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# Psychological Functioning in Adulthood: A Self-Efficacy Analysis

Daniele Artistico

Jane M. Berry
*University of Richmond*, jberry@richmond.edu

Justin Black

Dan Cervone

Courtney Lee

*See next page for additional authors*

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**Authors**

Daniele Artistico, Jane M. Berry, Justin Black, Dan Cervone, Courtney Lee, and Heather Orom

# Psychological Functioning in Adulthood

## A Self-Efficacy Analysis

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### Abstract

In the first edition of this handbook, we laid the foundation for a self-efficacy approach to understanding learning in adulthood. We examined self-efficacy applications to learning in adulthood from two broad-based theoretical perspectives: KAPA (knowledge and appraisal personality architecture; Cervone, 2004a) and SOC (selective optimization with compensation, Baltes, Lindenberger, & Staudinger, 2006). Both perspectives emphasize the dynamic interplay between dispositional, motivational, situational, and developmental contexts for successful functioning and adaptation in life. In this edition, we build upon earlier claims with new evidence regarding the central role of self-efficacy to adult development, aging, and well-being in memory, health, work, and everyday problem-solving contexts. Of these, the work context is new in this edition, and the sections on memory, problem solving, and health are expanded and updated. The unifying theme of our chapter is the individual's ability to adapt flexibly to new learning opportunities that arise in adulthood and old age by relying on perceived self-efficacy as a coping resource for navigating the changing social, cognitive, and physical landscape of late adulthood.

**Keywords:** self-efficacy, personality architecture, cognitive abilities, health, work motivation

## Adulthood and Successful Aging

Advances in medical science and technology have given rise to global socioeconomic systems that provide extensive educational opportunities and foster meritocratic social mobility for people of all ages. As such, lifespan developmental scholars and practitioners continue to investigate the psychological systems that foster learning and positive development into later adulthood. There seems to be somewhat greater urgency to this task than in past decades, as information technology constantly offers bigger (smaller!), better, and faster gadgets for consumers to master. Since the first edition of this handbook, Baby Boomers have grown older by five years and technology has risen exponentially along with cell phone towers on our horizons. "The Information Age" now seems like a quaint phrase attached to a bygone era—the 1990s. In fact, information technology is pervasive in the 21st century, shaping our social and interpersonal lives, our workplaces and schools, and our medical and health care institutions. What insights can be gleaned from lifespan developmental research to help individuals manage new information and learning tasks as they enter late adulthood? We believe that self-efficacy is a core component to adaptive and successful aging, and we present research and arguments to support this point of view in this chapter. Models of successful aging (Baltes, Rosler, & Reuter-Lorenz, 2006; Rowe & Kahn, 1997) and research on positive aging (Carstensen & Charles, 2003) appear with increasing regularity in leading scientific journals. In line with stories that older adults tell about their life longings (Scheibe, Freund, & Baltes, 2007), society's response should be an enabling one that allows older adults to live engaged, purposeful, and meaningful lives,

as free from mental and physical debilities as possible, and to ensure and enhance quality of life in late adulthood and senescence.

Most people aspire to live a long and healthy life to, on average, 85 years (Lang, Baltes, & Wagner, 2007), and more people are living to be centenarians than at any other time in history. Thus, it is incumbent upon researchers in fields of adult development and learning to delineate the modes and mechanisms that will allow older adults to lead dignified, meaningful, engaged lives. A complete understanding of adults' capacity to achieve these life outcomes requires attention to mechanisms of personal agency because individuals can shape their own experience of older adulthood. By studying agentic mechanisms, gerontologists can understand and potentially increase older adults' ability to control important life outcomes.

## Self-Efficacy in Adulthood

The purpose of this chapter is to review the contribution of self-efficacy mechanisms (Bandura, 1977a, 1997, 2006) to adults' capacity to learn new skills and to contribute to their personal development in an agentic manner. We do so by first taking a broad look at the nature of human agency and the architecture of mental systems that enable people to regulate their experiences and actions. Perceived self-efficacy takes the pivotal role in concert with other components of personal agency such as goals, evaluative standards, and control beliefs. Self-efficacy theory is but one aspect of Bandura's (1986) broader social-cognitive theory of personality, and is also central to other social-cognitive perspectives on personality functioning (Cervone & Shoda, 1999), including the approach known as KAPA, or knowledge and appraisal personality architecture (Cervone, 2004a).

We consider the contribution of self-efficacy processes and beliefs to adult development and learning within a broader perspective on social-cognitive mechanisms in personal functioning (e.g., Bandura, 1999b; Cervone, 2004a, b; Cervone, Shadel, & Jencius, 2001; Cervone, Orom, Artistico, Shadel, & Kassel, 2007; Cervone et al., 2008). We believe that the study of people's agentic capacities requires an understanding of the functioning of the whole person, that is, a comprehensive understanding of personality systems and their development (Caprara & Cervone, 2003; Orom & Cervone, 2009).

We will examine the domain-specific nature of self-efficacy in domains of functioning that are particularly relevant to adulthood and aging. We believe

self-efficacy is a vital resource for dealing with age-related changes and challenges in health, memory, problem-solving, and work domains. In this edition of the handbook, we have expanded our coverage of health topics to include the importance of physical activity to health and well-being in adulthood, and the role of self-efficacy to illness, chronic disease and self-management, and making critical medical decisions. We have also expanded our analysis of work-related self-efficacy relevant to the aging of the workforce and older adults' motivation to work (e.g., Schulz & Roßnagel, 2010). Finally, we have updated our sections on memory and everyday problem solving as well.

Our overarching purpose is to position self-efficacy at the intersection of learning (Berry, 1999), psychological well-being (Blazer, 2002), and personality development (Caprara, Caprara, & Steca, 2003) in adulthood. We focus on the formation, calibration, and refinement of self-efficacy beliefs related to developmental challenges and adaptations across the lifespan. We recognize that self-efficacy shares many conceptual features with other control-related constructs (e.g., Heckhausen & Schulz, 1995; Little et al., 2003; Luszczynska, Scholz, & Schwarzer, 2005; Rodgers, Conner, & Murray, 2008; Skinner, 1996), and cite this work as relevant to our purpose herein. We ask that the reader consider our inquiry as a "bridge" to these perspectives rather than a departure.

## Cognitive Components of Personal Agency

The most salient theme in the contemporary study of human development across the lifespan is that people have the capacity for personal agency (Bandura, 2006). Individuals can exert intentional influence over their experiences and actions, the circumstances they encounter, the skills they acquire, and thus, ultimately, the course of their development. What enables individuals to contribute to the course of their own development? What are the basic psychological ingredients that enable people to act as intentional, causal agents? This question is not only of basic scientific interest. It is also central to the design of interventions that empower people to gain control over their lives. We examine self-regulation, goals, and control beliefs in the next section.

### GOALS, EVALUATIVE STANDARDS, AND CONTROL BELIEFS

One approach to assessing agentic capabilities is a functional analysis. Here, the task is to identify the psychological functions that humans are uniquely

able to execute, and that enable them to exert intentional control over their actions and development. Both psychologists and philosophers have taken up this problem, and their conclusions converge (e.g., Bandura, 1986; Harré & Secord, 1972; Kagan, 1998). People have the capability to use language, to develop a sense of self (as both a doer and an actor who is observed by others), and to self-regulate their behavior, which entails not only monitoring one's actions but also monitoring the monitoring of one's own performance. This self-monitoring is accompanied by feelings of both satisfaction and dissatisfaction with the "self." Self-satisfaction contributes to self-regulatory efforts (Bandura & Cervone, 1983). The study of these self-regulatory functions is central to the contemporary field of adult development (Heckhausen & Dweck, 1998; Lang & Heckhausen, 2006; Stine-Morrow, Miller, & Hertzog, 2006) and the field of psychology at large (Baumeister & Vohs, 2004; Cervone, Shadel, Smith, & Fiori, 2006; Lajoie, 2008; Steel, 2007; Stone, 2000).

A psychological function of particular centrality to personal agency and self-regulation is that of mental "time travel" (Suddendorf & Corballis, 1997). Humans have the capacity mentally to reconstruct past events and to generate detailed mental images of hypothetical events that may occur in the future. People's ability to deliberate on the past and future, combined with their capacity to form a sense of self and social identity, enables individuals to select and shape the environments they encounter, to develop skills to meet future challenges, to pursue personal aims, and thereby to function as causal agents. Self-regulation and personal agency are critical components to effective learning throughout the lifespan, and perhaps become increasingly so in late life as older adults must monitor changes in abilities with increasing vigilance.

A second approach to assessing human agency focuses not on mental functions, but on psychological structures and processes that enable persons to carry out these functions. Just as, in the study of cognition, one can distinguish a function that is carried out (e.g., problem solving) from the cognitive components that enable a person to carry out that function (e.g., working memory), in the study of human agency one can distinguish psychological functions (e.g., behavioral self-regulation) from the components of mental architecture that enable persons to execute those functions.

An analysis of cognitive systems that underlie self-regulation indicates that these cognitions can be understood as consisting of qualitatively distinct types. Both philosophical (Searle, 1998) and psychological considerations (Cervone, 2004a) suggest a qualitative distinction among classes of thought. A brief consideration of these distinctions yields an intellectual framework within which perceived self-efficacy can be understood.

When analyzing the cognitive capacities that underlie human agency, a fundamental distinction is one that differentiates among three classes of cognition: goals, standards, and beliefs. Some "cognitions" are mental representations of future states that one is committed to achieve. Such personal goals may serve to organize activities over extended periods of time and to bring coherence to internal psychological life, guiding people's interpretations of their experiences and of prospective challenges (Emmons & Kaiser, 1996; Grant & Dweck, 1999). Mental representations of goals are closely linked to mental representations of strategies for goal achievement (Kruglanski et al., 2002). The ability to develop and deploy such strategies is critical to self-control, self-directed motivation, and the realization of individual potentials (Cantor, 2003; Kross & Mischel, 2010).

Knowing what one can and cannot do is vital to one's self-concept because it can influence goal setting, effort expenditure, and feelings of self-efficacy and self-worth (Bandura, 1986; Markus & Wurf, 1987; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995; Trope, 1986). The knowledge that one is succeeding or failing at a task has substantial implications for ongoing and future actions related to task performance and sense of mastery (Ehrlinger & Dunning, 2003). Such careful self-assessment and self-awareness is crucial for successful aging, and can be even more influential in late life when adults begin to experience functional changes in multiple domains. Possessing an accurate view of one's skills and expertise can serve as a compensatory mechanism because by knowing exactly what one can and cannot do, and therefore what still is and is not possible, individuals can decide which deficiencies to accept and which to attempt to improve as they navigate through physical, cognitive, and social changes in late adulthood.

Current research suggests that individuals in late adulthood may grow, develop, and even thrive in multiple life domains (Levy, Slade, Kunkel, & Kasl, 2002). Although older adults face inevitable and normative losses in both cognitive and physical abilities, the self is not "set in plaster" (Srivastava, John, Gosling, & Potter, 2003). Throughout adulthood,

individuals have the capacity to make, choose, and shape development in active and integrative ways (Markus & Wurf, 1987; Bruner, 1990; Brandtstädter, 1984; Labouvie-Vief, 1981; Helson & Soto, 2005; Frazier, Hooker, Johnson, & Kaus, 2000). Indeed, although late life is commonly seen as a time of cumulative losses against diminishing gains (Baltes, 1987), research suggests that positive self-views can mediate negative declines and changes in late life. Indeed, positive attitudes toward aging have health-related benefits (Levy, 2009; Levy, Hausdorff, Hencke, & Wei, 2000; Levy, Slade, & Kasl, 2002) and are related to longevity (Levy, Slade, Kunkel et al., 2002).

