Chapter 5
Situational Load and Personal Attributes: Implications for Cognitive Readiness, Adaptive Readiness, and Training

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Operational effectiveness in complex domains depends upon the degree of *readiness* individuals bring to performance (Morrison & Fletcher, 2002). While effectiveness refers to an evaluation of actual performance, readiness reflects the "potential of units or individuals to perform well" (Morrison & Fletcher, 2002, p. I-1). Such readiness can refer to the potential of multiple aspects of the person, as well as the conditions of the operational context to actualize that potential. For example, school readiness, or readiness for kindergarten through collegiate educational experiences (Wesley & Buysse, 2003), reflects the state of a student's cognitive, behavioral, social, and motivational preparation for learning and educational performance (Bierman, Torres, Domitrovich, Welsh, & Gest, 2009; Le, Casillas, Robbins, & Langley, 2005; Peterson, Casillas, & Robbins, 2006; Robbins et al., 2004). Workforce readiness refers to the skills workers can bring to effective job performance (O'Neil, Allred, & Baker, 1992). In team and organizational research,

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readiness has been used to reflect a collective's preparedness to adapt to change (Armenakis, Harris, & Mossholder, 1993; Eby, Adams, Russell, & Gaby, 2000). Combat readiness indicates at any chosen point in time the state of individuals in terms of their performance and skill qualifications as well as the presence and state of equipment and other performance resources going into combat missions (Morrison & Fletcher, 2002). In each of these domains, readiness is defined as a critical precursor to effective performance. Moreover, the components of readiness drive the content and need for education, training, and development.

In military domains, research on readiness has focused primarily on the degree of cognitive potential personnel bring to combat missions (Cosenzo, Fatkin, & Patton, 2007; Morrison & Fletcher, 2002; Smyth, 2007). Such *cognitive readiness* was defined by Morrison and Fletcher (2002, p. I-3) as, "the mental preparation (including skills, knowledge, abilities, motivations, and personal dispositions) an individual needs to establish and sustain competent performance in the complex and unpredictable environment of modern military operations." They included the following ability or skill elements as components of cognitive readiness: situation awareness, memory, transfer of training, metacognition, automaticity, problem solving, decision making, mental flexibility, and creativity, leadership, and emotion. These components reflex a mix of cognitive skills (e.g., situation awareness), cognitive processes (e.g., memory), and noncognitive elements (e.g., emotion). Researchers at the Center for Research on Evaluation, Standards, and Student Testing (CRESST; O'Neil, Lang, Perez, Escalante, and Fox, this volume) revised the Morrison and Fletcher's (2002) factors of cognitive readiness more tightly around cognitive-based knowledge, skills, and abilities (KSAs). Thus, they argue that cognitive readiness reflects skills and competencies in adaptability, adaptive expertise, creative thinking, decision making, adaptive problem solving, metacognition, situation awareness, and teamwork. Specifying the components of cognitive readiness more in terms of skills and competencies increases their utility to define and drive training content.

In this chapter we focus on the individual's *readiness to adapt to changing operational and environmental contingencies*. Adaptation was defined both by Morrison and Fletcher (2002) and O'Neil et al. (this volume) as central to the meaning of cognitive readiness. For example, Morrison and Fletcher (2002, p. I-3) noted that "the concept of cognitive readiness may be of special relevance and significance to those who must adapt quickly to emerging, unforeseen challenges." O'Neil et al. (this volume) also included both adaptability and adaptive expertise in their set of cognitive readiness competencies.

We suggest that cognitive readiness can reflect preparation for two distinct levels of performance. The first level refers to the "routine" cognitive aspects of problem situations. Thus, such readiness may reflect an individual's preparation to engage in situation assessment, analysis, and problem solving in familiar or "typical" missions. The second level of cognitive readiness rests on this first level but also reflects preparation to engage in the additional cognitive processes more peculiar to adaptive performance contexts. This distinction mirrors the differences between "routine" and "adaptive" expertise described by several researchers (e.g., Holyoak, 1991; Kozlowski, 1998; Smith, Ford, & Kozlowski, 1997). Routine expertise refers to skill in recognizing and applying well-known rules, procedures, and solutions to

typical problems; adaptive expertise reflects skills in understanding when and why existing procedures no longer apply to changing problems and knowing how to adjust problem-solving strategies (Kozlowski, 1998). Different componential cognitive skills likely derive from and contribute to each form of expertise. Likewise, we argue that readiness for complex problem situations that require adaptation centers on competencies that are broader in scope and different in kind than those for more "routine," albeit also complex problems. Accordingly, in this chapter we refer to the former as "adaptive readiness." We will describe the cognitive processes and skills that correspond more closely to adaptive readiness.

Another theme in this chapter argues that adaptive readiness includes more than cognitive preparedness. Many adaptive situations present to individuals not only cognitive demands but also significant emotional and social ones. Indeed, some situations may call for fewer cognitive resources and greater emotional and social capacities. For example, many military combat situations may not necessarily require altering problem strategies, but would require adapting to significant emotional stress (e.g., the wounding or death of fellow soldiers) or adjusting to unfamiliar social situations (e.g., establishing working relationships with tribal or local representatives in foreign countries) (cf., Pulakos, Arad, Donovan, & Plamondon, 2000). Although some level of cognitive demands still exists in such situations, operational effectiveness may rest more strongly on an individual's readiness to deploy emotional or social resources.

While this theme has not been strongly represented in the military readiness literature, similar elements have been defined as part of school readiness. For example, Robbins et al. (2004) included social involvement as a school readiness construct. Le et al. (2005) included such skills in working collaboratively with others and in developing and maintaining relationships with others as part of their Student Readiness Inventory. We also note that Morrison and Fletcher (2002) reported an emotion component to cognitive readiness. However, their focus was on maintaining effective cognitive performance under emotional conditions. Adaptive readiness also may entail skill in adapting more directing to emotional challenges by, for example, maintaining motivational focus and deploying effective coping responses.

In the next section of this chapter, we examine more closely the nature of adaptation, noting in particular the cognitive skills and processes that denote effective adaptive performance. We also describe how adaptive performance demands can present different levels of cognitive, social, and emotional demands on performers. We refer to these demands, respectively, as the situation's cognitive, social, and emotional load. These different demands carry implications for (a) the competencies and skills that define adaptive readiness and (b) the range of training strategies that contribute to growth in adaptive readiness. Several researchers have noted that training strategies needed to grow adaptability skills are different from those used in more traditional training domains (Bell & Kozlowski, 2002, 2008; Ely, Zaccaro, & Conjar, 2009; Kozlowski et al., 2001; Nelson, Zaccaro, & Herman, 2010; Smith et al., 1997). However, we would argue that most adaptability training strategies focus on the cognitive skills necessary for adaptation, i.e., those that promote cognitive readiness for adaptive performance. Later in this chapter, we augment these

strategies with ones that promote emotional and social readiness for adaptive performance as well.

5.1   The Nature of Adaptive Performance and the Components of Adaptive Readiness

Adaptive performance has been defined as distinct from other forms such as contextual or task performance (Pulakos et al., 2000). Most definitions of adaptation, whether at the individual or team level, describe the core of such performance as reflecting a change in behavior or performance strategies to realign with changed conditions in the operational environment (Banks, Bader, Fleming, Zaccaro, & Barber, 2001; Chan, 2000; Ely et al., 2009; LePine, Colquitt, & Erez, 2000; White et al., 2005). At the team level, adaptation refers to members adjusting their collaborative processes, role-based relationships, or collective performance strategies as the team's environment changes (Burke, Stagl, Salas, Pierce, & Kendall, 2006; Kozlowski, Gully, Nason, & Smith, 1999; LePine, 2003). Ely et al. (2009) emphasized two aspects of the definitions in this literature that are particularly relevant for adaptive readiness. First, adaptation is a *functional* response to environment change, meaning that strategy adjustments foster improved performance—"changes in behavior that are not effective under the new environmental conditions are not considered adaptive" (Ely et al., 2009, p. 176; see also Banks et al., 2001; White et al., 2005). Because notions of readiness reflect one's potential for effective performance, this functionality means that adaptive readiness includes the capacity to identify and enact the performance strategies most likely to bring the individual or unit into realignment with altered environments. Herein lies one of the conditions for a cognitive aspect of adaptive readiness. Cognitive readiness with respect to adaptation includes competencies in matching problem solutions and strategies to appropriate environmental circumstances. This element of adaptive readiness is similar to adaptive expertise, defined as knowing how and when particular solutions will or will not work across different problem domains (Kozlowski, 1998; Smith et al., 1997; see also Ericsson, this volume).

