

Understanding the Retention of High Potential Employees: A Comparison of Survival
Analysis Techniques

by Meredith R. Coats

B.A. in Psychology, May 2013, Texas A&M University
M.Phil in Industrial-Organizational Psychology, May 2016, The George Washington
University

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David P. Costanza
Associate Professor of Organizational Sciences
and of Psychology

The Columbian College of Arts and Sciences of The George Washington University certifies that Meredith R. Coats has passed the Final Examination for the degree of Doctor of Philosophy as of March 12, 2018. This is the final and approved form of the dissertation.

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Meredith R. Coats

Dissertation Research Committee:

David P. Costanza, Associate Professor of Organizational Sciences and of Psychology, Dissertation Director

Lynn R. Offermann, Professor of Organizational Sciences and of Management, Committee Member

Stefanie P. Shaughnessy, Senior Research Psychologist, U.S. Army Research Institute, Committee Member

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Abstract of Dissertation

Understanding the Retention of High Potential Employees: A Comparison of Survival Analysis Techniques

Turnover is an organizational level outcome of interest to organizations as it can represent the loss of highly valued employees as well as organizational resources such as time and money. Organizations are interested in selecting and retaining their high potential (HiPo) employees and consequently invest valuable resources into selecting and developing these individuals. Unfortunately, many organizations are failing to see a return on their investments in HiPo programs due to high rates of turnover for these valuable employees. This study seeks to address and understand this issue through integrating various literatures and then applying analyses that take a temporal approach. Results demonstrate that personality and developmental experiences are significantly related to the likelihood of turnover at any given point in time. Both formal and informal development were predictive of turnover, but these effects were found to diminish over time. Further, the pattern and strength of the relationship between personality, leadership, gender, and turnover varied depending on the type of analysis, the way time was accounted for in the analysis, and whether voluntary and involuntary turnover were considered together or separate. These results demonstrate that accounting for time influences the results and inferences that can be drawn from analyses and highlight the need for greater care and specificity when testing organizational theories.

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Table of Contents

Acknowledgements	iv
Abstract of Dissertation	iv
List of Figures	viii
List of Tables	ix
Chapter 1: Introduction	1
Chapter 2: Literature Review	11
Chapter 3: Method	40
Chapter 4: Results	62
Chapter 5: Discussion	85
References	121

List of Figures

Figure 1. Survival Function	67
Figure 2. Hazard Function	67
Figure 3. Survival Function at Mean of Covariates	73
Figure 4. Hazard Function at Mean of Covariates	73
Figure 5. Survival Function at Mean of Covariates by Turnover Type	84
Figure 6. Hazard Function at Mean of Covariates by Turnover Type	84

List of Tables

Table 1. Variable Summary and Correlations	64
Table 2. Life Table	66
Table 3. Kaplan-Meier Estimates	68
Table 4. Survival Analysis Model Results	72
Table 5. Survival Analysis Piecewise Regression Results	78
Table 6. Competing Risks Model Results	83
Table 7. Summary of Variables Across Analyses	97

Chapter 1: Introduction

For over 100 years, organizations have been seeking to discover causes of employee turnover and ways to reduce it (Diemer, 1917; Fisher, 1916; Slichter, 1919). Despite a great deal of research in the intervening years, employee retention and attrition remain of great interest to practitioners (Silzer & Dowell, 2010) and researchers (Hom, Lee, Shaw, & Hausknecht, 2017) alike. In particular, employers are interested in reducing the turnover of high potential employees (HiPos), or individuals expected to eventually fill leadership positions and contribute to the competitive advantage of an organization (Deloitte, 2017; Karaveli & Hall, 2003; Sizer & Church, 2009; Sizer & Church, 2010). In fact, a recent survey by the Society for Human Resource Management showed that development and retention of talent or HiPos are two of the top three human resource concerns (SHRM, 2015).

Organizations invest a lot of time and resources into the identification and training of HiPos, but the time and money are wasted if these employees leave before they ever fill these future roles (Barrick & Zimmerman, 2005; Barrick & Zimmerman, 2009; Tulgan, 2001). Unfortunately, there is little understanding of what leads to turnover of HiPo employees (Cappelli & Keller, 2014). Fewer than one third of organizations that invest in HiPo programs report receiving a significant return on their investment (Martin & Schmidt, 2010). To prevent further wasted resources and loss of valuable employees, organizations must first gain a better understanding of determinants and antecedents of HiPo turnover.

The continued focus on reducing HiPo turnover and the limited information available on what impacts the likelihood of turnover is attributable to two factors. First,

the siloed nature of research on turnover antecedents has resulted in a lack of understanding in how various antecedents work together to influence turnover. That is to say, there are many possible factors that could lead to a turnover decision such as individual differences, developmental opportunities, promotion opportunities, and other external factors. However, these antecedents are often studied within their own respective literatures rather than in conjunction with one another.

Second, the exclusion of time in research, both in terms of the amount of time until an event occurs and when an event occurs, has resulted in a dearth of information on how turnover antecedents change and unfold during an employee's tenure in addition to not allowing for a more complete understanding of the role of time in HiPo turnover. Both of these factors continue to complicate the prediction and reduction of employee turnover, and HiPo turnover in particular.

In the turnover literature, time has been cited as a critical component that needs to be incorporated in theory and research to improve understanding of turnover (Kammerlyer Mueller, Wanberg, Glomb, & Ahlburg, 2005). While there have been some attempts to remedy this in the general turnover literature, the role and impact of time is virtually non-existent in the study of high potentials, further contributing to the incomplete understanding of what leads to retention of HiPos. A better understanding of the role of time would include information about when events occur (e.g., the date of turnover), the duration of time until an event occurs (e.g., the number of years until turnover), and how dynamic variables might change over the course of time and how those changes relate to an event of interest (e.g., declining job satisfaction over time may lead to turnover). However, there are several bodies of literature in related domains that can contribute to

understanding of 1) what leads these highly valuable employees to turnover from an organization and 2) the impact and role of time in understanding HiPo turnover.

Theories to Increase Understanding of HiPo Turnover

Literature in the areas of turnover, employee development, and career paths provide frameworks, ideas, and approaches for the development of a more integrated framework that might elucidate the role of various antecedents to HiPo turnover. By integrating theory from these domains, it is possible to explicate the role of time and how time and other career related variables can influence turnover decisions. Collectively, these areas can clarify and explain theory as it pertains to HiPos and can offer insights and guidance for human resource practices and interventions.

Turnover Theory. The lack of time and temporal dynamics in turnover studies has long been lamented by researchers (Mobley, 1982; Morita, Lee, Mowday, 1993; Kammeyer-Mueller et al., 2005) and the importance of studying time and changes in antecedent variables is still listed as a top concern for future research (Hom, et al., 2017). By integrating career and developmental variables over time and capturing their dynamism, their impact and relationship with more commonly investigated individual difference variables can be uncovered to understand turnover antecedents. To improve the prediction of turnover, turnover research needs to be further integrated with employee experiences (e.g., development and career changes) and the timing of these experiences needs to be explored.

Talent Management. Increased organizational competition has given rise to the emergence of talent management departments (often a re-branding of previously existing human resources departments) within organizations. Talent management departments

emphasize selecting, developing, and retaining employees that will help to further the organizations' advantage in a competitive market (Cappelli & Keller, 2014). Many talent management departments create programs around employees that have the most potential to succeed and give them the designation of HiPo (Finklestein, Costanza, & Goodwin, 2017). Such programs are designed to identify, develop and retain an organization's best employees. The value of HiPos is often touted to be important for the competitive advantage of an organization (Karaveli & Hall, 2003; Silzer & Church, 2009; Silzer & Church, 2010), making the retention of these employees particularly important. However, many organizations struggle to retain their HiPos, with some research showing that over half of HiPos leave and drop out of the HiPo programs (Burke, 2014). Since talent management programs are designed to track employees over the course of their organizational tenure, integrating information and variables from this literature could uncover relevant aspects of talent management that pertain to and are predictive of HiPo retention such as their development experiences and the timing of those experiences during their time in an organization.

Employee Development. Employee development has been proposed as a solution to losing valuable talent because such efforts communicate to employees that they are valued and can help them to reach their career goals (Fernández-Aráoz, Groysberg, & Nohria, 2011; Coetzee & Stoltz, 2015). Development is particularly relevant to HiPo employees because identifying HiPos early in their career or tenure with an organization allows for specialized training, interventions, and opportunities. Because of this, many organizations choose to use a disproportionate amount of their development budgets on their high potential employees (Cappelli & Keller, 2014). While this is common practice

in talent management, many organizations report a lack of return on their investment in these HiPo programs (Martin & Schmidt, 2010). There is a lack of empirical evidence and theoretical support to understand why these programs are not leading to higher levels of retention. By examining both formal and informal developmental experiences of HiPo employees over their time with an organization, the link between development and turnover can be clarified and a better understanding of why these programs are not successful may emerge. This should in turn inform theory about employee development by both linking it to outcomes such as turnover and by contributing an understanding of time and timing of development to theory pertaining to employee development.

Career Paths. There is very little research that considers HiPo individuals from a modern or longitudinal career theory perspective (Dries & Pepermans, 2008). Further, career path research is often lacking in empirical evidence, particularly when concerning high potential employees (Dries & Peperman, 2008), limiting the conclusions that can be drawn about modern career paths and how it relates to turnover decisions for these individuals. Careers have been described in the literature with the metaphor of careers as a journey (Inkson, 2004). This career metaphor consists of two key career facets- time and direction (Adamson, Doherty, & Viney, 1998; Inkson, 2004). These metaphorical descriptions recognize the changes in positions and development that individuals go through over the course of their working lives in various organizations. Modeling these career changes over time can also help to understand how job changes over an individual's career impact turnover.

Leadership development, career changes, and experiences unfold over time (Arthur, Hall, & Lawrence, 1989a, 1989b) and are directly related to how and when an

individual chooses to leave an organization. Understanding direction and career changes leads to better understanding factors that lead to turnover or job changes within a single organization and will clarify and expand the theoretical importance of time dynamic predictor variables in turnover theory and can help to address the issue of HiPo retention. To reap the benefits of integrating these bodies of literature, there are analytic and methodological barriers that need to be addressed.

Analytical and Methodological Barriers to Test Integrated Theory

There is very little empirical research devoted to the issue of what leads to HiPo turnover which further contributes to the lack of understanding (Cappelli & Keller, 2014). Using empirical data from the aforementioned content areas can help to elucidate what leads to HiPo turnover and deepen theoretical understanding. A key challenge to integrating theory from these domains is that doing so requires a longitudinal approach and longitudinal data to capture the relevant dynamics and time related components of theory. Longitudinal data is not often used because it is complex in addition to being difficult and time consuming to collect (Shipp & Cole, 2015). However, the benefits of utilizing longitudinal data and conducting longitudinal analysis far outweigh the difficulties, especially in areas where the consideration of time as a factor is severely lacking.

In addition to using longitudinal data, there is a need to study HiPo individuals with analytic techniques that appropriately incorporate temporal components to improve our theory, conceptualization, and prediction of criterion of interest. Capturing this variance and dynamism in career paths and development over time can offer additional theoretical insights into the role of time and the study of HiPo employees. By studying

these individuals longitudinally over the course of their career, different developmental and career trajectories may emerge, offering variance between individuals that doesn't exist when only considering single time point, static variables. Ultimately, the integration of these content areas will help to answer questions about whether or when turnover occurs for HiPo employees. To better understand how data related to these different content areas informs the timing of an event, turnover, the analytic techniques being used to analyze the data should be focused on predicting event occurrence, specifically the occurrence of turnover. One family of techniques that is particularly suited to answer these types of questions is survival analysis.

Survival analysis is a set of statistical techniques that is useful for addressing time related phenomena (Putter, Fiocco, & Geskus, 2007). There are different types of survival analysis that incorporate change in time and dynamic predictor variables which allow for theory testing at different levels of specificity. By comparing different techniques, we can learn more about how time is incorporated into analyses and predict who will ultimately remain with the organization and advance into higher-level roles. Specifically, Kaplan-Meier estimates, Cox regression, and Cox regression with time dependent covariates will be compared because each incorporates time and dynamic variables in a different way. This will allow for the investigation of the additional explanation and prediction that can be added by incorporating time and dynamic variables at different levels of specificity. The comparison of different types of survival analysis can also help to determine whether the added complexity and data requirements that accompany each different version of the analysis are worth the trade-off for improved predictability.

This study will take an analytic comparison approach to see what can be learned from integrating research from the study of HiPos, turnover, development, and careers by comparing different types of analyses within the same analytic family. A comparison of survival analysis techniques will determine how different analyses handle the variance that is present between employees and the inferences that can be drawn from the various results. This approach will further inform and integrate the topic areas of high potential careers, development, and retention in terms of both theory and practical application. Individuals' developmental pathways, both through formal development and informal development and position changes, will be the investigated means of employee variation that adds additional prediction over and above stable predictors such as individual differences. Different analytic techniques can help to identify individuals who are more likely to progress into these higher-level positions and be successful over time despite appearing extremely similar to their peers.

Objectives and Contributions of the paper

By taking a more integrated approach that incorporates multiple bodies of literature and temporal dynamics, theory and practice can begin to explain the role of individual level variables, developmental opportunities and career path options offered by organizations, and how they relate to the retention of highly valued employees. Each of these content areas contributes different aspects of dynamic predictors that unfold across time. Moreover, incorporating time into the methods is not only a key component of theory relating to the criterion of interest, but also for the other bodies of literature being used to predict the criterion.

Thus, the goals of this dissertation are twofold. First, this dissertation aims to develop a better understanding of the dynamic nature of career paths and development and how it influences high potential individuals' decision to remain with an organization. By integrating turnover, development, and career theories, such an understanding would aid researchers in their efforts and practitioners in their work to study and address retention. Given that such an integration would lead to the inclusion of time as a key element in retention modeling, the second purpose of this paper is to investigate statistical techniques appropriate for studying this dynamic and temporal model of retention. Specifically, this effort will employ different survival techniques, how they account for the variance that exists between employees, and the relative benefits and limitations of each type of survival analysis.

This study will inform organizational research by exploring the utility and appropriateness of different longitudinal analytic techniques for predicting retention based on common leader and HiPo identification variables utilized in both research and practice. By using more appropriate analytic techniques, researchers can gain a more refined understanding of what traits, abilities, and situations interact to lead to successful, high performing leaders that remain with an organization. Further, theory surrounding time can be expanded and refined across turnover, employee development, career path, and even individual differences literatures. The results from this study will allow for improved testing of theory which can greatly advance scientific understanding.

Results from this study will inform future research designs to better capture the necessary variables for high performing and high potential individuals over time. By using more refined and appropriate analyses in combination with more refined theory,

researchers will gain a better understanding of what identifies individuals most likely to advance to senior positions at early career stages and practitioners can use this information to better inform selection decisions and career interventions to improve organizational retention. This research will lay the groundwork for future research by assessing individual differences and individual level developmental differences that influence turnover.

Chapter 2: Literature Review

In order to gain a more integrated view of the retention of HiPos and address this critical management concern (SHRM, 2015), a more comprehensive view of individual's time within a single organization, as well as time itself, should be considered. Better understanding the role that time plays in organizational theories is critical for advancing understanding of turnover and for informing useful interventions and human resources (HR) practices (Ployhart & Hale, 2014; Ployhart & Vandenberg, 2010; Shipp & Cole, 2015). In fact, Ployhart and Hale (2014) go so far as to say that "failing to understand the temporal dynamics underlying HR and employee or firm outcomes means we essentially don't know why HR systems or practices affect employee behavior" (pg. 76). Without incorporating temporal components across these content areas, the understanding of what leads to turnover of HiPos will remain elusive.

Current Theory Related to HiPo Retention

To address the incomplete understanding of what leads to employee and HiPo turnover, this dissertation will first review turnover theory and highlight issues that arise from not incorporating time into analysis of turnover and turnover antecedents. Second, this dissertation will review developmental talent management practices and career theory, both of which consider an employee's tenure and development unfolding over time. After these content areas have been reviewed and integrated, this dissertation will review various survival analysis techniques and explain how they can better capture and analyze the temporal components present in the aforementioned theories better than other, more commonly used analytic techniques.

Turnover. To keep ahead of competition, it has been stated that it will be critical for organizations to both attract and retain the best thinkers (Cascio & Aguinis, 2008b). The interest in reducing and preventing turnover, particularly turnover of HiPos, is due not only to the benefits of retaining valuable employees, but also to the negative outcomes that follow employee turnover. Organizations are motivated to select the best individuals possible for the job and, once they have selected them, reduce avoidable forms of turnover due to the time and costs associated with training, socializing, and integrating new individuals into the workplace (Barrick & Zimmerman, 2005; O'Connell & Kung, 2007). However, turnover is a part of employment and organizational life and is a persistent issue for organizations. Therefore, the prevention of turnover of talented employees, particularly HiPos, is a priority for organizations. When considering organizational turnover and the prevention of turnover, it is important to distinguish between the varying types of turnover.

Turnover can be voluntary or involuntary. Voluntary turnover is a temporal process with varying antecedents that include behaviors, attitudes, and individual differences that influence an employee's decision to leave or stay (Griffeth, Hom, & Gaertner, 2000; Hom, Mitchell, Lee, & Griffeth, 2012; Lee & Mitchell, 1994; Lee, Gerhart, Weller, & Trevor, 2008; Trevor, Gerhart, & Boudreau, 1997; Shaw, Delery, Jenkins, & Gupta, 1998). Turnover has long been described as a process. Early theories such as Mobley (1977) describe turnover as a process whereby declining job satisfaction can result in turnover. Current conceptualizations, such as the unfolding model of turnover (Lee & Mitchell, 1994) have continued to expand upon the idea of turnover as a

process that occurs over time and have included the turnover process to consider multiple exit paths that include different psychological processes and external events.

Involuntary turnover occurs when an employer makes the decision to end employment (Shaw et al., 1998). As such, it is important to differentiate between voluntary and involuntary turnover as the predictors might have different influences on these distinct exit paths. Researchers have called for additional research on these processes to better understand the differences between the two exit paths and to understand turnover as a time-based process (Hom et al., 2012; Shaw et al., 1998). By differentiating between exit paths, this dissertation should be able to better inform the differential patterns and antecedents of the two distant turnover paths and improve theory and understanding of the differences between voluntary and involuntary turnover exit paths.

