

Agency and Control Striving Across the Lifespan

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Introduction

The present chapter presents a motivational perspective on lifespan development and focuses on agency and control striving (Heckhausen & Heckhausen, 2008c; Heckhausen, Wrosch, & Schulz, 2009). I will discuss the interface of motivation and development from two perspectives, the development of motivation on the one hand and the role of motivation in guiding development, on the other. Both perspectives have to take into account the advances and declines in adaptive capacity across the lifespan. An example of age-related changes in regulatory capacity is the cognitive capacity to self-reflect, which enables the anticipation of feeling competent and powerful after success. Such anticipatory self-reinforcement cannot unfold its motivational dynamic before the cognitive maturity required for self-reflection is attained. Another example reflects age-related challenges to motivational self-regulation: Women moving towards the age of menopause can expect their opportunities for child-bearing to decline rapidly in the near future, a phenomenon we refer to as “developmental deadline.” As a consequence of the drastically declining opportunities for childbearing, women in the critical age range experience urgency for childbearing, and are likely to disengage once they pass the deadline.

This chapter cannot and will not attempt to cover the broad and multi-faceted field of perceived control, locus of control, and self-efficacy (Skinner, 1996). The topic of perceived control will be addressed only insofar as it is distinguished from control striving and control behavior.

Agency and Control Striving Across the Lifespan

Motivated human action has two basic characteristics, the striving for control of the environment, and the organization of behavior into goal engagement and goal disengagement cycles (Heckhausen & Heckhausen, 2008a; Heckhausen, Wrosch, & Schulz, 2010). *Control striving* -- i.e., the striving for direct or primary control of the physical and social environment -- is part of the motivational makeup of our species (White, 1959) and beyond, of at least all mammals (see the overview in (Heckhausen, 2000; Schneider & Dittrich, 1990). Attaining contingent effects in the environment has its own independent reinforcement value and thus enables the organism to stay focused on bringing about an outcome, while adjusting behavioral means. There are both theoretical and empirical reasons for assuming that a set of basic motivational modules regulate control striving: (1) Mammals and probably many other species have a pervasive preference for behavior-event contingencies over event-event contingencies: organisms are motivated to engage in behaviors that produce contingent effects (e.g., baby smiles, mother vocalizes). (2) Exploration is also a universal motivational system in mammals, and engages the organism with the goal of extending its range of control over the external environment. (3) There is much evidence for an asymmetric pattern of affective responses to positive and negative events (Frijda, 1988): organisms soon get used to the positive affect experienced after positive events, whereas the negative emotions elicited by negative events are much longer-lasting. This motivates individuals to aspire to new goals rather than resting on their laurels after successes, and prevents them from giving up too soon in the face of setbacks.

Human control striving is motivated by an innate preference for controlling the environment by one's own rather than environmental events being influenced by other external factors. In addition, and that is a specifically human characteristic, people are motivated by anticipating a positive self-evaluation after achieving a goal. So not only are people motivated by mastering their environment and achieving a goal, but also by the expected pride they will feel when achieving success. The latter motivational process of anticipated self-reinforcement is based on the self-concept and entails both positive (i.e., to perceive oneself as highly competent or becoming more competent) and negative incentives (i.e., to perceive oneself as incompetent or losing competence).

Human action and control striving is organized into *action cycles of goal engagement and goal disengagement* (Heckhausen et al., 2010). Such action cycles start with selecting a goal, then once a goal has been selected move into a phase of goal engagement, that leads either to success or failure, followed by a phase of goal disengagement, which concludes the action cycle and can be followed by opening a new action cycle. During each phase, various aspects of action regulation and information processing are adapted to the function of the given action phase, be it goal selection, goal engagement or disengagement. Perceptions, thoughts, emotions, skills, and activities are coordinated to facilitate either the attainment of goals or disengagement from unattainable or futile goals. During periods of goal engagement, individuals focus on what is important for goal-directed action and ignore irrelevant stimuli. They put key procedures in place, attune their attention and perception to stimuli that trigger or cue behavior, and shield themselves from potential distractions. Expectations of control during goal engagement are optimistic. Motivational research based on a general (not

developmental) model of action phases has provided a wealth of empirical evidence for mental and behavioral resources being orchestrated in this way to facilitate goal pursuit (Achtziger & Gollwitzer, 2008; Heckhausen, 2007).

In contrast, goals are deactivated during periods of goal disengagement. Such deactivation is not gradual; on the contrary, goal disengagement is an active process whereby goal-engagement related commitments are broken down and goal-pursuit oriented biases are inverted (Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Goal disengagement involves degrading the original goal and enhancing the perceived value and attainability of alternative goals, defending self-esteem against experiences of failure and, more generally, seeking to ensure that disengagement from a particular goal does not undermine motivational resources in the long term (Heckhausen, 1999).

Goal engagement and goal disengagement can be seen as two motivational modes: "go" and "stop." In adaptive behavior, at least, the two modes do not overlap, but discretely focus an organism's cognitive, behavioral, and motivational activities on the efficient investment of resources. After all, it is much more efficient to decide on a goal and pursue it resolutely than to dither between options, squandering resources without attaining the aspired goal. Should a goal prove to be unattainable or its costs too high, it makes sense to abandon that goal once and for all, without getting caught up in post decisional conflicts or clinging half-heartedly to old habits, thus wasting mental, behavioral, and temporal resources that could be put to better use in the pursuit of new, attainable goals. A suitable imagery for this type of adaptive switching between goal engagement and goal disengagement is a lion chasing its prey. The lion will begin the chase at top speed (i.e., goal engagement). As the lion finds itself outrun, it will not slow

down gradually, but will stop and turn away from its prey abruptly (i.e., goal disengagement) as soon as it becomes clear that its efforts are futile. In this way, the lion will invest effort only as long as the chase is worth it and save its energy for more worthwhile hunts.

Early Control Striving in Parent-Child Interactions: The Cradle of Action

Humans and mammals in general seem to be born with a *built-in readiness for primary control striving*, that is for exerting influence over the environment by one's own behavior. Studies on operant learning have shown that many mammals prefer to control an event by their own behavior over having this event controlled by external factors, regardless of whether the event provides primary reinforcement (e.g., food) or not (for an overview, see White, 1959). Chimpanzees favor objects that can be moved, changed, or made to emit sounds and light (Welker, 1956); rhesus monkeys spend hours solving mechanical puzzles (e.g., bolting mechanisms; Harlow, 1953); and both children and rats prefer response-elicited rewards to receiving the same rewards regardless of their behavior (Singh, 1970).

The first manifestations of control striving in human ontogeny can be observed in newborn babies (Janos & Papousek, 1977; Papousek, 1967). In fact, the ability to engage in operant behavior may develop in the womb. Papousek found that babies just a few days old learned head movements contingent on acoustic signals and milk reinforcement. Even when they were no longer hungry and the milk had lost its reinforcing potential, the babies continued to respond to the acoustic signal with a turn of the head, and showed positive affect when the milk bottle was presented as expected.

Taking a behaviorist perspective, Watson examined how operant learning can be fostered by providing opportunities for experiences of behavior-event contingency in the first months of life (Watson, 1966, 1972). Watson showed that it took only a few sessions of behaviorist training to establish an expectation in the infant for an effect that contingently follows a certain behavior. Confirmation of this expectation elicited intense pleasure when the expected effect occurred. Further studies on what Watson referred to as *generalized contingency awareness* showed transfer effects from one contingency experience to another, interference of non-contingent experiences (Finkelstein & Ramey, 1977; Ramey & Finkelstein, 1978; Rovee & Fagan, 1976; Watson & Ramey, 1972), positive affect in response to behavior-contingent outcomes (Barrett, Morgan, & Maslin-Cole, 1993), and negative affect to non-contingent stimulation that had previously been contingent (DeCasper & Carstens, 1981). In Piagetian terminology this kind of control striving would be referred to as "secondary circular reactions" (1952): infants repeat activities that have previously produced certain effects time and again, and respond to the effects with positive affect.

Human infants are born without the ability to manipulate objects and take months before they can even grab an object, never mind handle the object in a skilled enough way to produce noticeable effects. Does this mean that human infants for the first several months of their lives are deprived from experiencing control of outcomes in the environment? No, because long before infants are able to produce direct effects on their environment, they influence their parents' behavior in everyday interactions. Papousek and Papousek (1987) demonstrated that mother's responses to certain behaviors of their infants show high reliability and low latency, and occur without conscious control.

Sociobiological approaches to parent-infant interaction have conceptualized such patterns as part of a *natural parenting program* that provides for the basic infant needs of protection, nutrition, emotional warmth, and contingency experience (Keller, 2000).

The mother's greeting response to eye contact with her child is a case in point: The mother's mouth is opened, the eyes opened wide, and the eyebrows raised whenever the infant gazes at her face. This reaction is automatized and cannot be suppressed. It provides the infant with repeated, reliable contingency experiences that make minimal demands of the infants' competence to initiate action.