    A second point of distinction highlighted by Ely et al. (2009) argues that adaptation does not merely represent shifts in one's level or amount of current responding; instead it reflects a qualitative shift to an entirely different performance strategy (Chan, 2000). This point about adaptation reflects both cognitive and behavioral components of adaptive readiness. Adaptation may sometimes require the development of innovative or novel performance strategies, when those in one's behavioral repertoire are insufficient for new environmental challenges (Burke et al., 2006). Thus, adaptive performance may reflect the application of creative-thinking and problem-solving skills, a component of cognitive readiness defined by both Morrison and Fletcher (2002) and O'Neil et al. (this volume). Behavioral readiness in this context would reflect the individual or unit's willingness and capability to shift to and enact performance strategies that are fundamentally different from existing routines (cf. Bierman et al., 2009).

While all adaptive performance situations reflect a common performance requisite to fundamentally shift existing task or mission strategies, they may still vary along some important dimensions that influence requirements for adaptive readiness. Pulakos et al. (2000, p. 617) specified eight dimensions of adaptive job performance. These were *handling emergencies or crisis situations*; *handling work stress*; *solving problems creatively*; *dealing with uncertain and unpredictable work situations*; *learning work tasks*, *technologies, and procedures; demonstrating interpersonal adaptability*; *demonstrating cultural adaptability*; and *demonstrating physically oriented adaptability*. These dimensions encode specific tasks and activities that reflect these different forms of adaptive performance. For example, the dimension of demonstrating interpersonal adaptability includes activities such as "working well and developing effective relationships with highly diverse personalities" and "demonstrating keen insight of others' behavior and tailoring own behavior to persuade, influence, or work more effectively with them" (Pulakos et al., 2000, p. 617). Pulakos et al. (2000) provided evidence supporting this taxonomy from personnel in 24 jobs, including many military occupational specialties.

These dimensions suggest that individuals may face a variety of different challenges and performance demands across adaptive performance situations. These demands can be grouped into categories pertaining to how much cognitive, social, and emotional resources they require for effective adaptation. Adaptive situations requiring heavy deployment of cognitive resources can be defined as imposing a high *cognitive load* on the performer, situations requiring high social resources carry a high *social load*, and situations demanding heavy emotional resources have a high *emotional load*. This grouping can be compared to one offered by Mueller-Hanson, White, Dorsey, and Pulakos (2005), who distinguished among mental, interpersonal, and physical adaptability. However, while these categories group different sets of performance tasks under categories of adaptability, they do not necessarily correspond to the different types of psychological load or resources needed to complete these tasks. Performance tasks that would be grouped under one type of adaptability described by Mueller-Hanson et al. (2005) can still carry multiple kinds of loads. For example, handling emergency or crisis situations was listed by Mueller-Hanson et al. under mental adaptability and included the task of "maintaining emotional control and objectivity during emergencies while keeping focused on the situation at hand" (p. A-1). Such tasks will carry high amounts of both cognitive and emotional load; indeed, we suspect that such situations may carry a higher emotional than cognitive load, raising different implications for predictive attributes and training strategies. Likewise, demonstrating interpersonal adaptability can impose high levels of both cognitive and social loads on performers. Further, when having to handle work stressors that are interpersonal in nature (e.g., Fiedler, 1995) and that involve complex organizational problems, individuals are likely to experience high cognitive, social, and emotional loads. Thus, we would argue the delineation of different types of adaptive performance situations can be driven by precise specifications of the extant loads in each context.

5.1.1 Cognitive Load and Adaptive Readiness

Cognitive load theory (Paas & van Merriënboer, 1994; Sweller, 1988; Sweller, van Merriënboer, & Paas, 1998) has been used to describe the "load that performing a particular task imposes on the cognitive system" (Paas & van Merriënboer, 1994, p. 353). It reflects the amount of cognitive capacities and information-processing resources that need to be (or are actually) expended for effective performance (Paas & van Merriënboer, 1994). While cognitive load research has focused almost exclusively on learning and instructional design (Paas, Van Gog, & Sweller, 2010; Sweller, 1988), it has been applied to the development of skills necessary to "dynamically adjust cognitive activities based on flexible knowledge, nonroutinely approach new tasks and ideas, and rapidly acquire as well as use new knowledge and skills in practice" (Kalyuga, Renkl, & Paas, 2010, p. 175). It has also been used to understand coping mechanisms in posttraumatic stress syndrome (Aikins et al., 2009), an example of one of the adaptive performance dimensions presented by Pulakos et al. (2000; i.e., handling stress). Thus, the concept of cognitive load can be easily applied to understanding adaptive readiness and adaptive performance.

Cognitive load has been defined as deriving from both task and person attributes, including their interaction (Paas & van Merriënboer, 1994). According to Paas and van Merriënboer, task factors that can increase cognitive load include novelty, negative consequences for failure, and various external stressors such as time pressure, high noise, and extreme temperatures; person attributes include cognitive abilities, cognitive styles, and existing knowledge stores. Schroder, Driver, and Streuferi (1967) offer a formulation that describes the information attributes that contribute to task complexity. These include information load, or the number of sources requiring focused attention, information diversity, or the variety in information sources, and rate of information change, or the dynamism that characterizes information sources.

By virtue of the need to alter existing performance strategies, and in many cases come up with novel responses, adaptive situations can heighten the information-processing requirements for performers. Zaccaro and his colleagues (Ely et al., 2009; Zaccaro, Banks, Kiechel-Koles, Kemp, & Bader, 2009; see also Burke et al., 2006) specified six problem-solving processes related to adaptation, four of which are explicitly cognitive in nature. These four include (a) scanning operating environments for changes in situational patterns and critical performance requirements, (b) interpreting the meaning of observed environmental changes, (c) formulating adaptive responses to environmental change, and after an adaptive response has been implemented (d) monitoring the situation to determine if successful adaptation has occurred. The first two processes represent components of situational awareness (Endsley, 1997), but in this instance they refer to identification of what is changing in the environment and the interpretation of these changes. Core cognitive capacities necessary to effectively engage these processes include skills in altering one's cognitive frame when scanning the operational environment, making sense of observed changes, and coming up with novel responses (Ely et al., 2009; Nelson et al., 2010). These processing demands heighten the cognitive load in adaptive versus more routine kinds of situations. Thus, the cognitive component of adaptive

readiness entails having the potential to employ frame-switching skills when engaged in the aforementioned adaptation processes.

5.1.2   Social Load and Adaptive Readiness

Adaptive performance dimensions can also vary in terms of how much social resources they require of performers. At a simple low level, social load can entail working with people that are known to the performer, enacting common and familiar interpersonal routines. In teams, for example, members who have worked together for a long period, have developed strong shared mental models (Cannon-Bowers, Salas, & Converse, 1993), and are performing routine activities will not likely need to employ significant social resources. However, as situations increase in social complexity, greater amounts of social resources become necessary for operational effectiveness. Social complexity refers to the number and variety of individuals, teams, and organizations that are actors within performance episodes (Zaccaro, 2001). Such variety can be reflected in surface features, such as gender, race, cultural background, and functional expertise, and deep features such as personality, attitudes, and beliefs (Harrison, Price, & Bell, 1998; Harrison, Price, Gavin, & Florey, 2002).