In the study of adult development, much work indicates that goal structures and processes of goal selection are an aspect of future-oriented cognition that is key to well-being throughout adult development (e.g., Heckhausen, 1999, 2002; Heckhausen, Wrosch, & Richard, 2010; Pulkkinen, Nurmi, & Kokko, 2002; Staudinger, Freund, Linden, & Mass, 1998). In general, people who set goals in a manner that is congruent with their perceptions of the time available to them in their lifespan experience social relations that are more satisfactory and less stressful (Lang & Carstensen, 2002). More specifically, research on memory and aging shows that younger and older adults alike benefit from goal setting: People who set performance goals are more likely to attain higher performance outcomes (West, Welch, & Thorn, 2001).

In addition to action goals, people develop beliefs about what the future may bring. Converging lines of research suggest that the subset of future-oriented beliefs most central to personality functioning across adulthood is the belief in one's capacity to control significant life events (Skinner, 1996). One perspective on control beliefs concerns the degree to which causes of events are, in principle, under people's control as opposed to being the result of uncontrollable external forces (Rotter, 1966). Research on adult development indicates that higher levels of fatalistic beliefs—that is, beliefs that the nature of significant life events is inevitable and thus uncontrollable (Kohn & Schooler, 1983)—predict higher levels of disability among older adults (Caplan & Schooler, 2003).

Another perspective involves perceptions of one's personal capacity to execute courses of action in order to cope with events. Confidence in one's own ability to execute actions is, as a psychological construct, distinct from beliefs about the controllability of external events. The different sets of beliefs have distinct effects on cognitive and motoric outcomes in middle and older adulthood (Caplan & Schooler, 2003). Beliefs in one's capacity to execute courses of action have been studied extensively in the literature on perceived self-efficacy (Bandura, 1977a, 1997, 2006). It is this literature, and its implications for the study of adult development and learning, to which we now turn.

## PERCEIVED SELF-EFFICACY

Perceived self-efficacy refers to our judgments of what we think we can and cannot do. More formally, self-efficacy refers to our sense of confidence and competence, qualified by specific demands and features of the situation in which self-efficacy judgments are activated. When activated and the assessment is "I can," high self-efficacy will lead to new levels of learning and accomplishment. When the activated assessment is low—"I can't"—then self-efficacy will inhibit engagement in challenging situations, precluding skill development. The individual who has high expectations for learning and development—who sets and attempts challenging goals—will be likely to encounter both success and failure in goal acquisition, both of which shape and inform behavior. Successes provide encouragement and help to reinforce facilitative, goal-directed behaviors. Failures provide information about mistaken steps toward goals and help to narrow down and hone the behavioral repertoire. If opportunities for new experiences are avoided and deemed too risky, neither successes nor failures occur, and windows to learn close.

As reviewed in more detail elsewhere (Bandura, 1977a, 1986, 1997, 2006; Caprara & Cervone, 2000; Rodgers et al., 2008), self-efficacy beliefs are of particular importance to intentional action for three reasons. First, self-efficacy perceptions directly contribute to decisions, actions, and experiences. People commonly reflect upon their capabilities when deciding whether to undertake activities or to persist on tasks when faced with setbacks. People who judge themselves highly efficacious tend to be more willing to pursue challenges, to be more persistent on tasks, and to experience lesser performance-related anxiety (Bandura, 1997). Second, self-efficacy perceptions may moderate the impact of other psychological mechanisms on developmental outcomes. For example, as a general rule, individuals who acquire skills on a task achieve greater success, but if people still doubt their capabilities despite adequate instruction, they may fail to put their knowledge into practice (Williams & Williams, 2010).

Third, self-efficacy beliefs influence other cognitive and emotional factors that, in turn, contribute to performance. Of particular importance are links from self-efficacy processes to goal setting (Berry & West, 1993; Cervone et al., 2006; Locke & Latham, 1990). People with higher efficacy beliefs tend to set more challenging goals and to remain committed to their goals, and these goal mechanisms, in turn, contribute to motivation and achievement (Bandura & Locke, 2003; West et al., 2001; West, Dark-Freudeman, & Bagwell, 2009).

These links from self-efficacy beliefs to goal processes are particularly important to adult development and learning. One of the developmental tasks of adulthood is appraisal and reappraisal of life goals (Brandtstädter, Rothermund, Kranz, & Kuhn, 2010; Lang & Carstensen, 2002). Research shows that individuals who set learning or performance goals acquire higher skills and self-efficacy than those who set no goals (Bandalos, Finney, & Geske, 2003) or who are told to merely "do your best" (Brown & Latham, 2002). In one study, adults aged 30 to 59 years old who experienced loss in important domains to self and who subsequently downgraded the importance of goal attainment in those domains experienced less loss of perceived control overall than if goals in the failing domain were maintained at initial levels (Brandtstädter & Rothermund, 1994). In other words, rescaled goals (downward) in domains of personal importance can buffer the sense of perceived loss of control in that domain.

Self-assessment is usually evaluated via self-other comparisons. The literature suggests that these comparisons are guided by different goals, depending on the age group evaluated. For instance, Heckhausen and Krueger (1993) contrasted expectations of change for self across the lifespan with the change expected for "most other people." They proposed that the increasing risk of decline associated with late life might be construed by people as a threat, thereby eliciting self-enhancing social comparisons, in which people compare themselves to targets that are relatively inferior to themselves (Krueger, 1998; Taylor, Neter, & Wayment, 1995; Heckhausen & Brim, 1997). Results also showed that individuals between the ages of 50 and 80 indicated that they would experience fewer declines in desirable attributes and fewer increases in undesirable attributes compared to others. Additionally, older and middle-aged adults reported larger discrepancies than younger adults between self and other in late adulthood on negative personality traits. These findings

are consistent with research showing that people expect more positive future outcomes for themselves than for others (Regan, Snyder, & Kassin, 1995). For example, Martini and Dion (2001) tested adults across the lifespan, asking them to evaluate either themselves or an unknown other person of the same sex at one of three specified "target ages" (20, 45, or 70 years) using a modified Aging Semantic Differential Scale to assess attitudes and quantify bias and negative stereotypes. Results indicated that evaluations of the self became more positive with increasing target age, and evaluations of others declined with increasing target age. These data suggest that self-enhancement appears to have a developmental component as threats associated with age-related declines emerge in middle age and continue into late life; self-enhancement tendencies may increase in certain domains during middle adulthood to compensate for the emergence of declines in midlife. Further, participants' views of the discrepancies between self and other were not an all-or-none phenomenon; differences were seen as relatively small by middle-aged participants and larger by older participants, demonstrating a larger self-enhancing effect in late life.

When older adults are faced with self-assessment pressures or opportunities, they may reject prior developmental tendencies to bring the actual self closer to an earlier, idealized self (e.g., self-enhance) and instead become generally more accepting of themselves—bringing the idealized self closer to the actual self, in a directional shift (Dittmann-Kohli, 1990). In this model, older adults become more accepting of themselves and begin to focus on remaining strengths. Research supports this claim. In one study, young, middle-aged, and elderly adults evaluated themselves on six dimensions of psychological well-being according to present, past, future, and ideal self-assessments (Ryff, 1991). Young and middle-aged adults saw considerable improvement in themselves from the past to the present on all dimensions of well-being; however, the elderly indicated stability with prior levels of functioning. In other words, young and middle-aged adults positively enhanced the difference between past and present selves, whereas older adults reported no such enhanced difference between past and present selves. These results imply that as individuals age and make temporal rather than social comparisons, they become more realistic and accept the lesser likelihood of domain improvement in late life.

An increase in acceptance of actual self in late adulthood is consistent with the theory of selective

optimization with compensation (SOC; Baltes & Baltes, 1990; Freund & Baltes, 2002). This theory suggests that as losses in biological, psychological, and social domains begin to accrue, older adults begin to maximize gains and minimize losses by selectively optimizing strengths and compensating for weaknesses (Freund, Li, & Baltes, 1999). This theory can be applied to bringing actual and ideal selves into alignment. Minimizing the discrepancy between ideal and actual selves, and thus becoming more accurate in self-assessment, can be viewed as a resourceful strategy to prevent damage to self-concept and maintain high self-esteem (Brandtstädter & Greve, 1994). This reining in of personal ideals, as older adults become more realistic in discerning what they can and cannot do, suggests a later-life gain wherein the ideal self better fits the real self. Further, it might seem futile for older adults to attempt to self-enhance in domains that inevitably deteriorate with age (e.g., physical strength, reflexes). Instead, it may be more fulfilling to focus on strengths by mastering and maintaining domains where functioning is high and satisfying. This shift would require recalibration of self-efficacy across domains. Thus, self-enhancement may be become more domain specific in older adults. Indeed, one study of older women who completed self-reports of physical health, upward and downward social comparisons processes, and positive and negative aspects of psychological adaptation found that worse physical health was linked to more frequent usage of social comparisons (Heidrich & Ryff, 1993).

Although T. S. Eliot (1931, p.8) claimed that "only those who will risk going too far can possibly find out how far one can go," a less extreme, more balanced point of view may foster adaptive aging. That is, recognition and acceptance of limits is essential to adaptive aging. Yet, remaining open to possibilities and opportunities is an equally compelling lifespan task. Reasoned risk taking in older adults may contribute to continued and new growth in broad domains of functioning.

## A Systemic View of Self-Efficacy in Adulthood

The psychological construct perceived self-efficacy is often considered "in isolation," that is, out of the context of behavior. In empirical work, researchers often investigate self-efficacy as a predictor of some outcome variable of interest. In literature reviews, writers may analyze the causes and effects of self-efficacy processes while devoting little space to other psychological mechanisms. Few writers have put self-efficacy into developmental contexts, although the promise of such analyses has been articulated previously (Berry, 1999; Berry & West, 1993; Caprara et al., 2003; Cavanaugh, Feldman, & Hertzog, 1998; Cavanagh & Green, 1990). Tests of the value of self-efficacy theory and research must consider the broader theoretical framework within which the self-efficacy construct was developed and the range of psychological dynamics that are critical to understanding its processes. The status of the theory is reviewed next, followed by recent empirical work.

### Social-Cognitive Perspectives on Individual Development

As noted, Bandura's self-efficacy theory (1977a) is but one component of his broader social-cognitive framework for analyzing personality development and functioning (Bandura, 1977b, 1986, 1999b). The overall social-cognitive framework has been advanced not only through the efforts of Bandura, but by other investigators who analyze the social foundations of cognition, affect, and individuality (Caprara & Cervone, 2000; Cervone & Shoda, 1999; Mischel, 2004). These combined efforts yield a family of social-cognitive theories that possess three defining features: 1) interactionism, 2) a systems view, and 3) the building blocks and architecture of personality.

*Interactionism.* The first feature is interactionism. Bandura (1986) posits that development occurs through *reciprocal determinism*. Personal qualities, environmental influences, and behavior mutually influence one another, that is, they interact reciprocally. A large-scale investigation of math self-efficacy and math achievement in 33 countries used structural equation modeling (SEM) to analyze the mutual effects of self-efficacy and performance in a critical test of the theoretical premise of reciprocal determinism (Williams & Williams, 2010). Their results supported the mutual influence of efficacy and performance in the domain of mathematics. Other research supports the reciprocal determinism of self-efficacy and learning outcomes in other situated contexts, for example, computer-based, technologically rich environments (Lajoie, 2008).

This interactionist view goes far beyond the simplistic assertion that "people and situations influence one another." Instead, it speaks to deeply significant questions about human nature and the best way to construe human psychological qualities in a scientific analysis (Cervone, Caldwell, & Orom, 2008). Contemporary evidence shows that genetic

mechanisms themselves are activated by experience with the environment (e.g., Champagne, 2008; Gottlieb, 1998; Lickliter & Honeycutt, 2003a, b). The key feature of social-cognitive analyses is that the core units of analysis through which personality is analyzed are inherently contextual. The units of analysis describe beliefs, aspirations, and skills that are acquired through social interaction and whose contexts pertain to the contexts of people's everyday lives.

