



The influence of higher order cognitive capacities on leader organizational continuance and retention: The mediating role of developmental experiences[☆]

Stephen J. Zaccaro^{a,*}, Shane Connelly^b, Kristin M. Repchick^a, Andreina I. Daza^a, Mark C. Young^c, Robert N. Kilcullen^c, Veronica L. Gilrane^a, Jordan M. Robbins^a, Lindsey N. Bartholomew^a

^a Consortium of Universities in the Washington DC Area and George Mason University, United States

^b University of Oklahoma, United States

^c U.S. Army Research Institute for the Behavioral and Social Sciences, United States

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ABSTRACT

The relationship between cognitive capacities and retention or turnover has received scant attention in the extant literature. The few findings that have been reported show mixed to no linear effects of general mental ability on organizational continuance. In this study, we examined the association of more specific higher order cognitive capacities including complex problem solving skills and divergent thinking with officer continuance in the U.S. Army. We also tested the role of developmental experiences as a partial mediator of this relationship. Our sample included 640 officers who completed measures of these skills and of their career experiences in 1992–1993. To this sample, we added years of service from date of commissioning to 2008, as well as data on whether officers experienced particular assignments considered to be challenging and developmental. Our findings support the association of complex problem solving and divergent thinking skills with leader continuance. We also found that this effect is partially mediated by challenging developmental experiences. Thus, we provide stronger evidence than in prior studies for a linear relationship between cognitive abilities and continuance in an organization.

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Introduction

The retention of leaders and executives is a high priority for most organizations. Significant amounts of training and development dollars are devoted to the growth and development of these individuals, especially as they rise through organizational levels (Lamoureux, 2012). Yet the turnover rates for leaders and executives are high (Duffield, Roche, Blay, Thoms, & Stasa, 2011); research

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* Corresponding author at: Department of Psychology, MSN 3F5, George Mason University, Fairfax, VA 22030, United States.

has shown that failure rates among executives about 18 months in position can be as high as 40% (Crowley, 2004). A recent posting on Bloomberg.com indicated that “U.S. corporations are switching chief executive officers at the fastest pace in five years” (Green & Hymowitz, 2013). Such turnover represents a significant loss of investment, particularly in military organizations.

Most military organizations, such as the U.S. Army, invest considerable financial and human resources in training an officer before and after he/she is commissioned. In addition, such organizations rely on a closed personnel system where external recruits enter into junior level leadership positions, and thereafter only internal candidates are considered for further promotion into higher leadership positions (although some direct commissioning of individuals into higher ranks may occur if they have certain training, such as medical degrees). Moreover, after completing their initial active duty service obligation, officers typically make a formal decision either to continue to serve, or to leave the Army. Likewise, later in their careers, as chances for promotion narrow, they may consider leaving if they do not perceive strong promotion prospects or opportunities to attain more challenging leadership positions. Accordingly, excessive leader/executive separation rates can lead to a significant loss in leadership investment with an attendant decrease in overall productivity and military readiness (Gencer, 2002).

Indeed, a recent meta-analysis reported an overall significant negative association between turnover rates and subsequent organizational performance, with the relationship worsening when examining only voluntary turnover (Park & Shaw, 2013). Another recent meta-analysis found significant negative associations between collective turnover rates and lower customer satisfaction and performance efficiency, as well as positive associations with counterproductive work behaviors and error rates (Heavey, Holwerda, & Hausnecht, 2013). Accordingly, understanding the factors that contribute to career-long continuation and advancement of leaders and executives remains a significant concern for most organizations, and particularly for those that rely mostly on closed personnel systems.

In the present study, we examine the relationship between higher-order cognitive capacities such as complex problem solving skills and divergent thinking and military officers' tendencies to remain in the Army for longer periods of time. We argue that such capacities will increase the likelihood that officers will perceive a personal match with stronger cognitive job demands at higher leadership levels (Wilk, Desmarais, & Sackett, 1995), and therefore would be more inclined to continue their military service. We also suggest that the relationship between higher-order cognitive capacities and continuance will be partially mediated by the quality of a leader's developmental experiences. Such experiences increase the likelihood of being promoted into higher level leadership positions. They also facilitate the chances of success in those positions, raising even further the probability of future advancement.

Research on the causes and drivers of leader turnover has been relatively scant, at least in comparison with the volume of studies devoted to the more general issue of employee turnover (Gordon, 2010; Knudsen, Ducharme, & Roman, 2009; Lambrou, 2002). The voluminous Handbook of Leadership (Bass, 2008) contained only two pages on the theme of executive turnover, with the primary focus on the effects of executive succession; little or no research is cited regarding the antecedents of such turnover. A recent review of the turnover literature mentions only three studies that used managers or executives as a sample, and cited the need for more consideration of job level in turnover research (Holtom, Mitchell, Lee, & Eberly, 2008). Meta-analyses of employee turnover have not generally examined organizational rank as a sample characteristic (Heavey et al., 2013; Jiang, Liu, McKay, Lee, & Mitchell, 2012; Van Iddekinge, Roth, Putka, & Lanivich, 2011); if they do, they either report a small number of studies using managers/executives, few differences across levels (Cotton & Tuttle, 1986; Griffeth, Hom, & Gaertner, 2000), or do not examine antecedents of such turnover (Hancock, Allen, Bosco, McDaniel, & Pierce, 2013; Park & Shaw, 2013).

The few studies that have explored leader and executive turnover generally focused on contextual dynamics and drivers. Contextual factors that have been associated with turnover include pay differentials and other characteristics of executive pay (e.g., Bloom & Michel, 2002; Dunford, Boudreau, & Boswell, 2005), supervisory and organizational support (e.g., Bauer, Erdogan, Liden, & Wayne, 2006; Eisenberger, Stinglhamber, Vandenberghe, Sucharski, & Rhoades, 2002; Maertz, Griffeth, Campbell, & Allen, 2007); and organizational/job stressors (e.g., Hambrick, Finkelstein, & Mooney, 2005; Knudsen et al., 2009; Lee & Ashforth, 1993, 1996).

While contextual factors matter greatly in employee and leader turnover, significant variance in retention and turnover can also be attributed to a range of individual differences (Barrick & Mount, 1996; Barrick & Zimmerman, 2005; Mount, Witt, & Barrick, 2000). A focus on individual characteristics as drivers of turnover is helpful in two ways, especially in organizations with relatively closed personnel systems, where only internal candidates are promoted to higher organizational ranks. First, significant validity coefficients between individual differences and subsequent retention or turnover can help inform selection systems for entry into organizations and systems for the subsequent identification of high potential executives (e.g., Barrick & Zimmerman, 2005). Second, individual differences that can be linked to turnover and that are relatively malleable, such as particular cognitive and social skills, may then be specifically targeted in leader training, development, and succession programs. Thus, a focus on the relationship between individual differences and turnover outcomes can provide organizations with valuable tools to facilitate leader and executive retention.

A few reviews and meta-analyses have noted the role of personality as a predictor of employee turnover. For example, Porter and Steers (1973) reported that emotional instability and a strong achievement orientation were associated with turnover. A more recent review described several studies showing personality variables, such as self-confidence, conscientiousness, negative affectivity, self-monitoring, and risk aversion as being associated with either retention or turnover (Holtom et al., 2008). In a military sample, Capon, Chernyshenko, and Stark (2007) found that attributes related to core self-evaluations (e.g., self-esteem, generalized self-efficacy, locus of control, and neuroticism) influenced intentions to reenlist through the mediating mechanism of job satisfaction. Bauer et al. (2006) found that extraversion moderated the effects on one contextual variable, the quality of relationships between leader and subordinate (i.e., leader-member exchange, or LMX) on both turnover intentions and actual turnover in a sample of new executives.

Intelligence and cognitive abilities have received relatively less attention than personality in the turnover literature (Maltarich, Nyberg, & Reilly, 2010). This lack of research is surprising given consistently significant validity coefficients between intelligence

and most work outcomes, including leadership (Cortina, Goldstein, Payne, Davison, & Gilliland, 2000; Hunter & Hunter, 1984; Judge, Colbert, & Ilies, 2004; Schmidt & Hunter, 1998). However, what little research that has been completed on general mental ability and turnover indicates at best a weak relationship. An early meta-analysis found only six studies investigating intelligence and turnover; together they indicated a nonsignificant relationship (Cotton & Tuttle, 1986). A more recent meta-analysis also found “virtually no correlation between cognitive ability and turnover” (Griffeth et al., 2000, p. 479). Given this lack of effect, other recent studies have suggested more complex relationships between intelligence and turnover, such as a moderated curvilinear one (Maltarich et al., 2010) or one that is moderated by time (Dickter, Roznowski, & Harrison, 1996).