In addition to differentiating between the distinct exit paths (i.e., voluntary and involuntary), there have been calls to investigate voluntary turnover as a time-based process in line with its theoretical conceptualization (Hom et al., 2012; Kammeyer-Mueller et al., 2005; Russell, 2013; Ryan & Ployhart, 2014). Despite the fact that turnover has been conceptualized as a temporal process, studies investigating turnover rarely study it longitudinally or model it in such a way that allows for the dynamic change in predictor variables across time (Hom et al., 2017; Kammeyer-Mueller et al., 2005; Ryan & Ployhart, 2014; Steel, 2002). That is, across time, the weights of the various factors that influence the employee's decision to leave the organization may change (Steel, 2002). For example, early in an employee's time with an organization the amount of formal development opportunities and trainings may be highly related to the

decision to remain with an organization. Over time however, the impact of formal development opportunities such as trainings may become less predictive of turnover and informal development opportunities such as new positions or job rotations might be more predictive of turnover. In this example, time is relevant because the level of influence or the predictive power of turnover antecedents could fluctuate over time. To fully incorporate time into our understanding of turnover, it is important to consider turnover as a process rather than as a single instantaneous event. This will inherently include making time a relevant part of the research process in terms of data collections, measurement, and analysis. Further, an improvement in understanding the process of turnover will necessitate capturing the dynamism in the predictor variables that lead up to the turnover decision.

Current research largely focuses on more static predictors of turnover (Kammeyer-Mueller et al., 2005), most often measured at a single time point (Coats, Blacksmith, Costanza, & Gartner, 2015). The use of static predictors is problematic because it oversimplifies antecedents of turnover and does not allow for a greater understanding of the phenomena of turnover. Not only is there a need to better understand the temporal nature of turnover (i.e., turnover as a process that occurs over time), but there is a need for better understanding of when different variables are useful as well as the amount of time that they are useful as predictors (Holtom, Tidd, Mitchell, & Lee, 2013; Morita, Lee, & Mowday, 1993; Kammeyer-Mueller et al., 2005). By allowing for dynamism in the turnover predictors in this study, this dissertation should inform theory of time and dynamics, particularly as they relate to HiPo turnover. As a consequence of better understanding the antecedents of turnover, organizations can make

better use of their resources and will know where to aim interventions with the intention of increasing retention of their employees.

Fully understanding antecedents of turnover requires incorporating both stable and dynamic predictors. For example, general mental ability, considered to be a relatively stable individual difference, has long been established as a predictor of job performance and consequently is often used in selection procedures as cognitive ability is widely cited as the most valid predictor of performance on the job (Schmidt, 2002). While there has been less research on the ties between intelligence and voluntary turnover than other attitudinal and behavioral predictors, research has shown that voluntary turnover is also related to cognitive ability (Maltarich, Nyberg, & Reilly, 2010). Individuals who are high in cognitive ability might view themselves as having more job opportunities than those who are lower in cognitive ability and be more likely to search for another job (Boudreau, Boswell, Judge, & Bretz, 2001).

One study found that individuals who are lower in cognitive ability were more likely to remain in a job (Dickter, Roznowski, & Harrison, 1996). However, there was an interaction between time and cognitive ability such that the impact of cognitive ability on turnover diminished over time (Dickter et al., 1996). The diminishing influence of cognitive ability in predicting turnover over time demonstrates the utility of incorporating stable predictor variables while also considering that over time the influence of these variables might change.

Another commonly used psychological variable that has a long history in being used for selection, performance, and turnover is personality (Ghiselli & Barthol, 1953; Woo, Chae, Jebb, & Kim, 2016). Personality has been used in selection procedures as

research has shown that it is a valid predictor of job performance and can offer additional predictive validity over cognitive ability (Hough & Oswald, 2008; Van Iddikenge & Ployhart, 2008). In addition to its utility in predicting performance, personality traits have also been linked to turnover and turnover intentions. Specifically, research has found low emotional stability to be predictive of turnover intentions and low Conscientiousness and Agreeableness as predictive of actual turnover (Zimmerman, 2008). Recent research has recognized that the predictive strength of personality factors changes across time (e.g., Woo et al., 2016), demonstrating that time warrants consideration even with variables that are considered to be stable.

While some variables that have been shown to relate to turnover such as personality (Barrick & Zimmerman, 2009; Zimmerman, 2008) and general mental ability (Maltarich, Nyberg, & Reilly, 2010) might be stable, many other factors are dynamic, including abilities, satisfaction with the job, and performance. Further, these dynamic variables are even more likely to fluctuate when considering that individuals go through position changes and receive different developmental opportunities. While these individual level variables are often used to predict outcomes of interest, there is very little guidance on how individual knowledge, skills, abilities, and other characteristics (KSAOs) do these three things: a) how they develop or change over time, b) how long they are predictive of criteria c) how they relate to outcomes over time (Ployhart & Hale, 2014). Patterns of changes, interactions with time, and changes in predictability over time for KSAOs could all further inform understanding and prediction of turnover. By incorporating all of these aspects into this current study, theory on how and why KSAOs change and develop as well as how they influence turnover decisions over time can be

improved. The inclusion of time relevant variables and dynamic predictors into the study of turnover will answer calls in the literature to improve the time-based process of turnover that have long gone unanswered in the turnover literature.

Despite the fact that there is little guidance or research on how dynamic KSAOs predict turnover, individual development is often a suggested solution to decrease turnover, particularly for desirable or HiPo employees (Ashkenas, 2012; Fernández-Aráoz, et al., 2011). Employee development and other practices are often managed through organizations' talent management departments as the retention of HiPo employees is a primary strategic goal of talent management. The long-term development and retention focus of talent management literature and practice could be used to further inform the temporal aspects that are not well understood in turnover.

Talent Management. The phrase *talent management* originated in a McKinsey report from 1998 which stated that executive performance explained the overall performance of an organization (Chambers, Handfield Jones, Hanking, & Michaels, 1998). Since the concept was introduced nearly 20 years ago, it has become increasingly prominent (Cascio & Aguinis, 2008a; McDonnell, Collings, Mellahi, & Schuler, 2017) and has led to many new or re-branded practices within organizations including workforce planning, succession planning, employee development, and career management (Cappelli & Keller, 2014). Currently, talent management is viewed as a practitioner generated term or group of practices that can be viewed as the organization's role in an individual's career and is geared towards getting the right people in the right place at the right time (Cappelli & Keller, 2014). Often, this means that talent management is focused on planning for employees' futures within the organization.

The emphasis placed on timing and planning for the future makes talent management a useful perspective to consider when seeking to improve understanding of the role of time in turnover. The talent management perspective inherently considers an employee from a longitudinal perspective and is concerned with employees throughout their entire tenure with a single organization. Personnel data that is critical for many talent management functions (and that are collected over multiple points in an individual's tenure with an organization) can be used to gain insight into how patterns that emerge through personnel data relate to turnover. For example, personnel data at various time points could be used to further inform the unfolding model of turnover (Lee & Mitchell, 1994). Researchers could determine how personnel data relates to psychological processes that lead to turnover decisions for HiPos or how developmental and career patterns relate to turnover.

In addition to collecting and tracking personnel data over long periods of time, the retention of talent, or highly qualified employees, is a primary focus of talent management research and practice (Cappelli & Keller, 2014). The talent management literature often centers on the management and development of HiPo employees (McDonnell et al., 2017) and many of these practices are focused on reducing turnover. Specifically, there are two main approaches in talent management when it comes to employee development, inclusive and exclusive.

An exclusive approach to talent management is based on some evidence that certain employees contribute disproportionately to the performance of an organization (Aguinis & O'boyle, 2014; Felin & Hesterly, 2007; Gallardo-Gallardo, Dries, González-Cruz, 2013). This perspective results in talent management practices that are directed at a

subset of individuals, often those labeled as HiPos within an organization (McDonnell et al., 2017). An exclusive approach is also being emphasized in the small amount of academic literature devoted to talent management. Academic literature has begun to focus on workforce differentiation (Collings & Mellahi, 2009; Huselid & Becker, 2011; Lepak & Shaw, 2008) which states that organizations should disproportionately invest scarce resources into individuals and jobs that are anticipated to yield the greatest return. Exclusive approaches are the older and more traditional approach to talent management. For example, the military has assumed hierarchical arrangements which might promote this type of focus on a few individuals (Capelli & Keller, 2014).

Alternately, organizations can use an inclusive approach to talent management. Inclusive approaches to talent management reflect regulations in the workplace for equal treatment (Cappelli & Keller, 2014). As such, inclusive approaches tend to suggest that the benefits of talent management should apply to all of the employees within an organization. The more traditional exclusive approach was to invest more in the individual or position based on where employees were in the hierarchy, but newer exclusive approaches suggest that organizations should invest more time and resources into individuals expected to disproportionately contribute to performance regardless of hierarchical position (Cappelli & Keller, 2014). Inclusive and exclusive approaches could lead organizations to allocate developmental opportunities to their employees in different and varying manners which could create contrasting developmental patterns. Different developmental patterns or timing of developmental opportunities could change the likelihood of employees experiencing turnover.

It can be difficult to determine the impact of developmental practices on organizational retention due to the gap that exists between research and practice in this domain of talent management (Cappelli & Keller, 2014; Lewis & Heckman, 2006). Overall, there is little academic interest, but a large amount of practitioner interest (Cascio & Aguinis 2008a; Rynes et al., 2007). This is likely because HiPo programs emerged from practice rather than research. Consequently, published and available empirical work in this domain, particularly empirical work that incorporates critical temporal factors, is virtually non-existent. However, the personnel data and employee development practices that are central to talent management that are collected over time offer a wealth of opportunity to use this information to inform prediction of turnover through empirical research. To further explore how this information about their developmental experiences and career changes over time can be used, the incorporation of a more specific practice in talent management, development, can be assimilated into the framework for studying HiPo turnover. As a result, theories can be refined and expanded to include temporal aspects that relate to development.

Employee Development. Human resource and talent management departments were created based on the idea that both individual differences and management practices are drivers of employee performance (Cappelli & Keller, 2014). One of the key talent management practices expected to contribute to employee performance and retention is continued development. A high talent pool of employees, as well as a talent management department that successfully identifies and develops their employees, is considered equally important to business survival as successful financial management of the organization (Silzer & Dowell, 2010).

Employee development could be integrated into the study and prediction of turnover because developmental opportunities have become central to current organizational practices. In fact, employees now expect developmental opportunities from their employer. The changing nature of work has resulted in a shift in the psychological contracts that are held between employees and employers and placed an emphasis on continuous learning and development (Boud & Garrick, 1999). Employees have moved away from viewing organizations as owing employment security to owing opportunities for development and learning (Casey, 1999; Conway & Briner, 2005; Rousseau, 1995, 1996).

It is possible that this shift in psychological contracts is in part due to the current nature of work and organizations that also have shifted and changed over time (Huber, 2011). Research has demonstrated that choosing to make a career move from one organization to another often occurs because the individual has a negative evaluation of internal career opportunities (Ng, Sorensen, Eby, & Feldman, 2007). Because development is used as a tool to decrease retention and employees expect development as part of their organizational contracts, incorporating developmental opportunities could further inform patterns predictive of turnover. It is stated that development will improve retention for HiPos (e.g., Fernández-Aráoz et al., 2011; Coetzee & Stoltz, 2015), but there is a lack of studies that provide evidence for this. This study will fill this gap by empirically investigating the relationship between various types of development and turnover. Further, this will allow for investigation into the nature of the relationship in relation to time and different stages in an employee's career.

Career development or developmental opportunities can come in many forms. Some organizations, such as the U.S. Army, state that development is expected to continually occur through both formal systems and informal practices (Headquarters, Department of the Army, 2015). Formal development comes from trainings, school, or other well-defined programs made to help individuals progress through their career (Noe, 2010). Employees can also develop through more informal means. Informal development could occur through on-the-job training or even by taking a different position through a job rotation or a promotion (Manuti, Pastore, Scardigno, Giancaspro, & Morciano, 2015; Noe, 2010). When an individual takes on a different job, particularly if it is in a different area or field, they are learning and practicing new skills (Noe, 2010). Employee development for job experiences occurs through job rotations or expansion of current responsibilities, transfers, promotions, and other types of job experiences (Noe, Wilk, Mullen, & Wanek, 2014). A new job or position could mean a transition internal to the organization where they are currently employed or transitioning to a different organization.

Both formal and informal development could lower turnover through what the developmental opportunity communicates to employees. Providing developmental opportunities is a way to communicate organizational support to employees. Organizations should let employees know that they value their contribution and care about their well-being (Rhoades & Eisenberger, 2002). Baruch and Quick (2007) found that supportive organizational career systems can lead to positive career outcomes, a finding that is supported by other studies (e.g., Eisenberger, Armeli, Rexwinkel, Lynch, Rhoades, 2001).

However, fully understanding the impact of these developmental practices is more complicated than current practices and assumptions that simply assume any development leads to retention and organizational success (e.g., Burke, 1997; Cappelli & Keller, 2014; Fernández-Aráoz et al., 2011). Development unfolds over the course of an individual's career; it is not a single event. The developmental opportunities afforded to HiPo employees throughout their organizational tenure could potentially create different patterns over time and differences in the timing of developmental experiences that influence turnover. Researchers have called for longitudinal research that follows developmental practices overtime as this type of research could have an impact on understanding and bridging the science-practice gap that exists in many talent management domains (McDonnell, 2011).

Incorporating the role of development over the course of an individual's career can aid in understanding what leads an employee to remain with an organization. Further, investigation of employee development over time would answer a call for more "whole person" approaches to career development (e.g., Hall & Mervis, 1995). It would further answer calls for additional life course and longitudinal studies of careers (e.g., Savickas, 2002). Therefore, not only should more formal development be explored, but informal development that occurs throughout careers could meaningfully inform prediction of turnover. To this avail, career theories could further contribute to the understanding of what leads to HiPo turnover over time.

Career Theory. A career is an unfolding sequence of an individual's work experiences over time (Arthur, Hall, & Lawrence, 1989a, 1989b) within an occupational or organizational context (Van Maanen & Barley, 1984). An individual's career is a

major part of life as it provides a sense of purpose, challenge, self-fulfillment, and income as a means of support (Baruch, 2004). With these definitions, repeated turnover and shifts are an inherent aspect of an individual's work experience and these transitions are also influential in peoples' work lives (Chudzikowski, 2012). Incorporating the temporal and dynamic nature of a career by accounting for these transitions could serve to better inform HiPo turnover. This data could be more useful in informing turnover decisions in current organizational contexts than it was in the past due to shifts in the nature of organizations.

In the past, careers were based on hierarchical, highly structured, and rigid systems with unidimensional or linear advancement or promotion (Baruch, 2004). By the 1950s, practices that mirror modern talent management practices were being used in organizations including workforce planning, selection assessments and strategies, and providing employees with developmental opportunities. During this time, many advancements were only available to individuals that were already in the company and advancement occurred in well defined, hierarchical paths (Cappelli & Keller, 2014). Investment decisions for employee development were mostly handled in a centralized office and were related to advancement. Retention was less of a concern under these early frameworks when remaining with a single organization and moving up a very structured, hierarchical path was the norm. As this pattern begin to change, the need to incorporate temporal dynamics in careers and development changed as well.

Changes in the workplace in the 1980s included higher competition, flatter organizational structures, and broader job descriptions (Cappelli, 1995; Jacoby, 2005) which resulted in critical differences between twenty first century organizations and

organizations from the previous century (Cascio & Aguinis, 2008b; Cascio 2000; Huber, 2011). These changes in the workplace are now reflected in career path changes. Career systems have undergone major changes which have been defined as a shift from “linear career systems” to “multi-directional career systems” (Baruch, 2004). This means that there are multiple forms of movement and that there is no single way to reach success in comparison to the linear movement that defined previous careers (Baruch, 2004). Multi-directional careers imply increased dynamism and variability (e.g., changes in jobs, positions, industries) in employees’ careers. These dynamic career paths are often not captured in turnover research and it is unclear how the prevalence of boundaryless careers influences turnover in organizations.

There is little empirical evidence that supports the idea that organizational careers or traditional careers are no longer common or desirable, and the research that exists is largely characterized by special case studies and anecdotes (Clarke, 2013). The disagreement concerning the prominence and benefits of newer career types calls for additional research to examine traditional career paths that still seem to exist. By controlling for one factor, the organization, we can learn more about other elements such as job switching and job development before adding in additional complexities such as organizational changes that will be needed to gain a complete understanding of modern careers. Forms of traditional careers still exist and there is opportunity for growth in movement within large organizations. Further, in large organizations there is an increased opportunity for lateral movement within an individual’s career. By incorporating relevant changes from the careers literature into turnover research, there will be additional variance introduced within and between HiPo employees over time that might add

additional explanatory power for HiPo turnover. This research will also answer calls in the literature to examine the variety and complexity of career transitions (e.g., Rodrigues & Guest, 2010; Sullivan & Baruch, 2009).

Career path theory typically analyzes things from a longitudinal perspective, but does little to integrate between individual career development perspective and individual tenure within an organization. Further, career path research is not combined with research on other types of development. Most importantly, most publications on the subject of careers, particularly high potential careers, are non-empirical in nature (Dries & Pepermans, 2008). How do individuals spend time within a single organization, what developmental opportunities do they get, and how does this impact their decision to stay or leave? There is no shortage of literature that describes how newer career forms or career models are changing to account for employee opportunities, but the literature fails to describe how these new opportunities or employee development impact the decisions to either leave or remain with an organization. This results in a disconnect from the talent management and development literature with both career theory and turnover literature. This dissertation will not only draw from these literatures and integrate them, but it will test the relationships between various types of development and career changes to determine their impact on turnover.

More research is needed to investigate the actual nature of these changes and if or how they impact both individual decisions to turnover and organizations' overall retention. A common theme across the talent management, development, and career path literatures, is that time is relevant and that incorporating time and changes over time could offer additional insight. By thinking more purposefully about time and thoughtfully

incorporating time into analysis, these literatures can serve to better inform turnover of HiPo employees and time can be integrated into these existing theories.

The Role of Time

As this review has demonstrated, the consideration of time across the content areas of talent management, development, and career paths can help to improve the prediction of turnover by taking a more integrated and longitudinal approach to understanding turnover antecedents (Hom et al., 2017; Kammeyer-Mueller et al., 2005; Mitchell & James, 2001; Shipp & Cole, 2015). Many advances in turnover theory and study came after shifting from traditional to longitudinal research designs (Hom et al., 2017) due to the richness of data and greater amount of information preceding a decision to turnover that can be collected.

It is also important to consider time itself as it pertains to specific theories as most theories pertaining to organizational sciences are longitudinal in nature (Ployhart & Vandenberg, 2010). However, temporal dynamics are largely ignored within human resource theories and phenomena (Ployhart & Hale, 2014). In fact, it has been stated that even though critical factors related to HR are expected to vary over time, research devoted to investigating these dynamics is virtually nonexistent (Ployhart & Hale, 2014).