*A systems view.* A second defining feature of social-cognitive theory is that it is a systems viewpoint on human development and functioning. Social-cognitive and affective mechanisms are construed as a complex system of interacting elements (Mischel & Shoda, 1995, 1998). This *systems* thinking has significant implications for explaining the development of stable personality styles and individual differences (Cervone, 1997, 1999; Mayer, 2005; Nowak, Vallacher, & Zochowski, 2002; Read et al., 2009). The development of a dynamical system is not prefigured; instead, development occurs gradually, via reciprocal interactions between the system and the environment that it encounters. The full development of personality, then, is not encoded in the genome but matures from dynamic person–environment transactions. These transactions include agentic processes in which people contribute to the development of their own behavioral and affective tendencies (Caprara, Barbaranelli, Pastorelli, & Cervone, in press; Caprara et al., 2003; Hooker, 2002; Hooker & McAdams, 2003; McAdams & Pals, 2006; McAdams & Olson, 2010). As Hooker notes, the study of personality development in adulthood has moved beyond the trait approach to change versus stability, to the study of change itself as an individual difference variable and the changing individual as both agentic and receptive to exogenous forces—i.e., reciprocal determinism.

A systems perspective also opens the door to the study of idiosyncrasy. Any complex system may develop distinctive patterns of behavior. Understanding them requires careful analysis of the individual case—a point emphasized not only in social-cognitive models such as the KAPA model (e.g., Cervone et al., 2008), but also in the holistic perspective of Magnusson, Bergmnan, and colleagues (Bergman, 2002; Magnusson & Mahoney, 2003; Magnusson & Törestad, 1993), the research employing growth curve modeling to chart developmental trajectories at the level of the individual (e.g., Young & Mroczek, 2003), and investigations

of the foundations of interindividual and intra-individual measurement strategies (Borsboom, Mellenberg, & van Heerden, 2003; Molenaar, Huizenga, & Nesselroade, 2002). All these advances are congruent with the need to explain the actions of a person by reference to the person as a whole, rather than to independent "parts" of the individual (Bennett & Hacker, 2003; Harré, 1998, 2002; Sinnott & Berlanstein, 2006).

This systems-level perspective highlights the limitations of considering self-efficacy processes "in isolation." In the flow of thinking, thoughts about self-efficacy are inherently associated with other classes of cognition. In explaining the actions of a person, it is best to attribute actions to the person as a whole rather than to the isolated variable "self-efficacy."

*The architecture of personality.* The third defining feature of the social-cognitive perspective is levels of analysis, through which individuals and their development are analyzed. The question social-cognitivists ask is, "How can one model the psychological mechanisms that underlie the coherence of personal functioning?" (Cervone & Shoda, 1999). In other words, what basic "personality variables" are needed in social-cognitive theory? Such questions are critical because "one cannot advance a science of personality and its development without having a conception of what is developing" (Caprara, Steca, Cervone, & Artistico, 2003, p. 945).

A recent theoretical model of personality development emphasizes the overall design and operating characteristics of within-person psychological systems that contribute to the uniqueness and coherence of the individual (Cervone, 2004a). In brief, this model rests on three distinctions. One distinction differentiates feeling states (see Russell, 2003) from intentional cognitions—where the term "intentional" is used as in the philosophy of mind (Searle, 1998) to reference cognitive contents that are directed beyond themselves to the representation of objects in the world. (To illustrate, feelings of hunger do not represent—that is, symbolically "stand for"—an object or event in the world and thus do not have the quality of intentionality, whereas thoughts about a particular restaurant do.) A second distinction is one, noted above, that differentiates among those cognitive contents that we usually refer to as beliefs, evaluative standards, and goals. The third distinction is one that was developed by Lazarus (1991) in the study of cognition and emotion, a distinction between knowledge and appraisal. This distinction is so central to the overall

model that it is referred to as the Knowledge-and-Appraisal Personality Architecture (KAPA) model. Knowledge refers to enduring mental representations of a typical attribute or attributes of an entity (e.g., oneself, other persons, objects in the physical or social world). Appraisals, in contrast, are dynamically shifting evaluations of the personal meaning of events, that is, "continuing evaluation[s] of the significance of what is happening for one's personal well-being" (Lazarus, 1991, p. 144). Such evaluations generally are conducted by relating features of the self to features of the world. The distinctions a) between knowledge and appraisal, and b) among goals, evaluative standards, and beliefs are cross-cutting, yielding a taxonomy of six classes of social-cognitive personality variables (Figure 12.1).[1]

## Self-Efficacy Appraisals and Assessment

Within the KAPA model (Cervone, 2004a), the class of thinking that is generally referred to as "perceived self-efficacy" can be classified according to both dimensions of this taxonomy (Figure 12.1). Perceived self-efficacy refers to beliefs—specifically, beliefs regarding one's own capabilities for performance. Self-efficacy perceptions also are appraisals, that is, they are evaluations of whether one can cope with ongoing or prospective encounters, where those evaluations directly bear on the meaning of the encounter for the self. Self-efficacy appraisals, then, are akin to appraisals of coping potential in Lazarus's model (1991).

The class of cognitions identified by Bandura (1977a) in self-efficacy theory refers to appraisals of one's capabilities to handle prospective encounters (e.g., "Can I learn the skills required to get a new job as a Web page designer?" "Can I overcome shyness and re-enter the world of dating after a divorce?), rather than abstract knowledge about attributes of oneself or the social world (e.g., "Is Web page design hard?" "Am I attractive?"). Such knowledge, however, may come to mind as individuals appraise their efficacy for performance, and systematically influence those appraisals (Cervone, 1997, 2004a).

The term "self-efficacy" has also been used to describe phenomena at more general levels than theory dictates (e.g., Bandura, 1977a, 1997). Specifically, "generalized self-efficacy" refers to belief in one's overall competence and confidence to exert control over one's environment (Sherer, Maddux, Mercandante, Prentice-Dunn, & Rogers,1982). The generalized construct has been criticized on empirical and conceptual grounds, and it sacrifices predictive utility (Bandura, 1997; Cervone, 1997; Stajkovic & Luthans, 1998; Weitlauf, Cervone, Smith, & Wright, 2001). Moreover, it correlates so highly with other constructs, such as optimism and self-esteem, that it appears to lack discriminant validity (Judge, Erez, Bono, & Thoresen, 2002; but see a recent study by Wiesmann & Hannich, 2008).

Strategies for assessing self-efficacy beliefs reflect social-cognitive theory's dual concern with a) identifying psychological systems that causally contribute

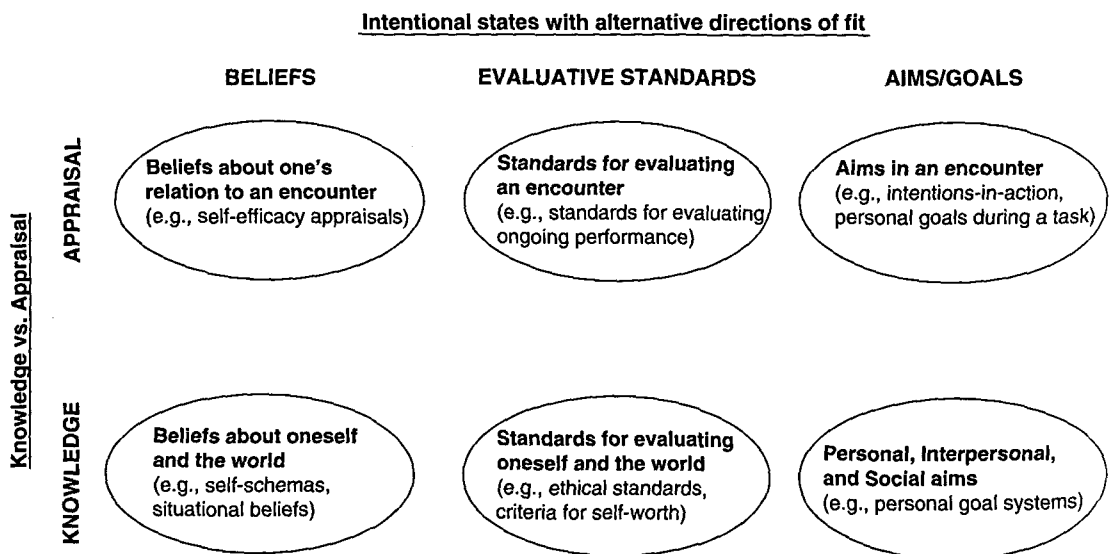**Intentional states with alternative directions of fit**

Fig. 12.1 The KAPA system of social-cognitive personality variables. In the variable system, the distinction among beliefs, evaluative standards, and aims holds at both the knowledge and the appraisal levels of the personality architecture, yielding six classes of social-cognitive variables.

to behavior and personal development while b) remaining sensitive to the possibility that individuals' thoughts about themselves may vary markedly from one life domain to another. To assess perceived self-efficacy, investigators inquire into people's appraisals of the level or type of performance they believe they can achieve when facing designated challenges. This is most commonly accomplished via structured self-report measures (Bandura, 1977a). People indicate either the level of performance they believe they can achieve on an activity (level of self-efficacy), their confidence in attaining designated levels of achievement (strength of self-efficacy), or both.

Measurement strategies were presented in our previous handbook chapter (see Cervone, Artistico, & Berry, 2006) and are not reviewed here. Generally speaking, self-efficacy scales are designed to tap people's confidence in their capabilities for performance in specific and often uncertain circumstances, and test content is determined by research in relevant task domains (e.g., Artistico, Cervone, & Pezzuti, 2003; Berry, West, & Dennehey, 1989). Self-efficacy assessments are used to gauge not only between-person differences but also within-person variations in efficacy beliefs across contexts (Bandura, 1977a; Cervone, 1985). Structured self-efficacy scales are not the only means of assessing self-efficacy appraisals. For example, some work employs think-aloud methods in which research participants' spontaneous self-statements regarding their efficacy for performance are analyzed (e.g., Haaga & Stewart, 1992). However, questionnaire methods have been by far the most common method of assessment. With this background on the nature and assessment of self-efficacy beliefs, we turn to the question of the development of self-efficacy beliefs and the capacity for personal agency.

## The Development of Self-Efficacy Beliefs

Personal agency is shaped by biological, psychological, and sociocultural forces that interact across the life cycle. These developmental forces are captured in various biopsychosocial models that guide research on health and well-being (Cavanaugh & Blanchard-Fields, 2006; Garland & Howard, 2009; Martin, Martin, Gibson, & Wilkins, 2007; Suls & Rothman, 2004). We propose herein that these forces operate continuously during life to propel individuals forward through multiple domains and contexts, promoting (or preventing) growth in each. In early infancy, the human organism begins to learn cause-and-effect relationships, including the

reciprocal effects of self in the world. These early experiences shape the child's general sense of personal agency and contribute to personal agency in specific behavioral developmental contexts. We identify or label such context-specific agentic beliefs as "self-efficacy" beliefs, and we argue that as behavioral strengths and weaknesses develop in context, so do the performance-based beliefs associated with these behaviors.

The importance of self-efficacy mechanisms to adult learning and development cannot be understated, as is evident from various applications of self-efficacy principles across domains in recent theoretical and empirical work. For example, Potter, Grealy, and O'Connor (2009) developed a measure of motoric self-efficacy and found that older adults with high motoric self-efficacy were better at cognitive tasks requiring inhibition (e.g., executive function) than older adults with lower motoric self-efficacy. Rejeski, Katula, Rejeski, Rowley, and Sipe (2005) uncovered important relationships between the desire for lower body strength and increases in strength-related self-efficacy in older adults. Structural equation modeling analyses of personality, self-efficacy, and physical fitness have revealed a mediated effect of pessimism on physical fitness through self-efficacy (Umstattd, McAuley, Motl, & Rosengren, 2007). In cognitive domains, self-efficacy expectations and judgments in older adults are influenced negatively when participants are told that performance tasks were memory tasks rather than tests of "orientation" abilities (Desrichard & Kopetz, 2005), lending credence to the stereotype threat literature. In a related vein, Miller and West (2010) manipulated performance expectancies and self-efficacy by providing false feedback on a reading task. High-performance feedback increased self-efficacy in both younger and older adults, but older adults with high control beliefs and high feedback increased their task-related attention and effort, providing strong support for self-efficacy theory. Maurer (2001) examined factors in the workplace and organization that contributed to midlife and older workers' low sense of self-efficacy for career-relevant learning and skill development in the workplace, and found that low efficacy mediates the relationship between age of worker and participation in career development and learning opportunities (see also Maurer, Weiss, & Berbeite, 2003). Sahu and Sageeta (2004) have examined perceptions of self-efficacy among women in the workplace and non-working women, with results indicating positive relations between workplace

experience and efficacy beliefs, and between efficacy beliefs and a sense of personal well-being. And Bandura himself has recently emphasized the vital role of self-efficacy to personal (Bandura, 2005) and global (Bandura, 2009) health outcomes. Self-efficacy is clearly central to myriad developmental domains.