A key contention of the present study is that higher cognitive capacities such as complex problem solving skills and divergent thinking may be more strongly associated with a leader's tendency to remain in an organization than intelligence. Leadership entails social problem solving in relatively ambiguous situations, particularly at higher organizational levels (Fleishman et al., 1991; Mumford, 1986). Accordingly, specific cognitive skills that foster such problem solving should result in better performance and greater access to developmental opportunities (Mumford, Zaccaro, Harding, Jacobs, & Fleishman, 2000). To date, there are few, if any, studies that examined leaders' complex problem solving and divergent thinking capacities as drivers of leader retention or turnover.

These capacities are especially noteworthy because, unlike personality and general mental ability, they are malleable as a function of long term and sustained developmental activities. Such growth is particularly viable in organizations, such as the military, that have closed personnel systems where leaders are selected or promoted from within, and long term leader development is emphasized. Accordingly, the major contribution of this study is to demonstrate the significant association between higher-order cognitive capacities and leader continuance over the course of Army officers' leadership careers. We also focus on the role of developmental experiences as a potential mediator of this relationship.

Part of the data for our study comes from a sample of officers tested in 1992 and 1993, in order to examine the influence of an array of individual differences on leader performance in the U.S. Army (Connelly et al., 2000; Zaccaro, Mumford, Connelly, Marks, & Gilbert, 2000). This earlier research highlighted the significant influence of cognitive skills, leader knowledge, and personality on leader achievement (Connelly et al., 2000). That research also suggested that individual differences, particularly cognitive capacities, varied across organizational ranks (Mumford, Marks, Zaccaro, Connelly, & Reiter-Palmon, 2000; Mumford, Zaccaro et al., 2000), implying that such capacities may have a role in leader continuance as well. In the present study, we added continuance data to the original sample to examine the role of cognitive capacities in predicting these outcomes. We also added data on whether or not a subsample of officers experienced particular developmental assignments.

Cognitive capacities and leader organizational continuance

Our focus in this paper is on leaders' continuance and advancement in an organizational leadership track. Our sample is derived from the U.S. Army. The officer corps of the U.S. Army is built upon the foundation of individuals who volunteer for service and choose to pursue a career as an officer. They enter the Army into junior leadership positions. Early in their careers, after completing their active duty service obligation, such leaders will make a decision to either continue their service or leave the U.S. Army. As they grow within this organization, they receive extensive training and development, including a range of operational and developmental experiences that foster growth in leadership capacities. Later in their career, continuance and advancement increasingly becomes the joint province of officers and the Army, as promotion decisions influence the maximum possible rank an individual is likely to assume within the officer corps. At later points in their careers, after reaching mid-level leadership positions (i.e., major, lieutenant colonel), officers may approach an “up-or-out” dynamic, where a perceived diminishing probability of promotion may lead them to decide to separate from service, especially if they have accrued sufficient time to receive retirement benefits. Accordingly, at such points, leaders' decisions to stay or leave are increasingly influenced by what Maertz and Griffeth (2004) describe as “calculative forces” (p. 670). They note that:

Calculative forces involve a cognitive evaluation of one's future prospects of membership in the organization.... A calculation that one can achieve valued goals through continued membership creates motivation to stay (Lee & Mitchell, 1994.) A calculation that valued goals are unlikely to be met at the current organization in the future creates motivation to quit.

Thus decisions by military leaders to continue in service may be driven in large part by how strong they perceive the probability of achieving personal career leadership goals. Moreover, we argue that such perceptions are likely to be associated with the leaders' levels of cognitive capacities, as well as unique developmental experiences linked to the possession, utilization, and growth of these capacities. Thus, the juxtaposition of leader continuance choices and the organization's role in (a) offering leader growth experiences and (b) determining the probability of leader advancement provides a useful setting to examine the relationships of complex problem skills, divergent thinking, and developmental experiences with leaders' tendencies to remain in an organization for longer periods of time.

Cognitive ability and turnover

Arguments for the relationship between intelligence and turnover have centered on the former's associations with both performance and the availability of job alternatives. General mental ability has consistently been found to be a significant predictor of job performance (Cortina et al., 2000; Hunter & Hunter, 1984; Schmidt & Hunter, 1998). In turn, several meta-analyses have

reported significant negative relationships between performance and turnover (Cotton & Tuttle, 1986; Griffeth et al., 2000). Better job performance likely leads to more positive employee outcomes and higher job satisfaction; both, in turn, result in lower turnover intentions (Griffeth et al., 2000; Holtom et al., 2008). Alternatively, however, higher intelligence, and its attendant effects on performance may also raise the attractiveness of the individual in the external job market, increasing the probability of available alternatives to one's current job (Allen & Griffeth, 2001; Maltarich et al., 2010; Trevor, Gerhart, & Boudreau, 1997). Such availability is positively associated with turnover intentions (Allen & Griffeth, 2001; Griffeth et al., 2000; Mobley, 1977). Thus, intelligence is likely to have mixed or opposing effects on turnover though its influences on work performance.

The gravitational hypothesis has been offered as a response to such mixed effects (Maltarich et al., 2010; McCormick, DeNisi, & Staw, 1979; McCormick, Jeanneret, & Mecham, 1972). This hypothesis suggests that employees will use job choices and mobility to attain jobs that match their level of cognitive ability to positional cognitive demands (Wilk et al., 1995). As the cognitive demands of the job increase, employees with lower ability are more likely to leave because of greater negative feedback, frustration and stress resulting from their performance levels not meeting job demands (Maltarich et al., 2010). They essentially make the choice to seek a position having lower cognitive demands (Wilk et al., 1995). Those with higher cognitive ability are more likely to turnover because (a) jobs that are lower in challenge relative to their cognitive ability are not likely to be interesting and (b) their higher levels of performance are likely to engender greater external recruitment (Maltarich et al., 2010). In essence, these job incumbents make choices to seek more challenging positions that match their level of cognitive capacity (Wilk et al., 1995). Maltarich et al. reported support for a curvilinear relationship between cognitive ability and turnover, with this relationship being stronger in jobs with higher cognitive demands.

The application of this approach to organizational leader continuance or turnover suggests an alternative and perhaps more linear prediction. The gravitational hypothesis argues that individuals will seek positions commensurate with their cognitive abilities. The job of "leader" is one that (a) requires, in general, a higher level of cognitive demands (Fleishman et al., 1991; Mumford, 1986), and (b) varies in requisite cognitive complexity such that senior leadership positions demand more cognitive resources than junior positions (Jacobs & Jacques, 1987). Lower level positions are likely to be less cognitively demanding because managers in higher organizational ranks impose considerable structure on the choices and decisions of lower level supervisors (Jacobs & Jacques, 1987; Katz & Kahn, 1978; Zaccaro, 2001).

Accordingly, one might expect from the gravitational hypothesis that at lower organizational levels, higher ability leaders will be more likely to quit, as they see the position as not matching their capacity. However, such leaders may also experience greater calculative forces motivating them to remain in the organization if they perceive higher promotion chances (Maertz & Griffeth, 2004). Their higher ability should facilitate their chances for success in lower level supervisory positions, which in turn should increase their probability of being promoted to higher leadership positions where job challenge is higher. In the U.S. Army, for example, successful performance in junior ranks will almost always result in promotion to the next rank. Thus, while high ability leaders may not see a match with cognitive job demands in lower level positions, they may perceive that such congruence is more likely after promotion. For such leaders, a mismatch between cognitive ability and a position's cognitive demands does not necessarily mean a greater probability of leaving the organization. Instead, if leaders display job success and the organization promotes accordingly, they will likely experience a greater calculative motivational force to stay with the company, engendered by expectations of more congruent cognitive demands and attendant benefits in future positions (Maertz & Griffeth, 2004). This argument would suggest that cognitive ability should be positively associated with organizational continuance and career advancement along a leadership track.