Incorporating time helps us to understand how theories from these content areas work together to understand why certain outcomes are expected and how this process is the driving force behind many organizational theories (Ployhart & Vandenberg, 2010; Shipp & Cole, 2015). Taking a longitudinal approach to identifying what leads to HiPo turnover can help to inform future research by approaching turnover and career theory

from an integrated perspective rather than looking at individual pieces of the puzzle in isolation, both in terms of content and time period.

Methodological Barriers to Incorporating Time

Savickas (2002) emphasized the importance of utilizing longitudinal research for understanding subjective experiences of careers. Without the incorporation of time into our study of organizational phenomena, our understanding is severely limited because we lack answers to basic questions such as why or when events of interest occur. An increased understanding of the timing of events not only stands the chance to improve scientific theory and rigor (Ployhart & Hale, 2014), but it greatly informs practice and improves practitioners' ability to build actionable intervention strategies. For example, Aguinis and Edwards (2014) stated that their methodological wishes for the future of research included research that describes the nature of an effect and a more careful specification of the nature of relationships. Others have called for temporal designs that better elucidate processes (Collins, 2006). Incorporating time and dynamic predictor variables will help to improve the nature and specification of relationships and understanding of the phenomena of turnover.

There is clearly a need to better utilize longitudinal research to improve theory and inform organizational interventions. However, longitudinal research is not without its limitations and drawbacks. For example, keeping track of individuals over time can be very difficult and the longer the time period of interest, the more likely the study is to experience drop out of participants. Additionally, collecting data that allows for the study of time is a very time-consuming process (Shipp & Cole, 2015).

Due to this limitation, the majority of longitudinal studies rely on cross-sectional data which use static data to estimate longitudinal processes (Ployhart & Vandenberg, 2010). While cross sectional data can incorporate some aspects of time such as studying individuals at different ages or periods within a specific context of interest, it also comes with some severe limitations in the conclusions that can be drawn from a study. Cross-sectional studies limit the contributions of a longitudinal perspective because these research designs do not allow for the study of within person change, they do not allow for any conclusions about causality, and perfect confounds exist. For example, when studying generations, a topic where time is an inherent part of theory, there exist age, period, and cohort effects that cross-sectional designs cannot address (Costanza & Finkelstein, 2015). While cross-sectional data allows for some insight into the role of time in theory, it does not allow for the examination of the patterns within a single group that unfold across time and how it relates to outcomes. Rather, it gives snapshots of different groups and the researcher is left to infer a pattern. Despite the difficulties in collecting longitudinal data, there are no real substitutes for capturing unfolding patterns over time within a single group.

Capturing unfolding patterns over time can also help to address another critical challenge when studying HiPos. Often, there is a lack of variance in the population on variables used to identify HiPos. This can occur when there is range restriction in the criterion of interest, often performance, in addition to range restriction that might have been introduced from assessments used for selection. Range restriction can significantly impact findings and lead to results that do not accurately reflect a relationship (Society for Industrial and Organizational Psychology, 2003; Raju & Brand, 2003). Insufficient

variance adds complications for many common methodological and analytic approaches used to study these individuals.

For example, if regression techniques are being used and there is little to no variance on either the predictor or criterion variable, the regression equation will not be able to predict with any precision. Studying employees longitudinally presents opportunity for variance in developmental or career paths to arise over time. If analytical techniques can then capitalize on the variance that emerges from longitudinal methodology, then theory and understanding of these concepts can be improved while turnover can be predicted with greater precision.

These methodological and analytic issues when conducting research with HiPo populations directly translate into practical barriers for organizations. For organizations that are trying to identify top performers or HiPos from a group that is more homogeneous than is typical, the problems that arise from trying to decide who will benefit from additional training or development are exacerbated. These decisions about development could also impact turnover decisions for these highly valued employees.

Identifying analytic techniques that can not only help to differentiate between similarly high performing individuals by capitalizing on the amount of variance that is present between similar employees, but also contribute to our understanding of retaining these individuals, has the potential to greatly benefit organizations. In this particular scenario, making a nuanced distinction among individuals that represent only a small part of the range of organizational talent, or rather differentiating within a ceiling effect population, could greatly improve the issue of differentiating among similarly talented individuals. Further, being able to better predict who among the identified HiPos are

more likely to remain with an organization, or understanding the impact of developmental or career experiences on the decision to remain with an organization, offers practical guidance for improving HiPo retention.

Once this data has been collected, it is important to use analytic techniques that capture time and dynamics in predictor variables to avoid analyses that over simplify or conceal relationships. If the analytic techniques used to analyze rich data over simplify or conceal relationships, then even a rich longitudinal data set will continue to fail in terms of understanding the role of time. Therefore, this study will compare different longitudinal methods that can be useful for incorporating time into the prediction of organizational turnover.

Given the extent of the challenges that are associated with identifying high potential and high performing individuals prior to their advancement into leadership roles, a number of different analytical approaches have been used. When studying turnover, methods such as regression or other forms of the general linear model are common. However, none of these analytic techniques has successfully captured the key variables or combination of variables that predict future leader success and many fail to appropriately capture the role of time. In fact, regression techniques generally are ill-suited to capture the occurrence of events such as the occurrence of turnover (Singer & Willet, 2003). Therefore, the goal of the present research is to compare different analytic techniques that incorporate a temporal or longitudinal component in order to better inform the early leader identification process.

Survival Analysis

Studies that incorporate longitudinal data are much less prevalent than many theories suggest are necessary. Therefore, there is a need to further explore longitudinal analysis techniques and assess the benefits that they can offer to both organizational theory and practice. One family of analysis that could be particularly helpful in understanding the role of time in theory, particularly with a dichotomous outcome of interest like turnover, is survival analysis. Survival analysis is a group of techniques that are used to examine the conditional probability of an event of interest over time with a focus on timing and duration until event occurrence (Allison, 2014; Mills, 2011). These analyses allow for the conceptualization and assessment of the impact of time on predictor-criterion relationships.

Further, survival analyses are particularly useful when time is a critical component of theory or plays an important role in understanding a process. In research it is imperative that the specification of the predictor-criterion relationship is accurate to avoid an oversimplification of the relationship or a limited or faulty theory (Converse & Oswald, 2014; Morita et al., 1993). Therefore, when investigating the influence of career development over time to predict employee differentiation and retention, incorporating the role of time is crucial, and survival analysis can appropriately incorporate the temporal components relevant in theory.

Survival analysis is particularly suited for answering research questions about “whether” or “when” events occur (Singer & Willett, 2003). Methodologically, the data being used for these analyses require several features that are not present for all types of event data or longitudinal data. In particular, data for survival analysis should have a specific event of interest that is being studied, should have an initial starting point where

no subject has yet to experience the event of interest, and should have a meaningful metric for tracking time (Singer & Willett, 2003).

Overall, survival analysis, particularly Cox regression, is a robust analysis that generally fits the data well and includes censored cases that are often ignored in other analysis making it particularly useful for exploring longitudinal data. Unlike general linear modeling or logistic regression, assumptions of multivariate normality, linearity, and homoscedasticity are not required for survival analysis, making it robust to data departures from these requirements (Tabachnick & Fidell, 2013). However, when using regression forms of survival analysis, meeting these assumptions can enhance the power of the analysis and result in better prediction when forming a linear equation of the predictors.

Survival analysis techniques are able to examine the effects of time in addition to the impact of predictor variables on the outcome of interest (Mills, 2011). In this context, survival analysis can investigate the impact of predictor variables such as individual differences and career development and assess the relationship between these variables and time. This occurs in different ways depending on the particular analysis used, and the details for each type of survival analysis that will be compared is outlined in the following chapter. Across analysis types, survival analysis predicts the conditional probability of an event through a hazard rate. A hazard rate, sometimes known as a failure rate, is the rate of not surviving to the midpoint of an interval, given that there was survival up to the start of the same interval (Tabachnick & Fidell, 2013). Probability density functions are often presented in conjunction with hazard rate and specifies the

probability of a certain individual experiencing the event of interest, in this case turnover, at a specific point in time.

Another benefit to this analysis is that survival analysis is able to account for censoring in the data, or incomplete data (Singer & Willett, 2003; Tabachnick & Fidell, 2013). Censoring in the data means that the exact survival time of an individual is unknown (Mills, 2011) and can occur because the start time is unknown (left censoring), the end time is unknown, an event has not yet occurred (right censoring), or there is a missing period of information from the middle of the study (interval censoring). Accounting for censoring, particularly right censoring which will be the most common in this study, means that the model is able to give an estimate of how likely turnover for an individual (voluntary or involuntary) is even if this event has not yet occurred for an individual. The use of censored cases also allows for a more effective use of the data associated with these longitudinal studies than analyses such as regression that cannot include individuals who have not yet experienced the outcome of interest (Steel, 2002).

The inclusion of all individuals can minimize biased outcomes that would be produced by not including developmental trends of individuals that remain with the organization (Sturam & Trevor, 2001). The ability to handle censored data or attrition in a meaningful way improves upon limitations of many other longitudinal methods (Ployhart & Vandenberg, 2010). This is unique to survival analysis, as most analyses, including general linear models, do not allow for the inclusion of individuals who have not yet experienced an event (Singer & Willett, 2003). Survival analysis however, allows for the analysis of individuals who have experienced an event as well as those who are capable of experiencing an event, but have yet to experience it. This means that survival

analysis can maximize data available from participants even if the criterion has yet to be experienced.

In sum, survival analysis techniques will be used over predictive analytic techniques for several reasons. First, dynamic analytic approaches to turnover are still relatively uncommon and regression, logistic regression, or other single time point methods are pervasive (Coats et al., 2015). Survival analysis methods were chosen as the various forms of the technique range in data requirements and can offer various glimpses into the role of time and dynamic predictors.

A recent study found that in the top journals in the field of Industrial-Organizational Psychology, only approximately 10% of studies investigating turnover used survival analysis (Coats et al., 2015). Of the studies that investigated independent variables that are theorized to change over time (e.g. satisfaction, performance), only 4% of the studies measured these variables on more than one occasion (Coats et al., 2015). It is disheartening that so few studies attempt to capture changes in these predictor variables since turnover is considered to be a dynamic process and since the variables used to predict turnover are dynamic as well. This study will help to fill the gap in the turnover literature by not only allowing the antecedents of turnover such as developmental experiences to vary across time, but it will also investigate the changing impact of predictor variables on turnover over time.

Proposed Study

Many content areas pertaining to the retention of HiPos have been criticized due to the science-practice divide that exists which has resulted in a lack of available empirical evidence (e.g., Cappelli & Keller, 2014; Cascio & Aguinis, 2008a; Cohen,

2007; Lewis & Heckman, 2006). Prediction of the retention of HiPos and the turnover field as a whole are criticized for not carefully considering time and not incorporating temporal aspects into the study or analysis of research questions and data. This project rectifies this by considering the relevant temporal aspects of several bodies of literature which each can contribute to better understanding the question about improving retention of HiPos, which in turn should inform theory pertaining to the temporal aspects of these literatures.

Even with the temporal component being recognized as a part of the turnover process, many of the models traditionally used to test this relationship do so in an inappropriate way. A majority of the regression style approaches to modeling turnover make the assumption that there is a stable relationship between the predictor variables and turnover that is both constant and linear (Holtom et al., 2013; Lee et al., 1994; Lee et al., 2008). The reviewed literature explored time and dynamic predictors across several content areas, but appropriate analyses that are able to capitalize on this data to improve prediction are largely missing from empirical studies. Additionally, the content areas that could offer variance or increased explanation over time are often studied in a siloed rather than integrated fashion. This led to the formation of three primary research questions:

Research Question 1: Does incorporating temporal and dynamic variables add to our understanding of HiPo careers within organizations?

Research Question 2: How can methods and analytic techniques that account for temporal factors improve theory and study of HiPo turnover?

Research Question 3: Does taking a more integrated approach to individual careers and development improve understanding of turnover?

To answer these questions, survival analysis was identified as a method to attempt to improve prediction and explore the variance that emerges among HiPo employees through different developmental opportunities allotted to them over the course of their career. Survival analysis can be a powerful technique when trying to better understand the role of time or the timing of events. Longitudinal employee personnel data relevant to several content areas were utilized in order to explore these research questions.

Three different forms of survival analysis were compared in this study including Kaplan-Meier estimations, Cox regression with proportional hazards, and Cox regression with time-varying covariates. Time varying covariates also allowed for within subjects change which has been called for in turnover research (Russell, 2013). Each form of survival analysis that was tested helps to inform different aspects of the general questions about time, methods, and turnover for HiPo employees. As Kaplan-Meier estimates and life tables answered questions about time, these analyses led to information about the rates of turnover of HiPos over the course of their career. These methods do not incorporate the influence of covariates, so this analysis served as a simplistic and baseline measure to which subsequent analyses were compared. The second method that was tested was Cox regression. The Cox model included more information and covariates than the Kaplan-Meier estimate, and the time dependent covariates added additional information about timing over the basic Cox model. This led to the first and second hypotheses.

Hypothesis 1: Cox regression with proportional hazards will explain more variance than the Kaplan-Meier estimator.

Hypothesis 2a: Cox Regression with time dependent covariates will explain more variance than Cox Regression with Proportional Hazards.

Hypothesis 2b tested was an extension of the Cox regression model that allowed for changes in predictor variables over time. Due to the additional information this analysis can account for, hypotheses 2b pertained to the expectation that increased information would lead to increased explanation.

Hypothesis 2b: Analyzing different specific time points utilizing Cox Regression with time dependent covariates will result in varying relationships between the covariates and likelihood of turnover.

This study drew from several different literatures that are innately temporal to investigate the impact of incorporating time and analyzing time appropriately on the understanding of HiPo turnover. In order to fully demonstrate how adding in time, time dependent covariates, and assessing the dynamism of predictors can inform theory, several additional hypotheses were tested. Hypotheses pertaining to employee development were tested as exemplars of the impact of these variables with varying levels of temporal specificity.

Hypothesis 3a: Incorporating time-dependent formal development into the model of turnover will add incremental prediction over static assessments of formal development.

Hypothesis 3b: Incorporating time-dependent informal development into the model of turnover will add incremental prediction over static assessments of informal development.

Hypothesis 3c: The impact of informal development on turnover will increase over time.

Hypothesis 3d: The impact of formal development on turnover will increase over time.

Chapter 3: Methods

Subjects and Procedures

Answering the proposed research questions and specific hypotheses required a sample of individuals considered to be the top talent of an organization and that had developmental and career pattern data spanning the course of a long enough period of time for the individuals to experience a sufficient amount of developmental experiences through formal trainings and career changes. One organization that routinely collects this type of data and is concerned with retention is the United States Army. The U.S. Army is a unique organization in terms of its goals, selection and training procedures, and the sheer volume of its annual applicant pool. The U.S. Army selects tens of thousands of individuals from a pool of hundreds of thousands through a variety of assessments that measure vocational aptitude, cognitive ability, personality, and a variety of other variables to select the best Soldiers possible (National Research Council, 2015). The large number of applicants that come in and out of the organization annually offer a unique opportunity to study turnover with a large group of individuals over a long period of time. Therefore, the U.S. Army was chosen as an organizational context to study the patterns and relationships of developmental and career variables over time and how they relate to turnover for individuals.

Investigating turnover of HiPos required looking at a specific group of individuals within the organization, namely their top performers, future leaders, or those expected to do exceptionally well (Cappelli & Keller, 2014; Silzer & Church, 2010). While the U.S. Army does not have a formal HiPo designation program, officers are considered to be leaders and are expected to continue to be leaders. Army officers can be commissioned

through four distinct paths: Army Reserve Officers Training Corps (ROTC), direct commission, officer candidate school, and by graduating from the United States Military Academy (USMA), otherwise known as West Point.

Of all the officers in the U.S. Army, those that are commissioned from USMA are expected to perform particularly well and are given extensive training in military leadership (Donnithorne, 1993). Officers that graduate from USMA are given resources such as their tuition, room, board, and expenses are paid for (USMA, 2017). While other programs receive resources as well, such as those in the ROTC program, it is not to the same extent as the resources and specialized military and leadership training as USMA graduates.

Although not a formal HiPo designation, the type of attention these officers receive mimics an exclusive approach to talent management. The military has also been considered to use exclusive approaches where resources and development opportunities are given more often to those expected to perform well in line with exclusive talent management approaches (Cappelli & Keller, 2014). The focus on officers who have graduated from USMA was therefore used as a proxy or parallel for top executives, an area that is more rarely studied than other types of leadership or leadership positions (Baruch & Quick, 2007).

Therefore, to study turnover among those expected to remain in the military and fill high ranking leadership positions, officers who graduated from USMA were chosen as the participants. To better understand what individual differences, developmental opportunities, and career changes and experiences are predictive of turnover in this

population, a large longitudinal data set with both individual differences and career data was utilized.

To meet these data requirements an archival longitudinal data set from the U.S. Army Research Institute for Behavioral and Social Sciences (ARI) was used. ARI is an organization that conducts research in support of Army goals. Its mission statement is to create and provide innovative behavioral and social science solutions that enable the Army to provide ready forces and force capabilities. Developing leaders and enhancing understanding of the leader development process falls within this mission. A prior effort resulted in the creation of a longitudinal data set which consisted of data on cadets¹ who attended West Point in the 1990s (Milan, Bourne, Zazanis, & Bartone, 2002).

This archival data set consists of a variety of individual difference and performance variables collected from cadets who graduated from USMA in the 1990s. One of the primary reasons for creating this data set was to identify experiences that contribute to leader development (Milan et al., 2002). Development is particularly important in the Army context because individuals have to move up through organizational ranks to reach high-level positions and the option for outside hiring at high level positions doesn't exist the way it does for other organizations. Because future high-level officers must come from inside the Army, development and retention are critically important within this population. Development can occur in terms of formal school assignments and trainings as well as through informal development opportunities such as promotions, job changes, deployments, and other key assignments. As such, once these individuals graduated from school, additional data was collected on these individuals

¹ Subjects are referred to as cadets while they were students at USMA. Once they graduate and enter active duty, they are referred to as Soldiers.

throughout their careers with the United States Army in order to track and inform leader development.

The initial phase of data collection for this cohort began during the summer of matriculation (Milan et al., 2002). After the subjects were admitted to USMA, the students spent six weeks at West Point before their first year of school began. During this time, the students experienced cadet basic training and completed a variety of assessments. This initial data collection was meant to include relevant measures from 10 categories that were deemed relevant to leader development including cognitive aptitude, complex problem-solving skills, tacit knowledge, temperament, motivation, leadership style, leadership performance, physical fitness, cognitive-emotional identity development, and developmental experiences. To reduce the burden on the participants, the data collection effort implemented a planned missingness design so that not every participant had to take all surveys at all time points (Milan et al., 2002).

