

# A Life-Span Theory of Control

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A life-span theory of development is presented that is based on the concepts of primary and secondary control. *Primary control* refers to behaviors directed at the external environment and involves attempts to change the world to fit the needs and desires of the individual. *Secondary control* is targeted at internal processes and serves to minimize losses in, maintain, and expand existing levels of primary control. Secondary control helps the individual to cope with failure and fosters primary control by channeling motivational resources toward selected action goals throughout the life course. Primary control has functional primacy over secondary control. An analysis of extensive and diverse literatures spanning infancy through old age shows that trade-offs between primary and secondary control undergo systematic shifts across the life course in response to the opportunities and constraints encountered.

In this article, we present a life-span theory of development based on the concept of control. Research on life-span development has become an increasingly active area of inquiry in the last two decades and has the potential of yielding fundamental theories about the emergence and transformation of human behavior over the life course (e.g., P. B. Baltes, 1987). However, as noted by Birren and Bengtson (1988), the field of life-course development and aging is at present best characterized as data rich but theory poor. Most existing developmental theories embrace limited temporal and functioning domains. With the exception of personality theorists such as Erikson, Loevinger, Gould, and Levinson (see Cavanaugh, 1990; Schulz & Ewen, 1993), psychologists have made few attempts to develop life-span theories of development, in part because such efforts require the integration of information from multiple domains, including the behavioral, social, and biological sciences. A second formidable challenge posed by such an undertaking is the problem of level of analysis. Ideally, such a theory should explain both macro-level behaviors such as major life-course decisions

as well as micro-level behaviors and cognitions that shape the development of the organism, particularly at younger ages. Finally, such a theory must grapple with issues of functionality or adaptiveness. It should be able to specify a priori whether behaviors and cognitions about the self and the world are adaptive or maladaptive for the long-term development of the organism.

The concept of control is ideally suited to meet these requirements of a life-span theory. It has spawned a number of micro-theories of development focused on specific segments of the life course such as infancy, childhood, and old age, and has generated vast quantities of useful empirical data. Moreover, control-related concepts have been applied to diverse areas of inquiry including intellectual performance, health, and social behavior. Finally, much of this research explores the adaptive or functional value of control-related phenomena.

The challenge we posed for ourselves was to develop a conceptual system that incorporates both existing theory and data, accounts for major life-course transitions, and is sensitive to the biological constraints and opportunities characteristic of human development, as well as the social-structural forces that shape individual lives. Our approach enables us to integrate diverse empirical literatures and theoretical perspectives and, we feel, represents an important first step in articulating a theory of development that spans all of the human life course.

This article is divided into four parts. In Part 1, we develop a theoretical framework for classifying control-related behavior based on distinctions between *primary* and *secondary* control. Four issues are addressed here. First, we discuss the focus or target of primary and secondary control processes. Second, we argue for the functional primacy of primary over secondary control. Third, we develop a classification system for primary and secondary control and apply it to the complete action sequence (predecisional phase, preactional volition, act, and post-action phase). Finally, we set the stage for describing control-related processes over the life course by examining the limitations of primary control and the need for secondary control. In Part 2, we describe the major biological and societal life-course constraints that shape human life-span development and exam-

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This research was in part supported by grants from the National Institute on Aging (AG05444), National Institute of Mental Health (MH41887), National Cancer Institute (CA48635), and the American Association of Retired Persons Andrus Foundation. We are also grateful to the Max Planck Institute for Human Development and Education in Berlin and to the University Center for Social and Urban Research of the University of Pittsburgh for their support in facilitating this collaborative effort. We want to thank Jochen Brandstädter, Jack W. Brehm, Margret M. Baltes, Dale Dannefer, Eric Klinger, Ulrich Mayr, Clemens Tesch-Römer, John R. Weisz, and three reviewers for their valuable comments on drafts of this article. We are particularly grateful to Ellen A. Skinner for the many valuable suggestions she made on earlier versions of this article.

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ine the role of control-related behaviors in optimizing the life course. This is followed by the third section, in which empirical evidence is presented regarding the development of control-related behavior during infancy, childhood, adolescence, adulthood, and old age. We conclude with suggestions for a future research agenda.

### Theoretical Framework for Classifying Control-Related Behavior

The scope of control-related phenomena in human behavior is vast. Included are such diverse behaviors as direct action on the environment, getting someone else to help, praying to God, devaluing unattainable goals, and blaming failure on others. This diversity has given rise to a variety of theoretical formulations, including such recently articulated distinctions as primary versus secondary control (Rothbaum, Weisz, & Snyder, 1982), problem- versus emotion-focused coping (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986), active versus avoidance coping (Holahan & Moos, 1987), and assimilation versus accommodation (Brandstädter & Renner, 1990).

An underlying assumption of all control theories is the idea that humans desire to produce behavior-event contingencies and thus exert primary control over the environment (White, 1959). A related and complementary assumption is that humans abhor losses in their ability to produce behavior-event contingencies and experience negative affect when faced with anticipated or actual losses of control. This perspective on human behavior has stimulated large quantities of empirical research, numerous theories regarding adaptive functioning, and many useful clinical applications.

Although many types of behavior and events have been examined from a control perspective, our focus in this article is limited to those that define the individual's status with respect to his or her ability to control important outcomes. This excludes many everyday activities that are trivial with regard to issues of control, such as deciding what item to select from a menu or which TV show to watch. These activities are consistent with and confirm existing perceptions about individual control but are not the primary focus of this article. From a life-span developmental perspective, pivotal events are those that increase, decrease, or threaten existing levels of control. Our intent is to closely examine these control-related transitions.

An important innovation in the development of control theory was the work of Rothbaum et al. (1982), in which they conceived of control as a two-process construct consisting of primary and secondary control. Primary control involves attempts to change the world so that it fits the needs and desires of the individual. Secondary control refers to attempts to "fit in with the world and to 'flow with the current'" (p. 8). Secondary control behavior is contrasted with relinquished control, helplessness, and other behavior expressing uncontrollability (Rothbaum et al., 1982). Moreover, primary and secondary control are often intertwined, shifting from one to the other depending on the challenges and obstacles encountered.

Rothbaum et al. (1982) provided many examples of secondary control, including attributions to limited ability, which serve to protect the individual against disappointment and enhance predictive control, construing luck as a personal charac-

teristic (illusory control), identifying with powerful others (vicarious control), and deriving meaning from otherwise uncontrollable events in order to accept them (interpretive control). Extensive empirical support for each of these mechanisms is found in the social psychological literature (see Rothbaum et al., 1982).

### *Focus of Control*

In our view, defining primary control as bringing the environment into line with one's wishes (Rothbaum et al., 1982) and secondary control as bringing oneself in line with the environment implies two things: First, that action is directed outward to the external world in primary control and inward toward the individual in secondary control; second, processes of primary control involve direct action on the environment, whereas secondary control processes are primarily cognitive. Thus, one could think of defining characteristics of primary and secondary control in terms of two orthogonal attributes, each with two levels: target (external world vs. self) and process (action vs. cognition). Although this is a useful heuristic for distinguishing these constructs, it is also fraught with some difficulty when we attempt to classify specific behaviors or cognitions as examples of primary or secondary control. For example, making social comparisons with others to raise one's self-esteem is a frequently cited example of secondary control. This is a cognitive process directed at the self. However, the behavioral analogue of this process—seeking out others for social comparison and self-esteem enhancement—is more difficult to classify. This behavior involves both action and cognition, its ultimate target is the self, and yet it involves engagement with the external world. Another example of secondary control is taking drugs to change mood states, which involves action targeted at the self. From our perspective, the key distinguishing characteristic of all these examples is that they are directed at the self and therefore should be classified as secondary control. Thus, we base the distinction between primary and secondary control principally on its target (i.e., self vs. external world), rather than on the process involved (i.e., action vs. cognition), because in practice, cognition and action are often so closely intertwined that it is difficult to separate one from the other.

To summarize, our distinction between primary and secondary control emphasizes that primary control targets the external world and attempts to achieve effects in the immediate environment external to the individual, whereas secondary control targets the self and attempts to achieve changes directly within the individual. Both primary and secondary control may involve cognition and action, although primary control is almost always characterized in terms of active behavior engaging the external world, whereas secondary control is predominantly characterized in terms of cognitive processes localized within the individual.

### *Primacy of Primary Control*

In Rothbaum et al.'s (1982) conception, primary and secondary control have similar functional value for the organism, although primary control is given somewhat higher status in their two-process model. Our view emphasizes the functional pri-

macy of primary over secondary control. Because primary control is directed outward, it enables individuals to shape their environment to fit their particular needs and developmental potential. Without engaging the external world, the developmental potential of the organism cannot be realized. As a result, it is both preferred and has greater adaptive value to the individual.

Furthermore, in our view, the primacy of primary control is invariant across cultures and historical time. We acknowledge that cultures vary widely in the extent to which they promote or reinforce aspirations for primary control (Azuma, 1984; Weisz, Rothbaum, & Blackburn, 1984), but this does not argue against an underlying preference for primary control. As we show later in this article, the major function of secondary control is to minimize losses in, maintain, and expand existing levels of primary control.

### *Secondary Control Facilitates Primary Control*

Humans have two inherent limitations that make secondary control strategies necessary. The first limitation is the *failure-proneness* of human behavior. The second limitation results from the inherent need to be *selective* in the goals pursued.