This prediction has received limited tests, with mixed results. The AT&T Management Progress Study found that cognitive ability was one of several variables that predicted managerial advancement over a 20 year period (Bray, 1982; Howard & Bray, 1988, 1990). However, Li, Arvey, and Song (2011) reported that while general mental ability had significant effects, mediated by self-esteem, on leader role occupancy, it had no influence on leader advancement over a 10 year time frame. While we note that lack of advancement is not the same as turnover, the idea of calculative forces suggest that perceptions of probable advancement should relate to continuance or turnover decisions. We acknowledge that in some instances, managers may choose to stay, even if they do not advance to higher positions, these studies do suggest mixed effects of cognitive ability on advancement as one indicator of longer term continuance in leadership or management positions. Moreover, as we noted earlier, after reaching mid-level leadership positions, officers may begin to face an "up-or-out" dynamic, where lack of promotion or advancement does lead more likely a decision to leave.

One reason for these mixed effects may be the focus on general forms of this cognitive ability rather than on more specific cognitive skills likely to be more closely related to leadership success. General cognitive ability is probably a requisite of all leadership positions at different organizational levels, while certain higher order cognitive capacities may become more important for leader success as positional performance requirements become more cognitively demanding (Jacobs & Jacques, 1987; Zaccaro, 2001). Accordingly, possession of the latter types of capacities may be more important than general cognitive ability in facilitating leader expectations of achieving more challenging leadership positions within their organization, thereby facilitating stronger calculative forces toward retention and continuance.

In a study that provides some support for this argument, Mumford, Campion, and Morgeson (2007a) measured four sets of leader skill requirements — cognitive, interpersonal, business, and strategic — across three organizational levels. Cognitive skills were described as "fundamental skills required for a large portion of the activities in which leaders are engaged" (p. 156). Indeed, they found support for their hypothesis that cognitive skills were required the most and at relatively constant levels across organizational leadership ranks. Mumford et al. also argued that strategic and business skills would become increasingly more required at higher organizational levels. These skills, particularly strategic ones, entail the use of higher-order complex problem solving processes to

ensure success. They found that, indeed, organizational level was more strongly associated with strategic and business skills than interpersonal and cognitive skills.

These findings, together with implications from the gravitational hypothesis, suggest that increasing cognitive demands across organizational levels may suit leaders with higher order skills in complex problem solving, with the match between such skills and leader job requirements reducing the likelihood of leader turnover. Moreover, because leader jobs at higher levels impose increasing job challenge as well as greater employee rewards and outcomes, advancement along a leader track may counter some of the “pull forces, primarily market-based forces that draw the worker out of the organization” (Maltarich et al., 2010, p. 1060), especially in military organizations with closed personnel systems, where internal candidates are selected for all but entry positions. Accordingly, in this study, we focus on the associations between complex problem solving skills and military leaders' years of service in an organizational leadership track. Because leadership work at higher organizational levels is likely to entail the generation of more novel solutions (Mumford & Connelly, 1991; Mumford, Marks et al., 2000; Mumford, Zaccaro et al., 2000; Zaccaro, 2001), we also examine the association of divergent thinking skills and leader continuance.

Leader complex problem solving skills and continuance

Leadership has been defined as a form of social problem solving in complex, dynamic, and ill-defined environments (Fleishman et al., 1991; Mumford, 1986; Mumford, Marks et al., 2000; Mumford, Zaccaro et al., 2000). This definition suggests the importance of specific problem solving skills for leadership effectiveness. Mumford, Marks et al. (2000) and Mumford, Zaccaro et al. (2000) identified several such skills related to understanding the nature of organizational problems, generating possible responses, and implementing best-fitting solutions. More specific skills include problem definitions, information gathering, sense-making, generation of trial solutions, evaluation of solutions, and selection and implementation of best fitting solutions (Mumford, Friedrich, Caughron, & Byrne, 2007; Mumford, Marks et al., 2000; Mumford, Zaccaro et al., 2000). Moreover, because many of the problems encountered by organizational leaders are likely to be novel ones, requiring the generation of new and creative solutions, divergent thinking skills are included among this set of requisite leadership skills.

A recent review of the leader attribute literature found that across 25 reviews and meta-analyses published over an 80-year period, such attributes as divergent thinking, complex problem-solving skills, cognitive complexity, cognitive flexibility, and metacognitive skills were cited as important for leadership outcomes in 10 of them (Zaccaro, LaPort, & Jose, 2013). Indeed, a recent meta-analysis reported corrected correlations with leader effectiveness of .31 for creativity, .39 for problem solving skills, and .52 for decision making skills; the corrected correlation for general cognitive ability was considerably lower (.17) (Hoffmann, Woehr, Maldagen-Youngjohn, & Lyons, 2011). Other studies have linked specific higher order cognitive capacities to executive potential and career advancement. For example, Lewis (1995) found that a measure of conceptual complexity, or the ability to build complex mental frames in a problem domain, was significantly associated with ratings of general officer potential in a sample of mid-career Army officers. Stamp (1988) found significant and strong validity coefficients between scores on this measure and attained organizational level by managers up to thirteen years later.

These findings suggest that complex problem solving skills and divergent thinking skills should be significantly and positively related to leader continuance and years of service for two reasons. First, such skills are significantly related to leader effectiveness, with at least one meta-analysis indicating stronger validity coefficients than between general cognitive ability and performance (Hoffmann et al., 2011). Based on prior research suggesting a negative relationship between performance and turnover (Cotton & Tuttle, 1986; Griffeth et al., 2000), we would expect that complex problem solving skills and divergent thinking skills should be positively related to leader continuance in an organizational leadership track. Moreover, because most theories of multilevel organizational leadership argue that the nature of leadership becomes more cognitively demanding and complex at higher levels (Hunt, 1991; Jacobs & Jacques, 1987; Katz & Kahn, 1978; Zaccaro, 2001), the gravitational hypothesis suggests that leaders with greater amounts of complex problem solving and divergent thinking skills are more likely to remain in the organization, as performance success moves them into positions that are more compatible with their skill levels (Wilk et al., 1995). While stronger complex problem solving and divergent thinking skills may also make higher performing leaders more likely to receive attractive recruitment opportunities (Maltarich et al., 2010; Trevor et al., 1997), we argue that within closed personnel systems, such capacities increase the probability of promotion into more challenging leader positions, and therefore are likely to facilitate calculative forces motivating organizational continuance (Maertz & Griffeth, 2004). Accordingly, we examine the following hypothesis in this study:

Hypothesis 1. Leader complex problem solving skills (H1A) and divergent thinking skills (H1B) are positively associated with continuance in an organizational leadership track

Developmental experiences as a mediator

Implicit in the arguments that we have offered is the notion that complex problem solving and divergent thinking skills will be associated with leader continuance because of increased performance rewards that are likely to accrue to the leader as a function of successfully displaying these skills. One of these potential rewards may be the assignment of effective leaders into more challenging assignments that afford greater gains in subsequent leadership growth. Such gains may then result in promotion to more cognitively demanding leadership positions, facilitating the retention of leaders with higher levels of complex problem solving and divergent thinking skills (Carson, Carson, Griffeth, & Steel, 1994).

In support of this perspective, [Tesluk and Jacobs \(1998\)](#) argued in their model of work experiences that individual differences may play two roles. First, individual attributes such as cognitive abilities may influence the quantity and quality of enriching experiences provided to a job incumbent. Second, these attributes may also determine how much skill growth and maturation individuals may derive from training and developmental experiences. As many leader developmental experiences reflect exposure to increasingly complex and novel organizational problems ([Ohlott, 2004](#)), the possession of high levels of problem solving skills and divergent thinking skills at the outset is likely to predispose the leader to selection for such experiences, and increase the likelihood of substantial growth from their completion. The employee and career benefits that accrue from successful completion of such experiences should increase the value of choosing to stay within the organization by the leader. Also, growth through such experiences makes it more likely that the organization will promote and seek to retain the leader. Accordingly, we suggest that challenging developmental experiences will partially mediate the relationship between higher order cognitive skills and leader continuance. We offer a hypothesis of partial mediation because we suspect that these skills influence continuance through multiple pathways. As we noted earlier, these higher-order cognitive skills are likely to be associated with stronger performance in higher ranking leadership positions, which should, in turn, increase other positive benefits and job satisfaction, and decrease turnover intentions ([Allen & Griffeth, 2001](#)). Thus, complex problem solving and divergent thinking skills should be related to officer continuance both through their effects on the quality of assigned developmental experiences, as well as through other more direct mechanisms. Accordingly, we proposed the following set of hypotheses:

Hypothesis 2. Leader complex problem solving skills (H2A) and divergent thinking skills (H2B) are positively associated with experience in more developmentally-oriented career experiences.