On a more meta-developmental level, one central task of adulthood is to learn and then accommodate to the limits of energy, strength, and speed resources. New adaptations are needed for changes in cognition, health, work status, and social and interpersonal roles. Changes at sociocultural levels, including technology, urban/suburban/rural development, the economy, and medical advances, may require new adaptations. Adjusting to the inevitable changes associated with aging is vital for positive development; recognizing that some changes are controllable and can be willfully selected and pursued will facilitate such adaptations.

Self-efficacy appraisals across domains of functioning will begin to fluctuate as the contingencies of behavior change with age. What was once a sufficient length of time and set of abilities to master new learning may no longer suffice when hearing and vision begin to fail and new tasks take greater time and effort. Competencies in various domains are shaped by performance successes and failures, effort and effort attributions, persistence and choice, and self- and other-provided feedback. Mastery and expertise develop in certain domains, and experts appear to be relatively good at knowing what they know.

Yet, changes in physical and cognitive functioning in adulthood force reappraisals of abilities across domains. Goals should be reset to accurately reflect recalibrated competencies. Sources of efficacy information in older adulthood include the same categories of information used by younger adults (mastery, modeling, persuasion, arousal), but the nature of self-efficacy source information may change with age to include greater proportions of failure experiences relative to success experiences—a proposition that is consistent with the shift in the ratio of gains to losses in Baltes's (1987) lifespan model of development. Likewise, the weights assigned to sources of efficacy information may shift from greater emphasis to external sources (e.g., peers, media messages) than internal sources (e.g., accurate self-feedback). To the extent that peers serve as salient points of comparison, the aging individual will have more opportunities in social contexts to observe memory failures, intellectual slowing, and

physical frailty and stiffness (e.g., perhaps witnessing walking with the aid of canes after a fall and/or painful attempts to use arthritic feet and hands). Sources of efficacy information abound—peers, family, media, stereotypes, doctors, neighbors, confidantes—and older adults might optimize their sense of well-being by attending specifically to positive, efficacy-building feedback from these environmental sources (Welch & West, 1995; West, Bagwell, & Dark-Freudeman, 2008).

We now turn to research in health and memory domains. We review recent findings on disease management and decision making in the health domain, and the role of memory beliefs, stereotypes, and training studies in the memory domain. We conclude the chapter with analyses of skill acquisition and problem solving in adulthood.

## Health

A growing literature identifies self-efficacy appraisals as an important psychological process that influences health and well-being across the lifespan. Self-efficacy appraisals influence health-promoting behavior among older adults and are a promising target for intervening to increase health-promoting behavior, even among older adults with disability, injury, or illness (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003; Neupert, Lachman, & Whitbourne, 2009; Rejeski, Miller, Foy, Messier, & Rapp, 2001). Also, older adults bear much of the population's chronic and life-threatening disease burden, and self-efficacy appraisals influence coping with chronic and life-threatening illness. Self-efficacy appraisals have been found to play roles in coping with pain, coping with illness-related stressors such as making cancer treatment decisions, and adherence to medication and rehabilitation regimens (Krein, Heisler, Piette, Butchart, & Kerr, 2007; Lorig, Ritter, Laurent, & Plant, 2008; Lorig et al., 1999; Orom et al., 2009).

Engaging in health-promoting behavior continues to protect against illness and disability even in late adulthood. For example, physical activity is protective against the onset of disease and exacerbation of disease morbidity (Seeman & Chen, 2002), and is associated with functional ability and well-being in older adults with and without illness (Rejeski & Mihalko, 2001). However, only half of adults 65 years of age and older meet 2008 physical activity guidelines (U.S. Department of Health and Human Services, 2009).

Physical activity has become an important domain for understanding the role of self-efficacy in

health behavior change in older adults. A relatively large number of studies, including prospective studies, identify exercise self-efficacy and self-efficacy for overcoming barriers to exercise as determinants of exercise initiation and adherence in older adults (Brassington, Atienza, Perczck, DiLorenzo, & King, 2002; McAuley et al., 2003; Orsega-Smith, Payne, Mowen, Ho, & Godbey, 2007; Perkins, Multhaup, Perkins, & Barton, 2008; Rhodes, Martin, & Taunton, 2001). A dynamic that is of particular relevance to the health, well-being, and quality of life in older adulthood is the role of self-efficacy in protecting against declines in physical activity and associated loss of functional ability over time. Studies of why physical activity declines in older adulthood demonstrate a downward cycle in which injury and declines in physical ability negatively impact appraisals of self-efficacy (Bean, Bailey, Kiely, & Leveille, 2007; Sihvonen et al., 2009). Reductions in self-efficacy are, in turn, associated with lower physical activity (Krein et al., 2007) and poorer functional ability (de Leon, Seeman, Baker, Richardson, & Tinetti, 1996). In contrast, continuing to appraise one's self-efficacy as high in spite of physical declines and chronic pain may be protective against loss of functional ability over time (de Leon et al., 1996; Rejeski et al., 2001). Interventions that foster physical activity self-efficacy in periods where this might be jeopardized (i.e., during recovery from injury or illness) may help preserve day-to-day functioning in older adults.

Mechanisms that show promise for enhancing physical activity self-efficacy (and physical activity) in older adults include involvement in physical activity programs (McAuley et al., 2007; Neupert et al., 2009; Rejeski et al., 2008) and, in particular, experiencing social support and positive affect in association with these programs (McAuley et al., 2003). Empirical tests of predictions derived directly from self-efficacy theory show that verbal persuasion sources of efficacy information influence exercise outcome efficacy ratings among older adults through doctors, family, and friends (Clark & Nothwehr, 1999).

## SELF-EFFICACY AND ILLNESS
Older adults bear an overwhelming proportion of the population's chronic and life-threatening disease burden. Over 80% of adults age 65 or older have at least one chronic condition, and the majority have two or more chronic conditions (Wolff, Starfield, & Anderson, 2002). Furthermore, over one-third of adults aged 65 years and over report limitation of

activity due to chronic conditions, most commonly due to arthritis or other musculoskeletal conditions and cardiovascular conditions (National Center for Health Statistics, 2007). Chronic illness is detrimental to daily functioning, quality of life, and independence; increases risk of long-term institutionalization; and places large demands on informal caregivers (Buchner, 2009; Nihtila et al., 2008). A major challenge, therefore, is to prevent and mitigate the negative impact of illness on day-to-day functioning, quality of life, and health outcomes among older adults.

### Chronic Disease Self-Management
Self-efficacy predicts self-care among patients with chronic disease and can result in better medical outcomes and reduced morbidity. For example, increases in self-efficacy have accounted for better glycemic control among older adults with diabetes (Trief, Teresi, Eimicke, Shea, & Weinstock, 2009) and increased physical activity among older adult patients with chronic obstructive pulmonary disease (Kaplan, Atkins, & Reinsch, 1984). Studies show that self-efficacy is inversely related to pain perception (Leveille, Cohen-Mansfield, & Guralnik, 2003; Reid, Williams, & Gill, 2003), and self-management self-efficacy has been found to buffer the impeding effect of chronic pain on physical activity in men with chronic disease.

Self-management interventions designed for older adults with one or more chronic diseases (e.g., the Chronic Disease Self-Management Program, CDSMP, Lorig et al., 1999) encourage patients to actively manage chronic disease by promoting self-efficacy for self-management through action planning, problem solving and decision making, peer modeling, and reappraisal of symptoms. The program has been found to increase self-management self-efficacy, health behavior, psychological coping, and medical outcomes when delivered in group settings (Lorig et al., 2001) or online (Lorig et al., 2008). Applications of new technologies such as telemedicine hold promise for providing more intensive services at reasonable cost. Telemedicine applications that augment behavioral support (e.g., remote monitoring of clinical data and educational counseling via the Internet) for patients living with chronic disease with a high self-management burden (e.g., diabetes) have been found to improve adherence and clinical outcomes, in large part mediated through increases in self-efficacy to adhere to the medical regimen (Shea et al., 2009; Trief et al., 2009).

## Making Complex Medical Decisions

Patient participation in medical treatment decision making has come to be viewed as a necessary component of high-quality clinical care (Epstein & Street, 2007). Older adults, who bear the lion's share of serious disease, are often involved in complex decision making about the treatment of their illnesses. A diagnosis of prostate cancer is a useful example of the challenges to patients taking part in treatment decision making. Prostate cancer is the most common non-cutaneous cancer in men and is most often diagnosed in men 60 years and older (Jemal et al., 2009). Although it has an excellent prognosis if detected when it is localized to the prostate (5-year survival rate is nearly 100%; Jemal et al., 2004), a diagnosis of prostate cancer nevertheless evokes fear and uncertainty (Perczek, Burke, Carver, Krongrad, & Terris, 2002). Men diagnosed with localized disease currently choose between active surveillance (monitoring the progress of the cancer but not treating it) or treating it with one of several options that potentially offer cure but that may cause serious side effects (e.g., incontinence, erectile dysfunction). For men diagnosed with prostate cancer, deciding on a treatment is a complex decision in which they must weigh probabilistic information about severity of disease, their overall health status, and preferences regarding potential risks and benefits under conditions of uncertainty. Not surprisingly, the decision-making process is distressing and difficult for a substantial proportion of men (Gwede et al., 2005; Orom et al., 2009). Perceiving oneself to be self-efficacious for making the treatment decision may buffer patients against treatment decision-making distress. High decision-making self-efficacy has been associated with experiencing less decision-making distress and greater satisfaction with the prostate cancer treatment decision-making process (Orom et al., 2009). Increasing self-efficacy for making treatment decisions is a promising strategy for reducing the psychological burden of illness and increasing long-term satisfaction with the treatment decision.

Together, these studies provide support for the idea that self-efficacy appraisals can function as a change mechanism and a buffering mechanism in various physical and health behavioral domains. Older adults who are highly efficacious appear to exert the necessary effort required for maintenance and adherence to important health behaviors, even in the face of pain or disability, and experience advantages with respect to coping with serious illness.

We turn now to recent research on efficacy and control beliefs related to memory in adulthood.

We report on training and intervention studies, as well as applied research with well-being and other indicators of psychology and physical health as key outcomes. A comprehensive view of self-efficacy in adulthood, grounded in the SOC framework, considers multifactorial, multimethod measurement approaches. Perhaps selective optimization can include "selection" of positive beliefs to view the negative changes in some skills and abilities in adulthood. Perhaps reliance on strengths such as verbal abilities and vast knowledge bases can help compensate for weaknesses in speed and physical resources. Indeed, Siedlecki, Tucker-Drob, Oishi, and Salthouse (2008) report that fluid intelligence is less predictive of subjective well-being as one ages. Likewise, compensation for suboptimal functioning might entail adjusting one's attitude toward personal performance standards. More than earlier in the life cycle, realistic appraisal of one's abilities might characterize optimal functioning. We will draw on relevant research from stereotyping, self-serving biases, and metacognitive monitoring in the memory domain to support this argument.

