms in parents of children with cancer are predicted by using goal disengagement from unobtainable goals
	Wrosch et al. (2005)	Benefits: For young, middle-aged and older adults, disengagement from trying to undo consequences of regretted life event moderates regret intensity and indirectly ameliorates depression and physical health problems
	Wrosch, Miller, et al. (2007)	Benefits: In Study 1, 18- to 85-year-old adults' dispositional ability to disengage from unattainable goals promotes less depressive symptomatology and through this better overall health. In Study 2, 18- to 56-year-old adults' goal disengagement predicted a more favorable pattern (steeper decline) of diurnal cortisol secretion. In Study 3, college students' health problems and lacking sleep efficiency predicted by lesser tendency

	Theoretical proposition	Citation	Findings ¹
			to disengage from unobtainable goals
8.	When choosing a goal, the beneficial and detrimental consequence for other goals are taken into account	Riediger and Freund (2004)	Benefits: Young and older adults' goal facilitation positively affects pursuit of individual goals; goal interference negatively affects well-being
		Riediger et al. (2005)	Older adults' compared with young adults' goal choice involves more intergoal facilitation; older adults' superior intensity of goal pursuit partly mediated by their greater intergoal facilitation
		Fishbach, Friedman, and Kruglanski (2003)	Five studies involving students: Individuals activate overriding higher order goals
		Shah, Friedman, and Kruglanski (2002)	Six studies involving students: An activation of life goals is associated with an inhibition of alternative life goals, particularly so among individuals who are highly committed to their goals
		Fishbach and Shah (2006)	Five studies involving students: Results suggest that individuals possess implicit dispositions toward avoiding short-term temptations over approaching long-term goals, which predict adaptive behavioral responses aimed at achieving self-relevant long-term goals
9.	When choosing a goal, people try to maintain activity in diverse areas of life	Kumashiro, Rusbult, and Finkel (2008)	Four studies including samples of students and community-dwelling adults: Individuals who were overly dedicated in one key domain of life reduced their motivation to make further progress in the respective area, and engaged in important alternative areas of life
	Action phases of goal choice, goal engagement, goal disengagement, and goal reengagement		
10.	When people make a goal choice, their mode of functioning shifts to goal engagement (longitudinal tracking)	Experimental studies needed on process of transition from phase of deliberating choices for action goal (crossing the Rubicon) and initiating action towards the chosen goal	
11.	Secondary control strategies enhance the effectiveness of primary control strategies during goal engagement	Hall, Perry, Ruthig, Hladkyj, and Chipperfield (2006)	College students: Positive reappraisal strategies enhance primary control striving after failure for academic goals
		McQuillen, Licht, and Licht (2003)	42- to 85-year-old adults with Parkinson's disease: Compensatory secondary control strategies (i.e., control of emotional response and changes in self to adjust to disease) predict less participation restriction in major life domains; secondary control strategies predict better well-being and less depression only via its influence on participation restriction
		Poulin and Heckhausen (2007)	German high school graduates' primary control striving for apprenticeship is

Theoretical proposition	Citation	Findings ¹
		maintained even after experiencing a major stressful event only if youth use selective secondary control strategies to maintain goal commitment
12. When people find a certain goal pursuit futile or too costly, they shift to goal disengagement (longitudinal tracking)	Experimental studies needed on process of transition from active pursuit of action goal to disengagement from action goal	
	Aspinwall and Richter (1999)	College students disengage from unsolvable tasks
	Babb, Levine, and Arseneault (in press)	10- to 11-year-old children, but not younger children and children with ADHD, shift from changing situation to adjusting to situation when peer vignettes contain increasingly uncontrollable challenges.
13. Self-protective and goal-disengaging compensatory secondary strategies are combined during goal disengagement	Bailis, Chipperfield, and Perry (2005)	Older adults with low control perceptions for health benefit with lower mortality and fewer hospitalizations from self-enhancing social comparisons with others their age
	Bauer, Wrosch, and Jobin (2008)	Adults' downward social comparison ameliorated feelings of regret in older but not younger adults
	Frieswijk et al. (2004)	Older adults with high levels of frailty and low identification with comparison target benefit with higher life satisfaction from downward comparison with others; with high levels of identification downward social comparison predicts less life satisfaction in frail older adults
	Mendola, Tennen, Affleck, McCann, and Fitzgerald (1990)	Women with impaired fertility benefited in their well-being from believing infertility has biomedical causes and has strengthened one's marriage
	Rothermund and Brandstädter (2003)	58 to 81 years: With low controllability of impairment lowering of comparison standard and downgrading of importance of impaired function
	Tykocinski and Steinberg (2005)	After uncontrollable but not after controllable outcomes adults show retrospective pessimism
	Wrosch, Bauer, et al. (2007)	Adults with life regrets benefited from experimental intervention to facilitate downward social comparison, self-protective causal attribution, and future goal engagement in terms of reduced regret-related despair
14. Goal disengagement is easier when an alternate goal can be pursued	Aspinwall and Richter (1999)	College students high in optimism disengaged from unsolvable tasks sooner when alternative tasks were available
	Duke, Leventhal, Brownlee, and Leventhal (2002)	Older adults' replacement of activities lost because of health problems predicted higher positive affect 1 year after illness onset
	Wrosch et al. (2005)	Young adults' negative affect about life regrets was predicted by more available future goals; older adults' negative affect about life regrets was

Theoretical proposition	Citation	Findings ¹
		predicted by fewer available future goals
	Wrosch, Scheier, Miller, et al. (2003)	Study 1: College students' well-being (i.e., stress, intrusive thoughts, mastery, purpose in life) predicted by dispositional ability to disengage from unobtainable goals and reengage with obtainable goals; for students with low disengagement reengagement improves well-being
		Study 2: Young and older adults' affective well-being predicted by an Age × Disengagement × Reengagement interaction: for young adults either disengagement from unobtainable goals or reengagement with obtainable goals protects well-being, for older adults both disengagement and reengagement need to be high to protect well-being
		Study 3: Depressive symptoms in parents of children with cancer are predicted by either ability to disengage from unobtainable goals or to reengage with obtainable goals
15. Information processing is biased to support the function of either goal engagement or goal disengagement	J. Heckhausen et al. (2001)	Childless women in their 40s recall fewer child-related sentences, and the fewer they recall, the less negative affect they report
	Light and Isaacowitz (2006)	Childless women in their late 20s and early 40s compared with childless women in their 40s recall more baby-related sentences and visually fixate on baby pictures longer
	Wrosch and Heckhausen (1999)	Young adults recall relatively more positive aspects of partnerships

Note. MIDUS = Midlife Development in the United States; ADHD = attention-deficit/hyperactivity disorder.

¹The note "Benefits" indicates findings that reflect beneficial effects of a particular behavior or cognition. Merely descriptive findings regarding the prevalence of a behavior or cognition are not marked in this way.