After the cadets graduated, additional personnel data was tracked in order to continue to study leader development and gather insight into characteristics and experiences that contribute to leader development (Milan et al., 2002). This effort included the collection of position and promotion data, deployments, civilian and military education, assignments, and awards and recognitions. These subsequent data collections provided the career path and developmental measures that were utilized in analyses.

Demographics. The graduating class started out with 1143 admitted cadets, but due to attrition for a variety of reasons that were not recorded, the final sample size of the class was 893, or 78% of the initial class. Only the 893 individuals who graduated from USMA were included in the study to allow for both stable individual difference variables

and career development variables to be assessed in relation to turnover. While time spent at USMA is considered to be a part of the Army career for Soldiers, turnover while attending USMA was not included in these analyses for two reasons. First, as the reasons for attrition were not recorded, including cadets who left before graduation might bias the results because the cause of turnover is unknown and likely to not be completely missing at random or even missing at random. Second, turnover before completion of the four-year college degree were excluded to avoid over-specifying results to the Army.

In terms of sample size, if five or fewer covariates are being estimated, a minimum sample size of 60 has been proposed (Eliason, 1993). Thus, this sample size meets the minimum requirements for power. Participants were 89% male with an average age of 22.04 years ($SD = .937$) at the time of graduation. The participants were approximately 83.6% Caucasian, 4.6% Hispanic, 4.5% African American, 5.3% Asian or Pacific Islander, 0.7% Native American, and 1.2% other. For the purposes of analysis, ethnicity was recoded into white or non-white to allow for interpretation of results and because no conclusions can be drawn from such small subsets of individuals.

Measures

Drawing from the literature review, a subset of variables was used to investigate the role of individual differences, development, and career changes on employee turnover. While there are many variables and a number of different repeated measures that could serve to further inform theory, the chosen variables and the number of time points are somewhat limited by what was available in the archival data set. Therefore, several individual differences and developmental variables that were collected from USMA class were used as covariates in the survival analysis models.

General mental ability. General intelligence measures were collected from all cadets as cognitive capabilities have been shown to predict effective leadership (Bass, 1990). The College Entrance Examination Rating was used as the general mental ability covariate in analyses. The College Entrance Examination Rating is a measure that was developed by USMA and is a rating based on both the individual's high school rank and their SAT or ACT score. SAT scores were a sum of their math and verbal scores, each of which could range from a score of 220 to 800 for a total of 440-1600. The reliability coefficients reported by the College Board Online are .92-.93 for the 60-question math portion of the test and .91-.93 for 78 verbal questions. The ACT has a possible range of 1-36 and the total score was reported as a composite of four sub-scales of the test which are science reasoning, math, reading, and English. The ACT Assessment Technical Manual (1997) reported that the average reliabilities for the 1995-1996 academic year ranged from .84-.96. It should be noted that while this is not the best measure of general mental ability, it is acceptable as it primarily measures general mental ability (Frey & Detterman, 2004; Koenig, Frey, & Detterman, 2007).

Personality. Personality was measured using analogs for the NEO Personality inventory (Costa & McCrae, 1985). Items from the Astin Student Information Form (SIF) and Class Characteristic Inventory (CCI) were used to empirically develop comparable scales to those used to measure personality constructs in the NEO-PI (Evans, 1997). This process allowed for personality to be measured without adding additional measures to the test battery given to incoming cadets (Milan, 2002). Analog scales were created using the SIF and CCI for Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Openness by identifying items that correlated highly with items from the NEO-PI. The

items identified from SIF and CCI were used in a stepwise regression to identify the items that best predicted scores on the NEO-PI and then subsequently were utilized in a multiple regression to predict scores for each individual on the NEO-PI scale (Evans, 1997). These scores were standardized to allow for interpretability in the results in this study. Due to the method of obtaining scores for the personality variables, traditional reliabilities are not available or meaningful.

Leadership. While attending USMA, all cadets are required to take a military leadership class during each year of school (Milan et al., 2002). Because HiPos are identified in order to fill future leadership positions, the final year evaluation of their leadership was used as a covariate in order to control for variations in leadership directly before the participants entered the workforce. The military development grade was determined by a weighted average given to cadets by various raters that include their tactical officer, their immediate superior in their chain of command, their second-level supervisory, and their third level supervisor. The ratings of these individuals were weighted such that 50% is determined by tactical officer, 30% from the immediate supervisor, 10% from their second level supervisor, and the remaining 10% was assigned by their third level supervisor. Cadets grades were assigned on a forced distribution to ensure variability such that a maximum of no more than 20% of cadets received an A, no more than 40% received a B, and no more than 40% received a C. Because survival analysis makes no assumptions about the normality of variables, the non-normal forced distribution did not cause analytic issues. However, if the ratings are not valid in reference to leadership ability because of the forced distribution imposed on the raters, it could be a reason Leadership scores are not a significant predictor of turnover.

Formal development. Formal trainings and schools were used to assess formal development of subjects. As it was not possible to assess the quality of the experience offered for each individual Soldier, the number of formal developmental opportunities allotted to Soldiers was used to represent formal development opportunities. Formal development includes the Basic Officer Leader Course (BOLC) and the Captain's Career Course. Both schools are attended by all officers, but the timing of when in an individual's career the schools were attended can differ across individuals on the basis of numerous variables such as performance and opportunity. In addition to these schools, there are joint schools that were included in formal development such as those operated by the U.S. Marine Corps, the Naval School, and National Defense Schools. Any other additional formal training program attended by individuals was measured as an additional formal development opportunity.

Informal development. Informal development was measured as a cumulative number of informal developmental opportunities. Informal development can come in many different forms. Most notably, different positions offer the opportunity to develop by learning a new position. Therefore, any promotion or position change qualified as an instance of informal development (Manuti, Pastore, Scardigno, Giancaspro, & Morciano, 2016; Noe et al., 2006). Other informal developmental opportunities that were included were the number of deployments that Soldiers experienced and the number of key developmental positions or "stretch assignments" that they experienced. Key developmental experiences were identified by three subject matter experts (SMEs). A key developmental position was only utilized for analysis if at least two of the three SMEs were in agreement. Each time a Soldier experienced a promotion, a key developmental

position, or a deployment, it was counted towards their number of informal developmental experiences. The Army classifies development into the categories of formal, semiformal, and informal developmental activities and opportunities (Headquarters, Department of the Army, 2015). Stretch assignments, developmental assignments, and rotational assignments all fall under the semi-formal label (e.g., acting commander). For the purposes of this project and the power limitations of the data, all new assignments were grouped with informal development as these are less formal than the trainings and schools that make up the formal development.

Development has been identified as the dynamic and differentiating variable of focus. While it is possible that other variables changed over time as well, only changes in formal and informal development over time were accounted for in analyses. First, changes and timing of developmental experiences were the only variables in the data set that were tracked over time. Second, by restricting dynamic influence of predictor variables to just development, changes in the results across analysis type can be attributed to differences in how development variables are being analyzed. In other words, the difference in results can be attributed to analytic technique and the different information that various analyses produce. Comparing result differences between analyses within a single study circumvents challenges that can result from trying to compare results across studies (i.e., determining if differences in results are due to method, number of time points, predictors, etc.). Survival analysis allows for the investigation of the influence of development by looking at changes in development over time rather than a single measure of development that would be used in something like regression without capturing added variance or dynamics.

Time. Because estimates in survival analysis are dependent on time, specifying a metric for time that will give the most precision is critical to having accurate estimations (Singer & Willett, 2003). Time was measured as an individual's tenure with the U.S. Army in number of days as the temporal metric. Another temporal factor that must be considered when conducting survival analysis is when time starts for an analysis (Singer & Willett, 2003). So that all individuals have the same start point, graduation from USMA was used as the starting point for time, or time zero, and the number of days until turnover after that starting period served as both time and an individual's organizational tenure. For individuals that are delayed in graduating, their start time will not be day one like the rest of their cohort, but will be denoted by the number of days they entered their first job after everyone else. For example, if an individual graduated 60 days after the rest of their cohort, their start time would be 60 days rather than 0 days.

Data Cleaning

Conducting survival analysis requires a considerable amount of data management. Primarily, this is because the data most often must be restructured before survival analyses can be conducted. Rather than each participant having a single row of data and a single score for each variable, the data must be structured in a time to event format (Mills, 2011). For the most simplistic types of the analysis such as life tables, the basic requirement is that the time until an event occurs (or until the study ends and there is censoring for right censored cases) must be included in addition to the standard data structure where participants have a row of data and each column represents a variable. This becomes more complex for analyses where the covariates can change over time. When variables are allowed to change, each time a change is possible the subjects must

have a column for the time and a column for the variable. The data was manipulated such that each time dependent covariate had a row for each participant to allow for examination of time varying covariates and time varying coefficients.

There is a certain type of missing data that should be paid extra attention in survival analysis studies. Earlier, it was mentioned that survival analysis can account for censored cases and include individuals with censored data in analysis. There is a notable exception to the acceptability of including subjects with censored data in analysis. If subjects with censored data differ systematically from those without censored data, then the result is missing data due to non-randomness (Tabachnick & Fidell, 2013). If this occurs, then conclusions about covariates on survival time could be inaccurate. However, in this particular study there is no reason to believe that censored cases, particularly those with right censored data or those that have yet to turnover from the Army, are systematically different than individuals who have already turned over from the Army. Thus, all individuals with covariate data were included in analysis.

Data Analysis

Survival analysis is fitting for this context due to the dichotomous nature of the dependent variable (turnover), the importance of time in the theories being tested, and the ability of different forms and extensions of survival analysis to account for both changes and dynamics in the covariates as well as dynamics in the influence of those covariates at different time points. In other words, survival analysis can account for time dependent variables as well as time dependent coefficients. In studies that utilize analyses such as regression or logistic regression, time can be included as a predictor variable, but the analyses cannot account for changes in the nature of other predictor variables over time

or changes in their relationship to the dependent variable over time. Further, in comparison to other regression-based techniques, survival analysis can integrate more information and test phenomena in a way that is more consistent with theory (Coats et al., 2015).

This study compared three primary forms of survival analysis including the Kaplan-Meier estimator and life tables, Cox regression with proportional hazards, and Cox regression with time dependent covariates. Each of these analyses helps to answer questions concerning the amount of time until an event occurs. However, each one can answer slightly different questions and has different data requirements. To be able to compare and contrast between analyses, it is useful to first have an understanding of the language and data requirements that are unique to survival analysis.

Survival analysis uses different language and terminology than other analytic techniques commonly used in the social sciences. To start with, because many early studies that used survival analysis were predicting death in the medical field, much of the language surrounding the analysis has a negative connotation (Singer & Willett, 2003; Tabachnick & Fidell, 2013). However, survival analysis can be applied to any event occurrence, not just questions of death or survival, and can even be extended to events that can occur more than once. Another language difference is the use of the term covariates. In survival analysis, covariates refer to any predictor being used, including control variables and treatment variables (Mills, 2011; Tabachnick & Fidell, 2013). While time does not have different terminology in survival analysis, because it is a key part of the analysis it also warrants special attention.

Time in survival analysis can be continuous or discrete. While the distinction between what constitutes continuous time versus discrete time is somewhat arbitrary, data that is considered to fall in intervals are considered discrete time while data that is recorded in smaller, more precise units is considered continuous time (Singer & Willett, 2003). What is considered continuous versus discrete can depend on the total amount of time being considered in an analysis. For example, if the total time in an analysis is a week, then days might be considered discrete time while hours or minutes could be considered continuous time. Since the total amount of time in this study spans 17 years and time is being measured in days, time data will be considered continuous. This is because accounting for days as discrete time points would not be meaningful as it would result in well over 5,000 time points. The flexibility and precision of turnover dates allows for banding time into years to test discrete time methods and use a more precise unit of days for continuous time methods.

Inherent in all forms of survival analysis is the prediction of an event and either when or if the event occurs. Across survival analysis types, event occurrence is the dependent variable. For this particular study, the event, turnover, is the outcome of interest and the dependent variable. In survival analysis terminology, when an individual experiences an event, they move from one state to another state. These states must be mutually exclusive and include all possible states (Singer & Willett, 2003). In terms of turnover in this study, individuals are either currently employed by the U.S. Army (state 1) and have not yet experienced turnover, or they are no longer employed by the U.S. Army because they have experienced turnover (state 2). An individual will experience the event of turnover the last day that they are employed by the U.S. Army. This means that

those who transition to the National Guard or the Reserves will not be considered to have experienced turnover. This will allow for their tenure to be calculated in the number of days from when the cadets were commissioned at graduation to their last day employed by the Army. On occasion, individuals may return to the Army after they have left (i.e., boomerang employees, Shipp, Furst-Holloway, Harris, & Rosen, 2014). For this study, we are only interested in what leads an employee to initially turnover, and therefore Soldiers will not be included in the study after they first experience turnover from the Army.

There are two different ways an individual can experience the event of turnover, voluntarily or involuntary. The multiple paths through which individuals can move from the first state to the second state, turnover, will be compared through competing risks survival analysis, which will be described later. These two distinct exit paths will be discussed in greater detail within each form of the analysis that will be compared. Before discussing specific models, it is useful to review general survival analysis equations pertaining to the estimations of survival.

There are two main equations in survival analysis, the probability density function and the survivor function. The probability density function, represented by the equation $f(t)$, is the probability that a survival time of T is less than or equal to the value of t where T represents a positive random variable that represents a survival time and t represents the actual survival time. The density function represents the unconditional instantaneous probability that an event occurs in the time interval $(t, \Delta t)$ and is expressed with the equation:

$$f(t) = \lim_{\Delta t \rightarrow 0} \frac{Pr(t \leq T \leq t + \Delta t)}{\Delta t}$$

In other words, this equation describes the probability of an event, or the failure rate, without the consideration of covariates at any given instant. The other primary estimation is the survivor concept and is represented by the equation:

$$\hat{S}(t) = 1 - F(t) = P_r(T \geq t)$$

This equation expresses the probability that a survival time of T is greater than or equal to some time of t represents the proportion of individuals who will survive past time t . This function decreases over time as subjects continue to turnover or experience the event over time. A related equation is the hazard rate or the hazard function, or the rate at which subjects fail by time t given that they have survived up until time t , is represented by the equation:

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{Pr(t \leq T \leq t + \Delta t | T \geq t)}{\Delta t}$$

This equation represents the instantaneous risk that the event occurs in the interval $(t, t + \Delta t)$ given survival of at least up to time t . These equations focus on opposite outcomes such that the hazard function focuses on experiencing the event of interest and the survivor function focuses on not experiencing the event of interest.

To understand the different ways in which time can be incorporated into the dichotomous prediction of turnover, three forms of survival analysis are described in detail. First, a discrete time method of the Kaplan-Meier estimator and life tables is described. In these forms of survival analysis, questions about proportions of subjects surviving at various times can be answered (Tabachnick & Fidell, 2013). Second, the most common form of survival analysis, Cox regression with proportional hazards, is described and compared to the Kaplan-Meier estimator and life tables. Lastly, extensions to Cox regression are described. The Cox regression forms of survival analysis answer

questions about the relationship of covariates and survival time (Tabachnick & Fidell, 2013). Each of these forms of survival analysis is described in terms of their mathematical formulas, their data requirements, and the relative advantages and disadvantages of each for answering questions about predicting turnover when considering integrated approaches to employee's careers and development.

Life Tables and Kaplan-Meier estimator. Life tables and Kaplan-Meier estimates are both non-parametric models meaning there is no assumption about the shapes of hazard functions, nor how covariates might influence them (Mills, 2011). The oldest and most commonly used form of survival analysis is the Kaplan-Meier (KM) estimate of survival analysis (Mills, 2011; Kaplan & Meier, 1958). This is a non-parametric approach that produces either a life table, a table that offers survival estimates for specific, predetermined time intervals, or a KM estimator of a cumulative hazard function (Mills, 2011, Tabachnick & Fidell, 2013). The KM estimator gives the probability that survival time is greater than a pre-specified time. The KM estimator, or product-limit estimation, estimates the probability that survival time is greater than time t , otherwise known as the survival function which is denoted by $\hat{S}(t)$. This estimate adjusts the estimates of survival time to account for right censored data or individuals who have not yet experienced turnover. The KM survival probability can be denoted by the following equation:

$$\hat{S}(t_{(j)}) = \hat{S}(t_{(j-1)}) \times P_r(T > t_{(j)} | T \geq t_{(j)})$$

Where the probability at failure time $t_{(j)}$ gives the probability of survival past the previous failure time $t_{(j-1)}$. This is then multiplied by the conditional probability of surviving past time $t_{(j)}$ given that there was survival up until the start of $t_{(j)}$.

This analysis determined the proportion of officers that experience turnover at different periods of time. For this analysis, time periods of one year were utilized for a total of 17 intervals. To plot the results of the life table, the cumulative proportion surviving (P_i) was plotted as a function of each one-year time interval. The cumulative proportion surviving was plotted for each of the 17 intervals. This model is advantageous for simplistic questions that concern the timing of events. It can help to answer questions concerning the timing of turnover for individuals and has minimum data requirements.

A primary disadvantage of these models is that they rely on predetermined time intervals that are both discrete and arbitrary (Mills, 2011). However, this approach can be useful when event times are not precisely measured. Life tables are another non-parametric approach that present the cumulative proportion of individuals that have not yet experienced the event of interest at each predetermined period of time. This is essentially a table version of survival likelihood at pre-specified time intervals. This model will provide initial information about when USMA graduates are likely to turnover and will provide an initial framework for understanding the timing of turnover. The other models being investigated will offer additional information by adding in the influence of covariates while also allowing for a more nuanced incorporation of time.

Cox regression with proportional hazards. The Cox regression model with proportional hazards introduced the concepts of proportional hazards and partial likelihood estimation (Cox, 1975; Cox & Oakes, 1984). This model can be utilized with both fixed and time varying covariates. A basic Cox regression model is a robust model that uses fixed covariates or predictor variables which remain constant over time (Mills, 2011; Tabachnik & Fidell, 2013). This form of survival analysis determines if covariates

are related to survival time. Cox regression is the most popular form of survival analysis for several reasons. First, it is a semi-parametric model which means that it is more flexible than a parametric model and does not require the selection of a probability distribution in advance of conducting analyses (Allison, 2014). The second reason that Cox regression is more common is because it is a robust model that generally fits the data well regardless of the most appropriate parametric model (Mills, 2011). These features make the Cox model very flexible and it is particularly useful if one is unsure of the probability distributions of the data being analyzed.