Most scientific accounts of the adaptive significance of secondary control emphasize the former aspect: The *compensatory* function of secondary control when primary control has failed. When confronted with a loss of primary control, humans not only have to deal with the frustration of not attaining a desired goal but in addition experience a threat to self-esteem, perceived self-efficacy (Bandura, 1982), or mastery (Harter, 1974). Moreover, after severe loss, expectancies about the general controllability of external events might be completely shattered, resulting in reduced activity, passivity, and depressive affect as described in the learned helplessness literature (Abramson, Seligman, & Teasdale, 1978; Seligman, 1975). These negative effects of loss of primary control can be buffered by secondary control. In particular, we emphasize that the compensatory role of secondary control not only protects emotional well-being and self-esteem, but more importantly preserves and rekindles the individual's motivational resources for maintaining and enhancing primary control in the future. In this way, secondary control serves as the pathway from loss of control back to primary control.

Secondary control not only helps in dealing with failures, but also fosters primary control directly by managing its *selectivity*. Because the human behavioral repertoire is so vast, individuals must make choices about which goals to pursue. The individual must focus on selected action sequences while at the same time ignoring or inhibiting alternatives that are not chosen. Thus, from a developmental perspective, secondary control plays an essential role in enabling the organism to select and focus on goals that expand existing levels of primary control. This is accomplished in a number of ways, such as by enhancing the attractiveness of chosen goals, disengaging from action alternatives that were not chosen, or overestimating personal competencies.

In sum, our view of secondary control emphasizes its link to primary control. Thus, secondary control strategies can foster development and enhance primary control by contributing to the selection of action alternatives throughout the *life course*; and when primary control is threatened or lost,

secondary control strategies can help maintain or minimize losses in primary control as well as expand the potential for primary control without the individual having to physically engage the environment.

Finally, although we identify a wide array of specific physical and cognitive activities that fit our definitions of primary and secondary control, it is important to acknowledge that other motivational factors, in addition to or instead of control, may at times influence the occurrence of these activities (Connell, 1990; Patrick, Skinner, & Connell, 1993; Skinner & Wellborn, 1994). For example, individuals could adjust their values or find new meaning in a given experience, because they have read a good book or heard a persuasive argument—all reasons unrelated to issues of control. However, when an individual engages in these types of activities in response to actual or threatened shifts in primary control, then we classify them as secondary control strategies.

### *Taxonomy of Control Strategies*

The conceptual model proposed here maintains that the basic distinction between primary and secondary control is that primary control involves behaviors targeted at the external world whereas secondary control involves activities internal to the individual. Thus, we agree with Azuma (1984) that some forms of vicarious and illusory control (e.g., spitting on a coin to make the desired side come up) should be classified as primary control because they involve behavior directed at the environment. However, examples such as these make salient that any taxonomy of control-related behaviors requires that we also make distinctions regarding the validity of individuals' perceptions about behavior–outcome links and their functional adaptiveness. We have chosen the terms *veridical–illusory* and *functional–dysfunctional* to capture these dimensions.

*Veridical–illusory dimension.* Primary and secondary modes of control can be differentiated with regard to their degree of veridicality: Are they based on valid accounts of the world and the causal relations between actions and outcomes? Because primary control is usually based on physical action, veridicality can be objectively defined in terms of the known properties of cause and effect in the physical world. Thus, spitting on a coin to make it come up heads would be an example of primary control that is illusory, because the action outcome expectancy underlying this behavior has no basis in physical reality. Defining veridicality with respect to secondary control is more difficult because objective standards are often not available. However, the veridicality of some secondary control processes can be determined by objective assessment. For example, the accuracy of individual perceptions of competence could be assessed to determine the extent to which they diverge from reality.

*Functional–dysfunctional dimension.* Although most people believe that to perceive the world veridically is adaptive or functional, this is not always true. Thus, we propose the functional–dysfunctional dimension as being conceptually orthogonal to the veridical–illusory dimension. Under conditions of threat, for example, veridical assessments might prove to be quite dysfunctional because they create despair and thus discourage further attempts to regain primary control (Taylor,

Table 1  
Two-Dimensional Model of Primary Control:  
Functionality and Veridicality

Type	Functional	Dysfunctional
Veridical	Effective behavior promoting short-term and long-term control	Effective behavior in the short term that debilitates long-term control potential
Illusory	Effective behavior based on invalid beliefs: behaving in the right way but for the wrong reasons	Ineffective behavior based on invalid beliefs, superstitious behavior

1989). Other examples include the literature showing that moderate but distinct overestimations of personal control are a hallmark of adaptive functioning in adulthood (Weisz, 1983). Even illusory control beliefs in a supernatural power or the infallibility of fate are by no means always dysfunctional. When opportunities for direct action are extremely limited, such illusory control may be an adaptive alternative. On the other hand, illusory control may be very dysfunctional if it undermines direct action, which has the potential of being effective. In sum, the dimension functional-dysfunctional captures the capacity of a primary or secondary control strategy to promote or reduce long-term potential for primary control.

*Two-dimensional model of primary control.* Table 1 identifies primary control strategies varying in veridicality and functionality. The first cell in this table, *veridical and functional* control, includes effective actions that promote both short-term and long-term primary control. This is the ideal type of primary control because it implies that an external goal is successfully attained and that the long-term potential for control is promoted. In contrast, *veridical but dysfunctional* primary control achieves short-term goals but jeopardizes long-term control potential. A case in point is a workaholic behavior pattern, which may exhaust long-term resources while achieving short-term successes. *Illusory and dysfunctional* control is the most harmful of all types of primary control strategies, because it fails to achieve immediate external goals and also weakens long-term control potential. An example is superstitious behavior, which fails to generate the desired outcomes and also maintains (or even strengthens) invalid beliefs that undermine effective action in the future. Finally, there is *illusory and functional* behavior. This can be characterized as behaving in the right way but for the wrong reasons. Examples of this type of behavior can be found among persons coping with a serious illness. Some persons have illusory beliefs in personal control over an illness, which may foster well-being and effective action in other domains of life (e.g., social relationships).

### Secondary Control as Support in Different Action Phases of Primary Control

One of the main functions of secondary control is support of primary control in terms of metamotivational and metavolitional action management. Recent advances in motivational action theory have identified action as a multiphase process in-

volving different and partly contrasting functional requirements (H. Heckhausen, 1991). Secondary control strategies are specifically tailored to serve the functional needs of each phase of action.

*The Rubicon model of action phases.* In his Rubicon model, Heinz Heckhausen distinguishes between four action phases: predecisional motivation, preactional volition, actional volition, and postactional motivation (H. Heckhausen, 1991). During the predecisional motivation phase, the individual considers the pros and cons of various action alternatives before making a decision about what to do (i.e., crossing the Rubicon).<sup>1</sup> During the two volitional phases, the individual waits for the appropriate opportunity (preactional phase) and then executes the action plan (actional phase). In the postactional motivation phase, the individual evaluates the action outcome, considers causal attributions for it, and draws inferences for future actions.

Attending to reality is adaptive for the two motivational phases, for selecting an appropriate goal (predecisional phase) and for evaluating an action outcome (postactional phase). This motivational mindset is characterized as "deliberative" (Gollwitzer, Heckhausen, & Steller, 1990). Conversely, during the volitional phases, when "one has to get one's act together," it is adaptive to strengthen one's commitment to the selected alternative and overestimate the probability of success. This volitional mindset is characterized as "implemental" (Gollwitzer, Heckhausen, & Steller, 1990).

During the different phases of action, the individual activates motivational (i.e., reality-oriented or deliberative) or volitional (goal-oriented or implemental) mindsets to optimize functioning in each phase. Differential effects of motivational versus volitional mindsets have been demonstrated in various experimental and real-life settings (Beckmann & Gollwitzer, 1987; Gollwitzer, 1990; Gollwitzer, Heckhausen, & Ratajczak, 1990; Gollwitzer, Heckhausen, & Steller, 1990; Gollwitzer & Kinney, 1989; H. Heckhausen & Gollwitzer, 1986, 1987).

*Aspects of action addressed by secondary control.* Three aspects of action regulation are the major targets of secondary control strategies: (a) *expectancy* of goal attainment, (b) *value* of goal attainment, and (c) *causal attribution* of action outcome. These three aspects correspond to the following three types of secondary control strategies: (a) expectation biases such as optimism, defensive pessimism, adjustment of aspiration level, and strategic selection of social reference group; (b) shifts in goal values such as the "sour grapes" effect, disengagement, and changes in goal hierarchy; and (c) biased attributions of outcomes such as egotistic attributions of success and failure.

Secondary control of expectancy, value, and attribution can occur at any phase of action, although it is most needed during the volitional phases and in postactional processing. The following section reconsiders phenomena widely discussed in the literature under the conceptual framework for secondary con-

<sup>1</sup> The Rubicon metaphor refers to Julius Caesar's decision to have his legions cross the Rubicon river in northern Italy, knowing this movement would instigate a civil war. The irrevocable nature of the Rubicon crossing was expressed in Julius Caesar's exclamation "alea iacta est!" Although the concept of action phases was not originally developed to characterize major life-course transitions, the Rubicon metaphor emphasizes its applicability to this broader context.

control presented in this article. Secondary control strategies are discussed with regard to their adaptive value during different action phases.

*Predecisional* secondary control strategies are used in response to anticipated losses in primary control. The individual tries to adjust to an anticipated failure to avoid disappointment. One benefit of this strategy is that at least predictive control (Rothbaum et al., 1982) is maintained (e.g., "I've known it all along"). Such strategies have also been conceptualized as strategic or "defensive pessimism" (Norem & Cantor, 1986a) or "cushioning strategies" (Norem & Cantor, 1986b). A particularly dysfunctional variant of the preactional type of secondary control is known as *self-handicapping* (Berglas, 1985; Berglas & Jones, 1978; Jones & Berglas, 1978; Pyszczynski & Greenberg, 1983). The individual actively self-handicaps, for instance, by avoiding effort (Pyszczynski & Greenberg, 1983) or drinking alcohol (Jones & Berglas, 1978), so that an anticipated failure can be attributed to the self-handicapping factors rather than to one's own ability.