Hypothesis 3. Developmentally-oriented career experiences are positively associated with leader continuance in an organizational leadership track

Hypothesis 4. The effects of leader complex problem solving skills (H4A) and divergent thinking skills (H4B) on continuance in an organizational leadership track are partially mediated by developmentally-oriented career experiences.

Method

Participants

Measures of individual differences, and one measure of career experiences, came from an archival dataset ([Connelly et al., 2000; Zaccaro et al., 2000](#)). The original sample, tested from 1992 to 1993, consisted of 1819 Army officers ranging in ranks from second lieutenant to full colonel (see [Zaccaro et al., 2000](#) for a detailed description). Participants in the original study completed a 2-hour assessment battery that included a range of demographic, personality, and cognitive measures. While the original sample included officers from both the Active and Reserve Components, the current sample was limited to those officers from the Active Component. Participants who were originally in the Army National Guard or Army Reserves were excluded because the job requirements and retention issues in the Reserve Component are known to differ from those of the Active Component ([Headquarters Department of the Army, 2010](#)).

A matching of the Active Army cases in the 1992/1993 dataset against the longitudinal database used to derive continuance scores yielded a total of 640 officers. This updated database was the final dataset used in the current study. The sample included the following officer ranks as of 1993: 63 second lieutenants, 62 first lieutenants, 177 captains, 167 majors, 144 lieutenant colonels, and 27 full colonels. The majority of officers who were excluded from the final database were non-Active Army officers (i.e., National Guard or

Table 1
Means, standard deviations, and correlations.

Variable	M	SD	N	1	2	3	4	5	6	7	8	9	10
1. Leader continuance ^a	20.58	7.41	633										
2. Gender ^b	1.07	.26	629	-.14**									
3. Marital status ^c	.78	.41	639	.40**	-.18								
4. Measurement form ^d	.49	.50	587	.04	-.03	.02							
5. Self reported developmental experiences	2.22	.58	629	.52**	-.05	.29**	.06						
6. Coded developmental experiences – majors	3.62	1.23	362	.45**	-.02	.14*	-.03	.11*					
7. Coded developmental experiences – Lt. Cols	.68	.94	396	.69**	-.07	.12*	.01	.21**	–				
8. Verbal reasoning	25.48	5.27	498	.10*	.02	.09	-.03	.09*	.13*	-.02			
9. Complex problem solving	2.77	.64	587	.41**	-.11**	.25	.08	.40**	-.03	.17**	.12**		
10. Divergent thinking	2.67	.44	598	.42**	-.04	.20**	.04	.40**	.18**	.26**	.20**	.50**	
11. Writing skill	2.30	.39	600	.23**	-.03	.205**	-.02	.18**	.16**	.02	.20**	.28**	.27**

* $p < .05$.

** $p < .01$.

^a Continuance was measured by total years of service.

^b Gender coded as 1 = male, 2 = female.

^c Marital status coded as 0 = single, 1 = married.

^d Measurement form refers to whether officers responded to the cued (0) or uncued (1) form.

Army Reserves). A smaller number of cases were excluded due to missing identification. Of the 640 officers in the original 1993 sample, 187 (29%) were still in the Active Component of the U.S. Army as of September 2008. Also, we note that missing data on particular variables in the data set resulted in some loss of participants for the regression analyses. We had continuance data for 633 officers. Our sample sizes for individual predictor variables extracted from the full sample ranged from 498 to 639 (see Table 1).

Measures

Constructed response measures of complex problem solving skills and divergent thinking were taken from the 1992/1993 archival sample. We also extracted measures of general cognitive ability, and demographic variables (gender, marital status). Several of these measures are described below and in Zaccaro et al. (2000). Measures on which responses were open-ended were rated by three trained coders. As indicated below, inter-rater reliabilities were high.

Cognitive attributes

Four sets of cognitive attributes were extracted from the 1992/1993 sample – complex problem solving skills, divergent thinking skills, verbal reasoning, and writing skills. To assess complex problem solving skills, participants completed one of two measures, each given to one-half of the original sample. One of the measures entailed the presentation of a military scenario to the participants along with cued prompts that specifically asked for responses around a set of problem solving processes. The presented military scenario was based on a hypothetical World War I scenario in which the participant adopted the role of a British general leading an Indian expeditionary force stationed in Mesopotamia. The general in the scenario is charged with planning a mission to capture Baghdad from the Turks (who were allies of Germany), despite being “too poorly equipped and undermanned to fight a prolonged war” (Zaccaro et al., 2000, p. 43). The scenario then provided the participant with information about the unit's equipment, availability of medical care, existing environmental conditions, and the relative strength of the two armies.

After reading the scenario, the participants were asked to respond to several prompts that cued specific problem solving constructs (Mumford, Marks et al., 2000; Mumford, Zaccaro et al., 2000; Mumford, Campion et al., 2007; Mumford, Friedrich et al., 2007), including those related to problem construction (“What do you see as the problem facing your army?”), solution generation (“what information do you feel you would need before deciding what to do?”, “what kinds of information do you feel are most crucial to solving the problem?”), solution evaluation (“Among the various plans of action that you may have considered, how did you decide which plan was best?”), and solution implementation (“what was the plan of action that you decided on?”; “how would like to see your plan carried out?”) (Zaccaro et al., 2000, p. 43). These responses were then rated for effective skill application by a set of judges who were doctoral students. These raters received training in the definition of skills to be rated and examples of varying levels of skill application. This training included practice exercises and discussions to consensus. Interrater reliability for this measure was .82. The full scenario along with the ten specific prompts and additional description of the rating procedures can be found in Zaccaro et al. (2000, pp. 42–43).

The original sample completed a second and shorter uncued measure of problem solving skills. This measure also presented military scenarios to participants. For example, one such scenario indicates that Burma has invaded Indonesia, who in turn has requested help from the United States. The participant is then tasked with developing a planned military response. The scenario provides a few additional details regarding relative troop strength, tank and artillery resources, and tactical air support. Participants are then simply asked to indicate the components of their developed plan. Raters (also doctoral students) assessed each of the plans for quality of displayed solution generation and implementation skills. They also participated in a rater training exercise similar to the one used for the cued measure. Interrater reliabilities for these assessments were .82. Additional details along with actual Burma scenario are presented in Zaccaro et al. (2000, p. 44).

One possible concern in the original scoring protocols used to produce these measures was the use of doctoral students as raters of military exercises. However, Zaccaro et al. (2000) described an earlier study (Zaccaro, Marks, O'Connor-Boes, & Constanza, 1995) in which a mixed team of military and student raters were used to rate these same measures from a different sample. The interrater reliability in that study was .81, suggesting that military and nonmilitary raters were able to score the responses in similar ways for display of problem solving skills.

In the original sample, the two sets of complex problem solving measures exhibited comparable correlations with related variables (see Table 10 in Zaccaro et al., 2000). Also, in the current sample, both measures showed similar patterns of significant relationships with divergent thinking (cued measured: $r = .42$; uncued measure: $r = .54$), the self-reported career developmental experiences (cued measured: $r = .38$; uncued measure: $r = .42$) and continuance (cued measured: $r = .32$; uncued measure: $r = .49$). Therefore, to minimize loss of sample size that resulted by only half of the original sample receiving each measure, the scores on each were converted to z-scores, then combined across the entire sample into a single measure labeled “complex problem solving skills.” However, measurement form (cued vs. uncued) was also coded and included in our analyses to account for possible differential relationships of each form to our criteria.

Divergent thinking skills were assessed with the Consequences A test from Christensen, Merrifield, and Guilford (1953). Respondents are provided with a number of unusual events (e.g., “gravity is cut in half”). They are then asked to list as many likely consequences of such events as occurred to them. These responses were then rated by three trained judges on several dimensions including quality, originality, realism, complexity, and outcome sensitivity. Judges were trained using procedures similar to those outlined earlier for the cued problem solving task. The scores on all the dimensions were combined into an overall index of divergent thinking skills relevant to leadership (Mumford, Supinski, Baughman, Costanza, & Threlfall, 1997; see Zaccaro et al., 2000 for more details). The average interrater reliability across ratings was .82.