Results for Cox regression includes survivor function, the hazard function, and parameter estimates. Parameter estimates, or regression coefficients, were calculated for each covariate in the model and estimate the relative effect of each covariate on the likelihood of experiencing the event of interest. These effects were then interpreted in terms of odds ratios because the regression is log-linear. In other words, an exponentiated coefficient is interpreted and represents the multiplicative effects of the variable being interpreted on the hazard (Mills, 2011). Each unit increase in a covariate is associated with either an increase or decrease in the likelihood of experiencing the event of interest. These covariates are also each given a value of statistical significance. A hazard rate can be interpreted as the rate at which the Soldiers turnover at a given time point, given that they have remained in the U.S. Army until that time (Allison, 2014; Mills, 2011). Odds ratios are used to interpret the impact of each predictor variable on an individual's probability of experiencing turnover. An odds ratio over one is interpreted as the individual having a greater chance of experiencing turnover while an odds ratio under

one is interpreted as an individual having a lesser chance of experiencing turnover (Tabachnick & Fidell, 2013).

For this model, measures of general mental ability, personality, leadership, formal development, and informal development will be entered into the model as covariates and reported in terms of odds ratios and statistical significance. The basic formula for a Cox regression model with fixed covariates is:

$$h_i(t) = h_0(t)\{\exp(\beta_1 X_{i1} + \dots + \beta_k x_{ik})\}$$

This overall model represents the hazard, or likelihood of experiencing turnover, for individual i at time t . The hazard consists of the baseline hazard function, represented as $h_0(t)$, which is the hazard function for a subject where all covariates have a value of zero (Mills, 2011). The baseline hazard is then multiplied by an exponentiated set of k fixed covariates where x represents the covariates. The overall model for the Cox regression will be reported. It should be noted that since the baseline hazard function is unspecified, these models do not have an intercept (Mills, 2011).

It is also possible to distinguish between the hazard rates for those who turnover voluntarily versus involuntarily. It is possible that the patterns and predictive utility of the predictor variables are different for these two exit paths. This was analyzed by including competing risks to investigate the different ways that an individual can experience turnover (Mills, 2011). The survival function, hazard function, and parameter estimates were reported differently for individuals who turnover voluntarily and those who turnover involuntarily. There are not estimation issues for different sample sizes in the voluntary versus involuntary turnover group, so uneven sample size does not present a problem (Tabachnick & Fidell, 2013). By modeling both of these outcomes it is likely

that the analyses will uncover more accurate probability estimates for the Soldiers with the given set of predictor variables (Mills, 2011).

It is assumed in these models that the same variables or covariates that influence survival at one point in the study also influence survival at later points in the study (Tabachnick & Fidell, 2013). In this study, that means that the variables that influence attrition at the beginning of the study are assumed to influence attrition at every subsequent time point as well. A related assumption in this model is the proportionality of the hazards. Proportional hazards means that the shapes of the survival functions are the same for all groups over time, akin to the assumption of homogeneity in a general linear model (Tabachnik & Fidel, 2013). When this assumption is violated, for example if the influence of a particular covariate changes at a particular point in time, extensions of the model with time dependent covariates can be used to work around this assumption violation (Singer & Willet, 2003). Time in Cox regression is assumed to be recorded on a continuous scale (Singer & Willett, 2003). In order to check for other data issues that might impact the interpretation of results the data will be tested for multicollinearity by investigating the standard errors for parameter estimates and testing tolerance.

Overall, this model should provide the same information about the timing of turnover through survival and hazard functions as the Kaplan-Meier estimation model. However, this model will use a more nuanced version of time which should offer increased specificity about the timing of turnover. Additionally, this model will allow for the assessment of the influence of various covariates on survival time, or the time until turnover. Each individual covariate can be assessed in terms of how it increases or decreases the likelihood of turnover. This will be useful for isolating influences on

turnover in terms of stable individual differences and both informal and formal development that individuals experience over the course of their military careers. In order to explore these influences further, the last form of survival analysis to be tested, Cox regression with time dependent covariates, will be tested to account for the dynamics in development that employees experience over the course of their careers.

Time dependent covariates and interactions with time. Cox regression with time dependent covariates is an extension of the Cox regression with proportional hazards model described above. This form of survival analysis offers a unique opportunity to examine the impact of dynamic covariates. The incorporation of these fluctuating variables is important as failing to account for the changes in predictor variables can result in biased parameter estimates (Holtom et al., 2013; Kammeyer-Mueller et al., 2005).

The data requirements for this type of analysis are more extensive than for other analyses as it requires a data point for the time dependent covariates at regular time points for the period of time being modeled. Despite the need for additional data that can be difficult to come by in organizations, Cox regression with proportional hazards should offer additional theoretical insight when time is a component in comparison to alternate techniques such as regression and logistic regression (Morita et al., 1993).

For the most part, calculating results for this analysis was similar to the aforementioned Cox regression with proportional hazards model. The adapted formula for the overall model is:

$$h_i(t) = h_0(t)\{\exp(\beta_1 X_{i1} + \beta_2 X_{i2}(t) + \dots + \beta_k x_{ik})\}$$

The addition of the t in the $\beta_2 x_{i2}(t)$ portion of the formula represents the time varying variables. In the equation, the first variable is fixed, and the second variable that

was just described is time varying. Just as with the Cox regression model with proportional hazards, the overall model was reported in addition to survival and hazard functions and parameter estimates.

Across all models, the coefficient of determination or R^2 will be reported. However, this is not a true R^2 but a Cox and Snell R^2 . A Cox and Snell is based on the log likelihood for the model being presented in comparison to the log likelihood for the baseline model (Cox & Snell, 1989). When interpreting these values, it is important to note that with categorical outcomes the theoretical value is less than one, thus the maximum possible value is also reported.

Chapter 4: Results

Descriptive Statistics and Correlations

Descriptive statistics and correlations for the variables used across analysis appear in Table 1. Correlations among personality factors varied widely. Neuroticism correlated moderately and negatively with Extroversion ($r = -.39$), moderately and negatively with Agreeableness ($r = -.29$), strongly and negatively with Conscientiousness ($r = -.69$), and the correlation was near zero with Openness. Extroversion had a small and positive correlation with Openness ($r = .15$) and a moderate correlation with Conscientiousness ($r = .47$). Agreeableness was moderately and positively correlated with Conscientiousness ($r = .30$).

The patterns among the personality variables are likely specific to this sample for several reasons. First, because of the way that personality was measured (i.e., personality was measured by creating analog scales of the NEO Personality Inventory from other measures, correlated with personality items from the NEO personality inventory, and entered into a stepwise regression equation) it is likely that scores could differ as not all measures of personality are perfectly correlated (e.g., DeYoung, Quilty, & Peterson, 2007; Lim & Ployhart, 2006). Second, across different studies and meta-analyses, the patterns among personality factors vary widely and the patterns are not consistently correlated in the same direction (e.g., DeYoung et al., 2007; Goldberg, 1992; Lim & Ployhart, 2006; Mount, Barrick, Scullen, Rounds, 2005). In other words, two personality factors that are moderately positively correlated in some studies are moderately negatively correlated in others. This small population in a specific organization may display patterns that differ from other samples in different organization types.

Scores of general mental ability were weakly and negatively related with Neuroticism ($r = -.14$). Leadership was not statistically significantly correlated with any of the other variables. Informal developmental experiences had a weak, negative relationship with Agreeableness ($r = -.12$) and general mental ability ($r = -.11$). Formal development and informal development were strongly and positively correlated ($r = .71$).

Table 1.
Variable Summary and Correlations

Variable	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9
1. Neuroticism	90.13	13.77	59.14	142.60	-								
2. Extraversion	119.52	10.33	79.86	143.42	-.39**	-							
3. Openness	110.47	12.75	81.44	169.79	0.07	.15**	-						
4. Agreeableness	107.18	8.63	80.84	131.93	-.29**	0.09	0.07	-					
5. Conscientiousness	116.68	12.93	45.50	147.46	-.69**	.47**	-0.04	.30**	-				
6. General Mental Ability	609.45	48.95	434	771	-.14**	-0.06	0.02	0.04	0.10	-			
7. Leadership	2.84	0.52	1.80	4.00	-0.07	0.05	-0.01	0.07	0.08	0.07	-		
8. Informal Developmental Experiences	6.08	3.43	1.00	19.00	0.06	-0.06	-0.00	-.12*	0.03	-.11*	0.03	-	
9. Formal Developmental Experiences	4.69	2.72	0.00	12.00	0.07	-0.02	0.04	0.05	0.01	0.09	0.05	.71**	-

Note. $n = 408$. * $p < .05$, ** $p < .01$.

Baseline functions.

Before directly comparing different survival analyses, baseline functions such as mean and median survival time can be used as they do not change across the various analysis. The mean survival time can be defined in this scenario because all subjects will eventually turnover from the Army. Because the area under the survival curve is not infinite, a median survival time can also be estimated in this scenario (Moore, 2016). The mean survival time, or mean time until turnover from the U.S. Army for HiPos or West Point graduates in this sample is 3791.94 days ($SD = 68.56$, $CI = 3657.58, 3926.31$) while the median survival time is 2923 days ($SD = 125.66$, $CI = 2676.71, 3169.29$). In a different metric, the mean survival time is approximately 10.39 years and the median survival time is approximately 8 years. The subsequent forms of survival analysis build upon these basic predictions of when individuals will turnover from the Army by providing additional information about the changing rates of turnover and variables that predict which individuals are more likely or less likely to experience turnover.

Life Tables

Life tables for turnover were built around one-year intervals for a total of 16 intervals. The survivor function is the cumulative proportion of the individuals that had not experienced turnover at the beginning of the interval (Tabachnik & Fidell, 2013). Table 2 displays the results in one-year increments. The table displays the number of individuals who enter each interval (who were currently active in the Army), the number of individuals who experience turnover within each interval, the proportion of individuals surviving each interval, and the cumulative proportion of people who survive each interval. A plot of the life table of survival function can be seen in Figure 1 and a plot of

the hazard function can be seen in Figure 2. The life table plot demonstrates the cumulative proportion of Soldiers who have not experienced turnover at each time interval. The life tables demonstrate that the largest jump in individuals experiencing turnover can be seen between years five and six with relatively few individuals turning over before the five-year mark. After the 12-year mark, the number of individuals experiencing turnover begins to taper off. The spike in turnover between year five and six explains why the median turnover time is over two years lower than the mean turnover time. Results from the Life Table begin to explain turnover patterns in the sample and give greater information than the baseline functions.

Table 2.

Life Table				
Interval	Number Entering Interval	Number Experiencing Turnover	Proportion Surviving	Cumulative Proportion Surviving
0-1 years	893	1	1.00	1.00
1-2 years	892	15	0.98	0.98
2-3 years	877	34	0.96	0.94
3-4 years	843	14	0.98	0.93
4-5 years	829	11	0.99	0.92
5-6 years	817	222	0.73	0.66
6-7 years	577	75	0.87	0.58
7-8 years	499	63	0.87	0.50
8-9 years	436	36	0.92	0.46
9-10 years	400	20	0.95	0.44
10-11 years	380	16	0.96	0.42
11-12 years	364	15	0.96	0.40
12-13 years	349	7	0.98	0.40
13-14 years	342	5	0.99	0.39
14-15 years	337	4	0.99	0.39
15-16 years	333	1	1.00	0.38
16-17 years	332	4	0.99	0.38

Note. $n = 893$

Figure 1.
Survival Function

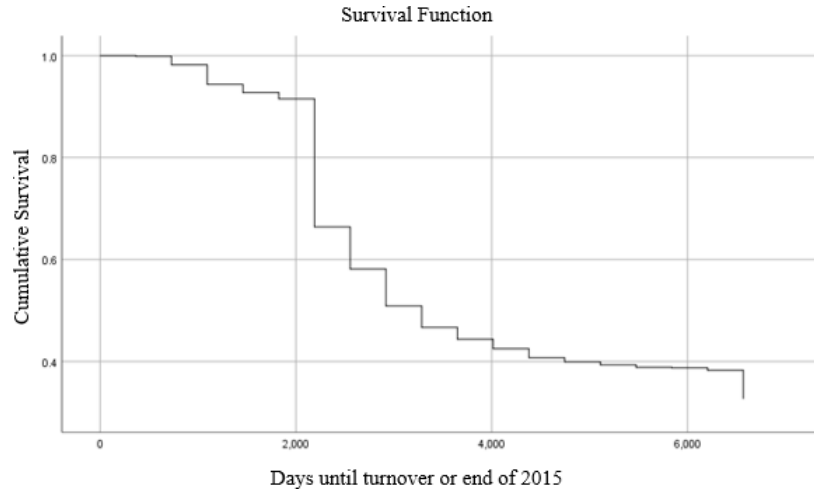
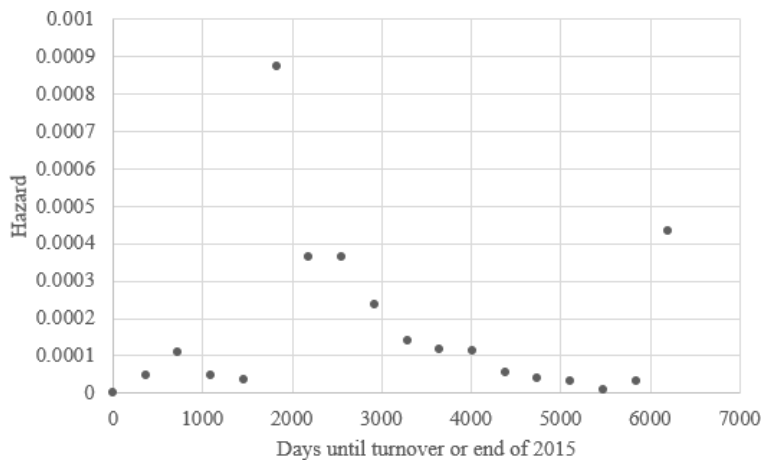


Figure 2.
Hazard Function



Kaplan-Meier Estimator

The Kaplan-Meier (KM) method estimates survival statistics each time an event is observed rather than at pre-specified intervals as in the life tables. The KM estimator also produced the baseline mean and median survival times reported above and can be used as a baseline comparison for all other forms of survival analysis. These estimates and

confidence intervals can be seen in Table 3. While this product-limit method produced slightly more nuanced results than the actuarial life tables approach, the KM method still only reports the timing of when turnover occurred. Similar to the Life Tables, the KM estimator demonstrates that the majority of individuals turnover sometime before 10 years of service with the highest concentration of turnover occurring between years five and eight. To understand what variables influenced the occurrence of turnover, Cox regression models were run to assess the influence of covariates on turnover.

Table 3.

Kaplan-Meier Estimates			
Interval	Estimate in days	CI	SE
Mean Survival Time	3791.94	[3657.57, 3626.31]	68.56
Median Survival Time	2923.00	[2676.71, 3169.29]	125.66

Note. $n = 893$

Cox Regression with Proportional Hazards.

Time in Cox regression is assumed to be recorded on a continuous scale (Singer & Willett, 2003). In order to check for other assumptions that might impact the interpretation of results the data were tested for outliers, multicollinearity, and proportionality of hazards. Assumptions were tested using SPSS Version 25. These assumptions were all met with the exception of the occurrence of some outliers and the proportionality of hazards. However, in this instance, outliers are not worrisome. Since the population is considered to be HiPos, having some individuals who are star performers or individuals who stand out from their peers on developmental experiences (Aguinis & O’Boyle, 2014) is neither unexpected nor problematic.

Proportionality of hazards, or the assumption that the hazard for any one subject is the same as the hazard of any other subject across all time periods (Mills, 2011; Tabacknik & Fidell, 2014; Singer & Willett, 2003), was tested by estimating and plotting

scaled Schoenfeld residuals. A violation of the proportionality of hazards assumptions represents time-varying coefficients in relation to the hazards rather than proportional hazards across individuals and across time. The overall model showed a violation of the proportionality of hazards as did all of the covariates with the exception of general mental ability. Further examination of the residual plots demonstrated non-linear patterns, providing further evidence for the time dependent nature of the covariates. The violation of this assumption is quite common (Allison, 2014). While this assumption does not hold, a basic Cox regression was still conducted so that it could be compared to other forms of the analysis.

Cox regression allows for a more detailed understanding of the baseline functions as it demonstrates the effect each covariate in the model has on the baseline hazard rate. Cox regression with proportional hazards was performed with general mental ability, personality, leadership, formal development, and informal development as the covariates since each of those covariates has a theoretical relationship with turnover in organizations.

A total of 385 individuals were included in analyses. Due to planned missingness in the original data collection effort, many individuals were excluded from analysis with listwise deletion. Listwise deletion is acceptable because the data are expected to be missing completely at random and there is still sufficient power to run the analyses (Tabachnik & Fidell, 2013). Further, seven individuals died between graduation and the end of data collection and were also excluded from analyses. These individuals were excluded because turnover for these individuals was not their choice, nor the choice of the organization.

Further, it is not of interest to predict death (from varying causes) with the predictor variables in this study and the cause of death is not known from the data. The overall model was significant ($\chi^2 = 339.70$, $df = 11$, $p < .001$) indicating that at least some of the covariates predicted the time until turnover. In total, 246 individuals experienced turnover by the end of 2015. Agreeableness, formal development, and informal development were the variables that significantly predicted time until turnover. For this model, every unit increase in Agreeableness was associated with an 18% increase in likelihood of turnover. For every unit increase in formal development individuals were 20% less likely to experience turnover. For each informal developmental experience resulted in a 27% decrease in likelihood of experiencing turnover at any given time. Full results can be seen in Table 4. The cumulative survival function plotted at the mean of the covariates can be seen in Figure 3 and the cumulative hazard function plotted at the mean of the covariates can be seen in Figure 4.

To further investigate the role of promotion through the ranks, a second Cox model was run with promotions separated out from other informal developmental experiences. Overall, the same pattern of effects was found in this model as the previous model where promotions were included with other informal developmental variables. The overall model was significant ($\chi^2 = 339.80$, $df = 12$, $p < .001$). As in the previous model, Agreeableness significantly predicted turnover such that for each unit increase in Agreeableness individuals were 19% more likely to experience turnover.

Formal development also continued to predict turnover such that for each additional formal developmental experience individuals were 19% less likely to experience turnover. For informal development, each additional informal developmental

experience not including promotion reduced turnover by 27% while each additional promotion reduced turnover by 29%. Since it appears that the influence of promotions does not differ from other types of informal development, this supports what was found in the literature and promotions will continue to be included with other forms of informal development. Additionally, a χ^2 test determined that there was no statistically significant difference between the two models ($\chi^2 = -11187.1$, $df = 1$, $p = >.05$). Full results can be seen in Table 4. In sum, results from the Cox regression and Cox regression with time dependent covariates explain more variance and improve understanding of turnover in comparison to the baseline survival estimates. While there is not a direct statistical comparison, the difference in information provided and the statistical significance of predictors from the Cox regression models and Cox regression with time dependent covariates provides support for Hypothesis 1.