*Volitional* (i.e., preactional and actional) secondary control strategies help the individual motivationally to initiate an action sequence and follow it through to completion. Such phenomena have only recently been acknowledged as vital strategies promoting the implementation of an action intention (Kuhl, 1983, 1984, 1987). They include such metacognitive strategies as selective attention to and encoding of action-relevant information, so that information processing is selectively optimized (Gollwitzer, 1993). Most relevant with regard to the present topic are metamotivational strategies (enhancing the value of the chosen action goal and exaggerating the likelihood of successful goal attainment) that serve to suppress potentially competing action tendencies. Metamotivational strategies of this kind are especially important when the individual is confronted with equally attractive options or when unexpected obstacles arise that lower the probability of success of an action sequence. It is also important to note that these types of secondary control strategies only include self-regulatory processes directed at volitional commitment. Developing a specific action plan aimed at achieving a certain goal would be classified as a primary control strategy.

*Postactional* secondary control strategies are most needed after experienced loss of primary control. Secondary control after failure helps the individual come to terms with the apparent lack of primary control, which can be handled in two ways. One can modify future attempts at primary control by adjusting one's aspiration level or restructuring one's goal hierarchy ("sour grapes," Elster, 1983). Alternatively, one can search for causes of the failure so one does not have to change one's goals while still maintaining self-esteem. Postactional secondary control strategies are manifold and have been investigated extensively. The prototypical phenomenon for these causal account-related strategies is the well-known *attributional bias* (e.g., Bradley, 1978; Kelley & Michela, 1980; Luginbuhl, Crowe, & Kahan, 1975; Zuckerman, 1979), also referred to as "attributional egotism" (M. L. Snyder, Stephan, & Rosenfield, 1978), "positive attributional pattern" (H. Heckhausen, 1987), and "benefactance" (Greenwald, 1980). According to these strategies, the individual exaggerates the perceived influence of external causes when encountering failure, while taking credit for

success. As a result, self-blame is avoided for failure and self-esteem is enhanced for success. Such strategies are related to what Rothbaum et al. referred to as *interpretive control* (Rothbaum et al., 1982). Other examples include attempts to control threatening events by finding meaning (Bulman & Wortman, 1977; Burgess & Holmstrom, 1979) or refabricating personal history (Greenwald, 1980; Ross, 1989).

Secondary control after failure can also be achieved through social comparison processes. In *downward social comparison*, for instance, people make themselves feel better about a given performance or state of affairs by comparing themselves with those who are worse off (Wills, 1981). The strategy of downward social comparison is a common response to a threat to the self, such as severe illness (Taylor & Lobel, 1989; Taylor, Wood, & Lichtman, 1984), disability (Schulz & Decker, 1985), or crime-related victimization (Burgess & Holmstrom, 1979).

Some secondary control strategies are used both before and after action outcomes; they are sandwiched between an experienced loss of control and an anticipated lack of control. This applies, for instance, to *vicarious control*. In vicarious control, the individual ascribes all or most control potential to a powerful other, be it God or some other sort of superior expert (e.g., physician), and identifies with this superpower. Thus, after a negative outcome, the belief in a powerful other helps to fend off self-blame. Moreover, identifying with powerful others helps prevent desperation and leaves the potential for primary control intact. The two strategies of adjusting one's aspiration level and restructuring one's goal hierarchy also work in two ways, enabling the individual to cope with a failure experience and preventing an anticipated loss of primary control. They both help the individual to disengage from unobtainable action goals (Klinger, 1975) and replace them with more realistic ones.

### *Three-Dimensional Model of Secondary Control: Functionality and Veridicality in Different Action Phases*

We have characterized secondary control processes and their role in different phases of the action sequence. Next, we develop an integrated model of secondary control that incorporates the two dimensions of control introduced earlier: functionality and veridicality. Functional secondary control is defined in terms of its capacity to maintain and enhance primary control. Veridicality captures the extent to which the control process is accurate with reference to an external standard. Table 2 illustrates the proposed taxonomy of secondary control strategies and describes each category. In the following section we shall consider a few illustrative examples of secondary control in the three phases of the action sequence: expectancy, value, and causal attribution.

*Expectancy of action outcome.* In the predecisional phase, secondary control strategies can modify (enhance or reduce) expectancies of action outcomes. Social comparison with age peers helps the individual to realistically assess his own competence, set attainable goals, and avoid disappointment. Thus, social comparisons with age peers are both a functional and veridical means for establishing appropriate expectancies for action outcomes. In contrast, someone who uses self-handicapping strategies, such as avoiding effort to protect against anticipated failure and consequent disappointment, may veridically

Table 2  
*Three-Dimensional Model of Secondary Control: Functionality and Veridicality in Different Action Phases*

Type	Functional	Dysfunctional
Veridical		
Expectancy	Social comparison with age peers	Self-handicapping
Value	Give up on unattainable goals	Dwell on unattainable goals
Attribution	Make accurate attributions	Make pessimistic attributions
Illusory		
Expectancy	Positively biased behavior-outcome appraisals; I could if I wanted to	Extremely exaggerated behavior-outcome appraisals; I can attain anything I want
Value	Devalue unattainable goals; sour grapes	Increase value of unattainable goals
Attribution	Egotistic attributional bias	Self-blame for uncontrollable events

account for the experienced outcome but is unlikely to attain future primary control. Positively biased behavior-outcome appraisals can be illusory and functional. This is the case, for example, when primary control has not yet been achieved but is attainable. When a new competency is being acquired, an optimistic expectancy for success—although currently unrealistic—can motivate effort and foster competency or primary control in the long run. Conversely, extremely exaggerated behavior-outcome appraisals are dysfunctional because they prevent the setting of attainable action goals, exposing the individual to recurrent failures.

*Evaluation of action outcome.* Perceived values of action outcomes can be modified (enhanced or reduced) in any of the four action phases (predecisional, preactional, actional, and postactional). Giving up on unattainable goals is functional as well as veridical because further investment in unattainable goals only yields frustration and long-term impairment of primary control. In contrast, persistent *dwelling on unattainable goals* is dysfunctional because it threatens self-esteem without fostering any appropriate action. To *devalue unattainable goals* (“sour grapes”) may be a distortion of reality but serves to protect self-esteem. One tries to convince oneself that an unattainable goal is not worth it and never was. This devaluation of a former goal makes it much easier to disengage from striving for it and also prevents the conclusion that failure to attain it is a reflection of one’s competence. To *increase the value of unattainable goals* is generally dysfunctional. Although such behaviors may be quite common with respect to objects of desire (e.g., an unrequited love), they are relatively rare with respect to important life goals such as professional careers.

*Causal attribution of action outcome.* Finally, secondary control can help one to make amends even “after the (f)act” by facilitating self-enhancing causal attributions for failure or success. Ideally, functionality and veridicality converge and lead to *accurate attributions*. When this happens, action outcomes are attributed to their real causes, and success or failure feedback is effectively used to guide future behavior. Making *pessimistic attributions* involves blaming oneself for failure while attributing success to external causes. A pessimistic attributional pattern might be veridical, but it exposes the individual to hopelessness and depression. In contrast, an *egotistic attributional bias* involves taking credit for good outcomes and rejecting responsibility for bad ones. This is a type of illusory control that is often adaptive because it fosters and protects self-esteem (e.g.,

Alloy & Abramson, 1979; Lewinsohn, Mischel, Chaplin, & Barton, 1980). Finally, *self-blame for uncontrollable events* can be very dysfunctional because it does not reflect reality, impairs self-esteem, and undermines effective future action.

### Life-Course Developmental Changes in Opportunities for and Constraints on Control

The scope of developmental change in humans over the life course is larger than in any other species. From complete helplessness, individuals evolve to develop extremely sophisticated cognitive and motor skills that enable them to exert extensive control over their environments. Such developmental growth takes a long time, and some would argue that it continues throughout life (P. B. Baltes, 1987; P. B. Baltes, Dittmann-Kohli, & Dixon, 1984; P. B. Baltes & Kliegl, 1986; P. B. Baltes & Smith, 1990; P. B. Baltes, Smith, Staudinger, & Sowarka, 1990; J. Smith & Baltes, 1990). The dynamics of growth and decline across the life span confront the individual with varying challenges to the maintenance of control (M. M. Baltes & Baltes, 1986).

As an individual moves through the life course, his or her potential for primary control undergoes major changes. We argue that primary and secondary control strategies are calibrated to share the task of coping with the demands and challenges encountered at each period of the life span (Schulz, Heckhausen, & Locher, 1991). The way this task sharing is accomplished is functionally related to the developmental potential of the individual at each segment of the life span. Thus, trade-offs between primary and secondary control shift in accordance with the concurrent developmental ecology.

Which potentials and constraints operate at any given segment of the life span is determined by two major classes of factors: biological and societal. Universal biological changes as well as social systems and normative conceptions provide basic constraints that determine what the organism can do and when. Biological and sociostructural constraints over the life course generate a time-ordered structure of opportunities and challenges for extending and maintaining control.