To assess general mental ability or intelligence as a control in our analyses, we used two measures completed by the participants. The first was the Employee Aptitude Survey Verbal Reasoning Test (Ruch & Ruch, 1980), which asks participants to complete six five-item logic problems. Prior studies have reported retest reliabilities and internal consistencies ranging from the low .80s to the .90s (Grimsley, Ruch, Warren, & Ford, 1985; Ruch, Stang, McKillip, & Dye, 1994). The second measure was the Alternative Headlines Test from Guilford and Hoepfner (1966), which assessed writing skill. Participants were given ten news headlines and were asked to rewrite each one in a new way. Three judges (doctoral students) that were trained using similar procedures to those outlined for the cue problem solving measure rated on five-point scales each restated headline for quality and originality, as well as for (a) the retention of the key point in the original headline, (b) its conciseness without using words from the original headline, and (c) its improvement of the original headline in terms of style and content (Hayes & Flower, 1986). Interrater reliabilities averaged .69. The scores were combined into an overall assessment of writing skill (see Zaccaro et al., 2000, for more details).

Developmental experiences

Developmental experiences were assessed with two separate measures, one extracted from the 1992–1993 sample, and the other created from subsequent U.S. Army records. The original sample contained a self-report measure called the *Career Experiences Questionnaire* (Mumford, Marks et al., 2000), from which we extracted 11 biographical data items asking about an officer's unique or special career-related experiences. Sample items included "How many special assignments have you had in the last 5 years?" and "How often have you taken care of work group problems for your boss?" This measure demonstrated an internal consistency coefficient of .67. The relatively low alpha may be due to the fact that officers surveyed in 1993 were at different stages of their careers (e.g., different ranks) and may not have had the same opportunities to hold certain positions or have the same experiences. For example, the experiences attained as a lieutenant colonel in 1993 would be very different in terms of challenge and variety than the experiences attained as a 1st lieutenant in 1993.

Developmental experiences were also assessed in two subsamples of officers by coding for whether or not they held a number of key positions that are considered relatively unique and highly developmental in nature. At the lower ranks (e.g., 2nd lieutenant, 1st lieutenant, and captain), work experiences are very similar for each officer. For example, the assignment of platoon leader for a 1st lieutenant provides a very common experience for officers in branch specialties that have such a position. If officers do not attain this experience, they will most likely not be promoted; thus, almost all 1st lieutenants hold this position (except for those for whom the position does not exist in their branch), rendering no substantial variation in the quality of developmental experiences at this level. Therefore, their scores were not included in the subsample using this measure to assess the effects of developmental experiences on career continuance.

The subsample of majors included officers who attained the rank of major by or after 1992 and for whom we had records of their developmental experiences during their tenure as majors. Similarly, the subsample of lieutenant colonels included officers who attained the rank of lieutenant colonel by or after 1992 and for whom we had records of their developmental experiences during their tenure as lieutenant colonels.

At the rank of major in the U.S. Army, work experiences begin to differ more significantly in their developmental nature, particularly in terms of challenge and variety. Positions held as a major may involve staff positions for more senior commanders, or units dealing with more novel and strategic problems. Also, attendance in particular formal educational settings also varies in terms of possible challenge. Three military subject-matter experts (SMEs) were interviewed and provided information about these positions and experiences in terms of their degree of likely developmental challenge for typical incumbents. From these interviews, a list of challenging developmental experiences were generated and validated by the SMEs. These experiences are displayed in Appendix A. Two coders then assigned scores to participants by counting the presence or absence of these relatively unique developmental experiences in the records of each officer who had advanced to the rank of major at some point over the course of data collection from 1992 to 2008. Each coder coded one half of the sample. Then, each coder examined the other half of the sample for count accuracy. Both coders then reached consensus on any discrepancies. Officers for whom the data did not allow us to capture their entire tenure as majors (i.e., those participants who had already attained the rank of major or higher prior to 1993) were eliminated, leaving 362 officers in this sample.

A second subsample was created from a similar coding scheme used with officers who had also reached the more senior rank of lieutenant colonel. In this position, officers typically experience command of battalions, which are generally composed of 500–600 soldiers organized into 3–5 companies (United States Army, 2015). In creating this sample, we again eliminated officers for whom we could not capture their full tenure at the rank of lieutenant colonel between 1993 and 2008. The final sample contained 396 lieutenant colonels (note that some of these individuals were also captured in the subsample of majors, as they had been promoted to major after 1993, and then promoted to lieutenant colonel). Again, attendance in particular formal educational settings varied in terms of possible challenge. At the rank of Lieutenant Colonel, formal education is available at the Army War College. The curriculum at the Army War College prepares students for strategic level leadership and can be delivered one of two ways (United States Army War College, 2014). The Resident Education Program offers a variety of core and elective courses, and includes strategic exercises and advanced seminars. The Distance Education Program consists of on-line courses, although participants do attend relatively short in-resident courses. Because of differences in delivery and opportunities to network with senior leaders, our subject matter experts indicated that the Resident Education Program is considered more challenging and fruitful in terms of developmental experience. This was the only developmental experience that could be obtained from U.S. Army records for lieutenant colonels, as much data was missing from other possibly codeable experiences.

Leader continuance

Measures of continuance were derived from an Army longitudinal research database, which contained officer personnel records updated through 2008. Continuance was assessed by determining the total number of years the participant served (or continues to serve) as a commissioned officer in the Army. Because of the varying ranks of the participants in the sample, some of the years of service occurred before administration of the measures. The average amount of participants' service from time as a second lieutenant (lowest rank) to the measure administration was about 9 years. However, the initial military service obligation ranged from about 4–8 years for this sample (Department of the Army, 2007), which means that on average officers could not even make their initial voluntary continuance or turnover decision until within 1–5 years prior to measure administration. Moreover, the average years of continuance for participants in this sample was 20.6 (SD = 7.4; see Table 1); thus, the average officer in our sample had many years after measure administration that was represented in the continuance criterion.

Results

Table 1 indicates the means, standard deviations and correlations among the variables in the present study. Initial support for our hypotheses is suggested by several correlations. First, all four of the cognitive skills and abilities were significantly associated with leader continuance in the Army. Both complex problem solving skills ($r = .41$) and divergent thinking skills ($r = .42$) displayed stronger correlations than verbal reasoning ($r = .10$) and writing skills ($r = .23$). This supports our earlier assertion that higher order cognitive capacities may display a stronger association with leader continuance and retention, than general mental ability. Table 1 also indicates significant correlations between complex problem solving ($r = .40$) and divergent thinking skills ($r = .40$), respectively, with officer self-reports of their challenging developmental experiences. Divergent thinking skills were also associated with coded developmental experience scores for majors ($r = .18$) and lieutenant colonels ($r = .28$). Finally, leader continuance was associated with self-reported developmental experiences ($r = .52$), and the coded experiences scores for majors ($r = .45$) and lieutenant colonels ($r = .69$).

Hypothesis 1 was tested with a hierarchical multiple regression analysis in which the control variables of gender, marital status, and measurement form were entered in Step 1. The cognitive attributes were entered in Step 2. The results of this analysis, shown in Table 2, indicated that after controlling for demographic and measurement variables, the set of cognitive attributes contributed significant incremental variance in leader continuance ($\Delta R^2 = .15, p < .01$). In the final step, complex problem solving skills and divergent thinking remained as significant predictors. Both verbal reasoning and writing skill were not significantly associated with continuance. Thus, Hypothesis 1 was supported.

The original data set contained a number of other individual differences (Connelly et al., 2000). To ascertain whether different attributes may account for our observed effects, we completed a regression analysis, in which continuance scores were regressed on these other individual attributes in Step 1, and the four cognitive capacities in Step 2. The results of this analysis indicated that after controlling for 22 other individual differences, the four cognitive capacities still added significant incremental variance to the prediction of continuance ($\Delta R^2 = .09, p < .01$). Again, complex problem solving ($\beta = .17, p < .01$) and divergent thinking skills ($\beta = .22, p < .01$) contributed unique variance, while verbal reasoning and writing skills did not (see Appendix B for these results).