Table 4.
Survival Analysis Model Results

Predictor	Cox Regression	Cox Regression	Cox Regression with Time Dependent Covariates
Sex	1.055	1.045	1.285**
Ethnicity	1.089	1.091	0.943
General Mental Ability	0.998	0.998	0.999*
Leadership	0.972	0.974	0.968
Neuroticism	0.913	0.915	1.022
Extraversion	1.027	1.026	0.963
Openness	1.099	1.089	1.004
Agreeableness	1.183*	1.186*	1.037
Conscientiousness	0.903	0.905	1.015
Formal Development	0.809***	0.813***	0.942***
Informal Development	0.730***		0.799***
Informal Development (without promotions)		0.734***	
Promotion		0.715**	
<i>n</i>	385	385	385
<i>d.f.</i>	11	12	11
Wald	274.700	276.300	687.100
χ^2	339.7	339.8	825.400
R ²	0.586	0.586	0.226
Maximum R ²	0.999	0.999	0.993

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 3.
Survival function at mean of covariates

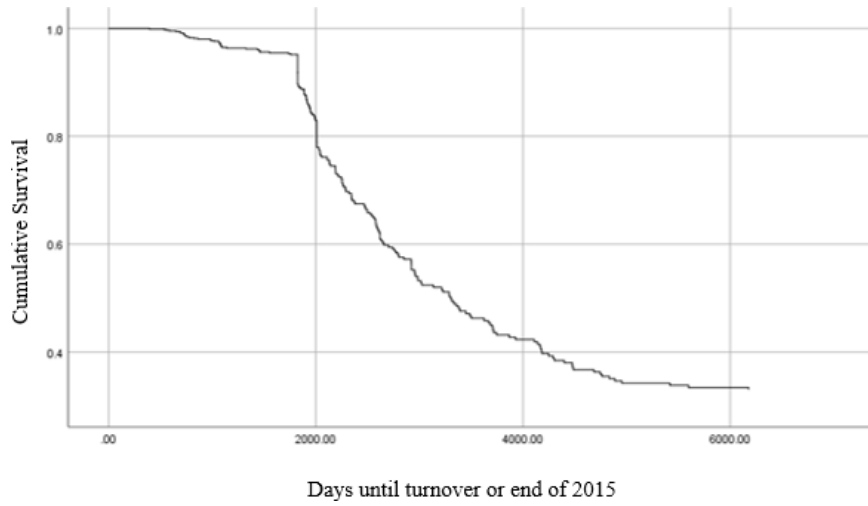
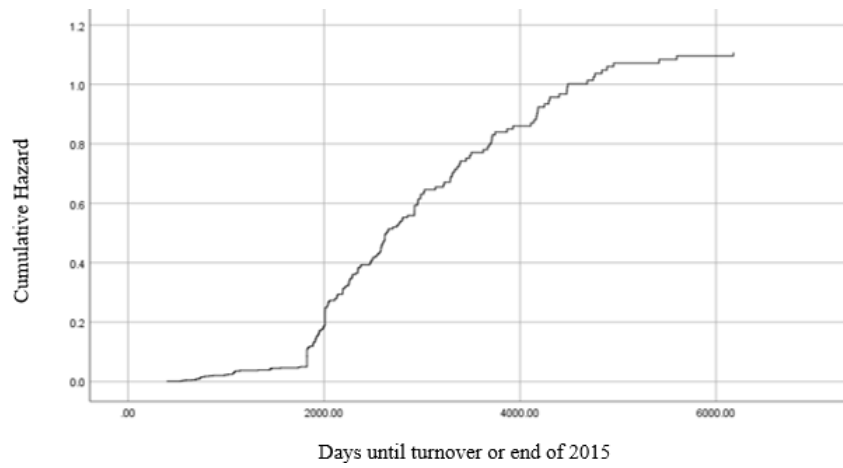


Figure 4.
Hazard function at mean of covariates



Cox Regression with Time Dependent Covariates

A Cox regression with time dependent covariates was conducted to build upon the results and further incorporate time and allow for the development covariates to vary across time. Rather than comparing those that experience turnover with those that do not experience turnover, time-dependent models examine the risk of an event at each time period, and reevaluate the risk at each time point based on whether or not each individual has experienced the event (i.e., turnover) at that time. As with Cox regression with proportional hazards, sex, ethnicity, general mental ability, leadership, and personality remained static. These covariates are interpreted similarly to prior models as they do not fluctuate over time.

Formal development and informal development were included in the model as time dependent covariates. Overall, the model was significant ($\chi^2 = 825.4$, $df = 11$, $p < .001$). However, the time model with time dependent covariates explained less variance than the static model, failing to provide support for Hypothesis 2a. Unlike the Cox regression with proportional hazard models, when controlling for all other covariates in the time dependent model Agreeableness is no longer a significant predictor, but gender and general mental ability are. For gender, being female instead of male leads to a 28% increase in experiencing likelihood of turnover. Although gender emerges as a significant predictor in the model, the small sample size of women in the analysis ($n=33$) suggests that these results should be interpreted with extreme caution. However, gender was left in the model to be included as a control variable for interpretation of other covariates. While significant, the impact of general mental ability is small such that for each unit increase in general mental ability, there is a 1% reduction in likelihood of

turnover. For time dependent covariates, the hazard ratio is interpreted as the amount by which the rate of turnover changes for a unit change in the time dependent covariate. For each unit increase in formal development, there is a 6% decrease in change in the turnover rate over time while there is a 21% decrease in change in turnover rate over time for informal development. The covariates in the time dependent model demonstrated different relationships with turnover than they did in the Cox proportional hazard model, supporting Hypothesis 2b. This demonstrates that allowing the covariates to vary over time changes the predictive power and the results between the different analyses. Both developmental variables decrease in their explanatory power when included as a time dependent covariate, failing to support Hypothesis 3a and 3b. Full results for the Cox regression with time dependent covariates can be seen in Table 4. The cumulative survival function can be seen in Figure 3 and the cumulative hazard function can be seen in Figure 4. These functions are the same as they are for the Kaplan-Meier analysis. The covariates are interpreted as the effect that they have on these baseline hazard and survival rates.

Period effects and interaction with time.

Due to the violation of the assumption of proportionality of hazards, it is appropriate to extend this model to test for changes in the influence of variables over time. However, this also means that it is inappropriate to test for linear interactions with covariates over time as the effect will not be linear over time. However, it is still possible to look for interactions with predetermined time periods and allow the covariates to change within each time period. This can be achieved by dividing the data into piecewise epochs and modeling the covariates relationship to turnover within each epoch. Modeling

survival analysis with piecewise functions allows to test for interactions in predetermined time periods while simultaneously investigating how predictor variables influence turnover within specific time periods. These epochs were determined in the methods section by breaking the time periods into the natural points for turnover related decision points for Soldiers in the Army. Namely, the epochs were defined as zero to five years, five to eight years, eight to 10 years, and 10 to 17 years. Each covariate was then estimated and given an odds ratio that was allowed to vary across each of the four epochs or time periods.

The development variables had the clearest and strongest effects. Contrary to prediction, the influence of formal development in relation to turnover steadily decreased over time. Across each epoch, each additional formal developmental experience decreased the likelihood of turnover by 41% from zero to five years, 32% from five to eight years, 16% from eight to 10 years, and 15% from 10 to 17 years, respectively. Similarly, the influence of informal developmental experiences also decreased over time. However, the overall influence was greater than formal developmental experiences with each additional experience decreasing the likelihood of turnover by 66% from zero to five years, 39% from five to eight years, 38% from eight to 10 years, and 21% from 10 to 17 years. Thus, neither hypothesis 3c nor 3d were supported.

There were other non-hypothesized changes and trends worth noting. First, there were unique findings for personality variables that emerged in this analysis. While higher Agreeableness had a moderate negative impact on likelihood of turnover for the other models, when broken into periods it appears that this effect switches and decreases the likelihood of experiencing turnover after 10 years. Neuroticism also has a changing

impact. Higher levels of Neuroticism indicate a decreased likelihood of experiencing turnover from zero to eight years, but from eight years onward higher levels indicate an increased likelihood of experiencing turnover. Openness was only a statistically significant predictor only during the five to eight-year period, and a unit increase in Openness was associated with a 19% increase in likelihood of turnover.

Leadership was a significant predictor in this model. During the first five years, each additional unit increase in leadership was associated with a 35% increase in likelihood of turnover while from eight to 10 years each unit increase was associated with a 54% decrease in likelihood of turnover. This unexpected finding was further explored in the competing risks analyses. The last notable effect that changed in strength over time was gender. In this analysis, female was the referent variable (opposite from other analyses for interpretation purposes). Results indicate that being male decreases the likelihood of turning over and that this effect increases in strength over time, even though it is only statistically significant from time periods five to eight years and from 10 to 17 years. Between these two time periods, being male decreases the likelihood of experiencing turnover by 22% between five and eight years while it decreases the likelihood of experiencing turnover by 66% from 10 to 17 years. As with the Cox regression model with time dependent covariates, the small sample size of women in this study means that these results are included for the purposes of a control variable. Results in this analysis pertaining to gender were not interpreted as the already small sample size diminished over each time period included in the analysis. While ethnicity does have some significant values in this model, the number of non-white individuals experiencing turnover at each time period is low and statistical significance is likely a statistical artifact

of this particular data set. This variable was intended to be included as a control however, and thus ethnicity is held constant for interpretation of all other covariates and does not need to be interpreted by itself. Full results for can be seen in Table 5.

Table 5.
Survival Analysis Piecewise Regression Results Model 4

Predictor	0-5 years	5-8 years	8-10 years	10-17 years
Sex(F)	0.839	0.781*	0.677	0.438**
Ethnicity	0.529*	1.371**	0.630†	0.716†
General Mental Ability	0.997	1.000	0.995**	0.995***
Leadership	1.345*	1.140†	0.468***	0.848
Neuroticism	0.798*	0.751***	1.260†	1.196†
Extraversion	0.996	0.927	1.088	0.984
Openness	1.060	1.190***	1.090	0.931
Agreeableness	1.140*	1.166***	1.270**	0.789***
Conscientiousness	0.971	0.833***	0.781*	1.064
Formal Development	0.591***	0.682***	0.843***	0.851***
Informal Development	0.341***	0.610***	0.624***	0.792***
<i>n</i>	385			
<i>d.f.</i>	44			
Wald	2759.000			
χ^2	3791.000			
R ²	0.305			
Maximum R ²	0.881			

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

In sum, many of the proposed hypotheses were unsupported and there were some additional unexpected findings. While the addition of covariates did add explanatory power, this trend did not continue with the inclusion of time dependent covariates. While not hypothesized, it should be noted that the Cox piecewise regression that fitted specific time periods and allowed for time varying coefficients rather than time varying covariates explained more variance. A summary of the hypotheses are below.

Hypothesis 1: Cox regression with proportional hazards will explain more variance than the Kaplan-Meier estimator: **Supported.**

Hypothesis 2a: Cox Regression with time dependent covariates will explain more variance than Cox Regression with Proportional Hazards: **Not supported.**

Hypothesis 2b: Analyzing different specific time points utilizing Cox Regression with time dependent covariates will result in varying relationships between the covariates and likelihood of turnover: **Supported.**

Hypothesis 3a: Incorporating time-dependent formal development into the model of turnover will add incremental prediction over static assessments of formal development: **Not supported.**

Hypothesis 3b: Incorporating time-dependent informal development into the model of turnover will add incremental prediction over static assessments of informal development: **Not supported.**

Hypothesis 3c: The impact of informal development on turnover will increase over time: **Not supported.**

Hypothesis 3d: The impact of formal development on turnover will increase over time: **Not supported.**

In order to investigate some of the unexpected findings, additional competing risks analyses were conducted. Since certain covariates changed in their strength between analyses and some covariates were statistically significant in some models but not others, the exact nature of the relationships between covariates and turnover was not clear nor were the causes of the varying results across analyses. Thus, additional analyses comparing voluntary and involuntary turnover were conducted to see if investigating the relationship between covariates and the type of turnover offered additional explanation for unexpected findings. These post hoc analyses were conducted to determine if the

unstable nature of some of the covariates could be due to the difference in their influence on voluntary turnover and involuntary turnover. Details about the models are below.

Competing Risks Models.

To further investigate findings and to determine if the predictor variables differ between types of turnover (e.g., voluntary turnover and involuntary turnover), a competing risks model was run. Competing risks models are used to analyze the different ways that an individual can experience an event (Mills, 2011). While ideally the type of turnover would be differentiated across all analyses, inclusion of a model with all covariates changing across time and split out by the type of turnover was not possible due to the small overall sample size.

Two types of competing risks models were run to further demonstrate how the choices made about analyses can influence results and interpretation of results. A latent or cause-specific approach was utilized to allow for survival analysis to be performed separately for each event type and relies on the generalized Kaplan-Meier based product limit curve (Mills, 2011). Alternate event types (e.g., for the voluntary turnover survival analysis model, the individuals who experienced involuntary turnover would be considered as experiencing an alternate event) were treated as right censored categories for this variation of the analysis.

A second form of competing risks analyses, the cumulative incidence approach, produces estimates of the marginal probability of an event (Kalbfleisch & Prentice, 1980; Putter et al., 2007) and does not impose the assumption that the competing risks are independent. Because being at risk for voluntary turnover does not exclude individuals

from being at risk for involuntary turnover, the assumption of independent risks is not met making the cumulative incidences approach more appropriate.

When considering only voluntary turnover, a total number of 385 individuals were included in analysis with 182 experiencing the event of interest, voluntary turnover. The overall model was significant ($\chi^2 = 270.90$, $df = 11$, $p < .001$) with Agreeableness, formal development, and informal development significantly predicting likelihood of turnover. In this model, each additional occurrence of formal development resulted in a 26% decrease in the likelihood of turnover while each additional occurrence of informal development also resulted in a 25% decrease in the likelihood of turnover. Agreeableness was significant such that each unit increase in Agreeableness is associated with a 19% increase in experiencing turnover. When considering only involuntary turnover, the overall model was significant ($\chi^2 = 81.850$, $df = 11$, $p < .001$) and 64 individuals experienced the event of interest. For involuntary turnover, each unit increase in their peer evaluated leadership score at West Point was significant such that each unit increase in their leadership score led to individuals being 57% less likely to experience turnover, each unit increase in informal development led to individuals being 34% less likely to experience involuntary turnover. Full results for both voluntary turnover and involuntary turnover can be seen in Table 6.

Overall, this analysis suggests that while informal development is a statistically significant predictor for both voluntary and involuntary turnover, formal development is only a statistically significant predictor for voluntary turnover and Leadership is a statistically significant predictor only for involuntary turnover. This demonstrates that the predictiveness of the covariates is dependent on how the individuals in the sample

experienced turnover. This is possibly one reason that some of the covariates appear unstable and change in their level of predictiveness both across analyses and across the time periods that were analyzed in the piecewise regression model.

A second form of competing risks analysis utilizing cumulative incidences was also performed. The model was significant ($\chi^2 = 281.900$, $df = 22$, $p < .001$) and resulted in a similar pattern between covariates as the cause specific approach but with slightly different values. Leadership scores were only a significant predictor for involuntary turnover and decreased the likelihood of experiencing it by 57%. Agreeableness was significant only for voluntary turnover, and a unit increase results in a 17% increase in likelihood of experiencing voluntary turnover. Formal development was only a significant predictor for voluntary turnover and each additional formal developmental experience resulted in a 26% decrease in voluntary turnover. Each additional informal developmental experience decreased likelihood of turnover by 25% for voluntary turnover and 35% for involuntary turnover. In general, this approach to competing risks decreases the inflation that is caused by taking a cause specific approach as it accounts for censoring in a more accurate way as it does not consider not experiencing turnover as the same way as experiencing a different type of turnover. A comparison between these two approaches and implications will be addressed in the discussion. Hazard and survival plots can be seen in Figure 5 and Figure 6.