## Memory

The ability to learn and remember new information changes with age, particularly with regard to how quickly we can process and use information, but new learning is not impossible. Currently, there is an explosion of interest in optimizing cognitive functioning in adulthood and minimizing cognitive deterioration and dementia in late life (Berry, Hastings, West, Lee, & Cavanaugh, 2010). To wit, a recent issue of *Newsweek* magazine (June 18, 2010) highlights research by leading scholars in cognitive aging, who point to limiting factors such as processing resources and the basic mechanics of thinking as well as the plasticity of the aging brain and the positive effects of aerobic training on cognitive functioning in older adults. Likewise, *The New York Times* blog about aging (http://newoldage.blogs.nytimes.com/) features advances in medicine, technology, and behavioral research related to healthy and successful aging, as well as the latest discoveries on Alzheimer's disease, including a recent piece (June 3, 2010) on its heritability in one Colombian family over several generations. The APA *Monitor* (Azar, June 2010) recently featured research on the benefits of aerobic exercise on executive functioning in sedentary elderly adults as well as its power to delay the progression of cognitive decline in people with mild cognitive impairment, often a precursor of Alzheimer's disease.

The appearance of these articles in mainstream lay publications and cross-disciplinary publications within the field is an outgrowth of the almost frenzied pace at which behavioral scientists are conducting basic and applied research on the mechanisms of learning and cognition in adulthood. In fact, a recent issue of *Psychological Science in the Public Interest* (Hertzog, Kramer, Wilson, & Lindenberger, 2008) is devoted to the question of plasticity and the preservation of cognitive capacity and functioning in adulthood. The editorial accompanying this issue points with cautious optimism to the success of some cognitive training programs and cites the general public's clamoring for cognitive remediation advice and interventions. Among other topics in the special issue, Hertzog and colleagues address the role of beliefs and attitudes toward aging, citing research on self-efficacy and control beliefs as important predictors and covariates of learning and cognition in adulthood.

Well-being in older adulthood depends on sound cognitive, physical, and emotional functioning and is determined by multiple factors including access to resources and the ability to make use of resources. Wiesmann and Hannich (2008) identify sense of coherence as one such critical factor that mediates the influence of coping resources on subjective well-being in the elderly. Their correlational analyses of questionnaire data from 170 older adults indicated that personality variables, including self-efficacy, explain unique variance in psychological well-being beyond that explained by "resistance" resources including education, physical health, social support, and personality. This study used a measure of generalized self-efficacy for dealing with challenging situations, with items such as "I can... solve difficult problems..." and "I am confident I can deal with... events." Their results indicated that generalized self-efficacy was a significant mediator of generalized well-being based on general coping resources. Although this study used a generalized rather than a task-specific measure of self-efficacy, it can be argued that this is an appropriate application of self-efficacy theory, methods, and measures because the units of analysis were at comparable (i.e., general versus task-specific), isomorphic levels. This study is especially important in pointing to sense of coherence as a positive outcome in older adulthood, and one that depends partly on high self-efficacy for accomplishing everyday activities and coping with everyday problems. Sense of coherence is consistent with the systemic approach to adaptive aging that we take in this chapter and to "the importance of feeling whole" (see Sinnott & Berlanstein, 2006).

The influence of self-efficacy on psychological well-being in adulthood is captured in case studies that elucidate the operation of self-efficacy processes at the individual level. Kim and Mueller (1997) analyzed interview data from older Korean Americans who varied on measures of memory self-efficacy, education, cognitive functioning, and self-esteem. Their analysis suggested that adaptability (e.g., adaptations to losses of aging) is a more important component of perceptions of ability than ability itself. They measured memory self-efficacy with the Memory Functioning Questionnaire (Gilewski, Zelinski, & Schaie, 1990) and the Memory Controllability Inventory (Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992), both of which assess degree, frequency, and type of subjective memory complaints commonly experienced by older adults. Kim and Mueller argue that case-study data are not always concordant with the tenets of self-efficacy theory and yield important insights into self-efficacy processes at the individual level, while acknowledging the need for large-scale, population-based studies as well. They selected four individuals from a larger case-study database to illustrate this point. Two of their interviewees yielded data that support self-efficacy theory—low memory performance accompanied negative perceptions of ability in one adult, and high memory performance accompanied positive perceptions in another adult. The two remaining interviewees' experiences were inconsistent with what theory would predict—one adult had positive perceptions but poor memory functioning, and the opposite was true for the fourth adult. The authors argued that life experiences and adaptation to aging help determine the degree of fit between perceptions of ability and actual ability. This claim points to the role of general beliefs and attitudes toward aging as relevant to self-efficacy analyses. We concur and believe that the observations of Kim and Mueller are consistent with a systems-level, social-cognitive analysis of aging, learning, and psychological well-being. The psychological well-being of these four individuals varied widely, with high cognitive function not necessarily supported by a positive sense of well-being. In fact, one adult had very low memory scores and perceptions of her memory ability but reported not being bothered by it. Negative experiences and cognitive decline may be "mitigated by the adaptability of the aging self" (p. 421). The authors acknowledge the limits of their case-study approach and advocate for empirical verification of their insights, but also advise that training "adaptability"

be included in memory and other intervention programs for older adults seeking relief from memory problems.

Researchers have responded to this charge with empirical, population-based studies of the relationship between subjective and objective memory complaints as related to self-efficacy, personality, and affective variables. These studies are consistent with a social-cognitive systemic approach to the study of self-efficacy in late life. In an empirical analysis of older adults with memory complaints who had sought help from a memory clinic, Ramakers and colleagues (2009) studied why some adults with subjective memory complaints (SMC) yet without objective memory problems still seek treatment at memory clinics for their self-perceived memory problems. The results indicated that people with SMC who sought help at a clinic were more likely to be worried about a family history of dementia, to have lower memory self-efficacy scores, and to experience lower overall quality of life (especially poor mental health) than people with SMC who did *not* seek help at a clinic. Additionally, family members of help-seekers reported deterioration in daily functioning, including memory, in their SMC relatives. Interestingly, the people with SMC who sought help at memory clinics had higher levels of education than people with comparable SMC but who did not seek help. Perhaps more highly educated people notice and monitor cognitive changes to a greater extent than those with less education. These results are consistent with Mol, Ruiter, Veryhey, Dijkstra, and Jolles (2008), who found that memory self-efficacy predicted perceived forgetfulness in elderly adults. Mol and colleagues also found that memory-related anxiety and the evaluations of important others were co-predictors of perceived forgetfulness, along with self-efficacy. Collectively, these studies provide support for one of the main tenets of self-efficacy theory, specifically, *sources* of self-efficacy such as self-perceptions, important others, and anxiety. Both Ramakers and colleagues and Mol and colleagues recommended that memory intervention programs and clinics should consider these affective, self-efficacy, and quality-of-life variables when designing treatment programs.

To the extent that self-efficacy beliefs predict performance, intervention programs should attempt to improve negative beliefs while training abilities for maximum impact. However, research on the relationship of changes in self-efficacy and performance in both longitudinal and intervention studies over time has been equivocal (see Rasmusson, Rebok, Bylsma, & Brandt, 1999; West, Welch, & Yassuda, 2000). For example, Windsor and Anstey (2008) investigated longitudinal change in memory, speed of processing, and verbal intelligence as a function of control beliefs in young, middle-aged, and older adults. Although control beliefs were correlated with cognition at baseline, within-person change in control beliefs over the four-year testing interval did not predict change in performance over the same interval. In related work, Valentijn, Hill, Van Hooren, Bosma, Van Boxtel, Jolles, and Ponds (2006) found that self-reported change in memory functioning, identified as a component of memory self-efficacy, was predicted by change in actual memory performance from baseline to subsequent testing six years later. Ancillary analyses of these data showed that individuals with self-reported high negative change in memory functioning at baseline improved less over time on the memory recall task than individuals with low negative change. Likewise, Lachman and colleagues (1992) were successful in changing memory beliefs but not memory performance in one of the earliest memory training studies. Taken together, these studies provide support for a positive relationship between beliefs and performance, but point to inconsistencies in how beliefs and performance covary together over time. Recent work by Lachman, Andreoletti, and Pearman (2006) showed that memory control beliefs predicted memory performance in young, middle-aged, and older adults, and that strategy-use instruction improved memory performance in young and middle-aged adults (but not older adults) and improved memory self-efficacy in older adults (but not in young and middle-aged adults). Likewise, Luszcz and Hinton (1995) showed that memory self-efficacy increases with task experience and tracks improvements in memory recall over trials, for younger and older adults alike, but memory self-efficacy is a greater predictor of memory performance for older than younger adults. These inconsistencies need to be resolved. Research by West and colleagues shows promise in this regard.

In a sophisticated and rigorous application of self-efficacy principles to memory training in adulthood, West and colleagues (West et al., 2008; West et al., 2009; West, Thorn, & Bagwell, 2003; West, Welch, & Knabb, 2002; West et al., 2001) have shown that self-efficacy is a significant predictor of multiple behavioral outcomes in the memory domain. In an exploratory study of the effects of goal-setting on memory performance, West et al. (2009) found that memory self-efficacy predicted

performance gains for older adults who had set goals. A more general measure of control beliefs predicted gains in college students. Use of mnemonic strategies was predictive of memory performance for both younger and older adults, but strategy use was not moderated by self-efficacy beliefs.

In other work, West and colleagues developed an intervention program that includes education about aging and memory, instruction in effective strategy use, shaping of positive statements about the ability to learn and improve memory, and setting of self-chosen performance goals. As West and colleagues (2008) report, participants were trained to focus on the potential for improving memory and the use of effective learning strategies, including setting goals, making positive self-statements, and applying memorization strategies (e.g., rehearsal) to study names and faces, grocery lists, and stories. The goal of the program overall was to enhance memory self-efficacy using mastery and encouragement as the primary sources of efficacy information, consistent with self-efficacy theory. Results showed that the training group reported higher memory self-efficacy and locus of control for memory tasks than the control group at the end of training. Training also led to improved memory performance on name and story recall tasks (but not grocery list recall). Regression analyses indicated that gains in self-efficacy by the treatment group explained unique variance in story and list recall scores (but not name-face recall). The West group attributed the significant effects obtained in their intervention research to highly controlled, rigorous procedures that incorporate self-efficacy elements at every level, which are then verified by measures of task-specific responses taken within and between groups over the course of "treatment." For example, West and colleagues' (2008) intervention program built mastery experiences into the program by providing incremental learning and feedback exercises, practice with strategies, verbal encouragement, modeling of memory behavior by peers (in training groups), and self-paced learning and self-set goals. All of these components are derived from self-efficacy theory and methods, and as such the West model may be said to represent a "best practices" approach to enhancing learning and memory in adulthood.

Note, though, that West and colleagues (2008) did not assess the relative superiority of a self-efficacy based memory intervention program over alternative types of memory improvement programs, including self-help or bibliotherapy (e.g., Floyd & Scogin, 1997) and programs that emphasize social support components (e.g., Lachman et al., 1992). Thus, Hastings and West (2009) compared self-help and group-based memory training groups to a wait-list control group to test the contribution of social support to memory performance outcomes following intervention. Their results showed that the group-based group achieved greater outcomes at post-test than either comparison group. Group-based self-efficacy scores increased significantly over the training period, whereas self-based scores remain unchanged and control group scores declined. Memory performance scores increased on two of three memory tasks (names, stories) for both training groups; all groups' memory scores increased on the grocery list recall task (suggesting a great practice effect for this task). Interestingly, locus of control scores increased for both training groups as well. The results of this study show that the most comprehensive effects were obtained among participants who received group-based training, strongly supporting the role of social support for boosting self-efficacy and performance outcomes.