To test Hypothesis 2, that complex problem solving skills (H2A) and divergent thinking skills (H2B) are positively associated with developmental experiences, we performed three multiple regressions, one for each sample (total, majors, lieutenant colonels). Developmental experiences were regressed onto complex problem solving and divergent thinking skills as well as the general cognitive ability measure of verbal reasoning and writing skills and the control variables of gender, marital status, and measurement form. As shown in Table 3, results for the total sample supported Hypothesis 2A and B. Both complex problem solving skills ($\beta = .23$,

Table 2
Regression of continuance on control variables and cognitive capacities in total sample.

	Standardized betas
Step 1	
Gender ^a	-.07
Marital status ^b	.39**
Measurement form	.03*
R ²	.17**
	$F(3,484) = 32.79$
Step 2	
Verbal reasoning score	-.01
Complex problem solving	.20**
Divergent thinking	.25**
Headlines/writing	.05
R ²	.32**
ΔR^2	.15**
	$\Delta F(4,480) = 27.02$

* $p < .05$.

** $p < .01$.

^a Gender coded as 1 = male, 2 = female.

^b Marital status coded as 0 = single, 1 = married.

Table 3

Divergent thinking and complex problem solving skills as predictors of developmental experiences.

	Total sample self-reported experiences	Majors coded experiences	Lieutenant colonels coded experiences
Gender ^a	.02	–.01	–.05
Marital status ^b	.18**	.11	.10
Measurement form	.03	–.03	.00
Verbal reasoning score	.00	.09	–.08
Complex problem solving	.23**	–.07	.07
Divergent thinking	.25**	.14*	.25**
Headlines/writing	.01	.09	–.02
R ²	.25**	.07*	.09
	<i>F</i> (7,480) = 22.80	<i>F</i> (7,281) = 2.95	<i>F</i> (7,276) = 3.98

* $p < .05$.** $p < .01$.^a Gender coded as 1 = male, 2 = female.^b Marital status coded as 0 = single, 1 = married.

$p < .01$) and divergent thinking skills ($\beta = .25, p < .01$) explained significant unique variance in self-reported developmental experiences, while verbal reasoning skills ($\beta = .00$) and writing skills ($\beta = .01$) displayed no significant effects. Marital status was the only control variable significantly related to developmental experiences ($\beta = .18, p < .01$). Being married was positively related to participation in developmentally-oriented career experiences.

Results for the major and lieutenant colonel samples, also shown in Table 3, used coded developmental experiences and supported Hypothesis 2B, but not Hypothesis 2A. In the major sample, only divergent thinking skills explained unique variance in coded developmental experiences ($\beta = .14, p < .05$) but complex problem solving skills did not. Verbal reasoning and writing did not account for significant variance, nor did any of the control variables. The same pattern was seen in the sample of lieutenant colonels (see Table 3) indicating that divergent thinking skills, but not complex problem solving skills, explained unique variance in developmental experiences ($\beta = .25, p < .01$). Again, control variables and the general cognitive abilities had no significant effects.

To test Hypothesis 3, that developmentally oriented experiences are positively associated with leader continuance, we performed three multiple regressions, one for each of the three samples. Continuance was regressed on self-reported developmental experiences in the total sample and on coded developmental experiences in the major and lieutenant colonel samples in step one of the regressions shown in Table 4. Developmental experiences accounted for significant variance in continuance (27%, 20%, and 47%) in the total sample ($\beta = .52, p < .001$) in the majors sample ($\beta = .45, p < .001$) and in the lieutenant colonels sample ($\beta = .69, p < .001$). Step 2 in these analyses added the covariates (gender, marital status, and measurement form) and the cognitive skills (complex problem solving, divergent thinking, verbal reasoning, and writing). Complex problem solving ($\beta = .12, p < .05$) and divergent thinking skills ($\beta = .17, p < .01$) accounted for significant continuance variance in the total sample. Divergent thinking ($\beta = .13, p < .05$) was significant in the majors sample while complex problem solving was significant in the lieutenant colonels

Table 4

Divergent thinking and complex problem solving skills as predictors of continuance after controlling for developmental experiences.

	Total sample continuance Standardized betas	Majors continuance Standardized betas	Lieutenant colonels continuance Standardized betas
Step 1			
Developmental experiences ^a	.52**	.45**	.69**
R ²	.27**	.20**	.47**
	<i>F</i> (1,486) = 179.22	<i>F</i> (1,287) = 71.01	<i>F</i> (1,282) = 254.31
Step 2			
Gender ^b	–.06	.07	.00
Marital status ^c	.23**	.25**	.06
Measurement form	.00	–.04	–.04
Verbal reasoning score	–.01	.01	–.06
Complex problem solving	.12*	.00	.12**
Divergent thinking	.17**	.13*	.02
Headlines/writing	.05	.07	.00
R ²	.40	.30	.50
ΔR ²	.13**	.10**	.03†
	Δ <i>F</i> (7,479) = 14.98	Δ <i>F</i> (7,280) = 5.49	Δ <i>F</i> (7,275) = 1.95

† $p < .06$.* $p < .05$.** $p < .01$.

^a Self-reported experiences were used in the total sample, while two different coded developmental experiences were used in the major and lieutenant colonel samples respectively.

^b Gender coded as 1 = male, 2 = female.^c Marital status coded as 0 = single, 1 = married.

Table 5

Mediation analyses for total, major, and lieutenant colonel samples.

Variable	Total effect	Direct effect	Indirect effect	Significance for indirect effect		
				Bootstrap		
				SE	95% confidence interval	
					Lower	Upper
Total sample						
Complex problem solving	3.17	1.85	1.32	.25	.86	1.85
Divergent thinking	4.46	3.08	1.38	.34	.76	2.08
Verbal reasoning	−.01	−.01	.00	.02	−.04	.04
Writing skills	.86	.54	.32	.32	−.29	.94
Majors						
Complex problem solving	.00	.00	.00	.00	.00	.00
Divergent thinking	1.51	1.00	.51	.24	.07	1.01
Verbal reasoning	.04	.01	.03	.03	−.01	.07
Writing skills	1.79	1.35	.44	.44	−.05	.96
Lieutenant colonels						
Complex problem solving	1.48	.99	.49	.27	−.05	1.03
Divergent thinking	1.11	−.21	1.31	.42	.50	2.15
Verbal reasoning	−.08	−.04	−.04	.03	−.10	.02
Writing skills	−.54	−.78	.24	.44	−.63	1.11

sample ($\beta = .12, p < .01$). We followed up on these results using Preacher and Hayes' (2004) bootstrapping procedure to test Hypothesis 4, which suggested complex problem solving and divergent thinking skills would mediate the relationship between developmental experiences and continuance.

Table 5 shows the results of three indirect effects analyses conducted using the mediate macro developed by Hayes (2013). Each model was run with 95% bootstrap percentile confidence intervals based on 10,000 bootstrap samples. In the first analysis using the total sample and subject-reported developmental experiences, significant indirect effects were present for complex problem solving skills [CI = .86, 1.85] and divergent thinking [CI = .76, 2.08] on continuance through developmental experiences. Verbal reasoning skills and writing skills did not display significant indirect effects, as they did not satisfy the criteria for mediation (Preacher & Hayes, 2004).

Due to the cross-sectional nature of the self-reported developmental experience survey, mediation was also tested using the longitudinal data in the subsamples of majors and lieutenant colonels. These results are also shown in Table 5. In the majors subsample ($N = 362$), a significant indirect effect was found for divergent thinking skills [CI = .07, 1.01]. Similar results were found using developmental experiences at the rank of lieutenant colonel ($N = 396$). The indirect effect of divergent thinking skills on continuance was significant [CI = .50, 2.15]. These analyses did not find similar significant effects using developmental experiences as a mediator of the relationships between complex problem solving skills and continuance. As was the case in the total sample, verbal reasoning and writing skills did not exert indirect effects on continuance.

Taken together, these results partially support Hypothesis 4. Developmental experiences transmit the effects of divergent thinking skills and complex problem solving skills when a self-report survey is used to quantify developmental experiences. However, when we examine a more longitudinal sample of officers at particular ranks, divergent thinking is the only cognitive ability (of those we looked at) that is significantly associated with continuance through developmental experiences.

Although we did not propose hypotheses regarding nonlinear relationships of cognitive abilities with continuance, we did examine these effects based on the findings of previous research (Maltarich et al., 2010). In order to test for curvilinearity, we performed a hierarchical regression with control variables in Step 1, cognitive abilities in Step 2, and their quadratic terms in Step 3. Entering the quadratic terms as a group accounted for no incremental variance in continuance and none of the individual quadratic terms even approached significance.