Table 6.
Competing Risks Model Results

Predictor	Latent Model Voluntary Turnover	Latent Model Involuntary Turnover	Cumulative Incidences Voluntary Turnover	Cumulative Incidences Involuntary Turnover
Sex	1.054	0.974	0.948	1.027
Ethnicity	1.188	0.882	1.190	0.882
General Mental Ability	0.999	0.997	0.998	0.997
Leadership	1.290†	0.427**	1.279	0.428**
Neuroticism	0.882	0.910	0.889	0.910
Extraversion	1.075	0.894	1.069	0.894
Openness	1.114	1.050	1.110	1.050
Agreeableness	1.191*	1.211	1.189*	1.121
Conscientiousness	0.903	0.878	0.909	0.878
Formal Development	0.737***	0.994	0.743***	0.995
Informal Development	0.753***	0.658***	0.751***	0.658***
<i>n</i>	385	385	385	
<i>d.f.</i>	11	11	22	
Wald	204.000	81.850	281.900	
χ^2	270.900	94.100	360.500	
R ²	0.505	0.217	0.374	
Maximum R ²	0.995	0.835	0.971	

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 5.
Survival function at mean of covariates by turnover type

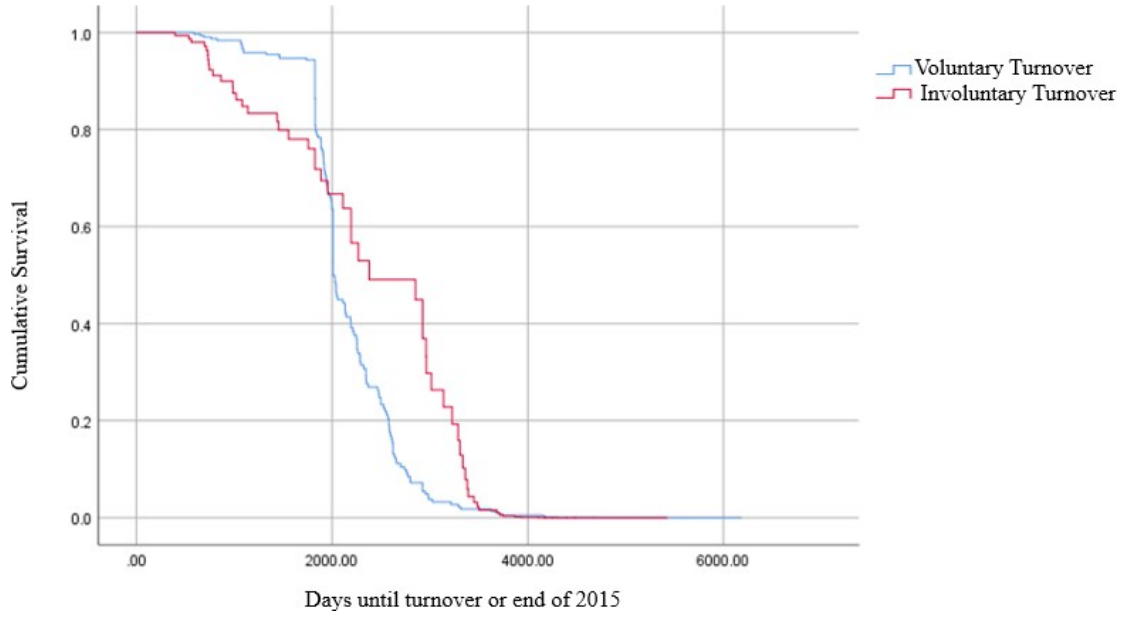
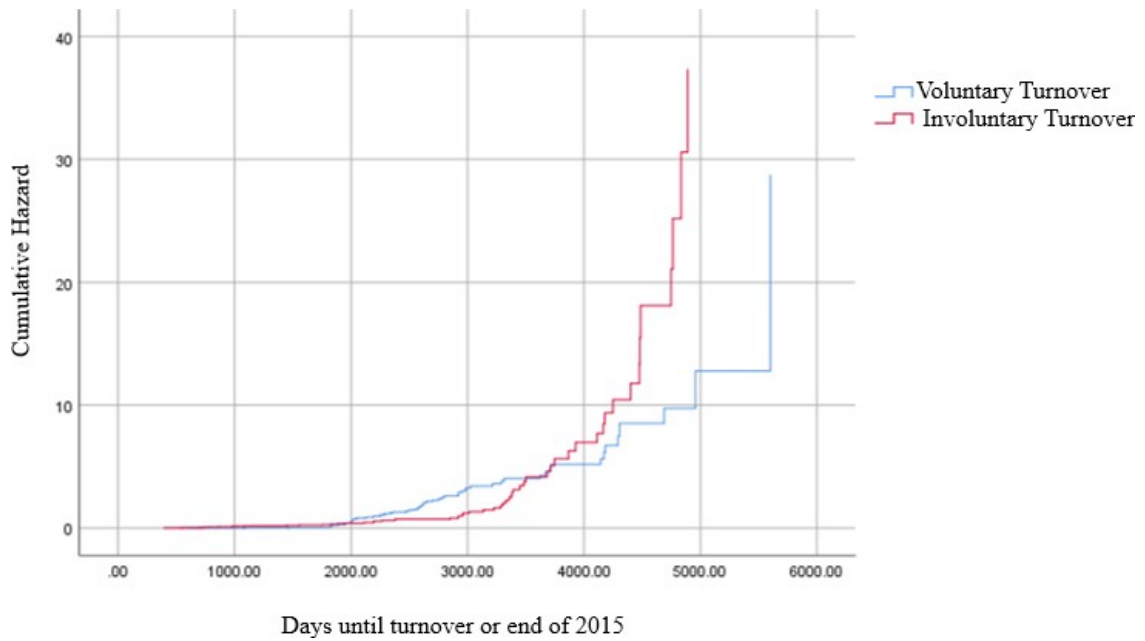


Figure 6.
Hazard function at mean of covariates by turnover type



Chapter 5: Discussion

Summary of Findings

The purpose of the present study was to develop a better understanding of the dynamic nature of career paths and development for HiPos and how it impacts HiPo turnover. To do so, this study also aimed to investigate statistical techniques that are appropriate for studying dynamic and temporal models of turnover. Overall, the research questions were answered as the incorporation of temporal and dynamic variables added to our understanding of HiPo careers, analytic techniques were compared and offered different pieces of information about HiPo turnover, and the integration of variables relevant to careers and development further aided understanding of HiPo turnover. While not all hypotheses were supported, the results did offer insights into which individual differences and developmental experiences are predictive of turnover as well as when they are predictive of turnover. Both formal and informal development were the strongest predictors of HiPo turnover, but the impact of both decreased over time. Overall, the results suggest that the chosen analysis will greatly impact the results and interpretations of the data. Details about each analysis and the results in relation to HiPo turnover are described in detail below.

Life tables and Kaplan-Meier estimator. To investigate the impact of time and predictors on the likelihood of turnover, several types of survival analyses were conducted. First, life tables and Kaplan-Meier estimation were conducted to investigate the base rate of turnover for Army HiPos. From these analyses, it can be concluded that the majority of turnover happens by the eight and ten-year mark. Further, examination of the life table demonstrates that by far the largest exit period is at the five-year mark. This

huge jump is most likely due to the fact that attendance at West Point incurs a five-year service agreement for Soldiers. Therefore, for most Soldiers this is the first opportunity to leave the Army. There is a much smaller spike at the eight-year mark which corresponds to when Soldiers who incurred extra time for school can leave. There is a clear decline in turnover after the ten-year mark with Soldiers leaving at a gradual rate through Year 17. In order for Soldiers to receive their full retirement benefits, they must stay in for 20 years. Therefore, it is likely that at a certain point the decline is due in part to the desire to want to stay long enough to receive those benefits. These spikes in turnover after year five and year eight correspond with the a priori time periods that were chosen for comparison in subsequent analyses. These results also mirror other Army studies that demonstrate that many soldiers leave the Army early, sometimes even before their first commitment is up (Klein, Hawes-Dawson, Martin, 1991), and that participating in the Army Continuing Education System can extend time until turnover (Sitcha, Dall, Handy, Espinosa, Hogan, & Young, 2003). This provides support that these are important time periods to compare.

Cox regression with proportional hazards. The Cox regression with proportional hazards model built upon the baseline findings from the life table and Kaplan-Meier results. Namely, this analysis allows for the inclusion of covariates in the model which allow for interpretation of the influence the covariates have on hazards, or likelihood of experiencing the event of interest. Incorporating covariates is important because the hazards can show changes in risk that may not be apparent from just examining the survival probability (Moore, 2016). Results from the Cox models with proportional hazards demonstrated that individuals that were higher in levels of

Agreeableness were more likely to turnover. This finding is contrary to prior research that has shown higher levels of Agreeableness relate to lower levels of turnover (Zimmerman, 2008) or have no relationship with turnover (Woo et al., 2016). The unexpected findings between personality and turnover might be due to limitations from the way personality was measured. More of both formal and informal development opportunities were predictive of a lower likelihood of turnover with informal being a stronger predictor. This relationship is supported by other findings in the literature which state that developmental practices can communicate to employees that they are supported and valued (Baruch & Quick, 2007; Eisenberger et al., 2001; Rhoades & Eisenberger, 2002). These findings generally support the idea that retention of HiPos is driven by providing them with developmental opportunities (Fernández-Aráoz et al., 2011; Coetzee & Stoltz, 2015).

Cox Regression with Time Dependent Covariates. Allowing for time dependent covariates in the Cox regression dramatically lessened the impact of formal development and also lowered the impact of informal development on turnover. Additionally, gender became a significant predictor in this model such that being female led to a 29% increase in turnover in comparison to males. As stated in the results section, the small sample of women included in this analysis should be interpreted with extreme caution. While women do generally turnover at a greater rate than males in the Army (Military Leadership Diversity Commission, 2010), it is interesting that this effect only became apparent once time dependent covariates were added into the model. It is possible that before allowing for this fluctuation, the influence of the static developmental variables produced an inflated relationship with turnover which suppressed the relationship between gender and turnover. Despite the small sample size that limits the

stability of the estimate, the finding that females are more likely to turnover than males is consistent with decades of military research that demonstrate that women are more likely to turnover (Laurence, Naughton, Harris, 1996; Putka & Bradley, 2008; Vernez & Zellman, 1987).

A similar effect occurred for general mental ability, in that it only became statistically significant after other variables were allowed to fluctuate over time. However, while statistically significant, the relationship is so small that it might not be practically significant as an increase in general mental ability reduces the likelihood of turnover by 0.1%. This relationship between general mental ability and turnover is counter to existing research as higher general mental ability has been previously found to be predictive of lower likelihood of turnover (Dickter et al., 1996). While the direction is the same, the relationship is stronger than the fraction of a percentage relationship that was found in this study. Perhaps the relationship is manifesting in a small percentage in this study because the relationship between cognitive ability and turnover has been found to be curvilinear in nature such that individuals who are both very high and very low in cognitive ability are likely to turnover (Maltarich et al., 2010). It is also possible that this impact could be larger and more consistent if a different or more highly g loaded measure was used.

Extensions to Cox Regression. Due to the violation of assumptions of the proportionality of the hazards, or the assumption that the covariate is similar in its level of prediction across all time periods, extensions to the Cox model were conducted to gain additional insights into the relationship between turnover and the chosen covariates at different time points. Utilizing a piecewise Cox regression is an extension that offers

considerable flexibility (Moore, 2011). Namely, it allows for the investigation of changing hazards within specific, predetermined time periods. Results from the piecewise regression model are likely to be the most accurate representation as all covariates, with the exception of general mental ability, violated the proportional hazards assumption in the Cox regression model. This violation demonstrates that the influence of the covariates is dynamic. Therefore, modeling the covariates over time to account for dynamism likely offers the most accurate representation of the relationship between the covariates and turnover.

Most notably, formal and informal development are still the covariates with the strongest relationship to turnover which is consistent with previous findings that developing HiPos reduces turnover (Burke, 1997; Fernández-Aráoz et al., 2011; Coetzee & Stoltz, 2015). However, allowing for time varying coefficients produces results that show that this effect steadily decreases over time. The decreasing influence of development was counter to expectations and failed to support hypotheses. Development was expected to become increasingly predictive of turnover over time as prior research has demonstrated that employees perceiving a lack of development as a driver of turnover (Ng et al., 2007; Rahman & Naz, 2013). This could be taken to mean that developmental opportunities are most likely to lead to HiPo retention early in an individual's career. However, with the data available in this study this is also confounded with being new to an organization. Future research could investigate this confound by comparing individuals in their first job with individuals in a new organization.

Results in this model paint a very different picture for the influence of personality on turnover than the more simplistic models do. While Agreeableness was a significant

predictor in the Cox regression with proportional hazards models, this model shows that Agreeableness interacts with time such that over time being more agreeable appears to increase the likelihood of turnover up to the 10-year mark. After that time however, higher levels of Agreeableness relate to a decrease in likelihood of turnover. This change in influence is possibly why Agreeableness was not a significant predictor in the Cox regression with time dependent covariates model. The changing effect could wash out over time or change the way it would be interpreted as a static predictor.

Prior research has shown personality predictors to be both stable predictors over time (Barrick & Zimmerman, 2009) and to change in their level of influence over time (Woo et al., 2016). Because so few studies investigate dynamism in the variables and the level of their influence, it is difficult to evaluate the true nature of these relationships. Without additional research it is impossible to determine with certainty if these relationships and the strength of their predictability varies over time or if the analyses are capturing idiosyncrasies in the data. The inconsistency of these findings might mean that the relationship between personality and turnover is best evaluated within the context of the position or organization.

In the context of the Army, being higher in Agreeableness may make for a lower person-job fit, person-organization fit, or person-environment fit, particularly earlier in an officer's career when they are more involved in directly disciplining their subordinates. A lower fit could explain the increased likelihood of turnover (Kristoff-Brown, Zimmerman, & Johnson, 2005; Vogel & Feldman, 2009). It is possible that after they have been in for 10 years when they have progressed higher through the ranks that the relationship between Agreeableness and likelihood of turnover changes. Perhaps later in

an officer's career it serves them more to be able to get along with other high-level leaders. These potential explanations could be explored in future research about the dynamic relationship between personality and turnover.

Additional personality variables that were significant predictors include Neuroticism, Openness, and Conscientiousness. Conscientiousness was only a significant predictor between five and 10 years and higher levels related to lower levels of turnover. This result is consistent with findings in the literature which in general have found that individuals higher in Conscientiousness are less likely to turnover (Barrick & Mount, 1991; Barrick & Mount, 1996; Barrick & Zimmerman, 2009; Salgado, 2002).

Neuroticism had an interesting effect such that early in the subject's careers, higher Neuroticism was related to a decreased likelihood of turnover while after eight years higher Neuroticism was related to increased likelihood of turnover, even though the relationship was only marginally significant. It is possible that higher Neuroticism is related to retention because the military is a good fit for individuals who like a lot of structure. However, as they progress up the ranks it is possible that there is less structure in their day to day lives and the relationship between Neuroticism and likelihood of turnover changes. Requirements differ at higher echelons in the military (Jacobs & Jaques, 1990) and it is possible that as the job requirements change the fit between individual's personality and the position that they are in in a way that impacts how likely an individual is to stay in their job or turnover.

Lastly, Openness was only predictive during the five to eight-year time period. Higher levels of Openness generally are related to lower levels of turnover, but often this finding is small (Barrick & Mount, 1991; Salgado, 2002). Recently, it has been found that

while small, the impact of this variable could increase over time, particularly learning approach or intellectual curiosity (Woo et al., 2016).

Because so many of the personality variables had small effects and changed in their relationship to turnover over time, it is not surprising that these relationships were not apparent in other, more simplistic versions of survival analysis. However, in this particular study it is impossible to determine if the emergence of dynamic relationships between covariates in turnover are because the more simplistic analyses failed to capture these changes in the relationship or because the more complex analyses over analyzed the data. Because the assumption of proportional hazards was not met for more simplistic analyses, it is more likely that the more complex analyses demonstrate the true relationship because it is able to model the dynamism that the Cox regression model could not. It is also worth noting that the way personality was measured could be causing unexpected findings as the personality variables were not measured with an assessment intended to capture personality.

There were several other variables that became significant predictors in the piecewise model that were not significant predictors in the model with proportional hazards. Being female was associated with an increased likelihood of experiencing turnover and this likelihood grew over each subsequent time period. Sporadic statistical significance is likely due to the small proportion of females, particularly when broken out into four time periods. As the females in the sample experienced turnover, there were less and less of them in the subsequent time periods which could be partly responsible for the inconsistencies in statistical significance.

Similarly, general mental ability and leadership also had inconsistencies in their effects. General mental ability was only significant during the eight to 10 and 10 to 17-year time periods. Although statistically significant, the relationship was quite small such that a unit increase in general mental ability was associated with a 0.5% decrease in the likelihood of turnover. While the literature shows a positive relationship between general mental ability and turnover (Boudreau et al., 2001; Dickter et al., 1996; Maltarich et al., 2010), it is possible that this relationship doesn't account for much after controlling for the other covariates in the model. Lastly, leadership was a statistically significant predictor from zero to 10 years. During that time the relationship between leadership and turnover went from higher levels of leadership relating to a 35% chance increase in turnover to higher levels of leadership relating to a 53% chance decrease in turnover. Leadership was also a significant predictor in the post hoc analyses and will be discussed there as well.

Results from the piecewise regression model offer the clearest demonstration of why it is critical to analyze results in a way that is both consistent with theory and the phenomena of interest as well as analyze data in a way that can answer questions where time is relevant. In other words, using a regression or ANOVA to assess the relationship between developmental experiences and turnover would yield very different results and would be incapable of answering questions such as “when are developmental experiences the most influential in reducing turnover?”

While it is possible that the influence of developmental experiences is strongest early in someone's career, there are historical events that offer alternate explanations. September 11, 2001 occurred during the first five year time period which overall

positively impacted Army recruitment and retention and Soldiers saw an increase in informal developmental experiences such as deployments (U.S. Army, 2006). Similarly, the ten-year time mark for this sample falls around the 2007-2010 recession (Bureau of Labor and Statistics, 2012). The relationship between developmental experiences and turnover could be lower because in general individuals felt that they had less options and therefore turned over at lower rates regardless of the opportunities they were afforded. While these questions are impossible to answer with the data that we have, examining the relationships at different time periods does offer additional insights and potential explanations that could not be considered if only looking at a single time point or if only the average hazard rate was assessed. While not measured directly in the model, breaking the model down into smaller time periods allows us to make inferences about events in history that could potentially play a role in the relationships that exist in each time period.

Competing Risks Models. Two types of competing risks models were conducted to examine relationships between covariates and type of turnover. The same pattern emerged between the latent approach and the cumulative incidence approach, but the latent approach slightly inflated relationships in terms of value and significance due to the fact that it did not account for the other type of turnover within the same model, but rather estimates the marginal probability of the event without requiring the assumption that the competing risks are independent (Kalbfleisch & Prentice, 1980; Mills, 2011; Putter et al., 2007). In other words, the covariate estimates in the cumulative incidence model are calculated based on individuals who experienced both voluntary turnover and involuntary turnover while the latent approach can only give estimates for one group at a time. If predicting turnover is the goal, accounting for either exit path is more useful

since organizations will not know ahead of time which type of turnover an employee will experience. Therefore, while the estimate might not be as strong, it is likely a more accurate representation of the covariate and likelihood of experiencing turnover.

For example, while the leadership values are very similar between analyses it is significant only in the latent model for voluntary turnover. The non-significance for the same outcome in the cumulative incidence model suggests that at high levels, leadership scores are not something that differentiates among individuals in terms of their likelihood of experiencing turnover. For those who turnover for involuntary reasons however, higher leadership scores while at West Point are a good significant differentiator. Results from these analyses offer additional insights into the relationship between early scores of leadership and the likelihood of turnover. Taken collectively with the results from the extension to the Cox regression model, it appears that individuals high in leadership ratings are more likely to turnover earlier in their tenure than later in their tenure, and that this effect is the most pronounced for individuals who experience involuntary turnover.

Development also showed varied relationships based on the type of turnover. Notably, formal developmental experiences were not statistically significant in their relationship with involuntary turnover. It is possible that individuals who turnover involuntarily are less likely to be given formal developmental opportunities, so a clear relationship does not emerge. Informal development on the other hand has a larger impact on decreasing chances of involuntary turnover. For individuals at risk for involuntary turnover, it could be that having additional opportunities in some way improves performance, changes behaviors, or in other ways makes involuntary turnover less likely. Future research should seek to further explore the potential causal relationship between

the type of developmental opportunities and the relationship it has to different types of turnover.

These findings clearly demonstrate that the ways in which temporal and dynamic predictor variables are incorporated into analyses impacts the conclusions that can be drawn. Collectively, these findings offer a more fine-grained understanding of the relationship between covariates, turnover, and time. Specifically, these results demonstrate when relationships are strongest and offer opportunities to refine theory and improve their applications. The theoretical and practical insights are discussed in more detail below.