Social resources that are employed as social load increases include both cognitive and behavioral, or interpersonal, activities. Cognitive activities may include social perception and the application of social schemas to interpret social cues (Fiske & Taylor, 1991; Moskowitz, 2005). Such application may entail the use of perspective taking or adopting the frame of reference used by other social actors (Galinsky, Maddux, Gilin, & White, 2008). Such activities may also involve the development of new schemas, or elaboration of existing ones, to apply to novel social situations (Fiske & Taylor, 1991). Thus, in part, social load can overlap with cognitive load when social information-processing demands rise as a function of social complexity.

Greater numbers of social stakeholders, and higher social variety, however, will also likely require a broader array of behavioral and interpersonal responses. Hooijberg (1996) defined such responsiveness as reflecting behavioral complexity. He specified two skill components of behavioral complexity—*behavioral repertoire* and *behavioral differentiation*. Behavioral repertoire refers to the multiplicity of behaviors and roles individuals can enact across different social situations. However, according to Hooijberg, a wide behavioral repertoire is insufficient for successful adaption to social complexity; there is also a need for an ability to determine and apply the most appropriate response to different situational contingencies. This behavioral differentiation is similar to the concept of behavioral flexibility offered by Zaccaro, Gilbert, Thor, and Mumford (1991). These notions suggest that adaptive readiness in high social load situations requires having ready skills in perceiving and understanding complex social environments and in deploying appropriate interpersonal responses.

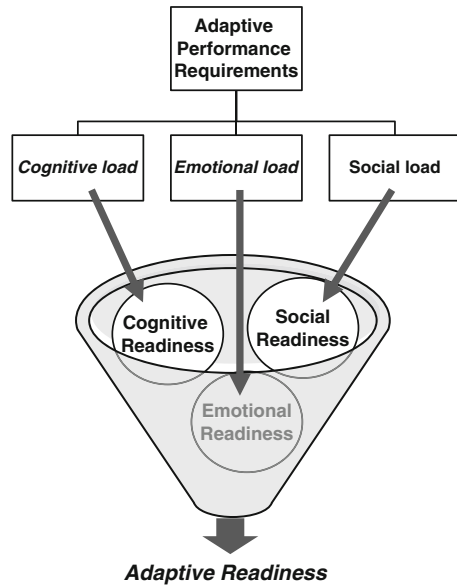### 5.1.3   Emotional Load and Adaptive Readiness

The concept of "emotional load" has not appeared much, if at all, in the human performance literature. The term is more commonly found in the psychophysiology literature and used to describe qualities or elements of an organism's environment (e.g., Adam, Mallan, & Lipp, 2009; Franz, Schaefer, & Schneider, 2003) or requirements of particular tasks (e.g., Thoeringer et al., 2007) that elicit psychophysical emotional responses. In the work literature, while not applying the term emotional load, several researchers have noted how job demands can trigger emotional states that tax employee resources. More specifically, the combination of high job demands, such as time pressure, work overload, role ambiguity, and conflict, and employees' resources to address such demand determines subsequent job stress and job strain (Bakker & Demerouti, 2007). The literature on a related construct "emotional labor" describes "the effort, planning, and control needed to express organizationally desired emotions during interpersonal transactions" (Morris & Feldman, 1996, p. 987; Brotheridge & Grandey, 2002). The labor necessary to expend would rise as a function of decreased congruence between felt emotions and desired ones (Morris & Feldman, 1997). This formulation suggests that emotional labor derives from situational demands. Grandey (2000) described two sets of situational antecedents of emotional labor—interaction expectations and emotional events. Certain jobs (e.g., customer service positions) carry expectations and display rules (Pugliesi, 1999) that incumbents exhibit certain emotions despite felt emotional states. Emotional events can increase the resources necessary for emotional labor, when they increase the contrast between felt emotions and those called for by emotional display rules (Grandey, 2000).

   These related themes from disparate literatures support the idea that situations can exert emotional demands on individuals, causing the expenditure of various resources to effectively address them. We would argue that the level of such demands in any situation determines its level of emotional load. Accordingly, we define emotional load as the presence of high levels of emotion-inducing stimuli in the operating environment that require the deployment of mental, social, and emotional coping resources to maintain operational effectiveness. Emotional components of adaptive readiness, then, would pertain to the skills and competencies that foster successful deployment and outcomes of such responses.

5.1.4   Summary

We have suggested in this section that adaptive performance situations can vary according to the cognitive, social, and emotional loads they exert on performers. These loads correspond, respectively, to the degree of cognitive, social, and emotional readiness necessary for operational effectiveness in adaptive situations.

Fig. 5.1 Components of
adaptive readiness

Adaptive readiness reflects a combination of these three forms of readiness. Figure 5.1 illustrates this model of adaptive readiness.

We want to make several points about this model. First, we argue that the proportion of cognitive, emotional, and social components of adaptive readiness will likely vary across different adaptive situations, because the load extant in each situation may have a correspondingly different mix of cognitive, emotional, and social elements. Thus, a complex task requiring creative problem solving and learning new technologies in a military school house setting will carry a high cognitive load, but perhaps a low emotional and social load. However, conducting such problem solving with a team composed of domestic and foreign officers heightens the social load in the situation. Finally, requiring such planning in a time-compressed planning phase of a critically important combat mission will greatly add to the emotional load confronting the performers. In each situation, adaptive readiness is necessary, but its components will change significantly according to its load elements.

A second point about our model is that the different components of adaptive readiness are not mutually exclusive. Cognitive skills are at times necessary for operational effectiveness in situations with high social or emotional load. Socially effective behavior often requires the application of social perception and social sense-making processes (Maitlis, 2005; Zaccaro et al., 1991)—i.e., socially oriented cognitive processes—to determine what the most appropriate responses should be when presented with a variety of social cues. Likewise, research on emotional intelligence suggests that the management of emotions entails in part the identification and interpretation of emotions in the self, and in others, as well as regulating emotions in the self and others (Brackett & Mayer, 2003; Caruso, Mayer,

& Salovey, 2002; Mayer & Salovey, 1997). Thus, situations carrying high emotional load may require cognitive competencies to understand emotions and social competencies in managing emotions in interactions between the self and others.

A third point that derives from our model suggests that if elements of adaptive readiness vary according to the blend of cognitive, social, and emotional load in the extant situation, then different mixes of core skills and competencies will be needed across different situations (cf. Ployhart & Bliese, 2006). Moreover, if a situation has high levels of multiple loads, then performers will need high levels of those knowledge skills and abilities that correspond to each form of readiness in the situation. Thus, if a performer has only high cognitive readiness in a situation that also has high social and/or emotional loads, then that individual may be no more prepared for operational effectiveness than performers with lower levels of cognitive readiness. This premise is similar to the pattern approach to leader traits and performance (Foti & Hauenstein, 2007; Zaccaro, 2007), which argues that effective leaders need high levels of cognitive, social, and motivational attributes to lead effectively. The absence of any one set of attributes will result in leadership performance no better than if a person possessed none of the attributes. We believe a similar framework may apply to understanding how the mix of KSAs defines adaptive readiness and its relationships to operational effectiveness in complex domains.

If the adaptive readiness requires different blends of cognitive, social, and emotional competencies, then different training strategies may be necessary to foster growth in adaptive readiness for situations with varying mixes of situational load. Most adaptation training strategies have focused primarily on developing the cognitive skills required to foster adaptive expertise (Bell & Kozlowski, 2002, 2008; Ely et al., 2009; Nelson et al., 2010). We would argue that generic adaptive readiness training will require a focus on growing those competencies for adaptive situations having high cognitive, social, and emotional loads. If trainers are targeting specific adaptive situations, then the preferred training strategy would need to derive from the particular mix of load elements in those situations. In the remaining section of this chapter, we describe in more detail the KSAs that we believe comprise adaptive readiness. We also briefly review the training strategies that are likely to foster growth in the cognitive, social, and emotional components of adaptive readiness.