### Biological Life-Course Constraints

The overall pattern of changes in biological resources across the life span resembles an inverted U. During childhood and

adolescence, cognitive abilities and physical maturity increase and provide the basis for the development of complex motor and cognitive skills. During adulthood, physical development plateaus and then declines. Declining reserve capacity first appears in middle adulthood (e.g., Schaie & Hertzog, 1983), especially under conditions of high performance demands. Age-related decline under testing-the-limits conditions also has been shown for peak performance in superathletes (Ericsson, 1990; Schulz & Curnow, 1988; Schulz, Musa, Staszewski, & Siegler, 1994), expert mnemonics (Kliegl & Baltes, 1987), and elderly people at risk for dementia performing highly trained fluid intelligence tasks (M. M. Baltes, Kuhl, & Sowarka, 1992). Moreover, after middle age, individuals become more susceptible to a variety of chronic, disabling, and sometimes life-threatening illnesses. In old age, physical decline affects even normal everyday functioning. Frailty and multiple chronic illnesses eventually take their toll at the upper limits of the life span (Schneider & Rowe, 1991).

### *Societal Life-Course Constraints*

There has been much research on the age stratification of societies (Hagestad, 1990; Hagestad & Neugarten, 1985; Kohli & Meyer, 1986; Riley, 1985). Age stratification can be described at two levels: in social institutions and in individuals' normative conceptions about development and the life course. Life-course sociology focuses on sociostructural constraints to life-course patterns that are enforced by social institutions such as the state, education and retirement legislation, and promotion rules in companies (Mayer, 1987; Mayer & Huinink, 1990). Developmental psychology targets normative conceptions about development as they are reflected in individuals' mental representations (see J. Heckhausen, 1990; and *Development of Control-Related Behavior* in the review section of this article). Both institutional constraints and constraints internalized by individuals set the stage for control-related behavior at the various phases of the life span.

There are three basic types of life-course constraints: (a) constraints in terms of the lifetime remaining until death, (b) constraints associated with chronological age, and (c) constraints resulting from age-sequential patterns. First, time left to live restricts the future time extension of developmental goals and life plans. Whatever is to be accomplished must be done within a specific and relatively finite period of time. A case in point is career planning near retirement age. There is a point in the life course beyond which one has to settle for what one has, rather than entertain ideas about possible career changes. Second, the human life course has an age-graded structure that defines normative ages for important life events and transitions. The prototypical case is fertility in women, which decreases rapidly during middle adulthood. Finally, age-sequential constraints result from a channeling of developmental and life-course processes into biographical tracks. Life-course sociology has identified such tracks as segregated biographical paths in a given society (Blossfeld & Mayer, 1988; Featherman & Lerner, 1985; Geulen, 1981; Mayer, 1986) that give rise to intracohort heterogeneity (Dannefer, 1987). A typical case is professional specialization, which yields ever increasing levels of expertise in the chosen field, while forcing one to give up on nonchosen alternative do-

main. Along such developmental tracks, functioning is optimized, but crossovers to alternative life tracks become increasingly difficult.

### *Striking the Right Balance Across the Life Course*

In a previous publication (J. Heckhausen & Schulz, 1993a), we elaborated P. B. Baltes' and Baltes' life-span developmental model of selective optimization with compensation to explain how individuals take into account the biological and social constraints in ways that optimize development (P. B. Baltes, 1987; P. B. Baltes & Baltes, 1990). Our goal here is to describe the optimal balance between primary and secondary control strategies over the life course and ways in which this balance is achieved.

Issues of balance are reminiscent of the Piagetian concept of equilibration between assimilative and accommodative processing (Piaget, 1985). While assimilative processing incorporates new external events into known cognitive schemata, accommodative processing adjusts cognitive schemata to new external phenomena. Equilibration, then, safeguards a delicate balance between assimilation and accommodation and promotes ever more adaptive cognitive representations of the outer world (Piaget, 1985). In a similar manner, striking the right balance between primary and secondary control might be the critical prerequisite for increasingly successful optimization of development (J. Heckhausen & Schulz, 1993b).

Developmental optimization comprises all three time perspectives: life review of the past, life management of the present, and life planning for the future. The three time perspectives of developmental optimization correspond to the three aspects of action addressed by secondary control. Expectancies about developmental outcomes are important for life planning; values ascribed to developmental goals determine engagement and disengagement in the management of life; and causal attributions and interpretations of developmental outcomes are key features of life review. Primary and secondary control work hand in hand to foster developmental optimization within each of these three time perspectives (life review, life management, and life planning). For example, relinquishing primary control with regard to a particular important life goal requires a revision of one's current hierarchy of goals and one's subjective account of the goal's past history, and it may require a revised life plan.

Control strategies vary with the developmental status of the individual. The preferred strategies of control shift in accordance with the developmental requirements at different periods of the life span. On a general level (see detailed account later in this article), the following life-span picture emerges. During childhood the preferred strategy of control shifts from a magic animatious image of the external world and an omnipotent view of the self to an increasingly realistic assessment of behavior-event contingencies and one's own competence (Weisz, 1983). One might be inclined to regard infants' and preschoolers' overestimations of their own competence as dysfunctional. However, small children experience very rapid increments in their bodily strength, motor abilities, and cognitive capacity. A static conception of one's own competence would be a great handicap for individuals undergoing rapid development. Thus, overestimating one's own powers and abilities at this early age is always



a safe bet. When the speed of development declines in middle childhood and fairly stable social reference groups are established, the estimates of one's own competence become more stable (Weisz, 1983).

During adulthood, those who hold realistic conceptions about the controllability of events and their own control potential tend to be higher in depressive affect, whereas the mentally healthy entertain exaggerated estimates of primary control (Alloy & Abramson, 1979; Langer, 1975; Lewinsohn et al., 1980; Taylor, 1989). However, for a majority of persons, these overestimations of personal competence are typically small distortions of reality. It is important that the individual is aware of the fine line between obtainable and unrealistic goals. Hence, good judgment about realistic action–outcome and outcome–consequence relations is a basic developmental prerequisite for the fine art of self-deception implied in the pervasive optimism found among adults.

While an optimistically biased view of one's own primary control is the adaptive strategy of early and middle adulthood, one could speculate that the strategy of choice for old age leans more toward elaborating secondary control as a means of preserving primary control (Schulz, 1986; Schulz et al., 1991). The increasing age-related constraints on primary control make direct investment in the development of primary control a risky proposition because of the increasing probability of failure. Not only because of declining powers, but also because of the changing ratio of lifetime spent to lifetime remaining, there is an increasing emphasis on the interpretation of the past rather than on planning future changes. Tracking personal consistency (Greenwald, 1980; Greve, 1990; Ross, 1989), constructing one's personal life story (Whitbourne, 1985), discovering meaning and connectedness in one's personal past (Dittmann-Kohli, 1990; Staudinger & Dittmann-Kohli, 1992), and interpreting life's successes and failures (Staudinger, 1989) are high-priority tasks in old age. Most of these activities can be viewed as serving secondary control needs to enhance selectivity and buffer the negative effects of losses, although other motivational bases for these behaviors, such as striving for a unique and meaningful self (see Filipp & Klauer, 1986) are possible as well. The ability to strike the right balance between primary and secondary control even toward the end of life might be the key to optimal development and successful aging.

### Changes in Primary and Secondary Control Across the Life Span: Empirical Findings

In this section we discuss empirical findings about the stability and change of control-related behavior across the human life course. Our review emphasizes the growth and decline of important primary and secondary control strategies and includes research on the development of contingency awareness, achievement motivation, attributional patterns, control beliefs, developmental goals, and coping strategies. When it is warranted by the scope of empirical research available, we focus on potential trade-offs between primary and secondary control strategies. Our principle theoretical position is that for each segment of the life course, modes of control are functionally adapted to the potential and constraints that characterize the respective age periods.

### *Development of Control-Related Behavior During Infancy, Childhood, and Adolescence*

*Striving for primary control as a built-in motivational system.* The developmental origin of activities directed at controlling external events (i.e., primary control) and acquiring generalized expectations about control can be traced to the very beginning of life. Even neonates are able to detect behavior–event contingencies (Janos & Papousek, 1977; Papousek, 1967). Papousek found, for example, that very young infants learned head movements contingent on acoustic signals and milk reinforcement. Even after complete satiation, when the milk had lost its reinforcing potential, signals elicited prompt head movements and pleasure on the occurrence of the expected contingent presentation of the milk bottle.

Operant conditioning studies with mammals show that behavior–event contingencies are preferred to event–event contingencies even in the absence of consummatory behavior (see review in White, 1959). Chimpanzees favor objects that can be moved, changed, or made to emit sounds and light (Welker, 1956); monkeys spend hours in solving mechanical puzzles (Harlow, 1953); and both children and rats prefer response-elicited rewards over receiving the same rewards without having to respond (Singh, 1970). These findings indicate that behavior–event contingency striving is a basic nonconsummatory need in mammals. Humans, and at least some animals, apparently start their lives with a built-in readiness to detect, strive for, and produce behavior–event contingencies.

Watson took the contingency-striving hypotheses further by investigating transfer and generalization effects of contingency experiences (Watson, 1966, 1972). In a study using operant conditioning of visual fixation, Watson found that infants are increasingly attentive and skilled in analyzing response–stimulus contingencies. A number of experimental studies, showing transfer from one operant learning task to another, interference of noncontingent experiences with contingency learning (DeCasper, Butterfield, & Cairns, 1976; Finkelstein & Ramey, 1977; Ramey & Finkelstein, 1978; Rovee & Fagan, 1976; Watson & Ramey, 1972), and negative affect to noncontingent stimulation that had previously been contingent (DeCasper & Carstens, 1981), provide support to Watson's concept of generalized contingency awareness.