One reason that applied research has focused on changing people's beliefs is the pervasive presence of negative stereotypes of aging and how these affect aging adults (see Kang & Chasteen, 2009). Empirical research has demonstrated that negative stereotypes of aging generally have negative effects on memory functioning. For example, Hess, Auman, Colcombe, and Rahhal (2003) examined recall in young and old adults under varying degrees of induced stereotype threat. Conditions that maximized threat resulted in lower performance in older adults relative to both young adults and to older adults who did not experience threat. Also, the degree to which threat affected older adults' performance increased with the value that individuals placed on their memory ability, implying that negative stereotypes can be even more influential in the elderly who highly value their memory abilities. Results also showed that memory performance of older adults covaried with the degree of activation of negative aging stereotype. These results are consistent with Hess and Hinson (2006), who found that stereotype threat operates differently at different ages, affecting middle-aged adults in a positive manner (i.e., they experienced "stereotype lift"). Hess and Hinson also found that improved memory performance in older adults was a function of changed beliefs rather than stereotype threat per se. The results from priming studies are equivocal, however, with some reporting that both young and old adults experienced increases and decreases in memory

when primed with positive and negative aging stereotypes, respectively (Levy, 1996), and others reporting that priming works selectively, especially in older adults who are unaware that threat has been activated (Stein, Blanchard-Fields, & Hertzog, 2002).

A recent study by Lineweaver, Berger, and Hertzog (2009) focused on expectations of memory change as a function of personality traits, exemplifying the social-cognitive approach to memory control beliefs in adulthood. Young, middle-aged, and older adults rated memory abilities of target adults, defined by adjective clusters, across the adult lifespan. Participants rated target adults with positive personality traits (e.g., active, sociable, independent) as having better memory ability and less age-related memory decline than target adults with negative personality traits (e.g., tired, fragile, stubborn). Results indicated that although adults of all ages expected memory to decline across the lifespan, these beliefs varied when applied to different types of individuals: When participants considered individuals who fit positive stereotypes of aging, they expected memory to be better overall and to decline less than when they thought of others who fit negative stereotypes of aging.

Cavanaugh and colleagues (1998) have argued eloquently for the self as "memory schematic" and have outlined a social-cognitive research agenda for studying memory beliefs and behavior across the lifespan. This model is quite consistent with self-efficacy approaches to studying memory and aging, especially in its emphasis on the dynamic nature of memory processing by a "self in context." Their theory proposes that when individuals confront memory tasks, they analyze features of the task and environment concurrently with retrieved and known information about self-as-memorizer. Memory processing as such is an online, constructive process, and just as self-efficacy theory dictates, past and current memory experiences and outcomes shape efficacy and performance in context. Berry (1999) expanded upon Cavanaugh and colleagues' framework, placing greater emphasis on personality variables, including a personological—whole person—approach to memory self-efficacy. Berry also argued that memory self-efficacy is probably a significant and meaningful concept for most older adults, fueled by declining memory abilities and prevalent societal stereotypes of negative memory aging.

In a recent review, Berry and colleagues (2010) argued that self-efficacy appraisals occur differentially across types of memory tasks and are relevant to transitions from normal to pathological memory aging. New research indicates that self-perceptions of ability can be influenced by framing effects (Finn, 2008) and superstitious beliefs (Damisch, Stoberock, & Mussweiler, 2010). Finn demonstrated that judgments of learning are adjusted up and down when tasks are presented from easy to difficult levels, and Damisch and colleagues showed that good-luck charms can boost memory performance through the mediation of positive self-efficacy judgments. These studies suggest that persuasion and positive messages might be used to combat negative beliefs and stereotypes related to learning and memory in adulthood.

Learning in adulthood extends beyond memory domains, of course. Proficiency in computer technology, for example, is increasingly necessary for successful navigation through the business, financial, health, education, and leisure markets of the 21st century (Charness & Boot, 2009). Self-efficacy beliefs may be important in this domain; people lacking in computer-use efficacy may fail to persist in learning experiences and thus may acquire only limited knowledge and skills. Studies show that older adults possess lower self-efficacy for computer learning than younger adults (Laguna & Babcock, 2000). Laguna and Babcock found that computer experience, computer self-efficacy, and anxiety about computer use mediated the relationship between age and working memory. As older adults face new learning situations, they would do well to rely on their strengths (e.g., verbal skills, domain-specific knowledge, and expertise) to compensate for slower rates of acquisition and plan to take longer to acquire new skills. Self-efficacy analyses can be used to identify means whereby learning in adulthood is prolonged and preserved.

Competencies in different domains develop (and decline) at different rates throughout the lifespan. Individuals are faced with different problems to solve in childhood relative to adolescence, adulthood, and senescence. These problems require different skill sets. Research on problem solving shows that adults of different ages solve problems differently. For example, everyday problem-solving tasks are ecologically representative of individuals' daily challenges; solutions to such dilemmas require individuals to draw on personal knowledge accumulated through social experience (Allaire & Marsiske, 2002; Baltes, Staudinger, & Lindenberger, 1999). Effective performance on traditional problem-solving tasks declines after middle age (Birren & Fisher, 1995; Salthouse, 1990), whereas effective performance on

everyday problem-solving tasks increases with age. Cornelius and Caspi (1987) compared adults ranging in age from 20 to 78 years on everyday problem-solving abilities and on traditional measures of cognitive abilities. They administered an inventory that assessed problem solving in situations that adults might encounter in everyday life, as well as a series of traditional cognitive tasks including the Verbal Meaning test and Letter Series test. Results revealed that performance on everyday problems and a verbal ability test increased with age, whereas performance on a traditional problem-solving test declined after middle age. A study by Artistico and colleagues (2003) corroborates these findings. They found that older adults performed better and had higher confidence for "age-ecological" problems than younger adults, who performed better and had higher confidence on "young" problems. Thus, individuals are competent in different domains at different points in the lifespan; they are most adept at and confident in solving problems that are most relevant to their cohort.

Generally speaking, processing speed and abstract reasoning skills decline with age (Bryan & Luszcz, 1996; Salthouse, 2004), whereas semantic and vocabulary abilities are relatively preserved in older adulthood (Parkin & Java, 1999; Horn & Cattell, 1967). Yet, in a short-term longitudinal study, Lachman (1983) found that perceptual speed and memory span increased in adults tested over a two-year period. Moreover, participants with higher fluid ability and internal control scores also maintained a more positive view of their intellectual self-efficacy. Thus, while intelligence generally declines in old age, age differences vary across task domains.

Not only do individuals perform better in particular domains across the lifespan, but they also appear to be more interested in particular life tasks and domains at different points in the lifespan. For example, as people enter adulthood, there is a shift from the pursuit of knowledge-related goals (e.g., knowledge acquisition, career planning, development of new social relationships, family life) to emotion-related goals (e.g., pursuit of emotionally gratifying interactions, emotion regulation). Several studies support this shift in goal orientation (Blanchard-Fields, Jahnke, & Camp, 1995; Sansone & Berg, 1993; Strough, Berg, & Sansone, 1996; Brandtstädter & Renner, 1990). Moreover, individuals begin to be more concerned with other people (e.g., their children; Nurmi, Pullianen, & Salmelero, 1992), and interdependency, intimacy,

and generativity become more salient (Erikson, 1968 McAdams, de St. Aubin, & Logan, 1993; Veroff & Veroff, 1980).

This motivational shift can affect the ways in which individuals solve problems, as people at different life stages may solve everyday problems using different strategies (Blanchard-Fields et. al., 1995; Blanchard-Fields & Camp, 1990). Older adults prefer to use more emotion-focused strategies (Watson & Blanchard-Fields, 1998). They also tend to employ more strategies overall when solving emotionally salient problems (Blanchard-Fields et al., 1995; Blanchard-Fields, 2007; Blanchard-Fields, Mienaltowski, & Seay, 2007). Additionally, older adults are poorer at solving instrumental, logic-based problems than their younger counterparts, but they excel in solving complex social problems. In one study, young, middle-aged, and older participants were given 40 descriptions of fictitious people, each consisting of equal amounts of positive or negative behavioral information relating to either honesty or intelligence, and were asked to provide impression ratings for each one based on this information. Results showed that older adults spent a disproportionate amount of time studying diagnostic behaviors relative to younger and middle-aged adults. Both middle-aged and older adults were more likely than younger adults to incorporate trait-diagnostic information into impression judgments. Furthermore, increasing the salience of trait-diagnostic information by increasing both the number and descriptive extremity of target behaviors increased the extent to which younger adults' ratings were based on this information. These data suggest that younger adults do not have the accessibility or breadth of application of knowledge that older adults have as social experts. The accumulation of social expertise throughout adulthood results in the establishment of knowledge structures about the social world. Young adults seem to require the same amount of behavioral information to confirm that someone exemplified a given trait dimension (e.g., smart; Leclerc & Hess, 2007).

## Self-Efficacy and Skill Acquisition

In this section, we review the role of perceived self-efficacy in activities that require sustained effort over prolonged periods. Circumstances in which the adult wishes to learn new skills are the prototypical case. The adult who wishes to develop new capabilities through new learning experiences faces challenges that can be understood as consisting of distinct components. These include becoming aware

of social resources (educational programs, social services) that are available to promote skill development, devising personal plans for taking advantage of these resources, and removing psychological or social barriers (e.g., shyness, daily life routines that may interfere) to partaking in educational opportunities (Prohaska, Peters, & Warren, 2000). A self-efficacy analysis highlights the fact that older adults may reflect on their capabilities to cope with each of these distinct challenges. As was indicated earlier, if one wants to assess control beliefs in a manner that captures the psychological life of the individual, it may be necessary to attend closely to issues of social context. Any given person may have a high sense of efficacy for meeting some challenges that arise in some contexts (e.g., doing the exercises) and a low sense of self-efficacy in others (e.g., getting to the exercise center).

Learning contexts vary across the lifespan and include at least two distinct periods that are generally associated with age—school and work. Specific skills and abilities are acquired in those settings, relevant to the goals and tasks of those settings. Outside of school and work contexts, expertise may develop in various domains of interest to individuals. Moreover, learning continues in the lives of retirees as they move from work and raising families to different pursuits. Retirement may provide time and opportunities for learning new activities that were not available in previous phases of life. Concordantly, for any given learning task, there might be differences in the sense of commitment and perceived challenge among individuals of different age cohorts. Even subtle variations in the perceived relevance of a task to one's age group can influence younger and older adults' perceived abilities to solve the task and their actual task performance. We review the role of context together with the ability to solve everyday problems immediately below.

### Cognition in Context: The Role of Everyday Problem Solving in Learning

In many areas of everyday life, people can base their judgments of personal efficacy on past personal experience. Past successes and failures form a basis for appraising one's capabilities for future action. However, new circumstances may contain features that are so novel that the individual faces the challenge of judging personal efficacy under conditions of substantial uncertainty. When this is the case, agentic individuals usually base their self-efficacy appraisals on past experiences that seem similar to the new challenge one is facing (Cervone & Peake, 1986).

Determining which past situations are relevant, and how relevant they are to the task at hand, involves judgmental processes that are affected by subjectivity.

When older adults face challenges for which they have no direct prior experience (e.g., adjusting to retirement, becoming a grandparent, or adopting a new medical or exercise regimen to cope with a medical problem), they must appraise their efficacy for performance and formulate goals under conditions of high uncertainty. In such circumstances, stereotypes or other judgmental influences may systematically distort these self-appraisals, in some instances causing individuals to underestimate their capacities for performance. In the language of the knowledge-and-appraisal model noted earlier (Cervone, 2004a), the stereotypes would function as enduring knowledge that biases lower older adults' efficacy appraisals.

Sometimes past experiences cannot be directly related to the task that one is facing. Imagine, for example, an older adult learning how to navigate a 3G technology without knowing how to use a computer. In this scenario, another cognitive activity that is central to self-efficacy judgment under uncertainty involves future-oriented cognition. People may mentally simulate pathways to goal achievement, and the ease with which they can envision reaching their goals may influence self-efficacy appraisals. Research indeed indicates that older adults' cognitive capacity to generate strategies for overcoming barriers to participation in programs is important to the learning process (Prohaska et al., 2000). People with adequate skills may fail to participate because they dwell on potential obstacles to participation. Qualitative research has indicated that for older people, to start and then maintain a learning program often means more than having the required skills and knowledge to do it, because the real challenge is to begin putting one's knowledge and skills into action (Williamson, 2000).