5.2 Cognitive, Social, and Emotional Competencies that Contribute to Adaptive Readiness: Implications for Readiness Training

We have argued that adaptive readiness reflects an individual's preparation or potential to exhibit a range of personal attributes that are related to effective adaptive performance. While these attributes are likely to include personality and general mental ability (Mueller-Hanson et al., 2005; Pulakos, Dorsey, & White, 2006), we

Table 5.1 Skills, competencies, and instructional strategies that contribute to adaptive readiness

Dimensions of adaptive readiness	Key skills and competencies	Training and development strategies
Cognitive readiness	Self-regulation	Self-regulation training
	Metacognitive thinking	Active learning
	Cognitive flexibility	Error management training
	Frame-changing	Experiential variety
	Creative thinking	Developmental work experiences
	Adaptive expertise	
Social readiness	Social perceptiveness	Developmental work experiences within socially and/or culturally diverse domains
	Perspective taking	
	Behavioral complexity/behavioral flexibility	Cultural assimilators
	Cultural acuity	
Emotional readiness	Emotion regulation and management	Emotion knowledge training
	Emotion identification—self/others	
	Emotion expression	
	Resilience, grit, hardiness	Emotion regulation and management training
	Stress resistance	Stress resistance training
	Stress management	Stress management

are limiting our coverage to those attributes that are likely to be more trainable (i.e., KSAs). Moreover, while we describe KSAs that pertain, for example, to cognitive readiness, we are not covering competencies for such readiness across all kinds of situations. Instead, we are focusing on attributes that foster the cognitive, social, and emotional components of adaptive readiness, that is, readiness for operational effectiveness in situations requiring high levels of adaptation. Finally, we do not pretend that this list is an exhaustive one. However, we believe these to be the most critical KSAs contributing to the three components of adaptive readiness. Table 5.1 indicates (a) each dimension of adaptive readiness; (b) key knowledge, skills, and competencies that compose each form of readiness; and (c) training and development strategies that target growth in some or all of these competencies.

5.2.1   Cognitive Components of Adaptive Readiness

Table 5.1 lists several cognitive competencies that researchers have linked to effective adaptive performance (Mueller-Hanson et al., 2005; Ployhart & Bliese, 2006; Pulakos et al., 2002, 2006; Zaccaro et al., 2009). These include self-regulation, metacognitive thinking, cognitive flexibility and frame-switching, creative thinking, and adaptive expertise. Self-regulation skills refer to competencies in "planning, goal setting, goal monitoring, evaluating goal progress (particularly the detection of

discrepancies between ongoing actions and goal progress standards), discrepancy reduction, and goal completion" (Ely et al., 2009, p. 180; see also Karoly, 1993). Such skills are important for adaptation because they are directed to tracking ongoing performance and helping the individual change goal paths in the face of environmental disruptions (Ely et al., 2009; Karoly, 1993). Metacognitive-thinking skills are important because they help performers monitor and regulate how and when they use cognitive processes to throughout stages of adaptive problem solving (Davidson, Deuser, & Sternberg, 1994; Kozlowski, 1998). Bell and Kozlowski (2008) found that metacognitive processes occurring during an adaptive training trial fostered self-evaluation activities and, through such activities, growth in knowledge that contributed to adaptive performance. Skills in both self-regulation and metacognition contribute to adaptive readiness because they prime performers to attend more closely to changing elements of the operating environment and to adjust accordingly to situational understanding and performance strategies.

Cognitive flexibility and, more specifically, frame-changing skills have also been linked to effective adaptation (Griffin & Hesketh, 2003; Nelson et al., 2010). Cognitive flexibility refers to "a person's (a) awareness that in any given situation there are options and alternatives available, (b) willingness to be flexible and adapt to the situation, and (c) self-efficacy or belief that one has the ability to be flexible" (Martin & Anderson, 1998, p. 1). Individuals who adopt a more cognitively flexible approach to problem solving are more likely to explore different cognitive frames when trying to construct and understand the problem space, as well as generate and evaluate potential solutions (Spiro, Feltovich, & Coulson, 1996). Such wide-ranging exploration of the problem space should also facilitate the development of adaptive expertise (Griffin & Hesketh, 2003).

Nelson et al. (2010, p. 133) defined frame-changing skills as "the capacity to switch among various perspectives or frames of reference" at different phases of adaptive problem solving. Thus, individuals can switch among alternate frames when (a) scanning changing operational environments, (b) making sense of environmental changes, and/or (c) deriving adaptive solutions. Horn (2008) defined three components of frame-changing processes—*frame-breaking*, *frame-switching*, and *frame integration*. Frame-breaking reflects skill in recognizing that existing conceptual models can no longer be applied to changing operational environments (DeYoung, Flanders, & Peterson, 2008; London, 1989). Frame-switching entails an exploration of alternate ways adaptive problems can be defined and resolved (Marshall, 1995). Frame integration refers to skill in integrating newly explored cognitive frames into existing cognitive schemas (Jacobs & Jaques, 1987; Jacobs & McGee, 2001). These processes and corresponding skills facilitate growth in adaptive expertise as performers are increasingly able to link different solution frames to different kinds of problems (Zaccaro, 2009).

Frame-changing is a highly effortful and difficult cognitive process to accomplish (Nelson et al., 2010; Zyphur, 2009). Zyphur (2009) noted that individuals who attempt frame-changing needed to "recognize their enacted mindsets and then consciously evaluate and alter them—no easy task" (p. 685). However, because of the

central importance of these processes for effective adaption, adaptive readiness entails having the willingness, capacity, and preparation to engage in cognitive frame-changing. For this reason, cognitive readiness for adaptive situations may need to center most strongly on this and related skills.

Mumford and Gustafson (1988) defined creative thinking in part as entailing "processes underlying an individual's capacity to generate new ideas or understandings" (p. 28; also see Hong, this volume). The ability to effectively engage such processes when necessary should contribute significantly to adaptation, especially when changing operational environments pose novel or unusual problems to performers (Pulakos et al., 2006). The use of creative-thinking skills in adaptive domains, combined with use of frame-changing skills, self-regulation, and meta-cognition, should help performers understand more readily when and how different kinds of solutions will apply to different types of problems. This understanding has been labeled adaptive expertise (Kozlowski, 1998; Smith et al., 1997). Adaptive experts know at a deep, principled level what and how problem and solution constructs are connected and, more importantly, what contextual parameters determine these connections (Kozlowski, 1998). Indeed, Kozlowski (1998) notes, "Adaptive experts are able to recognize changes in task priorities and the need to modify strategies and actions" (p. 119).

5.2.2 Cognitive Training Strategies for Adaptive Readiness

The training strategies necessary to grow adaptive readiness need to be fundamentally different from those used to develop other types of performance skills (Smith et al., 1997). Traditional strategies focus on routinizing the application of such skills. Adaptation training needs to target adaptive expertise and how performers connect contextual parameters, problem elements, and solution strategies (Bell & Kozlowski, 2002, 2008; Ely et al., 2009; Kozlowski et al., 2001). In Table 5.1, we list five strategies that should contribute to the development of the cognitive skills associated with adaptive readiness (cf. Ely et al., 2009; Kozlowski, 1998; Kozlowski et al., 2001; Nelson et al., 2010). These are self-regulation training, active learning, error management training, experiential variety, and developmental work experiences.

Self-regulation training entails instruction in processes such as goal setting, self-monitoring, and self-evaluation to regulation performance progress (Sitzmann, 2007). Trainees are provided prompts during training to engage in such processes until they become more routinized (Ely et al., 2009; Sitzmann, 2007). Bell and Kozlowski (2008) note that self-regulation processes may also follow from using active learning as an instructional strategy. They argue that such approaches, which give the trainees substantial control over their learning process and progress, can be particularly useful in developing adaptive expertise because they help individuals learn to use their existing knowledge to derive solutions to different or novel problems (i.e., adaptive transfer; Ivancic & Hesketh, 2000). Bell and Kozlowski (2002)

coupled such approaches with the use of *adaptive guidance*, or a "training strategy that provides trainees with diagnostic and interpretive information that helps them make effective learning decisions" (p. 269). This strategy entails use of tailored information to guide learners in making decisions about what instructional exercises and material will best foster skill growth in an active learning context.