Maternal contingency behavior (also known as responsive behavior) seems to be conducive to the formation of generalized contingency expectations as well as to habituation to redundant stimuli (e.g., Lewis & Goldberg, 1969; Papousek & Papousek, 1975, 1987), and to the development of intelligence (Clarke-Stewart, 1973; Clarke-Stewart, Vanderstoep, & Killian, 1979). Riksen-Walraven (1978) provided compelling evidence for these relationships in a longitudinal intervention study that trained mothers to either provide more stimulation, or to be more contingently responsive to their infants' behavior, or do both, provide more stimulation and responsiveness. Findings showed that enhanced stimulation levels had favorable effects on habituation rate (shorter habituation times) only, and did not impact exploratory behavior or contingency learning. When mothers showed heightened responsiveness in their interactions with their children, thus creating a contingent environment, however, there were very favorable effects on both exploratory behavior and the rate of contingency learning.

Another important component of control striving in early social relationships is *exploratory behavior*. We know from extensive experimental and fieldwork in the area of

attachment behavior, that in the mother-infant attachment system the *mother functions as a secure basis* (Ainsworth & Bell, 1970; Ainsworth, Bell, & Stayton, 1974; Harlow & Harlow, 1966; Harlow & Zimmermann, 1959; Sroufe & Waters, 1977) that enables the offspring to explore the environment and thus make it accessible for primary control striving. Leading researchers in the field concluded from extensive research in this area that infant-mother attachment is based not only on a need for closeness, but on a balanced system of curiosity and caution that permits exploration, but evades dangers (Ainsworth, 1972; Sroufe, 1977). This dyadic behavioral system facilitates the gradual extension of mobility and autonomy throughout the infant's motor and communicative development. As for inter-individual or rather inter-dyad differences in this regard, a relatively low tendency for maternal interference in the child's exploratory activities (i.e., provision of "floor freedom") has favorable effects on the mother-child bond and was found to be the second strongest predictor of children's intelligence (Ainsworth & Bell, 1970; Stayton, Hogan, & Ainsworth, 1971) after responsiveness (i.e., contingent responses to the child's behavior).

Infants' early experiences of control are thus bound up with their primary social bonds to caregivers, with their striving for autonomy within these relationships, and the restrictions placed on them. At this early age, experiences of control in the domains of achievement, power, and affiliation are not yet separable. Differentiations in control experiences, control striving, and control behavior soon begin to emerge, however, particularly as infants begin to manipulate objects, and as social (affiliation and power/autonomy) and nonsocial motivations (achievement) become distinguishable and, in some cases, collide. Colwyn Trevarthen's observations on the development of

intersubjectivity are particularly relevant in this context (Trevarthen, 1980; Trevarthen & Aitken, 2001; Trevarthen & Hubley, 1978). According to Trevarthen children's behavior is driven from birth by two complementary, but sometimes conflicting, motives: First, the motive to have an active influence on objects, and second, the motive to interact with other humans.

Over the first two years of life, these two motives for object-related control and social relationships alternate and come into mutual conflict. In their first 3 to 4 months, infants are focused on other humans, particularly the primary caregiver. At about six months of age, in what Trevarthen labels the "praxic mode," children begin to play with objects on their own, and to pay the primary caregiver less attention than before (Trevarthen, 1980; Trevarthen & Hubley, 1978). Joint play of mothers and infants at this age goes smoothly, if the mother joins the infant's intention for the activity (see, e.g., Collis & Schaffer, 1975), but infants' get upset when their mother introduces a goal for the activity that is inconsistent with their own. Finally, during the second year, parent-child interactions with objects become more cooperative at a new level of intersubjectivity, which Trevarthen calls "secondary intersubjectivity" (Trevarthen & Hubley, 1978).

Thus, in the course of the second year, the mother-child dyad gains significantly in joint competence. The child adopts challenging action goals proposed by the mother, and both work together to achieve them. Cooperation and persistence in pursuing the shared action goal initially relies on the mother keeping the infant's attention focused on the task at hand, thus providing an external scaffold for volitional action control (Heckhausen, 1987a, b; Kaye, 1977b; Rogoff & Wertsch, 1984; Wood, Bruner & Ross,

1976). As the child becomes increasingly competent, however, the action goal becomes the focus of the joint interaction.

In sum, the early parent-child interaction is the cradle of action. It is here that the major, universal foundations for individual action regulation are laid: experience of the effectiveness of one's own behavior, feeling comfortable to explore the unknown, setting goals and persist in the face of difficulties, recognizing an attained goal as such, and negotiating with others about goals and action means. At the same time, the significance of early parent-child interactions bears substantial developmental risks. For example, if a mother consistently over-challenges her child and responds negatively to the child's failures to meet her standards, the child will develop low confidence in her own ability and feel discouraged to take up new challenges. Thus, if parental influences are not appropriate to a child's level of development or are otherwise unfavorable, the development of motivation and behavioral regulation may be misdirected, resulting over time in maladaptive motivational patterns.

Self-Reinforcement Through Perceived Own Competence: An Added Incentive and Risk

During the second year, the focus of children's attention gradually shifts to the outcomes of their actions, although they do not yet begin to draw inferences about their competence at this young age. The regulatory demands of focusing on an intended action outcome differ depending on the goal in question with sudden, discrete effects requiring the least representational capacity and volitional self-regulation, and state-related goals of multistep activities (e.g., building a tower of blocks) requiring the most (Heckhausen & Heckhausen, 2008c).

Of the many and diverse incentives for achievement-motivated behavior, three that play a prominent and ubiquitous role in the western industrialized nations, at least, are the exploration of personal competence (“What can I do?”), the emotional and social-cognitive benefits of positive conceptions of personal competence (i.e., self-reinforcement; “This success tells me that I am competent.”), and the demonstration of personal competence to others (“This success shows to others that I am competent.”). According to achievement motivation theory, individuals are not only motivated to strive for achievement because they enjoy improving their mastery, but to a large extent because they anticipate to feel great about having shown themselves to be competent (H. Heckhausen, 1991). Two emotions play a key role in this motivational scenario, pride and shame. Individuals feel proud about having mastered a relatively difficult task, or feel shame about having failed in a relatively easy task.

Children under about 30 months of age show positive affect after success, but they focus on the effects of their actions, not on socially displaying pleasure and triumph about their success (Geppert & Heckhausen, 1990; H. Heckhausen & Roelofsen, 1962). During the second half of the third year children begin to show the typical pride reaction after success: They raised their eyes from their work, smiled, and gazed triumphantly at the loser. They straightened the upper body, and some of them even threw their arms in the air as if to enlarge their ego. What happens when children fail to attain the goal they set for themselves, for instance in a competitive game of tower building (H. Heckhausen & Roelofsen, 1962). The age at which children first show self-evaluative responses to failure ranges between three and four years depending on the study’s experimental set-up (Heckhausen & Heckhausen, 2008c). However, the behavioral pattern of such shame

responses is clear: When children lost, they slouched down in their chair, lowered the head, avoided eye contact with the winner, while their hands and eyes remain "glued" to their work. It is intriguing that these postural expressions of pride and shame reflect a close relationship to dominant and submissive behavior (Geppert & Heckhausen, 1990).

Another important behavioral pattern in the early development of motivation is the phenomenon of *wanting-to-do-it-oneself* (Geppert & Küster, 1983). Geppert and Küster studied the relationship between the development of the self-concept and the emergence of self-evaluative responses to success and failure and to offerings of help. Children without any self-concept accepted help without protest, evidently because they were indifferent to who actually executed the action. At the age of about one and a half, children who had a rudimentary sense of self started to protest against any interventions of the experimenter. They did not want their goal-directed activity to be interrupted, and were particularly upset when the experimenter tried to take over at the last action step (e.g., last block on tower). Older children above the age of two and a half years who had a fully developed sense of self as indicated by self-recognition in a mirror, did not mind interruptions, but vehemently protested against offers of help. They often verbally asserted their desire to do the task by themselves. Evidently, offers of help threatened their perceptions that the successful completion of the task was due to their own competence.