Moreover, when people are committed to a valued course of action that they believe they can achieve, they may fail to act on their intentions because of situational factors that distract them from intended pursuits. Helping individuals generate strategies for solving daily social, interpersonal, or intrapersonal everyday problems that interfere with planned activities might, then, facilitate daily adherence among older adults and reduce attrition from these programs. Older adults' participation in learning programs may thus hinge on their ability to solve everyday problems that can interfere with their taking part in valuable learning activities. This raises

the challenge of understanding factors that may influence older adults' problem-solving abilities—a challenge that is addressed by research on everyday problem solving.

## EVERYDAY PROBLEM SOLVING

In cognitive psychology, the term "problem solving" has typically been applied to the solution of abstract analytical tasks. A problem such as the Tower of Hanoi puzzle, in which the research participant moves geometric shapes of different sizes in accordance with logical constraints on their movement, is an example (Anzai & Simon, 1979). On such tasks, people are confronted with a well-defined problem, and reasoning may lead the individual through a fixed problem space in which there is one well-defined solution (Reitman, 1964; Simon, 1973). Although the study of such tasks may provide meaningful insight into human cognition, these problem-solving paradigms capture only a limited subset of the cognitive challenges faced by adults, particularly in the later years of life. To illustrate the point, consider a typical everyday problem. Suppose an older adult living in a condominium complex finds that meetings of the local condominium association frequently are disrupted by disagreements and arguing among the association members, and the individual wants to improve the tone of the meetings. Here the problem is not defined as sharply as a typical laboratory task, and it is hard to know what options are available to solve the problem or how much improvement in the problem is even possible. In this problem of daily life, there is no single solution. Any given solution may fail or work only temporarily. Many distinct strategies and forms of solution may thus have to be devised to make progress on the problem.

This typology of everyday problems is called "ill-defined" (Allaire & Marsiske, 2002) in that one or more of the elements that constitute the complete definition of the problem are missing. Reitman (1964) and Simon (1973) theorized that each problem should present three interrelated elements to be clearly defined. The three elements are the initial state or formulation of the problem, the means through which the problem can be solved, and the end state or the goal of the problem. In the context of everyday problems, both the initial and the end state of the problem may not be clearly defined. For instance, imagine someone who wants to increase social contact with others. Here, both the initial and the end state can be assumed yet not clearly stipulated. Helping individuals to define the problem-solving

space entails looking at the problem from different angles in terms of an "if-then" logic. At each "if-then" stage there could be elements that redefine the problem-solving space. In the example above, if a person wants to increase social contact, the solutions may hinge on the ability to identify and define the problem. Is the underlying issue shyness? *If* this is the case, *then* the solutions could be related to increase self-esteem and confidence. Is the end state of the problem to increase the social network? *If so, then* one could consider joining online networks to avoid feelings of shyness experienced in person. We found that this type of *if-then* logic can be taught to older adults to help increase their ability to solve everyday problems (Pezzuti, Artistico, Cervone, Tramitolo, & Black, 2009).

The scientific literature on everyday problem solving turned out to be of particular relevance to the study of cognitive aging from its conception (Denney & Palmer, 1981). Especially when cognitive decline becomes substantial (Salthouse, 1991; Salthouse, Berish, & Miles, 2002), skilled use of everyday problem-solving functioning and competence is crucial for maintaining an unaltered sense of well-being among older individuals (M. M. Baltes & Lang, 1997; M. M. Baltes, Maas, Wilms, Borchelt, & Little, 1999). Findings reveal that, when compared to the declines that are evident on tests of fluid intelligence or abstract reasoning, declines in performance on everyday problem-solving tasks are small, moderate, or nonexistent. This conclusion holds with respect to studies examining problem-solving fluency, or the number of safe and effective solutions generated (Denney & Palmer, 1981; Denney & Pearce, 1989; Denney, Palmer, & Pearce, 1982), or with respect to studies examining quality of everyday problem-solving reasoning (Allaire & Marsiske, 1999, 2002; Berg, Meegan, & Klaczynski, 1999; Cornelius & Caspi, 1987).

*Everyday problem solving across the lifespan.* Denney and her associates studied problem-solving trajectories over the lifespan (Denney & Palmer, 1981; Denney & Pearce, 1989; Denney et al., 1982). They indicated that although performance on traditional laboratory tasks tends to decrease linearly after early adulthood, a different pattern is found on everyday problems. Performance on everyday problem solving items increases from young adulthood to middle age, but then decreases in the elderly. Older participants were found to perform less well than middle-age persons even when working on items that were nominated by a sample of older persons as being particularly relevant to

their age group (Denney & Pearce, 1989). Although exceptions are occasionally found in which older adults outperform younger adults on everyday problems (Artistico, Cervone, & Pezzuti, 2003; Cornelius, 1984; Cornelius & Caspi, 1987), or in which some forms of everyday cognition are highly correlated with traditional measures of basic cognitive abilities (Allaire & Marsiske, 1999), many research findings suggest that everyday problem solving is a distinct cognitive domain in which experience-based knowledge that is gained across adulthood may facilitate performance; yet "experience cannot completely nullify the effects of aging" (Denney, 1990, p. 340). This was also the conclusion of Thornton and Dumke (2005) in a meta-analysis of everyday problem-solving ability across the lifespan in which they found that the younger adults outperformed older adults in generating alternative solutions to day-to-day problems.

Our recent work produced different results from previous research because we capitalized on a different conception of "psychological context." The conception of context used in our work was informed by social and personality psychology, in that the behavioral challenges, or the content of everyday problems, can be differentiated from the contexts in which challenges are situated. Context includes psychological factors such as the individual or individuals with whom one is interacting and the sorts of things they say and do—this is considered a psychological context. Instead, the content of the problems can be held constant. For example, increasing social contact with others or meeting a financial obligation is considered the content of the problem. These problem contents are presented in psychological contexts either relevant to young adults (i.e., you recently broke up with your girlfriend/boyfriend) or older adults (your significant other passed away). We demonstrated that when there is a perfect contextual match between the age of the problem solver (i.e., younger or older adult individuals) and age-relevance of the problem (i.e., younger adult problems and/or older adult problems), older adults' performance equaled those of the younger adults (Artistico, Orom, Cervone, Krausse, Houston, 2010).

*Everyday problem solving and perceived self-efficacy.* In addition to the role of context, several factors contribute to everyday problem-solving ability. Older adults may enhance everyday problem-solving performance by engaging effective use of self-regulatory strategies (Sinnott, 1989). Studying regulatory processes in later adulthood is a key factor for understanding how older adults are able to compensate for declines in virtually any cognitive ability (Artistico & Lang, 2002). A key question, therefore, is to understand how older people exert the goal-directed effort required to attain knowledge and develop task strategies about everyday problem solving (Berg & Klaczynski, 1996; Blanchard, 2007; Blanchard-Fields, Chen, & Norris, 1997; Hess & Blanchard-Fields, 1999).

Older adults do not always perform optimally on everyday problem-solving tasks, but if they do, it may be because they have high confidence in their ability to solve such problems, or perceived self-efficacy (Artistico, Cervone, & Pezzuti, 2003). Generating solutions requires sustained cognitive effort, and people who possess robust efficacy beliefs are more likely to exert that effort rather than abandon attempts at problem solving (Bandura, 1989). Variations in perceived self-efficacy predict problem-solving ability, specifically, viable solutions that individuals are able to generate for everyday problems (Artistico Cervone, & Pezzuti, 2003). Importantly, it is not merely the case that some people are generally good and others generally poor problem solvers.

Instead, we found significant within-person variability in self-efficacy beliefs and problem-solving abilities across contexts. When problems were typical of older persons' daily experiences (e.g., dealing with incompetent medical personnel), older adults judged themselves as relatively capable of solving the problems and exhibited superior levels of cognitive performance. In contrast, in domains that were less familiar to them, older adults had lower efficacy beliefs and performance than younger adults. Moreover, the results from this study suggest that perceived self-efficacy operates as a cognitive mediator of age-related performance differences on problem-solving tasks among young and older adults (Artistico, Cervone, & Pezzuti, 2003). Our explanation relies on the distinction between crystallized and fluid intelligence (Cattell, 1971). Crystallized intelligence normally underlies tasks that test knowledge that is accumulated through experience and years of education (P. B. Baltes, 1997). On the other hand, fluid intelligence is an ability used for spatial and abstract reasoning tasks, such as solving numerical or spatial puzzles. Crystallized intelligence might be relatively more relevant to solving everyday problems, whereas fluid intelligence might be more instrumental in solving abstract reasoning tasks.

In research on intellectual aging and the crystallized/fluid distinction, older people scored

significantly higher and perceived themselves as more efficacious to perform on a crystallized intelligence test than younger people (Lachman & Jelalian, 1984). In contrast, younger people scored higher and perceived themselves as more efficacious to perform on a fluid intelligence test than older people. Similar results were found in a study in which fluid intelligence was measured with a working memory task, and crystallized intelligence was measured by asking people to offer wisdom with respect to critical interpersonal dilemmas. Older adults were as capable as young adults of generating solutions for critical interpersonal situations and making life decisions and were as fast as younger people. Younger adults were more proficient than older adults at working memory tasks (for an overview of these results cf. Baltes & Staudinger, 2000). Taken as a whole, research on everyday problem solving and research directed by the distinction between crystallized and fluid intelligence indicates that personal experiences associated with perceived efficacy may help to explain cognitive performance in later adulthood.

We have reviewed self-efficacy applications in domains of functioning highly relevant to adulthood and aging, including health, memory, and everyday problem solving. We have presented empirical findings and new ideas relevant to the SOC and KAPA models of development. In short, research across different adulthood learning domains that integrates personality in context, includes the self-regulatory components of self-efficacy theory, and emphasizes the behavioral choices and balance implied by SOC and KAPA models provides a comprehensive understanding of how older adults manage the myriad challenges and opportunities encountered in late life.

It is our belief that basic research should aim to explicate both the developmental differences to be applied at the group level as well as the substantial within-person variability in self-efficacy and learning processes across the lifespan. Thus, we turn next to novel training procedures that draw upon everyday problem solving and self-efficacy. We then analyze how the concepts of older adulthood and work motivation shape a challenging transition in life for older workers.

## Skill Development through Training Programs

The contemporary industrialized world puts a premium on learning. New technologies infiltrate professions, forcing people at mid-career to acquire new skills. Many people retire from their primary profession 15–20 years before the expected end of their lifespan and have the opportunity to learn new things of value to their personal development. Learning new skills may become far more important than in the past. Questions about the design of training programs to confer new skills, and the role of self-referent beliefs in the skill acquisition process, are thus important both to society's demands and to the needs of the individual. Psychological science has the capacity to illuminate psychological factors that contribute to success in training programs in a vast array of cognitive domains (Maurer et al., 2003) over the lifespan (Poon, Rubin, & Wilson, 1989).

Training programs aimed at improving knowledge are precisely the sort of settings in which questions of personal efficacy arise (Bandura, 1997). Learning is associated with a sense of perceived challenge. There is much uncertainty at the beginning of new learning, which reflects the degree to which skills are lacking in initial phases. Moreover, it is sometimes difficult to gauge how quickly one is acquiring a new skill, or the skill level that one will ultimately reach. In such settings, people naturally ask themselves questions about their performance efficacy (e.g., "Am I capable of doing this?"). Subjective beliefs about one's capacity to engage and sustain engagement in learning programs thus contribute directly to the learning process (Bandura & Schunk, 1981; Schunk & Gunn, 1986).