Bell and Kozlowski (2008; see also Keith and Frese, 2005, 2008) also argue that training strategies using error management or exploratory learning approaches are effective means of developing adaptation skills. In these approaches, learners are encouraged to explore an unfamiliar problem space and instructed that errors are not only acceptable, but critical to the learning process. Researchers have linked emotion management training and exploratory learning to the development of adaptive expertise and adaptive transfer (Bell & Kozlowski, 2008; Ely et al., 2009). Nelson et al. (2010) noted that in these and other forms of active learning, instructional strategies should include the use of experiential variety or the exposure of learners to "stimuli or practice scenarios in training that vary in either surface or structural details that in turn require changes to performance strategies" (p. 133). They argued that when learners encountered qualitatively different problem scenarios during practice trials, they become more adept at changing the cognitive frames used to interpret, understand, and solve different types of problems.

A central principle underlying all of these adaptive training strategies is having individuals experiencing new kinds of problems as part of the instructional strategy. Most of the studies supporting this approach have been conducted in formal training contexts. Zaccaro and Banks (2004) argued that developmental work experiences, or stretch assignments (Ohlott, 2004) encountered in one's job context, can be effective tools for developing adaptation skills. These kinds of experiences entail giving to job incumbents assignments that challenge their current skill sets and cognitive frames. Both Banks (2006) and Horn (2008) found that developmental work experiences were associated with indicators of adaptive performance.

5.2.3   Social Components of Adaptive Readiness

The social elements of adaptive readiness entail being prepared to adjust to working with and across different types of people and social groups, including those from different cultures. The skills and competencies associated with such adaptation have been grouped under social and cultural intelligence (Earley & Ang, 2003; Pulakos et al., 2006; Zaccaro et al., 1991). Zaccaro et al. (1991) defined social intelligence as reflecting capacities to engage in effective social perception and awareness, as well behavioral flexibility, or the capacity to respond appropriately across different situations. Hooijberg (1996) elaborated the latter competency as behavioral complexity, which involves the possession of a broad behavioral repertoire and the capacity to perform behaviors in their repertoire in adaptive ways according to situational requirements.

Cultural acuity refers to the extension of social perceptions skills to understanding persons and social dynamics from multiple cultures (see similar themes in Earley & Ang, 2003). Such acuity has two foci—the self and the team (Chiara et al., 2010). According to Chiara et al. (2010), self-focused cultural acuity refers to understanding one's own culture-related biases and how they might influence interactions with individuals from other cultures. This skill reflects cultural self-awareness (Earley & Ang, 2003). A team-focused acuity refers to understanding how culture will affect interaction dynamics within a team that (a) is embedded within another culture or (b) is composed of members from different cultures. Sutton, Pierce, Burke, and Salas (2006) extended these ideas in their notion of cultural adaptability, defined as "the ability to understand one's own and others' cognitive biases and to adapt, as necessary, to ensure successful team performance" (p. 144). Their notion adds skill in adjusting behavioral responses to cultural variants.

Social intelligence and cultural acuity can often entail trying to be aware of and appreciate the understanding other people have of a particular social context. This awareness refers to social perspective taking (Johnson, 1975; Roan et al., 2009), defined as

> Taking the perspective of another person is the ability to understand how a situation appears to another person and how that person is reacting cognitively and emotionally to the situation. It is the ability to put oneself in the place of others and recognize that other individuals may have points of view different from one's own. (Johnson, 1975; p. 241)

Such perspective taking can foster adaptability because it facilitates the likelihood that performers will adopt the most appropriate strategy or behavioral response in socially diverse contexts. The selection of socially appropriate responses derives from a clear and deep understanding of how such responses are likely to affect others in the context; such understanding comes more readily to those individuals that can consider responses from the perspective of other who will be their recipients (Roan et al., 2009).

5.2.4 Social Training Strategies for Adaptive Readiness

The training and development of social competencies related to adaptive readiness entail having learners experience a diversity or variety of social contexts, with a focus on (a) understanding differences across such contexts and (b) learning context-specific and appropriate social behaviors. Such learning can occur through the use of developmental work experiences that require individuals to work across different social contexts (Ohlott, 2004). With respect to leader development, for example, Ohlott (2004, p. 161) recommends that leaders be given assignments to lead "people who are not like themselves;" doing so would challenge them "to move beyond their own beliefs and perspectives to understand personal, business, and workplace issues from perspectives that may differ greatly from, and sometimes even conflict with,

their own." Such experiences would not only obviously facilitate skill in perspective taking but also contribute greatly to the social knowledge structures that contribute to effective asocial intelligence (Zaccaro et al., 1991).

The development of cultural acuity entails the same principle of having individuals experience social diversity, except now across cultural boundaries. Being immersed into foreign cultures can create those "mind-altering, head-cracking experiences" (Gregersen, Morrison, & Black, 1998, p. 30) that foster the development of self-knowledge necessary for effective self-focused cultural acuity, as well as better understanding of the different cultural variants in behavior necessary for cultural adaptability. Indeed, regarding the development of such skills in leaders, Nelson et al. (2010) noted that "leaders would need (a) learning experiences that help them discover new, culturally variant leadership frames, and (b) guidance on the appropriate application of these frames" (p. 139). Not all such experiences need to occur in situ within foreign cultures—Bhawuk (2001) recommends the use of *cultural assimilators* or as defined by Nelson et al. (2010), "scenario-based, feedback-rich exercises that can provide (a) intensive culture-specific information to prepare leaders to adapt to specific cultural contexts, or (b) broad, culture-general theory, to help them focus on cultural dimensions that apply to many cultures" (p. 140; see Abbe, Gulick, & Herman, 2007 for a relevant review). Note that such exercises can be incorporated into formal training exercises designed to grow cultural adaptability; Nelson et al. argue for the incorporation of experiential variety into such exercises to make them even more effective.

5.2.5   Emotion Components of Adaptive Readiness

When situations requiring adaptation carry a high emotional load, adaptive readiness includes the potential to use both emotion understanding and management skills. Such readiness may also need to include capacities to withstand and work effectively under highly stressful circumstances. Emotion understanding and management skills are defined as components of emotional intelligence (Caruso et al., 2002; Mayer & Salovey, 1997). Mayer and Salovey (1997; see also Caruso et al., 2002) defined four competencies that contribute to the emotional intelligence—(1) the accurate identification of emotions and feelings, (2) interpretation and accurate understanding of emotions, (3) the effective use of emotions in social problem solving, and (4) the management and control of one's own emotions within the context of problem solving. In adaptive contexts that are high in emotion load, operational effectiveness will often require emotion management strategies before one can utilize problem-solving processes—performers need to understand and control their own emotions before they can begin to think effectively about an adaptive solution. Also the derivation and implementation of adaptive solutions in such contexts may also call for performers to help their colleagues and teammates to manage their own emotional reactions. There has been little if any research that has provided empirical evidence linking these skills to adaptation. We encourage

such research, suspecting that it will endorse their validity for predicting adaptive performance.

The understanding and management of emotions is one aspect of adaptive readiness. We expect that adaptation in many highly stressful and emotion-laden situations requires a degree of grit, mental toughness, and hardiness that helps the performer persist through difficult and challenging circumstances (Duckworth, Peterson, Matthews, & Kelly, 2007; Loehr, 1986; Maddi, 2007; Mueller-Hanson et al., 2005). In essence, these attributes reflect ability to remain calm and composed even under dire or very stressful circumstances (Loehr, 1986). Studies by Bartone (2000, 2006) show that these qualities are related to operational effectiveness under combat situations, one of Pulakos et al.'s (2000) adaptive performance dimensions.

5.2.6   Emotion Training Strategies for Adaptive Readiness

Caruso and Wolfe (2004) argued that individuals could indeed be trained in emotional intelligence skills. Such training would consist of formal instruction on the nature of emotions and understanding their role in behavior. It would also include practice in the regulation of emotions and particularly in how to "apply specific emotions in … everyday life" (Nelis, Quoidbach, Mikolajczak, & Hansenne, 2009, p. 37). Using this combined instructional strategy, Nelis et al. (2009) produced an increase in emotion identification and management skills that persisted 6 months after training. Similar findings were reported by Groves, McEnrue, and Shen (2008). Clarke (2006, 2010) described a training strategy that successfully used work team situations to explore and examine emotional knowledge and to practice emotion regulation situations in ongoing work assignments. Taken together, these studies suggest that emotion identification, understanding, and regulation skills that foster adaptive readiness can be developed through targeted formal and on-the-job instructional strategies.