Although a focus on self-evaluation can have a wealth of positive consequences, it also makes individuals and their perceptions of their own competence vulnerable to the negative effects of failure. To the extent that the individual sees goal-directed actions as tests of personal competence, he or she is exposed to the risk of negative self-attributions

(e.g., low competence, low self-esteem), particularly in social comparison situations with high levels of ego-involvement (Brunstein & Hoyer, 2002). These negative self-attributions can undermine the motivational resources needed for continued control striving, and must be counteracted and compensated by strategies of self-serving interpretation and re-evaluation, conceptualized within the theoretical framework of the lifespan theory of control as *compensatory secondary control strategies* (Heckhausen, 1999; Heckhausen & Schulz, 1995). Self-esteem may be protected by compensatory strategies of secondary control such as the following: attributing failure to external factors, thus negating personal responsibility for failure; engaging in "downward" social comparisons with people who are even less successful; and engaging in intraindividual comparisons with domains in which they are personally more competent. So far empirical research has found that simple strategies of self-protection, such as denial or re-focusing of attention away from the failure or control loss can be found in children as young as two years of age (Heckhausen, 1988), more elaborate cognitive strategies of distraction and re-interpreting the challenging event appear to develop in adolescence (Altshuler & Ruble, 1989; Band & Weisz, 1988; Compas, Worsham, Ey, & Howell, 1996; Heckhausen & Heckhausen, 2008c)

In sum, children enter a fundamentally different phase of motivational development once they realize that action outcomes have implications for their perceptions about their own competence. Anticipated self-reinforcement provides an additional and strong motivational pull for taking up challenges. However, it also bears the risk of self-blame for failure and control loss. Compensatory strategies of secondary control develop throughout childhood, but particularly proliferate during adolescence. A

caveat about cultural differences seems appropriate here. Every achievement-related action is characterized by a multitude of incentives residing in the activity itself, the action outcome (reaching an intended goal) and the internal (self-evaluation) and external (other-evaluation and social or material consequences) action-outcome consequences (Heckhausen & Heckhausen, 2008c). Cultures and indeed individuals and their families differ as to which incentives they highlight and how they combine intrinsic and extrinsic incentives for certain actions. In addition, people probably become increasingly savvy with increasing age and experience about what motivates them best and how to facilitate the salience of the personally relevant incentives (Rheinberg, 2008).

Cognitive Development Contributes to Advancements in Motivated Action

We focus here on achievement motivation, because research in this area has developed the most differentiated cognitive models about how goals (i.e., standards of excellence), expectations, perceptions about one's own action resources (i.e., competence and effort), and the combination of causal factors influence incentives and behavior. Cognitive development lays the foundation for these increasingly elaborate conceptions that help the individual decide for goals and interpret success and failure. The constrained space here only allows me to present a summary of research findings that is based on a more elaborate review of the literature (Heckhausen & Heckhausen, 2008c).

The perception of differences in task difficulty is a prerequisite for the formation of standards of excellence. *Task difficulty* and *competence* define each other: the more difficult the task executed, the higher the competence demonstrated. As it turns out, across childhood and adolescence the developing individual switches between focusing

on differences in task difficulty and differences in people's competence, depending on what the social context emphasizes. Children first learn to distinguish different degrees of task difficulty at preschool age, and do not start applying social reference norms to evaluate their competence until starting school. At the transition to secondary level schooling, individual reference norms gain in importance, at a time when the youth has to make decisions about which fields of competence to focus on and which to drop. During the last two years of high school when preparing for the transition to the adult world and its competitive challenges (e.g., college admission), social reference norms become more dominant than ever.

Causal conceptions of ability and effort are a prerequisite for guiding task choice, behavioral investment and causal attribution of success and failure. Between preschool age and 2nd or 3rd grade, independent conceptions of effort and ability slowly emerge from a general, optimistic, and failure-resistant conception of competence. The conception of effort seems to be more closely related to children's experience and thus easier to grasp than the conception of ability. With the transition to school, the conception of effort is consolidated -- and exposed to the pressures of success and failure in both individual and social comparison. For the first time, ability and effort are set in relation to conceptions of capacity and its limits (How much can I achieve when I apply maximum effort? Can someone else achieve more than I can when we both apply maximum effort?). These developments lay the foundations for the development of more complex causal schemata for the explanation of success and failure, and for realistic and independent assessments of personal capabilities. At the same time, they make children

vulnerable to experiences of loss of control and frustration about the limits of their capabilities.

In order to set realistic yet ambitious levels of aspiration, children must learn to *estimate their probability of success* in a given task, to reason about different components of *perceived personal control*, and to understand the *relation between expecting success and incentive value of success*. It is adaptive to generate broadly realistic, yet optimistic expectancies of success, because it is not usually possible to gauge the exact probability of success, but -- in the school setting, at least -- it is safe for children to assume that the tasks set are not entirely beyond their capacities, and that it is worth investing effort.

Research shows that expectancies of success become increasingly realistic until preadolescence. Interestingly, there are marked individual and cultural differences in how closely children's expectancies of success are related to their actual learning outcomes at school, the major performance domain in childhood and adolescence (Little, 1998).

Because the developmental context of the school is determined and controlled by adults for the purposes of cultural instruction, with performance demands being set by adult socialization agents rather than chosen by the students themselves, a strictly realistic approach is not in fact necessary, and might even inhibit goal striving.

In this context, the rich field of *beliefs and perceptions about self-efficacy and control* needs to be addressed, albeit in a brief fashion given the space constraints for this chapter. The two important research traditions investigating people's expectancies about the success of their actions are Bandura's self-efficacy approach (for an overview, see Bandura, 1977, 1986) and the study of control beliefs (for an overview, see T. Little, 1998; Skinner, 1996; Weisz, 1983). According to Bandura's self-efficacy model, positive

beliefs about the efficacy of one's actions in a task situation reinforce effort and persistence, thus increasing the probability of success. The more specific self-efficacy beliefs are to the task at hand, the more accurate the predictions generated by the model.

Seen from the perspective of modern motivation psychology, task-related self-efficacy beliefs are less a source of information about which challenges to address than motivational resources that make individuals more or less confident of success and thus provide them with more or less energy to implement their intentions (i.e., volition) in an ongoing task situation.

Conceptual models of control beliefs, which tend to apply to broader classes of action (e.g., scholastic performance in general), are more general than the construct of self-efficacy beliefs and, at the same time, more differentiated. What control beliefs and self-efficacy beliefs have in common is that they provide volitional resources for action implementation, rather than guiding task selection or goal setting. More recent approaches to children's control beliefs distinguish between beliefs about the contingency between causal factors and outcomes (e.g., the impact of teacher behavior on grades) and beliefs about individual access to causal factors (e.g., ability) (see Weisz, 1983; Skinner et al., 1988).

An individual will consider himself or herself likely to succeed in an activity only if the following two conditions are met: First, success must be dependent on conditions or behaviors that people like me can control. Naive theories or beliefs of this kind are termed contingency beliefs (Weisz, 1983), means-ends beliefs (Skinner et al., 1988), or causality beliefs (T. Little, 1998). These beliefs address the controllability of certain

events (e.g., getting good grades) and the means by which they can be attained (e.g., effort, ability, being on good terms with the teacher).

Second, the person herself must be in the position to control these behaviors (e.g., trying hard) or the presence of the conditions for success (e.g., being the teacher's pet). Conceptions of this kind are referred to as competence beliefs (Weisz, 1983), capacity beliefs (Skinner, 1996), or agency beliefs. They are individuals' beliefs about whether they personally have access to relevant means for bringing about success (e.g., access to personal ability or the support of the teacher).

Numerous studies show that slightly optimistic self-efficacy conceptions and personal control beliefs have a positive effect on subjective well-being and also on achievement and particularly on the development of achievement over time. Optimistic perceptions about the controllability of achievement outcomes and one's own capacities appear to function as a developmental resource (Heckhausen & Heckhausen, 2008c).

After addressing the field of control-related beliefs and perceptions, we finally turn to the development of *causal schemata* for explaining success and failure. When accounting for success and failure in tasks at various difficulty levels and child has to combine conceptions about their own ability for a given task and the effort they invested in the task. Causal schemata can reflect co-variation between effort and ability or at more advanced levels of cognitive development, represent compensatory relations, for example when high effort can compensate for low ability when mastering moderately difficult tasks. Causal schemata allow the individual to generate conclusions about unknown factors in two ways: They can either attribute known outcomes (e.g., success in a difficult task) to unknown degrees of effort and ability (e.g., both high), or they can predict an

outcome, when the main causal factors (primarily ability and effort) are known (e.g., if both effort and ability is low, a failure is likely even for easy tasks). Because they are, in essence, conceptions of the causal significance of effort and ability, causal schemata are highly relevant to the development of achievement-motivated behavior. They also invoke differential emotional responses. For adults, effort is the decisive causal factor in evaluations of others, and ability is the decisive causal factor in self-evaluations. Others are evaluated more highly if they have invested effort, but people tend to see cause for pride in their own achievements if they testify to high ability. In a nutshell, "effort is virtuous, but it's better to have ability" (Nicholls, 1976). Conversely, ability attributions (stable and unchangeable) of failure are problematic, because they imply that future attempts have little chance of success either. In contrast, effort attributions of failure spur the individual to try again, investing more energy and care this time to ensure success.