Generalized contingency awareness typically originates not in solitary infant activity but in the context of interactions between the infant and an adult caregiver. More complex actions, which involve planning and delayed outcomes, require volitional effort to divert the infant from competing action tendencies (i.e., management of action selectivity). It is initially the caregiver who introduces an action goal and keeps the infant's attention focused on the task at hand (J. Heckhausen, 1987a, 1987b; Kaye, 1977a, 1977b; Rogoff, 1990; Rogoff, Ellis, & Gardner, 1984; Rogoff & Wertsch, 1984). The caregiver provides an external scaffold (Wood, Bruner, & Ross, 1976; Wood & Middleton, 1975) for the selectivity of primary control. Gradually, the child evolves out of the infant–caregiver apprenticeship (Kaye, 1982; Rogoff, 1990; Schaffer, 1984) and becomes more self-reliant in the motivational and volitional control of his or her own activities (J. Heckhausen, 1987a).

In terms of the anticipatory cognitive representations of be-



havior–outcome contingencies, generalized contingency awareness is related to concepts from other fields in psychology such as Bandura's self-efficacy (Bandura, 1977, 1982), Rotter's perceived control (Rotter, 1966), and Seligman's learned helplessness (Abramson et al., 1978; Seligman, 1975). As for the motivational aspects, generalized contingency awareness is akin to Bühler's concept of *Funktionslust* (i.e., pleasure in functioning, Bühler, 1919), effectance motivation (White, 1959), and mastery motivation (Harter, 1974, 1975)—models that assume explicatory value for achievement-related behavior well beyond infancy. In the framework of the present life-span theory of control, generalized contingency awareness constitutes an important motivational resource for primary control.

*The development of motivation and management of action selectivity.* Mature human action typically involves substantial effort, persistence, and tolerance of the delay of gratification. In fact, these features of human action are the preconditions for developing more complex skills and abilities. An important motivational resource in adult functioning is anticipatory self-reinforcement (H. Heckhausen, 1991). An action goal appears attractive not only for reasons of its intrinsic value but also because its attainment bears desirable information about the actor's competence. Thus, positive perceptions about one's own competence are another important motivational resource for primary control.

During the second and third year of life, children acquire the ability to reflect an action outcome back to the self. During this period, children start conceiving of themselves not only as originators of external effects but also as bearers of competencies such as cleverness or strength (H. Heckhausen, 1982, 1987). Thus, when pursuing an action goal, a preschool-aged child is driven not only by a basic striving for behavior–effect contingencies, but also by the anticipation of positive self-evaluation.

How does this developmental advancement in the management of goal directedness (i.e., action selectivity) come about? Again, it is the adult caregiver who initiates and fosters the developmental gain in action regulation (J. Heckhausen, 1988). The caregiver praises the child when the action goal is attained and uses positive self-evaluation as an anticipatory incentive for on-line investment of effort. By the age of 2 years, the child begins to become self-reliant in evaluating the self on the basis of success experiences.

This developmental gain in the second year goes hand in hand with an important progression in the infant's conception of self from the "self as a subject" to the "self as an object" (Geppert & Küster, 1983; J. Heckhausen, 1988). At about 18 months of age, the child begins to conceive of himself or herself as having descriptive attributes and can therefore be characterized in terms of categories (e.g., the idea of categorical self, Lewis & Brooks-Gunn, 1979). This cognitive advance brings about the new emotional experience of pride about a successful outcome of an action (Geppert & Heckhausen, 1990). The child can now use information about an action outcome as information about the self—"I am clever because I have built a nice tower" (H. Heckhausen, 1983; J. Heckhausen, 1988). The emotion of pride, thereafter and throughout life, becomes a major motivator of achievement-related behavior. Anticipated self-reinforcement (i.e., pride) after a successful outcome motivates achieve-

ment striving (H. Heckhausen, 1991), even under conditions of delayed gratification.

*Developing strategies for coping with failure.* The awareness that action outcomes provide information about one's own competence also carries with it the risk of self-blame in case of failure. Negative inferences about one's own competence after failure threaten self-esteem and perceived competence and thereby jeopardize an important motivational resource for the further development of primary control. Apart from the negative emotions resulting from not attaining a goal, negative self-evaluation is the major reason the organism needs strategies of secondary control to regulate the consequences of failure experiences, which threaten to undermine important motivational resources.

It is interesting to note in this context that emotional reactions to failure, namely embarrassment or shame, developmentally do not occur simultaneously with pride reactions but are delayed by at least 1 year (Geppert & Heckhausen, 1990; H. Heckhausen, 1984). After failure, 2- to 3-year-olds, who already show full-blown pride reactions, merely exhibit surprise, anger, and even rage, but not embarrassment. This developmental delay of esteem-relevant failure reactions may protect immature individuals from negative self-evaluations (H. Heckhausen, 1984).

Between the ages of 3 and 4 years, children experience appropriate emotional reactions to failure and begin to generate negative self-evaluations. It is characteristic that simultaneously, children have been found to evade embarrassment after failure by using secondary control strategies such as reductions of aspiration level, denial, egotistic attributions, and reinterpretations of the action goal. For example, in a study of children's choices of tasks varying in difficulty, children as young as 3½ years lowered their aspiration level after experiencing failure (H. Heckhausen, 1974). Moreover, when failing in a competitive tower-building game, children as young as 3 years of age denied ("It was me who has won"), excused ("I was too tired"), and reinterpreted ("Now, we have two towers") the fact that they were last in finishing the tower. In addition, in the trials following failure, they showed evasive and self-handicapping behavior. Thus, at the same time as the motivational resource of positive perceptions of competence evolves, the organism also develops appropriate secondary control strategies to buffer the respective costs of failure.

Studies targeting the development of specific secondary control strategies for coping with negative events during middle childhood and adolescence are scarce. However, the topic has recently received more attention (Compas, 1987; Compas, Banez, Malcarne, & Worsham, 1991a). For a variety of stressor types (e.g., health, peer conflict, and family stress), initial evidence suggests that secondary control strategies are increasingly used during middle childhood (Altshuler & Ruble, 1989; Compas, Banez, Malcarne, & Worsham, 1991b; Curry & Russ, 1985; Wertlieb, Weigel, & Feldstein, 1987) and early adolescence (Band, 1990; Band & Weisz, 1988; Compas & Worsham, 1991). Utilization of secondary control might reach a temporary developmental plateau in adolescence; young adults do not use secondary control more extensively than do adolescents (Compas & Worsham, 1991).

Additional evidence for the growing role of secondary control

in middle childhood is reported by Nolen-Hoeksema, Girgus, and Seligman (1992). In their study on predictors of childhood depression, negative events by themselves predicted depression only in early childhood, whereas in later childhood, explanatory style emerged as a major determinant of stress impact. Explanatory style can be conceived of as a secondary control strategy targeted at the causal attribution of outcomes. Because of their cognitive requirements, explanatory styles may moderate the experience of negative events only at later ages, when children are sufficiently advanced in cognitive competencies.

Wertlieb et al. (1987) investigated 7- and 10-year-olds' open-ended reports about coping with recently encountered stressful situations. The 7-year-olds mentioned more primary control strategies (problem-solving, e.g., "clean up when I have spilled something") than the 10-year-olds. Conversely, secondary control strategies (emotion management, e.g., "I don't worry, because I am busy all day," and intrapsychic coping, e.g., "I think about something fun") were reported more frequently by the older children.

Altshuler and Ruble (1989) confronted 5- to 12-year-old children with hypothetical scenarios of uncontrollable stress. Scenarios dealt with a child having to wait patiently for a positive event (getting a big piece of candy in half an hour or having a birthday party later in the day) or a negative event (going to the dentist or getting a shot). The children's open-ended suggestions about what the main character should do were coded as approach-type coping (e.g., seeking information, changing the situation), complete avoidance (e.g., escaping), behavioral distraction (e.g., doing something else or watching TV), or cognitive distraction (e.g., thinking of something else or fantasizing). These four types of behavior can be classified in terms of primary and secondary control. Approach-type coping is an instance of primary control. Complete avoidance (escape) might appear to be a primitive type of secondary control, but should be classified as primary control, because for the child the goal is to remove a negative stimulus from its environment. Escape behaviors represent actions aimed at changing the external environment. Behavioral and cognitive distractions, on the other hand, represent secondary control strategies. Children as young as 5 years of age primarily generated behavioral distraction techniques as coping methods, thus displaying knowledge about secondary control strategies. With increasing age, children endorsed more cognitive distraction. Moreover, 5- to 6-year-olds favored escape (e.g., from getting a shot) much more often than older children, and 7- to 11-year-olds proposed cognitive distraction techniques significantly more often than 5- to 6-year-olds. The finding regarding distraction techniques is particularly noteworthy, because escape can be conceived as a dysfunctional type of primary control, whereas cognitive distraction is a functional secondary control strategy in medical situations such as those used in this study.

Evidence for domain specificity of secondary control strategies is reported by Band and Weisz (1988). They studied 6-, 9-, and 12-year-old children's ways of coping with everyday stressors in various life domains (friendship, medical care, parents, peer conflicts, school, and accidents). Age differences were found particularly with regard to the medical domain (e.g., getting a shot). Twelve-year-olds reported using less primary control (e.g., kicking and screaming to avoid getting a shot) and

more secondary control (e.g., looking away or thinking of something else) than 6- or 9-year-olds. Relative importance of primary and secondary control strategies varied across life domains. School-related problems elicited more primary and fewer secondary control responses than did medical stress.