Attributes as grit, resilience, and hardiness have often been described as dispositional qualities of the individual and therefore as not easily trainable (e.g., Mueller-Hanson et al., 2005). Maddi and his colleagues (2007; Maddi, Kahn, & Maddi, 1998), though, have demonstrated some success in fostering hardiness in adults. Moreover, researchers have suggested that controlled exposure to high-stress training conditions can be effective in developing resilience. For example, Paton (2006) argued that training simulations for police officers should reflect the conditions they might face in their dangerous operating environment. He noted that such exposure in training can "help increase knowledge of stress reactions and provide opportunities for officers to rehearse strategies to deal with them" (p. 3). The US Army has used variations of such extreme stressor exposure as part of their survival training courses (e.g., Morgan et al., 2000). Finally worksite stress management training programs, including stress inoculation programs (Saunders, Driskell, Johnston, & Salas, 1996), have been successful in helping workers develop cognitive and behavioral strategies that foster resilient reactions to work stressors (Richardson &

Rothstein, 2008). Thus, we believe that a combination of stress management training with exposure to extreme stressors in training scenarios can foster adaptive readiness for situations carrying high emotion loads.

5.3   Summary

In this chapter, we have made several key points about readiness for operational effectiveness in environments requiring adaptation. First, adaptive performance situations will vary in terms of their cognitive, social, and emotional loads. Some situations may carry high levels of all three types of performance requirements. Second, success in such situations will require varying degrees of not just cognitive readiness but social and emotional readiness as well. The literature on human performance in complex problem domains has emphasized primarily cognitive readiness; we suggest an expansion to other forms as well. Third, cognitive, social, and emotional elements of adaptive readiness reflect different sets of KSAs and competencies. Overall adaptive readiness will depend upon the combination of KSAs that corresponds to the load mix in a particular situation. Accordingly, in a situation with high cognitive social and emotional load, cognitive readiness will not be enough to ensure overall operational effectiveness. Finally, different training strategies will be needed to foster cognitive, social, and emotional readiness. And, again, when the situation load mix reflects high levels of more than just cognitive load, adaptive training strategies will have to focus on measurement and assessment of this mix as well as a broader range of cognitive and noncognitive skills than they do in the present. We expect that such a focus will foster a greater all around readiness to adapt successfully in multiple kinds of complex problem domains.

References

Abbe, A., Gulick, L. M. V., & Herman, J. L. (2007). *Developing cross-cultural competence in military leaders: A conceptual and empirical foundation*. Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Adam, A. R., Mallan, K. M., & Lipp, O. V. (2009). The effect of emotional and attentional load on attentional startle modulation. *International Journal of Psychophysiology, 74*, 266–273.

Aikins, D. E., Johnson, D. C., Borelli, J. L., Klemanski, D. H., Morrissey, P. M., Benham, T. L., et al. (2009). Thought suppression failures in combat PTSD: A cognitive load hypothesis. *Behaviour Research and Therapy, 47*, 744–751.

Armenakis, A., Harris, S. G., & Mossholder, K. W. (1993). Creating readiness for organizational change. *Human Relations, 46*, 681–703.

Bakker, A. B., & Demerouti, E. (2007). The job demands resources model: State of the art. *Journal of Managerial Psychology, 22*, 309–328.

Banks, D. (2006). *Stretch experiences and leader development: The relationships among work experience, individual differences, contextual variables, and leader adaptability*. Unpublished dissertation, George Mason University.

Banks, D., Bader, P. K., Fleming, P. J., Zaccaro, S. J., & Barber, H. F. (2001). *Leader adaptability: The role of work experiences and individual differences*. Paper presented at the 16th Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

Bartone, P. T. (2000). Hardiness as a resiliency factor for United States forces in the Gulf War. In J. M. Violanti, D. Paton, & C. Dunning (Eds.), *Posttraumatic stress intervention: Challenges, issues, and perspectives* (pp. 115–133). Springfield, IL: Thomas.

Bartone, P. T. (2006). Resilience under military operational stress: Can leaders influence hardiness? *Military Psychology, 18*, S131–S148.

Bell, B. S., & Kozlowski, S. W. J. (2002). Adaptive guidance: Enhancing self-regulation, knowledge, and performance in technology-based training. *Personnel Psychology, 55*, 267–307.

Bell, B. S., & Kozlowski, S. W. J. (2008). Active learning: Effects of core training design elements on self-regulatory processes, learning, and adaptability. *Journal of Applied Psychology, 93*, 296–316.

Bhawuk, D. P. S. (2001). Evolution of culture assimilators: Toward theory-based assimilators. *International Journal of Intercultural Relations, 25*, 141–163.

Bierman, K. L., Torres, M. M., Domitrovich, C. E., Welsh, J. A., & Gest, S. D. (2009). Behavioral and cognitive readiness for school: Cross-domain associations for children attending Head Start. *Social Development, 18*, 305–323.

Brackett, M. A., & Mayer, J. D. (2003). Convergent, discriminant, and incremental validity of competing measures of emotional intelligence. *Personality and Social Psychology Bulletin, 29*, 1147–1158.

Brotheridge, C. M., & Grandey, A. A. (2002). Emotional labor and burnout: Comparing two perspectives of "People Work". *Journal of Vocational Behavior, 60*, 17–39.

Burke, C. S., Stagl, K. C., Salas, E., Pierce, L., & Kendall, D. (2006). Understanding team adaptation: A conceptual analysis and model. *Journal of Applied Psychology, 91*, 1189–1207.

Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision making. In N. J. Castellan Jr. (Ed.), *Current issues in individual and group decision making* (pp. 221–246). Hillsdale, NJ: Erlbaum.

Caruso, D. R., Mayer, J. D., & Salovey, P. (2002). Emotional intelligence and emotional leadership. In R. Riggio (Ed.), *Multiple Intelligences and Leadership*. Mahwah, NJ: Erlbaum.

Caruso, D. R., & Wolfe, C. J. (2004). Emotional intelligence and leadership development. In D. Day, S. J. Zaccaro, & S. Halpin (Eds.), *Leader development for transforming organizations*. Mahwah, NJ: Erlbaum.

Chan, D. (2000). Understanding adaptation to changes in the work environment: Integrating individual difference and learning perspectives. *Research in Organizational Behavior, 18*, 1–42.

Chiara, J., Burke, C. S., Salas, E., Priest-Walker, H., Zaccaro, S., Riedel, S., et al. (2010). *The Multicultural Leadership Assessment and Development (Multi-LeAD) program: A training approach to the development of multicultural leadership skills (ARI Technical Report)*. Arlington, VA: U.S. Army Research Institute for Behavioral and Social Sciences.

Clarke, N. (2006). Developing emotional intelligence through workplace learning: Findings from a case study in healthcare. *Human Resource Development International, 9*, 447–465.

Clarke, N. (2010). Developing emotional intelligence abilities through team-based learning. *Human Resource Development Quarterly, 21*, 119–138.

Cosenzo, K. A., Fatkin, L. T., & Patton, D. J. (2007). Ready or not: Enhancing operational effectiveness through the use of readiness measures. *Aviation, Space, and Environmental Medicine, 78*, B96–B106.

Davidson, J. E., Deuser, R., & Sternberg, R. J. (1994). The role of metacognition in problem solving. In J. Metcalf & A. P. Shimamura (Eds.), *Metacognition: Knowing about knowing*. Cambridge, MA: MIT Press.

DeYoung, C. G., Flanders, J. L., & Peterson, J. B. (2008). Cognitive abilities involved in insight problem solving: An individual differences model. *Creativity Research Journal, 20*, 278–290.

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit, perseverance and passion for long term goals. *Journal of Personality and Social Psychology, 92*, 1087–1101.

Earley, P. C., & Ang, S. (2003). *Cultural intelligence: Individual interactions across cultures*. Stanford, CA: Stanford Business Books.