From the age of about 10 years, ability attributions become decisive for affective self-evaluation (H. Heckhausen, 1984a, 1984b). At first, this only applies after experiences of success, and not after experiences of failure. It is at this age, as differentiated conceptions of the two causal factors gradually emerge from a global conception of competence, that children also begin to grasp the compensatory relationship between effort and ability (Karabenick & Heller, 1976; Surber, 1980). The more success is attributed to ability, and failure to lack of ability, the more satisfied or dissatisfied they feel with themselves. Attributions focusing on a lack of personal ability pose first developmental risks, because the child may develop a stable conception of lacking ability and become discouraged to take on new challenges (Dweck 2002). Other people's (e.g., teachers') causal attributions of performance may also involve risks for the development of competence. Excessive praise for mediocre performance can undermine ability attributions; conversely, criticism for failure can be interpreted as indicating that

the teacher (mother, friend) had, on the basis of high ability evaluations, expected better outcomes (W. U. Meyer, Mittag, & Engler, 1986).

Development of Individual Differences in Control Striving and Agency

In the past two decades, conceptual development in the field of motivation psychology, and indeed psychology in general, has seen a move away from a strictly cognitive focus toward a perspective that also takes affective dynamics into account. The development of individual differences cannot be explained solely in terms of cognitive factors such as levels of aspiration or causal attribution styles, neither can it be clarified by an exclusive focus on how differences in the incentive value of success and failure emerge over socialization. McClelland's comparison of self-attributed (explicit) and implicit (not consciously represented) motives can serve as a useful organizing framework for an overview of research on the development of individual differences in achievement motivation (McClelland, Koestner, & Weinberger, 1989). There is much evidence to indicate that implicit motives (measured by projective tests) and explicit motives (measured by self-report questionnaires) are two independent motive systems that govern different types of behavior and that may be activated in concert or in opposition depending on the situation. Implicit motives are activated by incentives residing in the activity itself (to improve one's performance, to master a challenge) and thus generate motivation for more spontaneous behavior that is not pre-structured by the environment: the activity itself is attractive to people high in the achievement motive, independent of its outcomes. Explicit motives, on the other hand, are activated by social incentives (social recognition, reward, status) and thus determine pre-structured behavior in socially regulated situations, such as the classroom, where the contingencies for social

incentives are transparent (e.g., I have to do my homework carefully to please the teacher and get a good grade).

Individual Differences in Implicit Motives

The foundations for the development of *implicit motives* (e.g., achievement, power, affiliation) are laid in early childhood, before verbal instructions and self-reflection give motivational processes the deliberative character that distinguishes higher cognition (Kuhl, 2008). Although achievement-motivated behavior comprises both cognitive (explicit) and affective (implicit) processes, the preverbal development of individual differences in the incentive value of success and failure is decisive. It is at this early stage that children develop a heightened, probably lifelong, sensitivity to situational conditions that either provide opportunities to develop and optimize their control of the environment (of objects in the case of achievement motive and of other people in the case of the power motive), or that threaten to reduce or restrict that capacity.

Longitudinal studies of the origins and development of implicit motives are scarce, and results have been mixed (Heckhausen & Heckhausen, 2008c). Overall, family and parenting characteristics appear to lay a significant role for the development of the achievement and the power motive, but not the affiliation motive (McClelland & Pilon, 1983). Adults with a strong “socialized power motive” had experienced a childhood with a dominant father and a mother who was tolerant of the child’s transgression or rules. An adults’ egotistic or “personalized power motive” was associated with a childhood dominated by a strong mother figure. Adults with a strong achievement motive had had mothers who insisted on fixed meal times and strict toilet training. Other studies have uncovered the important role of developmental timing in parental mastery challenges

(W.-U. Meyer, 1973a; Reif, 1970; Trudewind, 1975). Developmentally adequate challenges posed by the parents are most conducive for the development of a success-oriented achievement motive.

Individual Differences in Explicit Motives (Goals, Expectancies, Incentives)

. As motivation researchers were using the widely accepted risk-taking model of Atkinson (Atkinson, 1957) to explain achievement-related behavior, it soon became clear that achievement-motivated behavior cannot comprehensively be explained by the combination of achievement motive strength with its value and expectancy components and task difficulty alone. Eccles showed, for instance, that the gender differences frequently observed in middle-school and high-school students' preferences for certain school subjects cannot be explained by the risk-taking model (Eccles, Wigfield, & Schiefele, 1998). Rather, the choice of subjects and tasks is influenced by the confidence a student has in his or her abilities and by the value of a particular course choice. A wealth of incentives, such as conforming to behavioral norms associated with one's gender and/or self-concept, receiving approval from peers, teachers, and coaches, are thus involved in achievement-related choices. *Eccles and Wigfield's expectancy and value model* (in contrast to Atkinson's expectancy-by-value model) does not assume the "objective" difficulty of a task (in social comparison) to be the decisive motivating factor (according to the risk-taking model, the more difficult a task is, the higher its attraction), but predict group and individual norms of adolescents' and young adults' to determine the subjective value of an activity (e.g., how desirable it is for a girl to do well in mathematics, sports, essay writing, football, or cheerleading). Another factor that Eccles assumes to influence the value of achievement-related choices is their potential costs

(Eccles, 2005). These include the anticipated threat to self-esteem of failure, the possible negative implications of discrepancies from the self-concept or group norms (e.g., if a girl decides to play football), and the opportunity costs incurred by deciding for one activity and against another. Furthermore, in the Eccles and Wigfield model, the expectancy component (i.e., subjective difficulty) is shaped over time by the individual's experiences and preferences. Students who decide against advanced mathematics and physics courses, for example, in favor of literature and theater studies, will soon feel at home in the world of literature and drama, but have little confidence in their mathematics and physics skills.

The Eccles and Wigfield model emphasizes change in individual preferences and achievement-related cognitions over time, and the impact of that change on long-term competence profiles. The model might thus be described as a dynamic, interactive and inherently developmental psychological approach. The choices an individual makes over time help to shape both subjective and objective influences on achievement-motivated preferences, thus leading -- "for better or worse" -- to canalized development that increasingly accentuates existing differences between individuals or subgroups.

Concepts of generalized goal orientations, i.e., explicit motives, have come to dominate U.S. research on the development of motivation in the past 20 years. A particularly influential line of research is the *achievement goal approach* (Dweck, 1975; Dweck & Leggett, 1988; Elliot, 2005; Elliot & Church, 1997; Nicholls, 1984) (Dweck, 1975; Dweck & Leggett, 1988; Elliot, 2005; H. Heckhausen, 1984b). Distinctions are made on two dimensions: learning/mastery goals vs. performance/ego goals, on the one hand, and approach goals vs. avoidance goals, on the other. The aim of learning or mastery goals is to improve one's competence; the aim of performance or ego goals is to

demonstrate one's competence to others and in social comparison. Learning and mastery goals have positive effects on achievement-oriented behavior, but not necessarily on the outcomes attained (Heckhausen & Heckhausen, 2008c). In contrast, a performance goal orientation has been found to have positive or neutral effects on outcomes when conceptions of personal competence are positive, but negative effects when conceptions of personal competence are negative (Harackiewicz & Elliot, 1993) and when the individual feels exposed to public evaluation. Findings also indicate that a combination of learning and performance orientations may be particularly motivating (Elliot, 2005) in the workplace, in sports settings, and even in educational contexts.

Goals can also be distinguished in terms of whether their aim is to approach a desirable action outcome or its consequences or to avoid an undesirable action outcome or its consequences (Elliot, 1999). The approach vs. avoidance orientation determines whether performance/ego goals, in particular, are conducive or detrimental to achievement-related behavior (Moller & Elliot, 2006). Goals aiming to minimize displays of incompetence tend to elicit effort avoidance and helplessness responses, especially after failure and when people are exposed to the judgments of others. If the assessment of personal competence is favorable, however, the striving to demonstrate that competence is conducive to effort, and to choosing ambitious, but attainable, levels of aspiration. This conclusion is supported by a host of studies from the United States that found performance-approach goals (i.e., demonstrating one's competence) to be especially conducive to achievement in school and college contexts, whereas mastery-approach goals often seem to have no positive effects on academic achievement (Harackiewicz, Barron, Tauer, & J., 1998).

Agency in Regulating One's Own Development

After having discussed several major topics regarding the development of motivation in childhood, adolescence, and adulthood, we are in this following section moving to the second perspective on the motivation-development interface, a focus on the role of motivation in guiding development. We organize this section according to the life-span theory of control. Other theoretical approaches, such as the Selection, Optimization, and Compensation (SOC) model of Baltes and colleagues (Baltes & Baltes, 1990; Freund & Baltes, 2002; Lang, Rohr, & Williger, this volume) and the dual process model by Brandtstädter and colleagues (Brandtstädter, 2006; Brandtstädter, Wentura, & Rothermund, 1999) are addressing similar phenomena and share some of our theory's concepts (e.g., selection and compensation in the SOC model, action-theoretical concepts in the dual-process model). We have discussed the similarities and differences, benefits and potential problems of these approaches elsewhere (Haase, Heckhausen, & Wrosch, 2010; Poulin, Haase, & Heckhausen, 2005).