Band and Weisz (1990) also investigated primary and secondary control in 7- to 16-year-old children suffering from juvenile diabetes. Use of secondary control strategies (e.g., "telling myself I can still live a full life") as compared with primary control (e.g., "taking insulin to control my sugar") was more common among children at a formal operational level of cognitive development than among preformal children. Ironically, use of secondary control in the formal operational group of youngsters was negatively related to behavioral and medical adjustment to diabetes. Perhaps for the cognitively more sophisticated children, secondary control (e.g., "I tell myself I don't care about any of it") served as an excuse for not engaging in primary control health behaviors (Band & Weisz, 1990). These findings serve as a prototypical example of dysfunctional secondary control strategies.

Flammer investigated adolescents' use of primary and secondary control strategies (Flammer, 1990; Flammer, Züblin, & Grob, 1988). He constructed a questionnaire assessing adolescents' control strategies in various life domains (school, parents, leisure, friendship, etc.). The questionnaire contained four types of control-related behavior: persistence in primary control (*Reaktanz*), indirect control (i.e., control through others), secondary control (change of goal after a reinterpretation of the situation), and giving up control altogether. In a sample of 14- to 16-year-olds, Flammer and his colleagues found the secondary control strategy, changing the goal, to be the second most frequently endorsed strategy after persistence in primary control.

*Developing beliefs about control and causal attribution for success and failure.* The development and differentiation of beliefs about controllability and personal capacities for control constitute important motivational resources for primary control. The early research on children's control beliefs suggested that perceived internality of control (relative to externality) increases during the early school years (see review in Skinner & Connell, 1986). More recent approaches to the study of control beliefs and their ontogenetic development differentiate between sources (causal factors) of control (Connell, 1985) and between beliefs about control, means-ends, and agency (Skinner, Chapman, & Baltes, 1988a). The conceptual distinction between beliefs about means-ends and agency focuses on the difference between beliefs about cause-outcome contingencies—that is, means-ends beliefs—and conceptions about personal access to relevant causes—that is, agency beliefs (Skinner et al., 1988a, 1988b; Weisz, 1983; Weisz & Stipek, 1982). This distinction is important for the development of primary and secondary control, because means-ends beliefs and agency beliefs involve different motivational resources, namely general beliefs about controllability of outcomes, on the one hand, and personal beliefs about one's own capacities, on the other hand. Skinner et al.'s conception is related to Bandura's (1977) differentiation between a response-outcome expectancy ("a person's estimate that a given behavior will lead to a certain outcome" [p. 193]) and an efficacy expectation ("the conviction that one can successfully execute the behavior required to produce the out-

come" [p. 193]). Another related concept is the reformulated model of learned helplessness (Abramson et al., 1978), which distinguishes between personal and universal helplessness.

During middle childhood (i.e., 8 to 14 years of age), conceptions about control become more definite and differentiated (see review in Skinner, 1991). For a variety of domains (e.g., cognitive, social, physical, and general), unknown causes are less often endorsed with increasing age, whereas powerful others (as a cause) become more prominent (Connell, 1985). Moreover, a progressive differentiation of causal agents during middle childhood was also identified (Skinner, 1990). Whereas the causal factors endorsed by 7- to 8-year-olds were differentiated on only two dimensions, known and unknown, a three-factor structure evolved for 9- to 12-year-olds' response patterns that reflects three sets of beliefs about internal (effort and ability), external (powerful others and luck), and unknown causes (Skinner et al., 1988a, 1988b). Above age 10, four factors were obtained: effort, ability, external (i.e., powerful others and luck), and unknown (Skinner, 1990).

Skinner et al.'s finding on the evolution of differentiated control beliefs about effort and ability is consistent with the development of causal attributions for success and failure (H. Heckhausen, 1984, 1987; Nicholls, 1978; Nicholls & Miller, 1985). The differentiation of ability and effort as causal factors is important because of the different affective consequences. In the case of social judgment, effort is evaluated as more "virtuous" (Rest, Nierenberg, Weiner, & Heckhausen, 1973; Weiner & Peter, 1973). Conversely, when evaluating one's own performance, "effort is virtuous, but it's better to have ability" (Nicholls, 1975). Moreover, in the case of failure, attributions to effort, an unstable and controllable causal factor, warrant future hope for success, whereas ability attributions suggest a pessimistic outlook on future control.

During middle childhood, children use simple covariation conceptions about ability and effort as causes for success and failure. In early adolescence, children begin to use compensatory schemata for ability and effort attributions (Nicholls, 1978). Thus, during middle childhood, high levels of invested effort go with perceptions of high ability, even if the outcome attained is moderate. Conversely, after the acquisition of compensatory causal schemata, a high level of invested effort for a given outcome implies low ability, whereas low effort indicates a high level of ability (H. Heckhausen, 1983). Because ability is more important for self-evaluation than effort, adolescents might decrease effort to protect a self-concept of high ability.

There is a widespread debate about the potentially debilitating effects of strategic reduction of effort—a case of self-handicapping—to protect self-ascriptions of ability (Jagacinski & Nicholls, 1990). Covington and Omelich (1979), for example, have shown that undergraduate students prefer self-ascriptions of low effort investment after failure and report that high effort investment renders a failure more embarrassing and induces perceptions of inability. Jagacinski and Nicholls (1987, 1990), however, argued that although a posteriori perceptions of low effort might be common, actual reductions of effort to anticipatorily buffer the negative effect of failure have not yet been demonstrated. They showed that strategic effort reduction occurs only when social comparison information about someone else's performance and invested effort is salient (Jagacinski & Nicholls,

1987) and the task is ego-involving. However, in the school achievement context, this should be more often the case than not. It therefore seems quite likely that avoidance of effort is an early and commonly used, yet dysfunctional, secondary control strategy.

*Developing interindividual differences in long-term motivational strategies.* During middle childhood, long-term motivational strategies evolve and also bring about interindividual differences in basic motivational orientations. These differences involve adaptive or nonadaptive conceptions about controllability of outcomes and about personal capacities for control. Moreover, they reflect preferences for either primary or secondary control strategies. Children start to show stable interindividual differences in terms of a predominance of hope for success versus fear of failure (H. Heckhausen, 1991). Hope versus fear orientations in achievement motivation are typically associated with the selection of aspiration levels as well as distinct attributional patterns after success and failure. Children (and adults) with high hopes for success select tasks at a difficulty level slightly above medium. Individuals with high fear of failure exhibit a significantly less pronounced preference for such tasks.

Patterns of causal attribution are also related to hope versus fear orientations. Hope for success is associated with internal and stable attributions for success, and external and variable attributions for failure, whereas fear of failure is associated with external and variable attributions for success and internal and stable attributions for failure (H. Heckhausen, 1987, 1991; Meyer, 1973a, 1973b; Weiner & Kukla, 1970). These emerging interindividual differences in hope versus fear orientation appear to be associated with parental socialization strategies, such as praising success versus criticizing failure, communicating attributions for success and failure, and using intraindividual (i.e., self-referent) versus interindividual (i.e., social) references for evaluation (Trudewind, 1982).

Dweck and Leggett's (1988) distinction between learning goals and performance goals targets similar phenomena as the hope-for-success versus fear-of-failure distinction adopted by achievement-motivation researchers. Children who conceive of intelligence as a fixed entity tend to be more concerned about demonstrating good performance than children who conceive of intelligence as a malleable quality that can be improved by learning. These different goals have important consequences for the development of achievement-related behavior (Diener & Dweck, 1978, 1980). Children oriented toward performance goals react to failure in a helplessness pattern. They report negative self-cognitions and negative affect, and they exhibit marked decrements in performance across a sequence of failure trials. In contrast, children focused on learning goals react to failure with a mastery orientation. These children exhibit heightened positive affect, have positive expectations for future performance, engage in self-instruction, and maintain or improve performance after experiencing failure. The contrast between performance- versus learning-oriented children provides a compelling case for the possible conflict between different motivational resources. Overconcern with a favorable image of one's own competence undermines hope for success and eventually produces passivity and actual decline in primary control.

*Veridicality and functionality in children's beliefs about mas-*

*tery and control.* Dweck and Leggett's (1988) research touches on two major issues in the development of control-related beliefs and behavior: How veridical are children's perceptions of control and how adaptive and functional are certain types of control for future development? Veridicality as a criterion of control-related beliefs has been emphasized by Weisz in a review of research about control beliefs across the life span (Weisz, 1983). Weisz noted that very little attention has been paid to differences in the validity of control beliefs. Weisz and colleagues have shown that preschoolers consistently attribute chance events to internal factors such as skill and effort (Weisz, 1980, 1981; Weisz, Yeates, Robertson, & Beckham, 1982). When children reach the late elementary-school level, however, they correctly acknowledge chance events and differentiate them from events controlled by their own behavior. Thus, children show a developmental progression from gross overestimations of their own control potential in the preschool years toward increasingly accurate assessments of their own competence in various domains (Stipek & Mac Iver, 1989).

Gross overestimations of personal control in early childhood are functionally adapted to the early development of primary control (Bjorklund & Green, 1992). Infants and young children are subject to rapid developmental progression. It would be very dysfunctional for them to be locked into any given temporary assessment of their own ability that might become obsolete the next week. Strictly veridical perceptions of one's own control potential would discourage the choice of and persistence on difficult tasks and thus jeopardize developmental progression altogether. On the other hand, gross overestimation of one's own competence would result in inappropriate task selection and futile persistence. Adult socializing agents play a crucial role in appropriate task selection during this phase of development.

As a child becomes more self-reliant during middle childhood, the development of veridical perceptions of control becomes more important, because such perceptions foster primary control at appropriate difficulty levels. The older the child, the slower the developmental progression and the greater the benefit of accurate self-assessment and task choice. An analogous but inverse pattern of conditions and developmental change would be expected for old age. With increasing age and a higher probability of failure, overestimating one's competence becomes more and more maladaptive, because whatever one can do currently might be out of reach in the near future.