Discussion

The purpose of this study was to examine the relationship between leader complex problem solving and divergent thinking skills, respectively, and leader continuance or years of organizational service. The organization that provided the sample for this study, the U.S. Army, has a closed personnel system in which (a) all leaders at all organizational ranks except entry level are selected and promoted from within (except for a few positions requiring officers with very specialized training, e.g., doctors), and (b) at different time points, particularly prior to midcareer, leaders need to make a clear decision on whether they would continue their service or leave the organization. Given the investment the Army makes in its leaders, these decisions carry considerable weight; therefore, understanding the individual attributes that facilitate leader continuance and retention can provide the basis for more effective selection and promotion decisions. Also, such understanding can contribute to the more general turnover literature that is largely bereft of (a) studies that have focused on cognitive abilities, particularly those examined here, and (b) studies that have used samples of leaders and executives.

Cognitive capacities and leader retention

The results of our study provide support for our hypothesis that complex problem solving skills and divergent thinking capacities were positively associated with leader continuance and retention. Moreover, the effects of these skills were stronger than those of more general mental abilities. Organizational leadership offers position incumbents considerable job challenge that increases as leaders transcend organizational levels (Jacobs & Jacques, 1987; Zaccaro, 2001). This challenge stems from the nature of leadership as a form of social problem solving in which the problems that leaders need to face become increasingly complex at higher levels (Jacobs & Jacques, 1987; Mumford, 1986; Zaccaro, 2001). A prior study of general mental ability and leader advancement did not find a significant relationship (Li et al., 2011). However, complex problem solving skills and divergent thinking are two specific higher order cognitive capacities that are more attuned to the nature of leadership positions, particularly at mid or upper organizational levels (Zaccaro, 2001). General cognitive ability is a fundamental requisite for most leadership positions (Mumford, Campion et al., 2007; Mumford, Friedrich et al., 2007) and has not been found to vary as a predictor of leader effectiveness across organizational levels (Hoffmann et al., 2011). Complex problem solving skills and divergent thinking are more likely to fit job requirements at higher levels (Jacobs & Jacques, 1987; Mumford, Campion et al., 2007; Mumford, Friedrich et al., 2007), and therefore are more likely to be associated with leader continuance in an organizational leadership track.

This argument is congruent with the one suggested by the gravitational hypothesis (Maltarich et al., 2010). This hypothesis argues that job incumbents will make job mobility choices that result in greater congruence between their cognitive abilities and the challenges they are required to confront in their jobs. Prior studies have examined this hypothesis in samples containing a broader spectrum of jobs that may or may not have included leadership positions (Maltarich et al., 2010). Because leadership positions contain considerable challenge that increases as individuals move across organizational levels, they would provide a different context than most other types of jobs for the examination of cognitive capacities and employee continuance. In such positions, especially in organizations with fully or mostly closed personnel systems, choices to stay or leave follow from the perceived higher challenge of future leadership responsibilities, and the likelihood of acquiring those responsibilities. Higher complex problem solving and divergent thinking skills should enhance such acquisition and therefore predispose the position incumbent toward continuing in the leadership track. Our findings support this assertion.

Our results also support the role of developmental experiences as explaining the association between higher order cognitive capacities and organizational leader continuance. A key element of the gravitational hypothesis as applied here is that leaders will continue in leadership roles when they perceive both higher job challenge in future leadership activities and a higher likelihood of being selected for those activities. Developmental experiences should enhance the probability of such selection for two reasons. First, these experiences entail exposure to and contention with considerable task challenge (Ohlott, 2004). They are supposed to be challenging enough to “stretch” the leader beyond his or her current skill set (McCauley, Eastman, & Ohlott, 1995; McCauley, Ruderman, Ohlott, & Morrow, 1994; Ohlott, 2004). Accordingly, their successful completion should increase the leader's readiness for more challenging future positions. Second, completion of such activities is likely to grow the leader's capacity for more complex higher level leadership positions (DeRue & Wellman, 2009; McCauley et al., 1994; McCauley et al., 1995; Ohlott, 2004). This readiness and increased capacity for more challenging positions should increase leader perceptions of promotability, and therefore predispose them toward continuance. Our findings support this argument, as both self-report and coded measures of developmental experiences were associated with leader continuance.

Developmental experiences also partially mediated the effects of higher order cognitive capacities, particularly divergent thinking skills on continuance. Higher levels of complex problem solving and divergent thinking skills should increase the likelihood of a leader being selected for such experiences (Tesluk & Jacobs, 1998). Thus, developmental experiences may act as a gateway to promotion into higher leadership positions. In essence, the organization rewards leaders' successful displays of higher order cognitive capacities earlier in their careers with access to opportunities to grow these capacities further, and increases their probability of future promotion. As our results suggest, the effect is an increased willingness to continue in leadership track within that organization.

Another reason why developmental experiences act as a partial mediator explaining the effects of higher order cognitive capacities on continuance is that such capacities may increase the likelihood of leaders learning and growing from such experiences (Tesluk & Jacobs, 1998). The types of developmental activities encountered by leaders are likely to entail more complex and novel problems than is typical in their current position (McCauley et al., 1994, 1995; Ohlott, 2004). Leaders who have higher levels of complex problem solving and divergent thinking skills are more likely to work through problems successively, accruing the learning benefits from their completion. These benefits lead to the kinds of organizational rewards and outcomes that foster continuance in an organizational leadership track.

Implications for practice

Our findings suggest that complex problem solving and divergent thinking skills matter in facilitating leader retention. Some prior studies and essays have argued that cognitive abilities should have deleterious effects on leader continuance, especially in the military, where the attraction of external market forces may be too strong, and officers with higher cognitive abilities tend to leave (Barno, 2013; Kane, 2012). Our findings suggest otherwise. Consequently, organizations may benefit from a focus on complex problem solving and divergent thinking skills in decision systems used to select leaders for organizational entry, for development experiences, and for advancement. A caveat, however, is that entry and lower level leadership positions in most organizations may not provide leaders with enough opportunities to display these skills. These positions are typically well structured, with significant direction provided from higher level managers; moreover the problems confronted by lower level leaders are not likely to have many novel

elements requiring divergent thinking (Katz & Kahn, 1978; Zaccaro, 2001). Thus, the nature of typical work early in a leader's career may not afford organizations with sufficient information about the complex problem solving and thinking skills emphasized in this study.

This lack increases the importance of developmental experiences at this stage. Not only do they provide early career leaders with opportunities to nurture nascent skills, when appropriately structured, they can also serve as an assessment of problem solving and divergent thinking skills at this early career stage. The key is that such experiences need to be carefully designed to have incumbents confront more complex problems than they are used to, with solution elements requiring a greater degree of creativity. Performance variance in such assignments should cue more senior decision makers about which leaders should receive advancement, with attendant consequences for retention. These benefits point to the importance for organizations to provide such experiences to early career leaders. Indeed, the provision of developmental assignments to those leaders with higher cognitive capacities may increase calculative forces on them to stay within the organization, and reduce receptivity to recruitments for positions with other companies.

Limitations

We point to several primary limitations regarding this study and our findings. First, our measures of coded developmental experiences likely did not capture the full range of such activities rising officers would experience. We could only code what we could (a) find in the extant record, and (b) consider as truly challenging and stretching for the participant. Also, our self-report measure, while broader in its coverage, was administered in the same time frame as the measures of cognitive capacities. While the latter were likely to be relatively stable and therefore precede the occurrence of the self-reported experiences, we cannot presume definitively that capacities were likely to be causally determinative of the selection for and completion of developmental experiences.

A second limitation lies in the specification of our model. We proposed complex problem solving skills and divergent thinking as exogenous predictors of both developmental experiences and leader continuance. However, prior studies have suggested that divergent thinking skills may be a predictor of problem solving skills, along with other key variables such as expertise and general mental ability (Guilford & Christensen, 1973; Mumford et al., 1997; Sternberg & O'Hara, 1999; Vincent, Decker, & Mumford, 2002). Although several of our analyses indicated unique effects of these predictors on our outcome variables, the aforementioned prior research suggest the possibility of alternative causal relationships that include our variables as well as several others. Indeed, there are a number of related cognitive capacities that were not included in our study that may influence our set of predictor and outcome variables (e.g., systems thinking, cognitive flexibility; practical intelligence). Accordingly, future studies should explore in more detail how more complex arrangements of different cognitive capacities influence both the receipt and accomplishment of development experiences, as well as overall organizational continuance.