The lifespan theory of control provides a comprehensive model for the processes involved in individuals' motivation directed at their own development (Heckhausen, 1999; Heckhausen & Schulz, 1995; Schulz & Heckhausen, 1996; Schulz, Wrosch, & Heckhausen, 2003). Over the past two decades, the theory has been elaborated in terms of specific models for goal engagement and disengagement and their sequential organization in action phases (Heckhausen, 1999, 2007; Heckhausen & Schulz, 1993; Schulz, et al., 2003). These conceptual and empirical developments were integrated into a comprehensive motivational theory of lifespan development (Heckhausen, et al., 2010)

which comprises an elaborate set of testable propositions. The theory distinguishes between primary and secondary control striving. *Primary control striving* refers to exerting influence over the environment by one's own behavior. *Secondary control striving*, by contrast, aims at influencing internal, psychological processes, particularly after failure to attain a goal, and includes motivational disengagement from the goal, as well as self-protective strategies such as self-protective social comparisons (i.e., comparison with others inferior to oneself), and causal attributions that avoid self-blame (e.g., attribute to external factors).

Substantial empirical evidence has been collected supporting the theory's central propositions about the functional primacy of primary control striving throughout life and its beneficial consequence for objective and subjective well-being and active capacity, about the increasing importance of secondary control strategies with increasing age, and about the adaptiveness of congruence between goal controllability and goal engagement and disengagement such that goal engagement and disengagement is adjusted to life-course changes in opportunities for goal pursuit and attainability.

Developmental Precursors of Agency in Regulating One's Own Development

With increasing age, partly prompted by their parents, but not least on their own initiative ("wanting to do it oneself") (Geppert & Küster, 1983), children begin to actively strive for independence in their striving for control and mastery. In addition, with the gradual *expansion of the developmental-ecological life space* (Bronfenbrenner & Morris, 1988) from the home to the neighborhood, and later to the school and recreation sites (Eccles, Barber, & Jozefowicz, 1999), children and adolescents are exposed to new and more diverse influences and, at the same time, play an increasingly active role in

selecting social contexts and interaction partners. This increasing involvement in the orchestration of opportunities, social relations, and networks -- in other words, developmental contexts -- is associated with the stabilization and accentuation of conscious and unconscious preferences, values, beliefs, and self-images (Lang & Heckhausen, 2006). Young people's life goals and developmental goals become more individualized, leading to divergent developmental trajectories that become increasingly stable, unique, and irreversible as a result of developmental canalization. This is arguably the reason why individual differences in personality traits increase in their year-to-year stability until midlife when an individual's capacity to determine her own life circumstances and social networks is at its peak (Roberts & DeVecchio, 2000).

Control Striving Reflects Shifts in Gains and Losses Across the Lifespan

In modern societies characterized by high levels of social mobility and flexible life choices, individuals play a key role as *producers of their own development* (Brandtstädter & Lerner, 1999; Lerner & Busch-Rossnagel, 1981). However, individuals need to take into account the characteristics of the life course as an action field, including its changing opportunities to attain certain developmental goals (e.g. finish school, enter a career, build a family, reach one's career peak, retire, etc.). For one thing, primary control capacity does not remain stable across the lifespan, but first increases rapidly in childhood and adolescence, then reaches a peak or plateau in midlife, and finally declines in old age (see inverted U-curve for primary control capacity in Figure 1) (Heckhausen, 1999; Schulz & Heckhausen, 1996). When asking adults at different age levels about their expectations about developmental change in psychological characteristics, a pattern of predominant developmental gains that decrease with advancing age, and of

developmental losses that increase with advancing age, emerges (see Figure 2) (Heckhausen, Dixon, & Baltes, 1989).

(insert Figure 1 and Figure 2 about here)

While *primary control striving* remains a stable source of motivation throughout the life course (see stable line for primary control striving in Figure 1), the goals for primary control are typically adjusted to the primary control capacity available at a given point in an individual's life course. On the large scale of the whole adult lifespan, this means that individuals pursue many growth oriented goals, but decreasingly so at older ages (Ebner, Freund, & Baltes, 2006; Heckhausen, 1997). Analogously, maintenance and loss-preventative goals come increasingly into focus at older ages. In addition to these adjustments of goal content, individuals use other compensatory secondary control strategies to buffer the effects control loss and failure experiences have on their self-confidence and hope for future success (see linearly increasing curve for secondary control strategies in Figure 1).

At the level of specific goal pursuit (e.g., having a child, entering a career) developmental goals need to be adjusted to the waxing and waning of control potential at the current age level and social setting (Heckhausen, 2002). Most important life goals are not obtainable at just any time during the life course, but involve a pattern of increasing, peaking, and decreasing opportunity. For example, bearing a child has both biological and social normative age-related constraints. It should not happen before age 18 or so, and typically cannot happen after age 45 or so. In between these onset and deadline age boundaries, opportunities for having a child follow an inverse U trajectory which probably peaks somewhere in the mid to late twenties for western industrial societies.

Thus, in his/her quest to shape his/her own development and pursue life goals the individual has to take account of the *constraints and age-graded structures* of both biological maturation and aging (e.g., the "biological clock" and childbearing) and societal institutions (e.g., the age-graded structure of the education system). This age-sequenced structuring of developmental potential provides a framework for developmental regulation (Heckhausen, 1990, 1999). Individuals' movements within this framework, the paths chosen, and the consistency of goal pursuit, depend largely on the direction and effectiveness of individual motivation and its implicit motives and explicit goals.

Developmental Agency is Organized Into Phases of Goal Engagement and Disengagement

The *action-phase model of developmental regulation* has been developed in the context of the lifespan theory of control to generate specific predictions about the control strategies used to pursue or deactivate goals at different phases in the lifespan (Heckhausen, 1999, 2002; Heckhausen & Farruggia, 2003; Schulz, et al., 2003; Wrosch, Schulz, & Heckhausen, 2002). The model is based on four major principles: (1) developmental goals function as organizers of developmental regulation; (2) the adaptive developmental principle of congruence between developmental goals and developmental opportunities; (3) the sequence of action phases in a cycle of action directed at a developmental goal: goal selection, goal engagement, and goal disengagement; and (4) radical shifts from goal deliberation and choice to goal engagement and from goal engagement to goal disengagement.

Developmental regulation is directed at goals relating to one's future development and important life-course transitions (Brandtstädter, 2006; Brunstein, Schultheiss, &

Maier, 1999; Heckhausen, 1999; Heckhausen & Heckhausen, 2008c; Nurmi, 1992; Nurmi, Salmela-Aro, & Koivisto, 2002). According to our action-phase model of developmental regulation, individuals are most effective in their efforts to influence their own development, if they select their developmental goals in accordance with the current opportunities for goal pursuit. For example, striving for a college degree is most effective during the transition into adulthood, even though a later timing is not unfeasible, but will invoke more costs for competing goal pursuits (e.g., family building).

Another aspect of the organizing characteristic of developmental goals (according to our action-phase model) is that a goal cycle is structured into distinct phases -- from the selection of a developmental goal to a phase of active goal pursuit, followed by goal deactivation and finally evaluation of the action outcome. The theory proposes that in order to be most effective, transitions from one phase to the next, should be discrete and coherent. This means for example that the transition from selecting a goal to investing oneself into pursuing this goal should be rapid and radical. Once a decision for a particular goal is made, there should not be lingering, post-decisional conflict, and distractions by other possible goals. Similarly, once it is clear that a goal that has been pursued for some time is no longer obtainable (e.g., bearing a child after menopausal changes have set in), the individual should shift from goal engagement to goal disengagement.

Developmental deadlines mark the point at which it no longer makes sense to invest resources in goal pursuit, and when the time has come to disengage from that goal (see Figure 3). These timing constraints in goal attainability can be anticipated by the individual, and elicit phases of urgent goal striving immediately before the developmental

deadline is reached. As soon as the developmental deadline has been passed, however, individuals need to disengage from the now futile goal, and invest their energy in other, more fruitful projects. Developmental deadlines make extraordinary demands of an individual's regulatory capacities; they require a switch from urgent, intensive goal engagement in the immediate run-up to the deadline to goal disengagement and protection of self-esteem as soon as the deadline has been passed. Developmental transitions involving developmental deadlines are thus particularly suitable for testing the potentials and limits of individual developmental regulation.

(insert Figure 3 about here)

A series of studies on developmental deadlines for child-bearing and romantic partnerships supported key proposals of the action-phase model of developmental regulation (Heckhausen, Wrosch, & Fleeson, 2001; Wrosch & Heckhausen, 1999). Two studies on child-bearing showed that overall women tended to adjust their goals regarding child-bearing as well as their control strategies to age-graded opportunities, with younger women endorsing child-bearing goals and control strategies of goal engagement (Heckhausen, et al., 2001). Women in their 40 and 50s did not endorse child-bearing goals and reported compensatory secondary control strategies of goal disengagement and self-protection (e.g., "I can lead a happy life without having children." "It is not my fault, if I don't have children."). Moreover, biased information processing was also found, reflecting a focus on child-relevant information in women of childbearing age compared to women at post-child-bearing age. A longitudinal study on partnership goals found that younger adults after a separation were more likely to keep pursuing the goal of finding a romantic partner, whereas people in their mid fifties were more likely to disengage from

partnership goals altogether after a separation (Wrosch & Heckhausen, 1999). Moreover, adults who prematurely disengaged from partnership goals or those who failed to disengage at late midlife, suffered declines in positive affect after an 18 month period following the initial assessment. Thus again it was shown that opportunity-congruent goal engagement and goal disengagement yielded the best developmental outcomes.