#### *Control-Related Behavior During Adulthood and Old Age*

Two important conclusions emerge from our review of the early development literature. First, much of development is aimed at expanding the child's primary control potential. Second, the development of primary control is facilitated by the emergence of secondary control strategies relatively early in life, and by the time individuals reach young adulthood the basic repertoire of secondary control strategies is in place. What happens to primary and secondary control throughout adulthood and old age? In general, we predict stability in primary control striving throughout most of adult life; however, as one moves into old age, the maintenance of primary control increasingly depends on secondary control processes because of biological

declines and sociocultural constraints. Thus, secondary control should increase with age.

*Stability of primary control striving throughout adulthood.* Direct evidence for this prediction is reported by Peng and Lachman (1993; Peng, 1993). In a sample of adults aged 18 to 84, primary control did not differ by age, whereas secondary control was highest for the oldest respondents (aged 60+), next highest for middle-aged respondents (aged 40 to 59), and lowest for young respondents (aged 25 to 39). That primary control remains constant while secondary control increases as a function of age suggests that individuals increasingly use secondary control strategies to maintain primary control throughout the adult life course.

However, seemingly contradictory findings were reported by Brandtstädter and Renner (1990). They identified tenacious goal pursuit and flexible goal adjustment as two ways of coping with adult crises and life transitions. Consistent with our concept of primary control, tenacious goal pursuit is measured by items such as "When faced with obstacles, I usually increase my efforts a lot." Flexible goal adjustment is measured by items such as "I usually find something positive even about giving up something I cherish," similar to our concept of secondary control. In a cross-sectional study of German adults ranging in age between 34 and 63 years, Brandtstädter and Renner (1990) found an age-related increase in flexible goal adjustment and a decrease in tenacious goal pursuit. Thus, although Brandtstädter and Renner's findings support our prediction that secondary control should increase with age, the decrease in tenaciousness appears to contradict our prediction, as well as data reported below showing that primary control striving remains stable throughout adulthood.

More recent data on age differences in primary and secondary control striving, reported by J. Heckhausen and Schulz (1994), contradict Brandtstädter and Renner's (1990) findings regarding age declines in tenacious goal pursuit (primary control). Ratings on tenaciousness and flexibility were obtained in three studies of German adults ranging in age between 20 and 85 years. As predicted, tenaciousness was stable throughout adulthood, whereas flexibility showed an increase from young to old age (J. Heckhausen, 1994; J. Heckhausen & Schulz, 1994). Further analyses revealed that the inconsistent pattern of results reported by the two groups of researchers may be attributable to the fact that the tenaciousness scale is comprised of two subfactors exhibiting differential age trends (J. Heckhausen & Schulz, 1994).

Additional, although less direct, evidence for the stability of primary control over the life course is found in the extensive literature on perceived control. As a group, these studies consistently show that generalized or internal control remains stable well into old age (Brandtstädter & Rothermund, 1994; Grover & Hertzog, 1991; Lachman, 1986, 1991; Lachman & Leff, 1989; Reker, Peacock, & Wong, 1987; R. P. Smith, Woodward, Wallston, & Wallston, 1988). At the same time, there are consistent age-related shifts in perceived control with respect to specific domains of functioning characterized by age-related declines, such as health and intellectual functioning (Beisecker, 1988; Keller, Leventhal, & Prohaska, 1989; Lachman, 1986; Lachman & Leff, 1989; Reker et al., 1987). If we assume that generalized or internal control is roughly equivalent to our concept

of primary control, then these data provide additional evidence for the stability of primary control throughout the adult life course.

*Primacy of primary control in adulthood.* As noted above, the available data suggest stability in primary control over the adult life course. Although stability alone does not imply a preference, other data show that adults of all ages prefer primary control when it is available. A large body of experimental, survey, and observational research demonstrates that individuals readily embrace opportunities to directly control outcomes in their lives. A variety of field experiments have been carried out showing the benefit of control-enhancing interventions for the elderly (Langer & Rodin, 1976; Reich & Zautra, 1989, 1991; Rodin & Langer, 1978, 1980; Schulz, 1976; Schulz & Hanusa, 1978, 1980). Survey research and observational studies also show that disabled elderly persons living at home and in long-term care institutions have a strong desire for independence; they prefer and benefit from environments that provide high levels of primary control (Bowsher & Gerlach, 1990; Timko & Moos, 1990; Wahl, 1991).

Complementary evidence showing that the loss of primary control is distressing is also available. For example, Krause and colleagues (Krause & Baker, 1992; Krause, Jay, & Liang, 1991) found that loss of control associated with financial problems led to increased distress among samples of elderly Americans, Japanese, and Canadians. Herzog, House, and Morgan (1991) showed that elderly individuals who have control over whether they work report higher levels of physical and psychological well-being. Swan, Dame, and Carmelli (1991) also found that individuals reporting involuntary retirement tended to have poorer adjustment to retirement, more illness, poorer physical status, and more depressive symptomatology. Finally, Williamson and Schulz (1992a, 1992b) found that restrictions in activity were a strong, independent predictor of depression among elderly outpatients. Taken together, these studies show that personal or environmental events that constrain the ability to exercise primary control are highly undesirable and have negative mental and physical consequences.

*Management of selectivity in the adult life course.* Because of the limitations in human ability and the limited life span, individuals must choose among a finite set of life-course options. As a result, once a particular career path is chosen, many alternative career paths are lost as possible options. The secondary control strategy of enhancing the value of a selected goal relative to nonselected alternatives is an adaptive strategy in this context, because it promotes the development of primary control for the chosen domain. At any given point in the adult life course, effective functioning should be enhanced to the extent that individuals believe that they have made the correct life-course choices for themselves. Support for the idea that humans engage in behaviors consistent with achieving this type of personal coherence is found in the literature on hindsight bias (Greenwald, 1980), immunization of the self-concept against external threats (Brandtstädter & Greve, 1994; Brandtstädter, Wentura, & Greve, 1993; Greve, 1990), and the construction of personal histories (Ross, 1989). For example, Ross suggested that individuals develop implicit theories regarding the inherent consistency of their attributes and then use these theories to construct a personal history.

*Secondary control strategies for coping with age-related losses.* Physiological decline and associated functional disabilities have become a hallmark of aging, particularly among individuals reaching their eighth and ninth decades of life. Recent research shows a strong consensus among individuals of all ages that aging in general is associated with declines in a substantial number of psychological attributes as well. For example, Heckhausen and colleagues (J. Heckhausen & Baltes, 1991; J. Heckhausen, Dixon, & Baltes, 1989) found among young, middle-aged, and old subjects that expected age-associated changes were generally negative, undesirable, and less controllable. They found, for instance, that forgetfulness, rigidity, and increased confusion were attributed to older ages and were perceived to be less controllable. Although individuals of all ages are willing to acknowledge age-related declines in generalized others, they are much less likely to concede these declines in themselves. In particular, older persons perceive less decline in themselves when comparing themselves with other old people and do not admit to significant declines in primary control until they reach very old age (J. Heckhausen & Krueger, 1993). That older persons are able to maintain relatively stable perceptions of primary control well into old age suggests that they effectively use secondary control strategies.

As described earlier in the research on tenaciousness and flexibility, one of the hallmarks of aging is the increased use of flexible goal adjustment (Brandtstädter & Renner, 1990; J. Heckhausen, 1994; J. Heckhausen & Schulz, 1994; Peng & Lachman, 1993). This is just one of several secondary control strategies frequently used by older adults to cope with common problems of late life.

In general, older people are likely to be faced with situations (e.g., health problems) over which they have little control—that is, where the possibility of achieving desired changes through direct action is limited. As a result, coping activities are likely to be focused on regulating emotion rather than action on the environment. Such an interpretation converges with findings of Blanchard-Fields and Irion (1988), who showed that young and middle-aged adults preferred problem-focused coping (primary control) strategies in controllable situations while resorting to emotion-focused (secondary control) strategies in uncontrollable situations. Folkman, Lazarus, Pimley, and Novacek (1987) also found that younger persons were more likely to identify problems in the domains of finances and work and used proportionately more active, interpersonal, problem-focused forms of coping (confrontive coping, seeking social support, and planful problem solving). Older persons, on the other hand, identified problems in the domains of environmental and social issues, home maintenance, and health, and used more passive, intrapersonal emotion-focused forms of coping (distancing, acceptance of responsibility, and positive reappraisal). These findings are consistent with those of Schulz and Decker (1985), who found that one of the ways elderly spinal-cord-injured persons coped with their disability was to emphasize the importance of “brain” over “brawn” in defining the quality of their lives. Moreover, Koenig, George, and Siegler (1988) identified religious coping as an effective means for dealing with challenges encountered in old age. Finally, data reported by Ryff (1991) suggests that older adults downwardly adjust their ideal self and view their past more positively than younger adults, thus possi-

bly compensating for the less promising future outlook they expected in old age. Together these studies illustrate a wide variety of secondary control strategies, including self-protective causal attributions, adjustment of goals and aspirations, positive reappraisal, and identification with powerful others.

Another effective method for coping with losses in later life involves the use of downward social comparison—a secondary control strategy. Older persons who have a relatively negative stereotype of “most other people” should find it easier to raise their self-esteem by contrasting their own status with that of others. Evidence for this is reported by Schulz and Fritz (1988) and Harris and Associates (1975, 1981), who show that most older adults regard their own well-being as better than that of “most other people.” In addition, a secondary analysis of the Harris survey data by O’Gorman (1980) revealed that the more serious a problem was for respondents personally, the more serious they perceived the problem to be for the majority of their age peers. Convergent findings are reported by Heidrich and Ryff (1993), who found that elderly women facing health-related threat or loss profited most from self-enhancing social comparisons. Finally, J. Heckhausen and Krueger (1993) showed that old respondents reported larger favorable self-other discrepancies than young respondents. This would be expected because the need to use this type of secondary control strategy is greater for elderly respondents. In sum, normative conceptions about aging provide a convenient framework for evaluating and coming to terms with one’s own developmental decline (J. Heckhausen, 1990). In this way, negative stereotypes of aging, which have long been viewed as detrimental to the elderly, may actually increase older people’s self-esteem by providing a negative comparison group.