One means through which self-efficacy processes influence learning involves the initial decision to enroll in a training program. Adult education is commonly a proactive choice. People with a strong sense of self-efficacy for learning are more likely to make the positive choice to engage the challenge of a training program, as suggested by much research documenting the impact of perceived self-efficacy on academic motivation (e.g., Schunk & Pajares, 2002). A recent meta-analysis of self-efficacy, career interests, and career choice supports this point (Rottinghaus, Larson, & Borgen, 2003). Rottinghaus and colleagues found that perceived self-efficacy predicts a substantial portion of the variance in career interests. An interesting possibility in this area is that the relation between self-efficacy and interest in an activity may be nonlinear; empirical results suggest that activities are relatively uninteresting when self-efficacy for performance is either extremely high or extremely low (Silvia, 2003).

Once in a training program, a strong sense of self-efficacy for performance in the given context

enhances achievement (Bandura, 1997). For example, in studies of adults in workplace literacy programs (Mikulecky, Lloyd, Siemental, & Masker, 1998), learners who were confident about their writing and reading abilities (literacy self-efficacy) had higher text comprehension outcomes than those who did not have high levels of literacy self-efficacy. Research by Vinokur, van Ryn, Gramlich, and Price (1991) provides another illustration. Large numbers of unemployed American adults took part in a brief (eight-session) training program that conveyed skills for identifying and pursuing new employment. Compared to a control condition, this training program fostered higher levels of employment and higher earnings at a follow-up assessment 2.5 years later (Vinokur et al., 1991). Mediational analyses indicated that training had its effects largely through its influence on perceived self-efficacy (van Ryn & Vinokur, 1992), which had both a direct and an indirect (through job-search attitudes) influence on the behaviors involved in seeking re-employment. This work demonstrates how a relatively brief intervention can enhance learning and developmental outcomes through the mediating mechanism of perceived self-efficacy.

Similar training procedures enhanced performance among older adults as well. Older people trained at evaluating improvement from their self-paced performance were more likely to succeed on intellectual tasks (Dittman-Kohli, Lachman, Kiegel, & P. B. Baltes, 1991) and on memory tasks even when their work was to participate in several intervention sessions (McDougall, 1998). A recent study from our lab addressed learning experiences in everyday problem solving associated with self-efficacy perceptions among older adults (Artistico & Pezzuti, 2003; Pezzuti et al., 2009). Subjects trained in solving everyday problems performed better on a second task compared to subjects in the control group (the research used three parallel versions of an everyday problem-solving test). Importantly, however, variations in performance were paralleled by variations in perceived self-efficacy. Variations in perceived self-efficacy partially mediated the relationship between training and performance on everyday problem-solving tasks (Artistico, Cervone, & Pezzuti, 2003; Pezzuti et al., 2009).

One normally associates the idea of "training" with the acquisition of professional skills. However, research on training programs, self-efficacy beliefs, and their effects suggests a clear message: Training programs should include not only information about the skill acquisition task, but also about interventions designed to boost participants' perceptions of their capabilities to handle challenges, since these self-efficacy perceptions have a significant effect on interests, choices, and motivation. One interesting application of these ideas is discussed below. We targeted older adulthood and work motivation.

## OLDER ADULTHOOD AND WORK MOTIVATION

The workforce is aging in most of the world's developed countries (United Nations Population Division, 2010). In the United States alone, the percentage of workers aged 55 and older (i.e., "older workers") is projected to increase from 19% in 2010 to 24% in 2018, with 60% of that increase coming from those working past the normal retirement age (Bureau of Labor Statistics, 2010). When individuals work into older age, opportunities for work-based learning and enrichment persist into later adulthood. Those opportunities arise in challenging, contingency-based contexts for many older adults, for example, in the context of younger, faster workers with superior vision and hearing, as well as state-of-the-art technological know-how. In a youth-centered work environment, older adults may be particularly well-served by self-efficacy as a resource. Self-efficacy is a powerful mechanism through which older adults can engage in work-based learning and development in the face of these challenges. Before we describe possible mechanisms by which self-efficacy might operate in older workers, we review the concept of "supplies-values fit," or the alignment between job demands and workers' preferences, and its relationship to motivation.

## OLDER WORKERS, SUPPLIES-VALUES FIT, AND MOTIVATION

A recent integrative theoretical framework proposed by Kanfer and Ackerman (2004) depicts the interplay between older workers and motivation. Their model asserts that not all intraindividual changes progress in the same direction or even along the same trajectory. Kanfer and Ackerman classified change on six individual characteristics—intelligence, personality, affect, vocational interests, values, and self-concepts—according to four trajectories—loss, growth, reorganization, and exchange. Intelligence serves as an illustrative example. It is widely accepted that fluid intelligence tends to decline with age (*loss*), whereas crystallized intelligence tends to be maintained or to increase with age (*growth*). In addition, one's interests and motives may change with age (Kanfer & Ackerman, 2004). For instance,

an older worker might be better qualified to take on mentoring roles because of increases in crystallized intelligence, but will perhaps be motivated to actually take them on because of generativity motives (McAdams et al., 1993; Newton & Stewart, 2010). Generativity motives refer to midlife and older adults' desire to help others, that is, to give back to younger generations. Taken together, these ideas reinforce the fact that older workers' self-concepts are highly dynamic (Kanfer, 1987). Self-concepts may or may not evolve in a manner adaptive to work demands. For instance, in the example of the older worker above, her self-concept has changed and she is now more interested in and able to do mentoring work, but her work demands might require her to learn a new software program that helps to analyze data, a task in which she is now less interested.

When individuals' self-concepts match the demands of the activity (e.g., an older worker may think, "I know a lot about this job and I am provided many opportunities to share that knowledge with younger workers"), both the interest in performing the activity and the level of performance are higher than when self-concepts do not match the task demands (Kanfer, 1987; Lawton & Nahemow, 1973). The match between employees' preferences and the characteristics of the job is known as "supplies-values fit" (Kristof-Brown, Zimmerman, & Johnson, 2005).

Supplies-values fit is associated with critical outcomes such as higher job performance, greater identification with the organization, job satisfaction, and reduced strain (see Kristof-Brown et al., 2005 for a review). Indeed, recent research has shown that the relationship between age and job performance is moderated by job type, such that jobs high in requisite crystallized intelligence demands and low in requisite fluid intelligence demands appear to be better suited to older adults (Beier & Beal, 2010). The issue of fit is especially critical for older adults because its absence seems to affect them more negatively than it does younger adults (Grube & Hertel, 2010). Grube and Hertel found that a misfit between one's self-reported values and one's perceived opportunities at work had a stronger negative impact on job satisfaction for older workers than it did for younger workers. Jobs comprise several work activities. Despite the fact that supplies-values fit has been operationalized as a match between people and jobs (Kristof-Brown et al., 2005), we would expect the phenomenon to hold at the work activity level. In other words, if the relationship between self-concepts and performance differs as a function of *job*, it also differs as a function of *task*. In fact, the impact of task might be stronger than that of job because it operates at a more specific level.

*Improving motivation via learning with self-efficacy.* There are two broad approaches to increasing supplies-values fit: one is to change the environmental features (e.g., change jobs, adjust the requirements associated with the job); the other is to change individual-level characteristics (e.g., abilities, motives). One primary way that individuals change in order to meet the requirements of their work activities is to learn new skills or new ways of doing things (e.g., by adopting new technology; Charness & Boot, 2009). Self-efficacy can be instrumental in fostering adaptive learning and behavioral change, especially when such activities have traditionally required abilities that have declined or were never developed (Pezzuti et al., 2009).

As was addressed in the section on everyday problem solving and self-efficacy, challenges that older workers face are likely to be open to multiple solutions. This means that a similar problem can be solvable through various strategies. Although no research to date has investigated self-efficacy and everyday problem solving at work, some highly plausible propositions can be made by extrapolating from research in other domains. For example, Wood, Bandura, and Bailey (1990) found positive relationships between perceived self-efficacy and managerial decision making.

We know from past research that individuals can learn to improve their everyday problem-solving ability (Pezzuti et al., 2009) and that self-efficacy partially mediates the relationship between training and performance on everyday problem-solving tasks (Artistico, Cervone, & Pezzuti, 2003). We also know that self-concepts change in predictable ways as people age (as discussed above; Kanfer, 1987; Kanfer & Ackerman, 2004). Consistent with the KAPA model (Cervone, 2004a), aspects of those self-concepts might be altered in ways that improve self-efficacy to solve challenging work problems, such as when an older worker might benefit from mastering a new technology but lacks the experience and confidence to do so. As noted in the previous section, our research demonstrated the power of self-efficacy-based interventions to improve older adults' performance on everyday problems (e.g., Pezzuti et al., 2009). These interventions operated on older adults' self-concepts. Specifically, older adults were taught optimal strategies for addressing everyday problems and then shown how that strategy

might work in practice. These older adults were subsequently more confident in their ability to solve similar problems, and indeed they were able to perform better than before the intervention. Increasing self-efficacy via personalized training could boost learning not only in the lab but also in a work context.

A self-efficacy-based intervention to improve older workers' motivation would be a natural extension of our suggestion. Consistent with the KAPA framework, it is important to be cognizant of the idiosyncrasies that older workers may bring to that perception. Consider the problem of changing careers in older adulthood (e.g., a professor who retires from academia in her sixties and takes a position with a consulting firm). Different people will perceive this challenge differently. For some, the primary challenge would be to let go of certain well-established habits from the previous profession in order to thrive in the culture of the new job (e.g., the professor might refrain from lengthy answers to mundane questions). For others, the primary challenge would be to apply existing knowledge and skills in new ways (e.g., another professor might rely on his expertise in order to meet a tight deadline without having to do extensive background research). Of importance here, the primary research objective moving forward is to better understand which *activities* are particularly challenging for older adults in the contemporary work domain.

## Conclusions and Future Directions

We have reviewed diverse theories and research results regarding personal choice and human agency. Our work can be summarized by two simple themes. The first concerns the nature of human development, and the second concerns the nature of personal agency.

In individualistic cultures, the major roles and contexts of one's life, those involving, for example, profession, family, or location of residence, are not conceived as fixed or inevitable. Instead, people recognize that they can choose among life paths. This increases not only opportunity but also uncertainty. Ages ago, individuals may have been relatively secure in the knowledge that they could adopt a lifestyle in which their ancestors had lived successfully for generations. In contrast, rapid changes in social and family life reduce personal feelings of certainty about one's life course. For example, although college-aged Americans today have an abundance of opportunities, they also are more likely to believe that the outcome of important life events may be beyond their personal control, as compared to the beliefs

expressed by their cohorts only a few decades earlier (Twenge, Zhang, & Im, 2004). When faced with choice and uncertainty, people naturally reflect on themselves and their capacities to handle the challenges ahead. We believe that reflections on self-efficacy and personal agency are key to development. As reviewed herein, people with stronger beliefs in their efficacy to succeed and reach goals are more likely to develop the skills, exert the self-control, and persist toward task mastery than people with weaker beliefs. Robust feelings of self-efficacy are, in turn, related to higher levels of subjective well-being. Positive self-efficacy would appear to be vital for tackling the challenges that life presents.

We have promoted a perspective on self-efficacy that is integrative rather than isolationist. In the early days of self-efficacy theory (Bandura, 1977), it was important to document that self-efficacy was a unique construct, that is, one that captured distinctive aspects of mental life that uniquely contribute to human achievement and well-being. These efforts can be declared a success (see Bandura, 1997). Now, after three decades of research, it is clear that self-efficacy beliefs are but one aspect of the overall architecture of human mental systems (Cervone, 2004a). The advantages of this latter perspective are twofold. First, it yields an integrative view of human development grounded in different theoretical traditions (e.g., Bandura, 1986; Baltes, 1987; Baltes & Baltes, 1990). Second, it shifts attention from a single variable—self-efficacy—to a target of much greater interest and complexity: the whole individual in his or her developmental context (Cervone, 2004a). The next generation of self-efficacy applications to adult development and learning holds great promise with these moorings. In the future, assessing the dynamic relationship between the role of context and the idiosyncrasies that people bring about in context when formulating their self-efficacy judgment may aptly inform sense of progress (and development) about learning among older adults.

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