Eby, L. T., Adams, D. M., Russell, J. E. A., & Gaby, S. H. (2000). Perceptions of organizational readiness for change: Factors related to employees' reactions to the implementation of team-based selling. *Human Relations, 53*, 419–442.

Ely, K., Zaccaro, S. J., & Conjar, E. A. (2009). Leadership development: Training strategies for growing adaptability in leaders. In C. Cooper & R. Burke (Eds.), *The peak performing organization* (pp. 175–196). London: Routledge.

Endsley, M. R. (1997). The role of situation awareness in naturalistic decision making. In C. E. Zsambok & G. Klein (Eds.), *Naturalistic decision making* (pp. 269–283). Mahwah, NJ: Erlbaum.

Fiedler, F. E. (1995). Cognitive resources and leadership performance. *Applied Psychology, 44*, 5–28.

Fiske, S. T., & Taylor, S. E. (1991). *Social cognition* (2nd ed.). New York: McGraw-Hill.

Foti, R. J., & Hauenstein, N. M. A. (2007). Pattern and variable approaches in leadership emergence and effectiveness. *Journal of Applied Psychology, 92*, 347–355.

Franz, M., Schaefer, R., & Schneider, C. (2003). Psychophysiological response patterns of high and low alexithymics under mental and emotional load conditions. *Journal of Psychophysiology, 17*, 203–213.

Galinsky, A. D., Maddux, W. W., Gilin, D., & White, J. B. (2008). Why it pays to get inside the head of your opponent: The differential effects of perspective taking and empathy in negotiations. *Psychological Science, 19*, 378–384.

Grandey, A. A. (2000). Emotion regulation in the workplace: A new way to conceptualize emotional labor. *Journal of Occupational Health Psychology, 5*, 95–110.

Gregersen, H. B., Morrison, A. J., & Black, J. S. (1998). Developing leaders for the global frontier. *Sloan Management Review, 40*, 21–32.

Griffin, B., & Hesketh, B. (2003). Adaptable behaviours for successful work and career adjustment. *Australian Journal of Psychology, 55*(2), 65–73.

Groves, K. S., McEnrue, M. P., & Shen, W. (2008). Developing and measuring the emotional intelligence of leaders. *The Journal of Management Development, 27*, 225–250.

Harrison, D. A., Price, K. H., & Bell, M. P. (1998). Beyond relational demography: Time and the effects of surface-and deep-level diversity on work group cohesion. *Academy of Management Journal, 41*, 96–107.

Harrison, D. A., Price, K. H., Gavin, J. H., & Florey, A. T. (2002). Time, teams, and task performance: Changing effects of surface- and deep-level diversity on group functioning. *Academy of Management Journal, 45*(5), 1029–1045.

Holyoak, K. J. (1991). Symbolic connectionism: Toward third-generation theories of expertise. In K. A. Ericsson & J. Smith (Eds.), *Toward a general theory of expertise* (pp. 301–336). Cambridge, England: Cambridge University Press.

Hooijberg, R. (1996). A multidirectional approach toward leadership: An extension of the concept of behavioral complexity. *Human Relations, 49*(7), 917–946.

Horn, Z. N. J. (2008). Linking developmental stretch assignments with adaptive outcomes: The importance of cognitive frame complexity. *Dissertation Abstracts International Section B: Sciences and Engineering, 69*(06), 3867.

Ivancic, K., & Hesketh, B. (2000). Learning from errors in a driving simulation: Effects on driving skill and self-confidence. *Ergonomics, 43*, 1966–1984.

Jacobs, T. O., & Jaques, E. (1987). Leadership in complex systems. In J. Zeidner (Ed.), *Human productivity enhancement*. New York: Praeger.

Jacobs, T. O., & McGee, M. L. (2001). Competitive advantage: Conceptual imperatives for executives. In S. J. Zaccaro & R. Klimoski (Eds.), *The nature of organizational leadership: Understanding the performance imperatives confronting today's leaders* (pp. 42–78). San Francisco: Jossey-Bass.

Johnson, D. W. (1975). Cooperativeness and social perspective taking. *Journal of Personality and Social Psychology, 31*, 241–244.

Kalyuga, S., Renkl, A., & Paas, F. (2010). Facilitating flexible problem solving: A cognitive load perspective. *Educational Psychology Review, 22*, 175–186.

Karoly, P. (1993). Mechanisms of self-regulation: A systems view. *Annual Review of Psychology, 44*, 23–52.

Keith, N., & Frese, M. (2005). Self-regulation in error management training: Emotion control and metacognition as mediators of performance effects. *Journal of Applied Psychology, 90*, 677–691.

Keith, N., & Frese, M. (2008). Effectiveness of error management training: A meta-analysis. *Journal of Applied Psychology, 93*, 59–69.

Kozlowski, S. W. J. (1998). Training and developing adaptive teams: Theory, principles, and research. In J. A. Cannon-Bowers & E. Salas (Eds.), *Decision making under stress: Implications for training and simulation* (pp. 115–153). Washington, DC: American Psychological Association.

Kozlowski, S. W. J., Gully, S. M., Nason, E. R., & Smith, E. M. (1999). Developing adaptive teams: A theory of compilation and performance across levels and time. In D. R. Ilgen & E. D. Pulakos (Eds.), *The changing nature of performance* (pp. 240–292). San Francisco, CA: Jossey-Bass.

Kozlowski, S. W. J., Toney, R. J., Mullins, M. E., Weissbein, D. A., Brown, K. G., & Bell, B. S. (2001). Developing adaptability: A theory for the design of integrated-embedded training systems. In E. Salas (Ed.), *Advances in human performance and cognitive engineering research* (Vol. 1, pp. 59–123). New York: Elsevier Science/JAI Press.

Le, H., Casillas, A., Robbins, S. B., & Langley, R. (2005). Motivational and skills, social, and self-management predictors of college outcomes: Constructing the Student Readiness Inventory. *Educational and Psychological Measurement, 65*, 482–508.

LePine, J. A. (2003). Team adaptation and postchange performance: Effects of team composition in terms of members' cognitive ability and personality. *Journal of Applied Psychology, 88*, 27–39.

LePine, J. A., Colquitt, J. A., & Erez, A. (2000). Adaptability to changing task contexts: Effects of general cognitive ability, conscientiousness, and openness to experience. *Personnel Psychology, 53*, 563–593.

Loehr, J. E. (1986). *Mental toughness training for sports: Achieving athletic excellence*. Lexington, MA: Stephen Greene Press.

London, M. (1989). *Managing the training enterprise: High-quality, cost-effective employee training in organizations*. San Francisco, CA: Jossey-Bass.

Maddi, S. R. (2007). Relevance of hardiness assessment and training to the military context. *Military Psychology, 19*, 61–70.

Maddi, S. R., Kahn, S., & Maddi, K. L. (1998). The effectiveness of hardiness training. *Consulting Psychology Journal: Practice and Research, 50*, 78–86.

Maitlis, S. (2005). The social process of organizational sensemaking. *Academy of Management Journal, 48*(1), 21–49.

Marshall, S. P. (1995). *Schemas in problem solving*. Cambridge, England: Cambridge University Press.

Martin, M. M., & Anderson, A. M. (1998). The cognitive flexibility scale: Three validity studies. *Communication Reports, 11*, 1–9.

Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. Sluyter (Eds.), *Emotional development and emotional intelligence: Implications for educators* (pp. 3–31). New York: Basic Books.

Morgan, C. A., III, Wang, S., Mason, J., Southwick, S. M., Fox, P., Hazlett, G., et al. (2000). Hormone profiles in humans experiencing military survival training. *Biological Psychiatry, 47*, 891–901.

Morris, J. A., & Feldman, D. C. (1996). The dimensions, antecedents, and consequences of emotional labor. *Academy of Management Review, 21*, 986–1010.

Morris, J. A., & Feldman, D. C. (1997). Managing emotions in the workplace. *Journal of Managerial Issues, 9*(3), 257–274.