*Failure of control.* A number of existing theories specifically address the effects of failure or loss of control (Abramson et al., 1978; Alloy & Abramson, 1979; Seligman, 1975). Most notable is the learned helplessness model, which was designed to provide a control-based explanation for the occurrence of depression. Although our focus is on normative life-course development rather than clinical pathology, our theory also allows us to make predictions about the impact of absolute declines in control. From our perspective, when both primary and secondary control strategies fail to redress losses in primary control, the individual is likely to become distressed and eventually demoralized and depressed (Schulz, Heckhausen, & O’Brien, 1993). The disabling process in the elderly serves as a good example of a normative life-course event in which direct action alternatives and secondary control processes together are often insufficient to protect the individual from fundamental losses in primary control. Initially, older adults affected by a progressively worsening condition such as arthritis are able to modify their behavior to adapt to the condition (Schulz, Heckhausen, & O’Brien, 1994; Verbrugge & Jette, 1994) and develop secondary control processes such as downward comparisons to maintain stable levels of primary control. In the long run, however, the condition will worsen to the point that independent functioning is no longer possible and secondary control mechanisms are no longer able to compensate for the inability to perform activities of daily living. When this point is reached, negative affect in the form of increased depression is likely to be a response to the

decline in primary control (Kennedy, Kelman, & Thomas, 1990; Williamson & Schulz, 1992a, 1992b).

Sudden and substantial losses in primary control are likely to be particularly devastating in that they do not allow individuals time to adapt and compensate through secondary control processes before significant loss occurs. For instance, when an individual experiences disability after a stroke, individual resources are likely to be inadequate to meet these immediate threats to primary control. Depressive symptomatology is frequently the outcome of such events, which occur suddenly, disrupt an individual’s typical experience of primary control, and may have permanent negative effects (Schulz, Tompkins, & Rau, 1988; Tompkins, Schulz, & Rau, 1988). Over time, however, even crises such as these can be overcome as control is reestablished and elaborated. For instance, a stroke victim can engage in primary control by obtaining rehabilitation and can eventually adapt to the disability through secondary control processes such as adjusting goal hierarchies.

In sum, it is only when individuals experience absolute declines in primary control that cannot be compensated for cognitively that individuals experience distress and depressive affect. These negative effects should be greatest under circumstances where both current and future primary control potential is threatened, as would be the case when an individual undergoes a permanently disabling condition. However, even under these circumstances, many individuals are eventually able to regain a sense of control, and thus they optimize their potential for primary control in the long run.

### Summary and Conclusions

This article proposes a conceptual model that characterizes control-related behavior in terms of three dimensions: primary versus secondary, functional versus dysfunctional, and veridical versus illusory. Primary control involves behavior aimed at achieving effects in the immediate environment external to the individual. Secondary control targets the self in attempts to achieve changes directly within the individual. Both primary and secondary control can involve cognition and action, although primary control is usually characterized in terms of active behavior engaging the external world, whereas secondary control is predominantly characterized in terms of cognitive processes localized within the individual. The dimension of functionality captures the degree to which control-related behavior optimizes an individual’s long-term potential to control behavior–event contingencies. Finally, veridicality refers to the degree to which control-related behavior and cognition reflect objective reality.

Our view emphasizes the functional primacy of primary over secondary control. Primary control enables individuals to shape their environment to fit their particular needs and developmental potentials. As a result, it is both preferred and has greater adaptive value to the individual. Indeed, we argue that the major function of secondary control is to minimize losses in, maintain, and expand existing levels of primary control. Secondary control strategies help the individual cope with two inevitable features of any human activity: its selectivity and failure-proneness. Action selectivity can be optimized by such secondary control strategies as enhancement of the chosen goal’s value and

devaluing alternative goals. Potentially negative effects of failure on the individual's emotional and motivational resources are buffered by secondary control strategies such as self-serving attributions.

Secondary control strategies can address any of three aspects of action: the expectation (or setting) of goal attainment (e.g., strategic optimism or pessimism and adjustment of aspiration level), the value associated with a goal (e.g., the "sour grapes" effect, and disengagement), and the causal attribution for the action outcome (e.g., attributional egotism). An extensive repertoire of related phenomena (e.g., predictive control, vicarious control, and self-handicapping), previously addressed by diverse and separate areas of research, is considered, conceptualized, and classified in an integrative theoretical framework.

Although our emphasis in this article has been on linking behaviors to control-related phenomena, it should be noted that many of the behaviors we classify can be multiply determined. Other motivational factors will at times influence the occurrence of these activities in addition to, or instead of, primary and secondary control. For example, alternative theoretical positions have been proposed for activities such as striving for autonomy (DeCharms, 1968; Deci & Ryan, 1985), need for social relatedness (Connell, 1990; Skinner & Wellborn, 1994), searching for a unique self (C. R. Snyder & Fromkin, 1980), finding personal meaning (Dittmann-Kohli, 1990), and reconstructing biographies to achieve personal consistency (Greenwald, 1980; Whitbourne, 1985). Many pivotal life events exert their effects on individuals through mechanisms other than control. In addition, it is important to note that many behaviors in daily life bear little relation to issues of control. For example, most consummatory behaviors are typically motivated by factors unrelated to control.

To maintain functional equilibrium, primary and secondary strategies of control have to be balanced. It is argued that the trade-offs between primary and secondary control undergo systematic shifts across the life course in response to the opportunities and constraints encountered at each period of the life course. Although the striving for primary control is present even in newborns, secondary control strategies emerge in early childhood. They play an important role in facilitating the development of primary control early in life and in preserving primary control potential late in life. In an extensive review of the literature, phenomena reflecting various strategies of primary and secondary control are discussed for each period of the life span.

Our goal has been to provide a coherent conceptual framework regarding control-related behaviors and apply it to development across the life course. For this purpose, we focused on pivotal behaviors and events that define the individual's status with respect to the ability to control important outcomes. The advantages of this approach are twofold. First, it enables us to integrate a vast and diverse literature and articulate a life-span theory of development centered on the concept of control.

Second, the conceptual framework presented helps us identify important gaps in our understanding of control-related processes and hence a research agenda for the future. Examples of possible future areas of scientific inquiry are listed below.

1. Relatively little is known, even at a descriptive level, about the extent to which specific primary and secondary control strategies are used over the life course. Even less is known about

the adaptive or functional value of specific strategies. One approach to the latter problem might be to carry out a cost-benefit analysis of striving for versus relinquishing primary control. We would predict that secondary control strategies are most adaptive when the costs of pursuing primary control are high relative to their long-term benefits. Moreover, illusory kinds of secondary control can be expected to be more harmful (involve greater costs) when the potential for attaining primary control is high as opposed to low. Finally, the effectiveness of a given control strategy should be enhanced to the extent that it is used in the appropriate action phase. For example, illusory types of secondary control are likely to be more effective during the post-decisional as opposed to the predecisional action phase.

2. Little research has been carried out on the developmental origin and acquisition of secondary control strategies. When do secondary control processes first occur in early childhood? Do reactive strategies (i.e., after failure) precede anticipatory strategies? How are secondary control processes acquired? Are they self-generated in response to experienced losses of primary control or are they socialized by parents and teachers? Are there interindividual differences in the acquisition of secondary control strategies, and at what age do they emerge? Is there continued growth (or decline) in the availability of strategies throughout the life span beyond childhood? Is there increased diversity in the use of individual strategies across the life span or increased restriction (specialization)?

3. Life-span research on the utilization of secondary control should target major life transitions that involve a disengagement from specific life goals and a shift from primary to secondary control. A particularly relevant age period might be middle adulthood. During midlife, individuals encounter biological or societal deadlines that limit the attainment of certain goals such as having children or following a particular career path. We predict that individuals increase efforts to attain important goals shortly before the deadline is reached and then disengage from the goal once the deadline has expired. Thus, in a comparatively brief period of time and with regard to the same goal, the individual has to shift from primary to secondary control strategies. These functional requirements make midlife transitions a prime testing ground for the functioning of trade-offs between primary and secondary control.

4. Secondary control strategies are more easily invoked for normative, as compared with nonnormative, losses in primary control. Normative losses in control are predictable and therefore enable the individual to engage in anticipatory as well as post hoc secondary control processes. For unanticipated losses in primary control, we argue that only post hoc secondary control processes are available to the individual. When effective coping is delayed, the risk of negative outcomes increases.

5. Researchers have become increasingly interested in exploring biological mediators (e.g., immune and endocrine function) of control-related phenomena. Our analysis suggests that biological effects are likely to be maximized under circumstances where primary control is threatened or lost and secondary control strategies are ineffective in preserving or restoring primary control. After failure to restore control through primary means, the second line of defense is the repertoire of cognitive secondary control strategies. Only after this line of de-



fense fails would we expect to find direct biological consequences of loss of control.

The research possibilities outlined here are far from exhaustive. It is our hope that the integrated model of control-related behavior and its application to the human life course presented here will open a rich new field for scientific inquiry.

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Received November 19, 1992

Revision received May 15, 1994

Accepted May 20, 1994 ■

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