Urgent striving during high opportunity phases. Another aspect of the action-phase model of developmental regulation addresses the urgency phase immediately before a developmental deadline is reached. This phase, during which primary control striving is exposed to enormous time pressure, can only be examined in longitudinal studies. Even then, the long time periods involved, and the heterogeneity of developmental trajectories and life-course transitions in adulthood, pose considerable challenges for research. We thus chose a transition involving a developmental deadline that is relatively strictly regulated in Germany, namely the transition from school to vocational training in the dual educational system (on-the-job training combined with general and vocational education at a vocational school). The major challenge of this transition is to find an apprenticeship position, preferably before leaving school. In other countries, such as the United States, the transition from high school to the world of work is far less strictly regulated. Many young people end up "floundering" (Hamilton, 1990) and at risk for downward social mobility (for details on international variation in the school-to-work transition, see Heckhausen, 2002b; Heinz, 1999; Paul, 2001). The transition to vocational training is also a challenging and critical step for young people in Germany, however, because the number and quality of apprenticeships (within a single company or at multiple sites; commercial vs. trade apprenticeships) by no means matches

the demand. During their final year at school (typically 10th grade), students not wishing to continue their general education have to find an apprenticeship that opens up relatively positive long-term career prospects (Heckhausen & Tomasik, 2002; Tomasik, 2003) given their individual capacities. Navigating between the Scylla and Charybdis of over- and under-aspiration under urgency conditions is thus a considerable challenge to developmental regulatory capacities of 16-year-old school leavers.

We investigated students in their final year at four high schools located in lower and lower middle class residential areas in the eastern and western part of Berlin, Germany. Data on students' goals, control strategies, and vocational aspirations were collected twice in 9th grade and five times at 2-month intervals in 10th grade. Findings showed that the adolescents adjusted their vocational aspirations, measured in terms of the social prestige, to their grades, i.e., their educational resources on the labor market. The adolescents even adjusted their ideas of a "dream job" to the apprenticeships they could realistically hope to be offered (Heckhausen & Tomasik, 2002), such that the vision of a dream job did not prevent them from investing in the search for an appropriate position.

Did this strategy of taking into account one's school achievement when selecting vocational aspirations, lead to better outcomes? Of course, lower aspirations are easier to attain, but beyond that were well-calibrated students more successful in obtaining a relatively prestigious vocational training position given their school grades. In analyses utilizing the bi-monthly data collections during grade 10, we investigated trajectories most likely to result in apprenticeships with relatively high vocational prestige. We found that more promising trajectories would start slightly above one's own achievement level

and then adjust downward until an apprenticeship is obtained (Tomasik, Hardy, Haase, & Heckhausen, 2009). Interestingly, youth showing this trajectory of vocational aspirations also were more goal engagement and less disengaged, judging from their ratings of control strategies. Goal engagement with striving for an apprenticeship proved particularly beneficial for girls' success in securing a vocational training position (Haase, Heckhausen, & Köller, 2008).

Conducting a longitudinal study of the transition from high school to college and work in the United States offered a unique opportunity to study the motivational processes that lead to success versus failure under critically different societal conditions. The educational system in the U.S. differs fundamentally from the German system in that it is integrated until high-school graduation, whereas the German system is three-tiered starting at 4th grade (in some of the German states 6th grade). The key difference between institutions of secondary education in the USA and Germany is that the U.S. educational system does not constrain upward mobility by formalized institutional barriers as it does in Germany. To the contrary and particularly in California, the college system provides post-secondary educational opportunities that allows the individual to follow a step-by-step upward mobility from high school or equivalent attainment on an entry test (showing that the student is "capable of benefitting from instruction") to community college and then a transfer to four-year colleges that lead to a Bachelor degree (Code, 1960). This is not to say that the US high-school system does not have its own social inequalities, which are primarily based on the great differences between neighborhoods and make it harder for students from lower-income neighborhoods to take advantage of the institutional opportunities to climb upwards in the system.

We tracked a sample of more than a 1000 high-school seniors in the Los Angeles Unified School District longitudinally one, two, three and four years after graduation (Chang, Chen, Greenberger, Dooley, & Heckhausen, 2006; Chang, Greenberger, Chen, Heckhausen, & Farruggia, in press; Heckhausen & Chang, 2009). It was striking in comparison to the German sample that vocational and particularly educational aspirations were high. A large majority of the youth anticipated to complete a Bachelors degree, even if their own senior-year grades were too low to enter a four-year college right after high school (Heckhausen & Chang, 2009). In an educational system that is more segregated and less permeable as it is in Germany (Hamilton, 1994), such high aspirations would lead to unrealistic choices and failure. However, in this Californian sample the youth with the most ambitious educational expectations actually ultimately succeeded in enrolling in and completing four-year college degrees (Heckhausen & Chang, 2009). Moreover, those youth with particularly strong and focused goal engagement for attaining a college degree also reported better subjective well-being and mental health after high-school graduation.

It was striking in comparison to the German sample that vocational and particularly educational expectations were very high and not calibrated to the actual school performance (Heckhausen, in press). A large majority of the youth anticipated completing a Bachelors degree or more (i.e., complete graduate school), even if their own senior-year grades were as low as “Cs and lower” (Heckhausen & Chang, 2009). Such high aspirations would lead to unrealistic choices and failure in an educational system, such as the German system, that is more segregated and less permeable (Hamilton, 1994). However, in this Californian sample the youth with the most ambitious educational expectations ultimately succeeded in enrolling in and completing four-year college

degrees, whereas youth with more “realistic” goals ended up with less progress in post-secondary education (e.g., community college or less) (Heckhausen & Chang, 2009). Moreover, those senior high-school students with ambitious short-term educational aspirations in terms of planning to enroll in college fared better on the long run, even if they initially did not attain their short-term goals one year after high school (Heckhausen, Lessard, & Chang, 2008).

Disengagement with Decline or Loss of Opportunities. An important proposition of our motivational theory is that individuals should disengage from goal pursuits, which are futile. So if opportunities for goal attainment are lost due to developmental change (e.g., “biological clock”, aging-related decline), disability or illness, disengaging from the motivational commitment to the goal and withdrawal of effort will preserve behavioral and motivational resources that can be invested in more promising goal pursuits (Heckhausen, 1999; Heckhausen, et al., 2010; Miller & Wrosch, 2007; Wrosch, Scheier, Carver, & Schulz, 2003; Wrosch, Scheier, Miller, et al., 2003). In the context of the studies on developmental deadlines we found evidence that individuals who had passed the deadline for a given life goal were better off in psychological well-being and mental health, if they disengaged from the futile goal, both in terms of conscious goal commitment and with regard to goal-relevant biases in information processing (Heckhausen, et al., 2001; Wrosch & Heckhausen, 1999, 2005). Numerous studies indicate that with increasing age (Ebner, et al., 2006; Heckhausen, 1997) and under conditions of disability (Boerner, 2004; Evers, Kraaimaat, van Lankveld, Jongen, & al., 2001; Menec, Chipperfield, & Perry, 1999; Wahl, Becker, Burmedi, & Schilling, 2004), people disengage from goals that are no longer attainable.

Wrosch and his colleagues conduct an extensive research program on the benefits of goal disengagement under low control conditions. They show that dispositional differences in college students' capacity for goal disengagement under conditions of low controllability are associated with more favorable mental health and well-being (Wrosch, Scheier, Miller, et al., 2003) as well as physical health and diurnal cortisol secretion patterns (Wrosch, Bauer, Miller, & Lupien, 2007). The same is true for a sample of adults who are experiencing a very strong uncontrollable stressor, namely parents of cancer-suffering children (Wrosch, Scheier, Miller, et al., 2003). Very recent work from this group indicates that depressive symptoms experienced during adolescence may prompt an elaboration of the capacity to disengage from unattainable goals and thus can serve to protect against depression on the long run (Miller & Wrosch, 2007; Wrosch & Miller, 2009).

Opportunity-Congruent Goal Engagement and Goal Disengagement in Older Adults With Health Problems. Many older adults face the challenges of acute and chronic health problems. To the extent that these problems are controllable by adaptive health behaviors, they call for intensified primary control. However, over time health problems often become irreversible and thus uncontrollable, especially if they are associated with chronic diseases of old age such as macular degeneration, Parkinson's disease or dementia. According to the life-span theory of control, primary control striving to overcome acute health problems and to minimize the effects of illness and disease on everyday functioning should be intensified when control opportunities are still present. On the other hand, goal disengagement should occur when control opportunities have been lost and the individual needs to adjust to the new, lowered control capacity (e.g., in

terms of mobility, vision, etc.). As summarized in the next paragraphs, several pertinent studies support these predictions.