Morrison, J. E., & Fletcher, J. D. (2002). *Cognitive readiness (IDA Paper P-3735)*. Alexandria, VA: Institute for Defense Analyses.

Moskowitz, G. (2005). *Social cognition*. New York, NY: Guilford Press.

Mueller-Hanson, R., White, S. S., Dorsey, D. W., & Pulakos, E. D. (2005). *Training adaptable leaders: Lessons from research and practice (Research Report 1844)*. Arlington, VA: U.S. Army Research Institute for Behavioral and Social Sciences.

Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integrations, application, and innovation. *Psychological Bulletin, 103*, 27–43.

Nelis, D., Quoidbach, J., Mikolajczak, M., & Hansenne, M. (2009). Increasing emotional intelligence: (How) is it possible? *Personality and Individual Differences, 47*, 36–41.

Nelson, J. K., Zaccaro, S. J., & Herman, J. L. (2010). Strategic information provision and experiential variety as tools for developing adaptive leadership skills. *Consulting Psychology Journal: Practice and Research, 62*, 131–142.

O'Neil, H. F. Jr., Allred, K., & Baker, E. L. (1992). *Measurement of workforce readiness: Review of theoretical frameworks* (CSE Tech. Rep. No. 343). Los Angeles, CA: National Center for Research in Evaluation, Standards, and Student Testing, University of California.

Ohlott, P. J. (2004). Job assignments. In C. D. McCauley & E. Van Velsor (Eds.), *The Center for Creative Leadership handbook of leadership development* (2nd ed., pp. 151–182). San Francisco, CA: Wiley.

Paas, F., van Gog, T., & Sweller, J. (2010). Cognitive load theory: New conceptualizations, specifications, and integrated research perspectives. *Educational Psychology Review, 22*, 115–121.

Paas, F., & van Merriënboer, J. J. G. (1994). Instructional control of cognitive load in the training of complex cognitive tasks. *Educational Psychology Review, 6*, 351–372.

Paton, D. (2006). Critical incident stress risk in police officers: Managing resilience and vulnerability. *Traumatology, 23*, 1–9.

Peterson, C. H., Casillas, A., & Robbins, S. B. (2006). The Student Readiness Inventory and the Big Five: Examining social desirability and college academic performance. *Personality and Individual Differences, 41*, 663–673.

Ployhart, R. E., & Bliese, P. D. (2006). Individual adaptability (I-ADAPT) theory: Conceptualizing the antecedents, consequences, and measurement of individual differences in adaptability. In C. S. Burke, L. G. Pierce, & E. Salas (Eds.), *Advances in human performance and cognitive engineering: Vol. 6. Understanding adaptability: A prerequisite for effective performance within complex environments* (pp. 3–39). Amsterdam: Elsevier.

Pugliesi, K. (1999). The consequences of emotional labor: Effects on work stress, job satisfaction, and well-being. *Motivation and Emotion, 23*(2), 125–154.

Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). Adaptability in the workplace: Development of a taxonomy of adaptive performance. *Journal of Applied Psychology, 85*, 612–624.

Pulakos, E. D., Dorsey, D. W., & White, S. S. (2006). Adaptability in the workplace: Selecting an adaptive workforce. In C. S. Burke, L. G. Pierce, & E. Salas (Eds.), *Advances in human performance and cognitive engineering: Vol. 6. A prerequisite for effective performance within complex environments* (pp. 41–71). Amsterdam: Elsevier.

Pulakos, E. D., Schmitt, N., Dorsey, D. W., Arad, S., Hedge, J. W., & Borman, W. C. (2002). Predicting adaptive performance: Further tests of a model of adaptability. *Human Performance, 15*(4), 299–323.

Richardson, K. M., & Rothstein, H. R. (2008). Effects of occupational stress management intervention programs: A meta-analysis. *Journal of Occupational Health Psychology, 13*, 69–93.

Roan, L., Strong, B., Foss, P., Yager, M., Gehlbach, H., & Metcalf, K. (2009). *Social perspective taking (ARI Technical Report 1259)*. Arlington, VA: U.S. Army Research Institute for Behavioral and Social Sciences.

Robbins, S., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130*, 261–288.

Saunders, T., Driskell, J. E., Johnston, J. H., & Salas, E. (1996). The effect of stress inoculation training on anxiety and performance. *Journal of Occupational Health Psychology, 1*, 170–186.

Schroder, H., Driver, M., & Streuferi, S. (1967). *Human information processing*. New York: Holt, Rinehart and Winston.

Sitzmann, T. (2007). *Prompting self-regulation to improve learning outcomes in Web-based training.* Presentation at the 22nd Annual Conference of the Society for Industrial-Organizational Psychology Conference, New York, NY.

Smith, E. M., Ford, J., & Kozlowski, S. W. J. (1997). Building adaptive expertise: Implications for training design strategies. In M. A. Quinones & A. Ehrenstein (Eds.), *Training for a rapidly changing workplace: Applications of psychological research* (pp. 89–118). Washington, DC: American Psychological Association.

Smyth, C. C. (2007). Sensitivity of subjective questionnaires to cognitive loading while driving with navigation aids: A pilot study. *Aviation, Space, and Environmental Medicine, 78*, B39–B50.

Spiro, R. J., Feltovich, P. J., & Coulson, R. L. (1996). Two epistemic world-views: Prefigurative schemas and leaning in complex domains. *Applied Cognitive Psychology, 10*, S51–S61.

Sutton, J. L., Pierce, L. G., Burke, C. S., & Salas, E. (2006). Cultural adaptability. In C. S. Burke, L. G. Pierce, & E. Salas (Eds.), *Advances in human performance and cognitive engineering: Vol. 6. A prerequisite for effective performance within complex environments* (pp. 143–173). Amsterdam: Elsevier.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(1), 257–285.

Sweller, J., van Merriënboer, J. J. G., & Paas, F. G. W. C. (1998). Cognitive architecture and instructional design. *Educational Psychology Review, 10*, 251–296.

Thoeringer, C. K., Sillaber, I., Roedel, A., Erhardt, A., Mueller, M. B., Ohl, F., et al. (2007). The temporal dynamics of intrahippocampal corticosterone in response to stress-related stimuli with different emotional and physical load: An in vivo microdialysis study in C57BL/6 and DBA/2 inbred mice. *Psychoneuroendocrinology, 32*, 746–757.

Wesley, P. W., & Buysse, V. (2003). Making meaning of school readiness in schools and communities. *Early Childhood Research Quarterly, 18*, 351–375.

White, S. S., Mueller-Hanson, R., Dorsey, D. W., Pulakos, E. D., Wisecarver, M. M., Deagle, E. A., et al. (2005). *Developing adaptive proficiency in Special Forces officers (Research Report 1831)*. Arlington, VA: U.S. Army Research Institute for Behavioral and Social Sciences.

Zaccaro, S. J. (2001). *The nature of executive leadership: A conceptual and empirical analysis of success*. Washington, DC: APA Books.

Zaccaro, S. J. (2007). Trait-based perspectives in leadership. *American Psychologist, 62*, 6–16.

Zaccaro, S. J. (2009). *Principles and strategies for developing skills that promote adaptive performance*. Arlington, VA: U.S. Army Research Institute for Behavioral and Social Sciences.

Zaccaro, S. J., & Banks, D. (2004). Leader visioning and adaptability: Bridging the gap between research and practice on developing the ability to manage change. *Human Resource Management, 43*(4), 367.

Zaccaro, S. J., Banks, D., Kiechel-Koles, L., Kemp, C., & Bader, P. (2009). *Leader and team adaptation: The influences and development of key attributes and processes (Tech. Rep. No. 1256)*. Arlington, VA: U.S. Army Research Institute for Behavioral and Social Sciences.

Zaccaro, S. J., Gilbert, J. A., Thor, K. K., & Mumford, M. D. (1991). Leadership and social intelligence: Linking social perceptiveness to behavioral flexibility. *The Leadership Quarterly, 2*, 317–347.

Zyphur, M. J. (2009). When mindsets collide: Switching analytical mindsets to advance organization science. *Academy of Management Review, 34*(4), 677–688.