A third limitation pertains to inferences of causality that can be made from our findings. As continuance was defined as total year of service, some portion of it occurred prior to measure administration. However, as we noted earlier, for much of the sample, the measures were administered relatively close to (or before) the time officers completed their military service obligation and could make their first decision to leave the Army. Likewise, our measure of continuance contained on average many years of service after measure administration. Caution about causal inference also stems from the measure of development experiences that was a self-report assessment administered at the same time as the cognitive measures. We added the coded measure using two subsamples to partially address this concern. Nonetheless, it is possible that the occurrence of multiple development experiences can raise cognitive capacities, in turn explaining the effects of experiences on continuance rather than the obverse as we have suggested in our arguments. We suggest that future studies use a design that incorporates multiple assessments over time of cognitive capacities, challenging developmental assignments, and stay/turnover decisions to provide a more fine-grained analysis of which variables are leading indicators of others, and the temporal or dynamic interactions of these variables.

A fourth limitation pertains to the nature of the organization as a relatively closed personnel system in which all promotions to higher organizational ranks came from inside. This kind of system may present different reward possibilities than more open systems where higher level leaders can be hired from outside the company. Our core premise that continuance decisions will be influenced by the perceived match in cognitive challenge at higher ranks with one's own capacities would still apply under both types of hiring systems. However, we suspect that the readiness or likelihood of an organization to engage in external executive hiring will moderate the relationships we found in this study.

Also, members of military organizations often join for reasons beyond monetary or other job-related incentives. Subsequently, they may continue their tenure and employment because of a higher sense of service and commitment to the ideals of such organizations. Such influence reflects what Maertz and Griffeth (2004) call moral/ethical motivational forces on continuance and turnover, which are defined as "maintaining consistency between behavior and values regarding turnover" (p. 669). Other models of cognition and turnover have suggested that individuals with higher cognitive capacities may be recruited more heavily by external organizations, and that internal promotions may actually signal to these organizations the heightened value of these individuals (REFS). This potential dynamic has been used to propose a curvilinear relationship between cognitive capacities and turnover. However, in military organizations, the generally higher service orientations of members, along with calculative forces engendered by higher cognitive skills and developmental experiences may act to minimize their receptivity to external recruitment. This argument suggests that service orientation may moderate the relationships observed in this study. Moreover, the differences between military and other types of organizations that we have suggested here indicate a need to either replicate the relationships we have found here in other non-military organizations, or examine how they might be moderated by particular organizational characteristics.

Conclusion

The relationship between cognitive capacities and retention or turnover has received scant attention in the extant literature. What few findings that have been reported show mixed to no linear effects of general mental ability on organizational continuance. In this study, we examined the higher order and more specific capacities of complex problem solving skills and divergent thinking in the context of officer continuance in an organizational leadership track. Our findings support the association of these skills with leader years of service in an organizational leadership track, and suggest that this effect is partially mediated by challenging developmental experiences. Thus, we provide stronger evidence for the connection between cognitive abilities and decreasing turnover. We hope our findings foster additional research on leader retention and turnover, in order to (a) extend our results to other types of organizations with more porous personnel selection systems; (b) uncover additional mechanisms that explain the association between higher order cognitive abilities and leaders' decisions regarding job and organizational mobility; and (c) examine more closely other individual differences and contextual variables that may interact with cognitive skills in the context of continuance and turnover. Such research can lead to a richer and more nuanced examination of how cognitive capacities are connected to employee retention at different organizational levels.

Appendix 1

Coding of major developmental experiences

Experience/assignment	Coding scheme
Command and General Staff College (CGSC)	0 = did not attend, 1 = attended by correspondence, 2 = attended in residence
Operations and Training Officer (S3)	0 = did not have assignment, 1 = held assignment at Battalion level, 2 = held assignment at Brigade level
Executive Officer (XO)	0 = did not have assignment, 1 = held assignment at Battalion level, 2 = held assignment at Brigade level
General Staff Officer (G3)	0 = held assignment, 1 = did not hold assignment
Chief of Plans/Operations	0 = held assignment, 1 = did not hold assignment
Joint assignment	0 = held assignment, 1 = did not hold assignment
Total development score	Summation of individual assignment scores

Coding of lieutenant colonel developmental experiences

Assignment	Coding scheme
Army War College	0 = did not attend, 1 = attended by correspondence, 2 = attended in residence

Description of experiences

Executive Officer (XO)

At the Battalion and Brigade level, XOs are usually the second highest in position to the commanding officer. Their responsibilities include managing other staff positions. According to [Bonn \(2002\)](#), this staff assignment is considered the “best possible training toward becoming a battalion commander ([Bonn, 2002, p. 298](#)).” This type of experience is considered a challenging assignment that prepares officers for increasing responsibility, with brigade assignments involving more rigorous demands than battalion ones ([Headquarters Department of the Army, 2010](#)).

S-3

The S-3 is a staff position (the Operations and Training Officer), which includes planning and organizing unit operations and training activities. The S-3 also works with the executive officer in contributing to mission-relevant decisions. This position is also considered more developmentally stretching than other positions, especially at higher levels of command involving more units (e.g., Brigade staff) ([Headquarters Department of the Army, 2010](#)).

G-3

The G-3 is a member of the division-level general staff, serving under the supervision of the chief of staff to a general officer. Such positions entail a variety of developmental experiences working with different senior officers, and working across different staff sections ([Bonn, 2002](#)).

Joint Officer

Joint duty experiences entail assignments that include units from two or more military branches working together ([Joint Chiefs of Staff, 2011](#)). These assignments provide opportunities to stretch branch specific skills and knowledge.

Chief of Plans/Operations

Assignment at the division level or lower where the officer is responsible for the development and execution of training, plans, programs and unit operations ([Headquarters Department of the Army, 2010](#)).

Command and General Staff College

This school “educates, trains, and develops leaders for Unified Land Operations in a Joint, Interagency, Intergovernmental, and Multinational operational environment” (United States Combined Arms Center, 2014)

Appendix 2

Effects of cognitive capacities on officer continuance^a after controlling for demographic, measurement, personality and skill variables.

Variable and statistic	Standardized betas	
	Step 1	Step 4
Step 1		
Socially desirable responding	−.03	−.01
Gender ^b	−.11**	−.09*
Marital status ^c	.31***	.25***
Measurement form	.03	.01
Networking skills	.00	.03
Emotional perceptiveness	−.09	−.08
Interpersonal insight	.03	.02
Consideration leadership style	−.01	.03
Structuring leadership style	.05	−.01
Verbal expression skills	−.16**	−.13
Flexibility	.13*	.11
Extroversion	−.02	.01
Dominance	−.03	−.03
Achievement orientation	.07	.07
Stress tolerance	.05	.07
Self efficacy	−.08	−.09
Learning goal orientation	−.21***	−.17***
Status seeking	−.05	−.05
Openness	.03	−.02
Responsibility	.18***	.11
Agreeableness	.08	.04
Tolerance for ambiguity	.11*	.07
Step 2		
Verbal reasoning		−.01
Complex problem solving		.17***
Divergent thinking		.22***
Writing skills		.03
R ²	.29	.38
ΔR ²		.09***

Note: * $p < .05$, ** $p < .01$, and *** $p < .001$.

^aContinuance was measured by total years of service.

^bGender coded as 1 = male, 2 = female.

^cMarital status coded as 0 = single, 1 = married.

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14. ABSTRACT The relationship between cognitive capacities and retention or turnover has received scant attention in the extant literature. The few findings that have been reported show mixed to no linear effects of general mental ability on organizational continuance. In this study, we examined the association of more specific higher order cognitive capacities including complex problem solving skills and divergent thinking with officer continuance in the U.S. Army. We also tested the role of developmental experiences as a partial mediator of this relationship. Our sample included 640 officers who completed measures of these skills and of their career experiences in 1992–1993. To this sample, we added years of service from date of commissioning to 2008, as well as data on whether officers experienced particular assignments considered to be challenging and developmental. Our findings support the association of complex problem solving and divergent thinking skills with leader continuance. We also found that this effect is partially mediated by challenging developmental experiences. Thus, we provide stronger evidence than in prior studies for a linear relationship between cognitive abilities and continuance in an organization.					
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