Health-related primary control striving has beneficial consequences for the psychological well-being and mental health of older adults with health problems (Pakenham, 1999; Wrosch, Schulz, & Heckhausen, 2002; Wrosch, Schulz, et al., 2007) and even helps prevent an increase of chronic and functional health problems over time (Wrosch & Schulz, 2008). Beneficial effects of enhanced primary control has also been shown in an exemplar intervention study, which boosted primary control over the risk of falls by using a combination of physical and occupational therapy tailored to functionally vulnerable older adults' daily activities and home environments (Gitlin, Winter, Dennis, Corcoran, Schinfeld, & Hauck, 2006; Gitlin, Hauck, Winter, Dennis, & Schulz, 2006). Primary control enhancing interventions improved various aspects of daily functioning (e.g., self-reliant bathing), enhanced self efficacy and led to a substantial reduction in fear of falling (Gitlin, Winter et al., 2006). Moreover, these primary control enhancing interventions also reduced mortality over a 14-month period for the intervention group (1% mortality), but not the control group (10% mortality), and were particularly effective among those with low primary control striving before the intervention (Gitlin, Hauck et al., 2006).

Wahl, Schilling, and Becker (2007) report that older adults with macular degeneration sharply increase their use of compensatory primary control strategies (seeking help and advice from others) shortly after their initial diagnosis, whereas the use of compensatory secondary control strategies (disengagement, self-protective attributions and social comparisons) was predicted by the loss of functioning in activities of daily living over longer periods of time.

When controllability of health problems and its consequences on daily functioning is diminished, older adults do better if they adjust their goals for daily functioning (Rothermund & Brandtstädter, 2003) and disengage from overcoming their health problems. Middle-aged and older adults with macular degeneration were found to benefit from a disposition for flexible goal adjustment in terms of having fewer mental health problems, such as social dysfunction and depression (Boerner, 2004). Multiple sclerosis patients' who accepted the reality of their illness and disability reported better health status and mood a year after initial assessment (Evers, Kraaimaat, van Lankveld, Jongen, Jacobs, & Bijlsma, 2001).

Moreover, patients with uncontrollable health conditions benefit from self-protective strategies such as self-enhancing downward social comparisons (Bailis, Chipperfield, & Perry, 2005; Frieswijk, Buunk, Steverink, & Slaets, 2004) or reappraisal of health problems (Wrosch, Heckhausen, & Lachman, 2000). It also seems to be beneficial, if older adults with health problems that constrain their daily activities replace some lost activities with alternate attractive activities (e.g., listening to music, reading may replace athletic activities) (Duke, Leventhal, Brownlee, & Leventhal, 2002).

Research addressing older adults' use of both primary and secondary control strategies, revealed that older adults who predominantly used primary control strategies and those who used a combination of primary and secondary control strategies achieved better physical and psychological well-being compared to older adults who relinquished control or those who failed to use compensatory secondary control (Haynes, Heckhausen, Chipperfield, Perry, & Newall, 2009). Finally, a longitudinal study followed older adults with serious health problems that were either acute and involved some

potential for primary control (after heart attack or stroke) or were chronic with little controllability (e.g., arthritis, heart disease) over a period of nine years. The study was focused on how the older adults dealt with the loss of a specific area of functioning they perceive as the greatest loss associated with their health condition, and specifically investigated which controls strategies of goal engagement, goal disengagement, and self-protection control strategies were used by the older adults (Hall, Chipperfield, Heckhausen, & Perry, in press). In accordance with the congruence theorem (i.e., control striving should match controllability) of the life-span theory of control, the use of control strategies associated with goal engagement (e.g., primary control striving) predicted lower mortality for individuals with acute conditions, but poorer physical health for those with chronic conditions and also among the oldest old. In contrast, goal disengagement predicted poorer physical health for those with acute conditions, yet better health for individuals with chronic conditions and the oldest old. Self-protective strategies (positive reappraisal) predicted lower mortality as well as greater health and subjective well-being for those with acute conditions, as well as better physical health for the oldest old.

Overall, the evidence shows that those older adults who flexibly use primary and secondary control strategies in congruence with the degree of controllability of the health condition and its consequences for daily activities fare best both in terms of objective indicators of physical health and functioning and in terms of subjective well-being and mental health.

In this final section, I outline a set of research topics that deserve closer attention by future research. A recent article on the motivational theory of lifespan development presents a more comprehensive discussion of future research addressing understudied aspects of our theory (Heckhausen, et al., 2010). I am considering here a subset of those and some other topics that address the development of motivation.

A first area of future inquiry should focus on the question: How do *divergent developmental pathways* towards adaptive and maladaptive motivational systems of self-regulation come about? Previous research has addressed (at least in part) how strategies of primary and particularly of secondary control develop across childhood and adolescence and are elaborated during adulthood (see review in Heckhausen et al., 2010). Much more can be learned about universal processes here, but the greatest dearth of research concerns the emergence of individual differences. Individual differences can involve various aspects of motivational self-regulation (Heckhausen, et al., 2010): (1) the capacity to detect changes in goal attainability that can then lead to goal disengagement and re-selection; (2) the capacity to mobilize goal engagement when opportunities for the respective goal open up; (3) persistence in goal engagement in the face of difficulties; (4) the willingness and ability to deactivate and disengage from a goal when opportunities change for the worse; (5) skill and preferences for using certain kinds of self-protective strategies to compensate for a loss or failure of control; and finally (6) the capacity to engage with a new goal after a disengagement from a futile goal. Just to give one example of the kinds of studies needed in this area, here is one addressing the emergence of individual differences in the capacity for goal disengagement (issue number (4)). Wrosch and Miller report that adolescents who suffered from depressive symptoms

compared to adolescent without depressive symptoms were more likely to develop a capacity to disengage from unfeasible goals. Most notably, those who developed a greater capacity for goal disengagement in this way, 18 months later at a follow-up assessment reported fewer depressive symptoms than comparison peers with less refined capacity for goal disengagement (Wrosch & Miller, 2009).

Another important topic at the interface of motivation and development is the motivational management of *life-course transitions*. During life-course transitions, for example from the exclusive family context into preschool or from college into work life, the individual needs to re-tool his/her regulatory system for motivated behavior. Transitions typically involve major changes in the way external influences (e.g., the parent, the curriculum of a college major) shape the individual's goal selection, goal engagement and behavioral investment. The individual thus has to pick up the slack or in some cases (e.g., move from independent living to assisted living) give up some self-regulation. Another aspect of life-course transitions is that they usually involve significant changes in the social context. Transitions may involve a major shift in reference group that metaphorically resembles a move from a big fish in a small pond to a small fish in a big pond. A case in point would be a high achieving high school graduate moving from an average high school to a highly selective university.

A third promising area of inquiry addresses *how educational institutions influence the development of motivation and self-regulation*. Research about the motivational characteristics of typical classrooms suggests that schools may provide detrimental institutional ecologies for the development of an implicit achievement motive (Heckhausen & Heckhausen, 2008b). One major problem is the dominant emphasis on

social comparison for evaluating a student's achievement and the lacking opportunities for the experience of intra-individual improvement of mastery. Another hindrance to stimulating students' implicit achievement striving is the lack of opportunity for self-selected assignments and tests. Here research should address the question of how schools can become more nurturant contexts for the development of achievement motivation? This is not to say that explicit motives and goal setting is of no significance. Indeed, it is of major importance to master developmental challenges in careers and other life domains. Self-regulation should combine implicit and explicit motives (Brunstein & Maier, 2005), and the school context could be a sheltered developmental context to learn managing these two sources of motivational incentives.

A fourth area of inquiry should address dynamic interactions between individuals and their environment in terms of *mutual influences between societal context and individual agent over time* (Roberts & Caspi, 2003). As individuals move into adulthood they select their social context and relationships for example by career choices, mate selection, and selection of friends (Lang & Heckhausen, 2006). An extreme case of environmental selection is migration. A fascinating line of inquiry would address the between country gradients in primary control potential that motivate people to emigrate from their native environments and launch themselves into the highly risky adventure of immigration. Cross-national studies of subjective well-being suggest that happiness is closely linked to perceptions of greater freedom of choice. Do streams of migration follow the same gradients? Another type of transaction between individual agents and society involves direct active influence of the individual on his/her environments to fit better with his/her motivational preferences. If such active influences are taken by a

coherent, sizable and influential subgroup of the population, it could eventually lead to social change, in normative conceptions as well as ultimately in institutional and legal change. A well-known example from the last century is the student movement in the late 1960s and early 1970s, which had many lasting consequences in society. A recent example is the change in legislation regarding gay individuals' rights to serve in the military, to marry, and to adopt children. During historical phases of socio-political change, the dynamic transactional efforts of individuals, coupled with the leverage of the collective, can develop great – albeit rare – powers that transform the societal ecology for lifespan development and individual agency far beyond one individual's immediate range of control.

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Figure Captions

Figure 1. Hypothetical life-span trajectories for primary control capacity and primary and secondary control striving (adapted from Heckhausen, 1999).

Figure 2. Gains and losses across the adult lifespan as expected by adults of various ages (adapted from Heckhausen, Dixon, & Baltes, 1989).

Figure 3. Action-phase model of developmental regulation (adapted from Heckhausen, 1999).

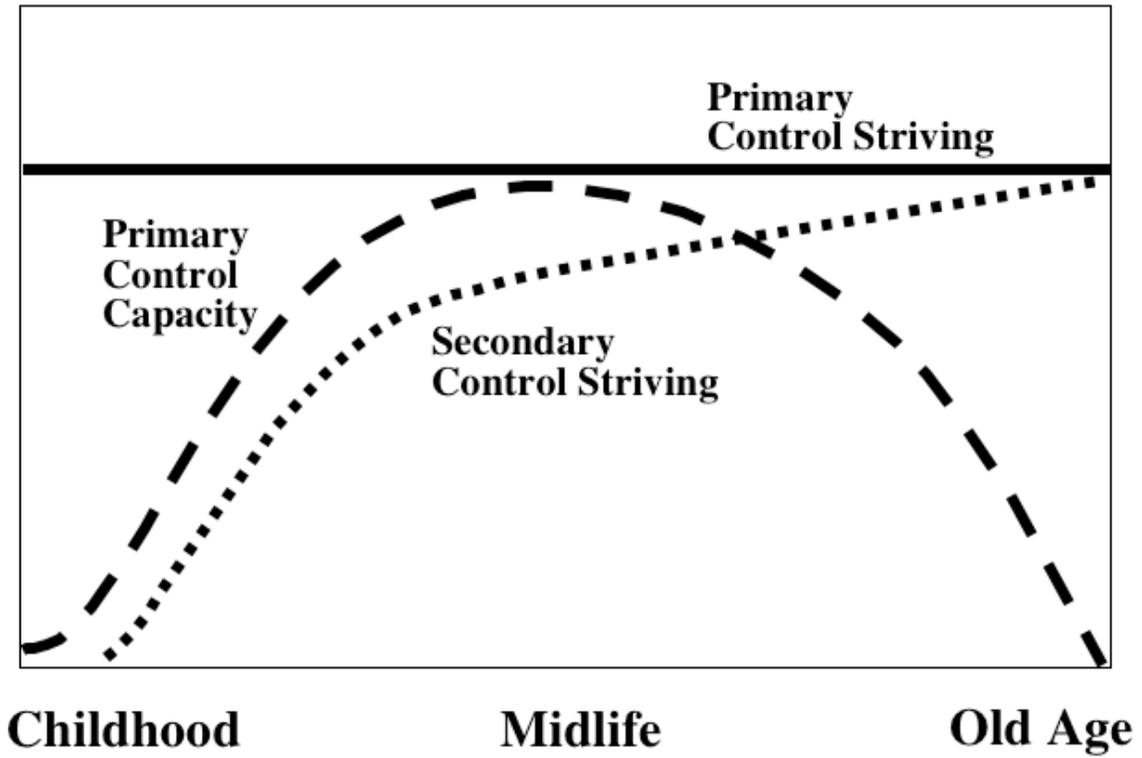


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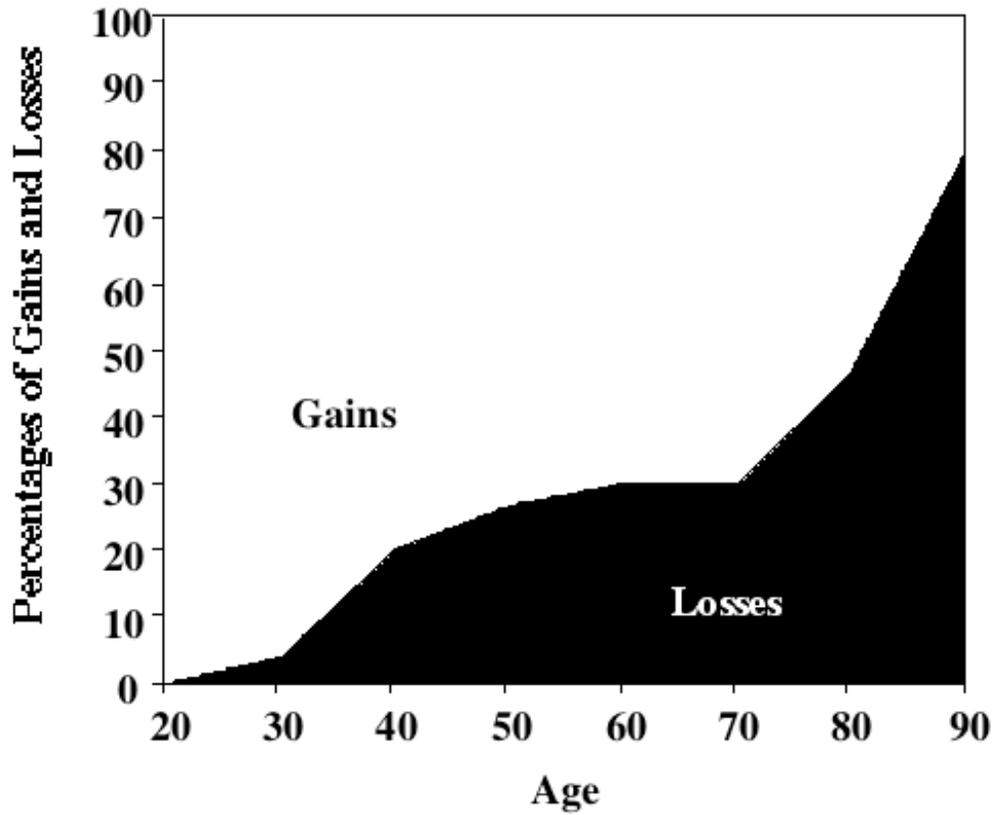


Figure 2. Gains and losses across the adult lifespan as expected by adults of various ages (adapted from Heckhausen, Dixon, & Baltes, 1989).

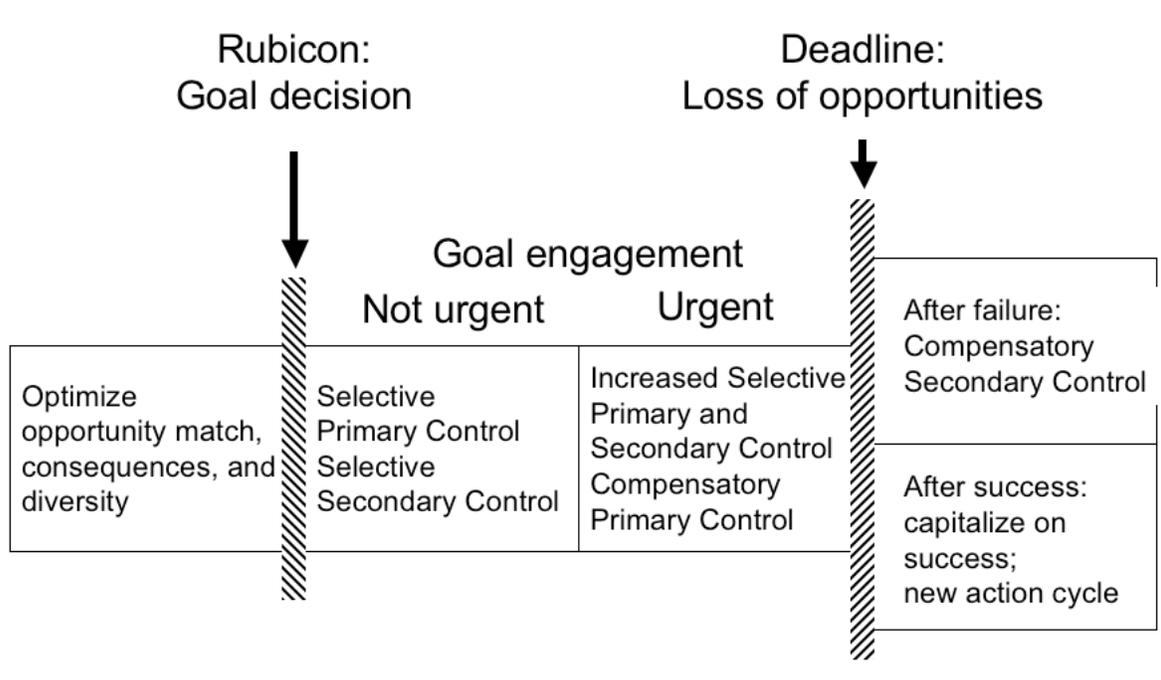


Figure 3. Action-phase model of developmental regulation (adapted from Heckhausen, 1999).