Table 7.
Summary of Variables Across Analysis

Predictor	Cox Regression	Cox Regression with Time Dependent Covariates	Piecewise Cox Regression	Competing Risks Latent Model	Competing Risks Cumulative Incidence Model
Sex		Females are 29% more likely to turnover	Females are 22% more likely to turnover between year 5 and 8; Females 56% more likely to turnover after year 10		
Ethnicity			Non-white individuals 0.05% more likely to turnover after year 8		
General Mental Ability		Unit increase related to 0.01% decrease in likelihood of turnover	Unit increase related to 0.05% decrease in likelihood of turnover after year 8		
Leadership			Unit increase related to 35% increase in likelihood of turnover up to year 5; 64% decrease from years 8-10	Unit increase related to 67% decrease for involuntary turnover model.	Unit increase related to 67% decrease of involuntary turnover.

Table 7.
Summary of Variables Across Analysis

Predictor	Cox Regression	Cox Regression with Time Dependent Covariates	Piecewise Cox Regression	Competing Risks Latent Model	Competing Risks Cumulative Incidence Model
Neuroticism Extraversion Openness			Unit increase relates to 20% increase in likelihood of turnover years 5-8		
Agreeableness	Unit increase relates to 19% increase in likelihood of turnover		Unit increase relates to 14% increase in likelihood of turnover years 1-5, 16% increase in likelihood of turnover years 5-8, 27 % increase in likelihood of turnover years 8-10, and 20% decrease in likelihood of turnover years 10-17		
Conscientiousness			Unit increase relates to 16% decrease in		

Table 7.
Summary of Variables Across Analysis

Predictor	Cox Regression	Cox Regression with Time Dependent Covariates	Piecewise Cox Regression	Competing Risks Latent Model	Competing Risks Cumulative Incidence Model
Formal Development	Unit increase relates to 19% decrease in likelihood of turnover	Unit increase relates to 6% decrease in likelihood of turnover	likelihood of turnover years 5-8 and 22% decrease in likelihood of turnover years 8-10 Unit increase relates to 41% decrease in likelihood of turnover years 1-5, 32% decrease in likelihood of turnover years 5-8, 16% decrease in likelihood of turnover years 8-10, and 15% decrease in likelihood of turnover years 10-17.	Unit increase related to 26% decrease in likelihood for voluntary turnover model.	Unit increase related to 26% decrease in likelihood of voluntary turnover.
Informal Development	Unit increase relates to 27% decrease in likelihood of turnover	Unit increase relates to 21% decrease in likelihood of turnover	Unit increase relates to 66% decrease in likelihood of turnover years 1-5,	Unit increase related to 25% decrease in likelihood of turnover for	Unit increase related to 25% decrease in likelihood of voluntary turnover

Table 7.
Summary of Variables Across Analysis

Predictor	Cox Regression	Cox Regression with Time Dependent Covariates	Piecewise Cox Regression	Competing Risks Latent Model	Competing Risks Cumulative Incidence Model
			39% decrease in likelihood of turnover years 5-8, 38% decrease in likelihood of turnover years 8-10, and 21% decrease in likelihood of turnover years 10-17.	voluntary turnover model and 34% decrease in likelihood of turnover for involuntary turnover model.	and 34% decrease in likelihood of involuntary turnover.

Note. This table provides summary information on significant predictors of turnover in each model.

Theoretical implications

Tackling the question of what leads to the retention of HiPos required integrating theory across the domains of turnover, talent management, employee development, and career paths. Each domain provided insights into what variables are predictive of HiPo turnover, but questions pertaining to when these variables were predictive of turnover and how the relationships may change over time remained. Specifically, the role of time can be further explicated across each of these content areas and utilized to build theory specific to HiPo retention, an area that is of great interest to practitioners but to date is largely void of research.

Turnover theory can be improved due to the elucidation between predictors of turnover and the likelihood of experiencing turnover, as well as how these relationships change over time. The relationship between employee development and turnover can be improved as the results demonstrated that while development reduces the likelihood of experiencing turnover, the strength of this predictor decreases across an employee's tenure with an organization. Lastly, the theoretical refinement from turnover and employee development offer insights into how these processes might unfold over time and across HiPo employee careers.

This study contributed to theory related to the temporal process of HiPo turnover. The absence of time and temporal factors in turnover research has long been lamented in the turnover research and is still cited as one of the largest issues facing turnover theory and research (Holtom et al., 2013; Hom et al., 2017; Kammeyer-Mueller et al., 2005; Lee, Burch, & Mitchell, 2014; Mitchell & James, 2001; Morita et al., 1993). This study

has also helped close the gap in temporally related aspects of turnover theory, specifically in relation to turnover of HiPos, in several ways.

First, this study is one of few in turnover research to specify time. Very few studies capture time in their research methods, model it in analyses, or incorporate the effects of time into analyses. Mitchell and James (2001) noted that organizational theory and research historically makes inappropriate inferences in research because time has been missing or ignored when considering theory, methods, analysis, and inference. This study contributed to understanding the role that time plays in turnover theory by incorporating variables that could fluctuate over time and utilizing analyses that incorporated the time until turnover as well as allowing the predictors to change in their value and in their strength over time. Accounting for this dynamism in variables and predictability answers calls to be more specific with our theories and utilize methods that allow for more specified theories (Cortina, Aguinis, & DeShon, 2017; Mitchell & James, 2001).

Studies that incorporate dynamism in predictors has been shown to reduce bias and increase prediction in turnover research (Sturman & Trevor, 2001) which lends credibility to the findings. Thus, it can be assumed that the inferences made from this study are more appropriate than studies that do not account for time either in theory or analysis. At the most basic level, this study contributed to theory by demonstrating that when predictor variables for turnover are averaged together, the findings can appear to be statistically insignificant; while allowing the predictor variables to change in their value or in their strength can reveal different patterns. The impact of appropriately modeling data in a way that is consistent with theory is therefore imperative because the alignment

between theory and analysis is the only way to accurately test hypotheses related to the theory. For example, in the Cox regression model each unit increase in Agreeableness was associated with an 18% increase in experiencing turnover. However, in the piecewise regression survival analysis model, higher levels of Agreeableness went from being related to an increased chance in experiencing turnover to being related to a decreased chance of experiencing turnover over time. When collapsed, it appears that high levels of Agreeableness are always related to an increased likelihood of turnover when in fact after 10 years it appears to actually reduce the likelihood of experiencing turnover. By understanding the variation, it becomes possible to establish links between personality and changing job demands (e.g., Jacobs & Jacques, 1990) that might in turn impact turnover. In continuing to understand the predictors of turnover, it will be imperative to differentiate what predicts turnover early in an individual's tenure with an organization and what predicts turnover later in an individual's tenure with an organization.

Further, this study answered calls in the literature to study change in turnover antecedents (Hom et al., 2017). Incorporating change in turnover antecedents further contributes to the specification of time in research because in our methods and analysis we are incorporating and accounting for when any changes in these predictor variables are occurring (Mitchell & James, 2001). Incorporating time dependent coefficients into the analytical method allowed for interesting and important findings that would not have emerged from different analytical designs such as the more simplistic survival analysis models even though they incorporated other temporal variables (e.g., time until turnover).

Namely, this study found that developmental opportunities and some personality factors are the most predictive of turnover early in an individual's career and that these

effects can diminish over time. This type of research leads to theories that are clearer in the relationship between variables and outcomes over time. This type of research can also improve predictive utility and offers more information for practical application. For example, similar research has found that trajectories of employee job satisfaction offer greater predictive power than static predictors of employee job satisfaction (Liu, Mitchell, Lee, Holtom, & Hinkin, 2012). Similarly, some of the predictor variables in this study were stronger predictors when they were allowed to vary across time periods rather than when they were assumed to be static. In addition, patterns emerge when predictors are allowed to vary across time. By allowing for this dynamism in predictors, it was found that formal and informal development have the strongest relationship to turnover in the first five years of Soldiers' careers and that the relationship diminishes across time. Research studies and theories that have more specific and detailed aspects of time embedded can ultimately lead to more actionable and effective applications of theories.

Results across the different analyses also strengthened the theoretical relationship between personality and turnover. Prior research has found that individuals who are lower on Agreeableness may be more likely to turnover (Zimmerman, 2008). This is because individuals who have positive work experiences or who make friends and feel similar to those they work with are expected to be more likely to stay in their current positions (Liao, Chuang, & Joshi, 2008; Zimmerman, 2008). Interestingly, this study only partially supported these prior findings. In general, results from this study found that higher levels of Agreeableness related to greater chances of experiencing turnover. This effect only changed at the 10-year mark, where the effect reversed, and higher levels of Agreeableness were related to lower chances of experiencing turnover.

It is possible that the findings in this study differed from the other study investigating the changing influence of personality on turnover because of the sample. Being agreeable and getting along with coworkers could be beneficial in lowering likelihood of turnover in many positions, but an opposite relationship in the Army. Particularly in the first 10 years after graduation, most individuals in this sample would have job duties that required disciplining other Soldiers which might not be pleasant for highly agreeable individuals who have tendencies to form friendships when they are in small groups (Barrick, Stewart, & Piotrowski, 2002).

In this sample, being lower in Agreeableness could be beneficial for these aspects of the job. It is further possible that the change in this relationship at the 10-year mark occurs because the further military personnel get in their careers, the less directly tied to disciplinary actions they are. Therefore, the high Agreeableness being related to lower turnover relationship found in other studies may not emerge until later in Army careers. This is an interesting finding that would benefit from future research and exploration. In particular, future research should seek to investigate the dynamic relationship between Agreeableness across various fields and jobs that may benefit differentially from high levels of Agreeableness. Further, rather than directly tying personality to turnover, it might be more beneficial to investigate the relationship between personality and job requirements or job tasks. While other personality variables did not have strong or consistent relationships with time and were rarely significant, future research could also benefit from exploring the relationship between turnover and other personality factors as well.

While it was not an original goal of the study, findings from the piecewise Cox regression have suggested that there are some contextual variables that are worthy of additional consideration and that should be incorporated into future research on turnover. Recent reviews have noted that context is still largely absent from turnover research (Hom et al., 2017). While it was not tested directly, larger historical contextual events could further explain the patterns and results that emerged in these analyses, particularly in the piecewise Cox regression. For example, the time period from zero to five years coincided with events of September 11th which had positive effects on Army retention and were also related to an increase in developmental experiences, specifically deployments, the covariates that had the strongest relationship to retention (Bureau of Labor and Statistics; U.S. Army, 2006). These external events could be an additional driver of the findings and patterns displayed during the first five-year time period.

In future research it will be important to further explore the boundary and context-specific nature of these findings. If it is found that historical events are driving the patterns between individual differences or developmental experiences and turnover, this could further inform theory between turnover and context and would change could change implementation of turnover related programs in organizations. For example, if the state of the economy is found to be an important contextual factor, then the state of the economy should be considered when interpreting turnover rates. Rather than assuming individual and organizational level factors are the only drivers, general historic or economic trends could be an additional source of information for interpreting turnover trends.

The results in this study that inform turnover theory also play a role in informing theory in the talent management domain. Since much of talent management literature and talent management practice is focused on retention of HiPos (Cappelli & Keller, 2014; Lewis & Heckman, 2006), this research establishes a theoretical basis between the practices being implemented and why they may or may not be effective. Further, this research provides some empirical and theoretical evidence for talent management practices which to date have largely been practitioner driven, atheoretical, and lacking in research and empirical evidence (Cappelli & Keller, 2014; Cascio & Aguinis, 2008a; Finkelstein et al., 2017; Rynes et al., 2007). Namely, the link between developmental opportunities and retention is clearly established and demonstrates that informal developmental experiences might be a particularly fruitful area of focus for future talent management research.

The strength of the relationship between informal development and reduced turnover reflects other trends in the literature that focus on learning and development that occurs outside of formal organizational trainings (Bell, Tannenbaum, Ford, Noe, & Kraiger, 2017). Results from this study demonstrate that while both formal and informal developmental experiences relate to lower rates of turnover for HiPos, the effect is the largest for informal development. The findings herein add support to assertions that development and learning that occur outside of formal training are important. While the results of this study establish a link between informal development and reduced likelihood of turnover, future research should seek to further investigate the links between informal development, turnover, effectiveness or success for HiPo populations. Prior research has demonstrated that climates for development can lead to lower turnover

intentions (Spell, Eby, & Vandenberg, 2014) or that development can lead to career success (Maurer & Chapman, 2013), but more research establishing causal and directional links is needed. Establishing a link between informal developmental experiences, HiPo success, and HiPo retention will be especially valuable in bolstering success of talent management and HiPo programs.

A recent model of potential and the HiPo designation process states that developmental opportunities are a critical component of leader success (Finkelstein et al., 2017). As the model of potential and HiPo designation and the findings in this study suggest, the relationship between development and HiPo experiences in the workplace are critical. Finklestein, Costanza, and Goodwin's model suggests that growth opportunities will be related to a higher motivation to succeed. While this study does not link developmental opportunities and performance of HiPos, it does establish that it is related to the retention of these valuable employees. If developmental experiences are related not only to turnover, as suggested by this study, but also leader success, as suggested by Finkelstein and colleagues, then leader development should be explored in detail as a method to not only improve leader success but to retain those successful leaders. Future research should seek to further integrate development, performance, and turnover to understand if the individuals being retained are also the individuals that are performing well.

Findings concerning the link between development and turnover also have implications for career path theory. Namely, it establishes a link between developmental experiences and whether an individual stays in the career they are in or choose to leave and pursue a different career path. On the one hand, the career path literature is filled

with newer career types such as multi-directional careers that suggest that modern career types are fragmented, varied, dynamic, and are the result of employees turning over many times to explore new options (Baruch, 2004). On the other hand, it has been proposed that multi-directional careers are rare, based on anecdotal evidence, and that many individuals still have traditional careers (Clarke, 2013).

It could be that HiPo individuals who do not feel they are being afforded adequate developmental opportunities are more likely to have multi-directional careers while those that are satisfied with the amount of developmental opportunities they receive or who feel they need less developmental opportunities are more likely to remain with a single organization and have a more traditional, linear career. This would explain why formal and informal developmental variables are the most predictive in the first five-year period as individuals who have unmet developmental needs would be likely to leave within the first five years. Alternately, individuals could be motivated to remain with an organization and gain further development due to individual differences in need for mastery. This study demonstrated a larger effect for informal development, which could suggest that this type of development is more important for making career related decisions.

Additionally, it could be that development is an important early in individual's career, and that over time other aspects become more important. The relationship between development and turnover at different stages in an individual's career should be tested in future research as this domain could benefit from more theoretical refinement. Further, future research should seek to determine if development is most important early in an individual's career, early in an individual's tenure with an organization, or both.

Teasing apart the cause for this finding could be informative for both developmental theory and career path theory as it would begin to establish causal links that are currently absent in the literature.

Across these content areas, this study builds theory related to time or the dynamic nature of relationships. This study answered calls to determine how individual level variables interacted with time and related to outcomes overtime which has been cited as essential for improving theories that are vital to informing HR practices (Ployhart & Hale, 2014). Without knowing how long these variables are predictive or how predictive they are at different points in time, practical applications of these findings and updated theories would be limited. Collectively, these findings have considerable theoretical implications about time and the relevance of timing across organizational theories and accentuate the importance of moving towards a temporally based perspective for many aspects of organizational phenomena and research.

Related to the importance of theory pertaining to time, this study contributes to measurement theory as it relates to dynamism and temporally dependent variables. The findings herein demonstrate how the different ways we collect and subsequently model and test available data can influence the conclusions that are drawn. Therefore, moving forward it will be critical for researchers and practitioners alike to be mindful of the type of data they are collecting and the frequency and timing of such data collections. Equally critical will be subsequently choosing an analysis that models the data appropriately and answers the question that is being posed (for an example in another domain, see Costanza & Finkelstein, 2017). For this same study, choosing a different type of analysis would present issues.

For example, if this study were analyzed with multiple regression, the assumption of linearity would not be satisfied, the likelihood of experiencing turnover at any point in time could not be calculated, and only individuals who had already experienced turnover could be included in the analysis. Further, the errors were not identically distributed (a further assumption violation) and the predictions would be difficult to interpret (e.g., probability of turnover is $p = .3$ as opposed to each additional formal developmental opportunity reduces the likelihood of turnover by 30%). Logistic regression would result in the loss of information because the variables would have to remain static, it could not account for time in the same way, and there is no way to account for time varying covariates or time varying coefficients. While Kaplan-Meier analysis, life tables, and Cox regression do not inherently account for time varying covariates or time varying coefficients without extensions, they still produce general hazard functions that show how the rates of individuals experiencing the outcome of interest vary over time. Analyses such as general linear regression and logistic regression would fail to capture the dynamic and changing level of influences the variables have over time. While not every study needs to incorporate dynamic or time varying covariates or coefficients, if time or dynamic variables are inherent in the theory being tested they should at least be considered or addressed in some way.

If general patterns are of interest, life tables and Kaplan-Meier estimates are a simplistic way to examine patterns over time. If understanding the influence of covariates on event occurrence over time is of interest, Cox regression is a robust analysis that would elucidate the relationship between the variables of interest and event occurrence. If

the predictor variables are known to vary across time, time dependent covariates are a basic extension to Cox regression that account for dynamic predictors.

Lastly, if there are historical events likely to influence the relationships between covariates and outcomes or known time periods where the influence of predictor variables are likely to change or vary, piecewise Cox regression can help to answer questions about how the relationship between covariates and event occurrence change across predetermined time periods. Of course, there are additional types of survival analysis and extensions that can be further tailored to answer the question of interest and researchers should be mindful to choose the model that allows them to best answer their theoretical question.

Practical implications

Beyond the methodological implications for researchers, there are important applications that apply to organizational practice. In general, the guiding best practices have stated that development should be used to retain HiPos (Ashkenas, 2012; Fernández-Aráoz, et al., 2011). However, the results from this study suggest that these recommendations should be amended to state that to retain HiPos, they should be given developmental opportunities earlier in their career or tenure with an organization. Because the impact of developmental experiences appears to diminish, for formal development in particular rather dramatically, this could explain why so many HiPo programs are reportedly not very effective.

That is to say, it may not be that the programs are not effective, but that the developmental incentives are not effective all the time. Rather, these programs might be very effective for early career HiPos or HiPos that are new to the organization, but the

program could diminish in effectiveness over time. When the program is evaluated, the effect produced for those early in their career or new to the organization could be hidden by less effective results at a later time. Alternately, these programs could only be effective for employees who are motivated by new experiences. If this is the case, it could suggest a different way to structure programs focused on HiPo retention. Organizations implementing HiPo programs should consider the timing of their programs and interventions when assessing their effectiveness. This could not only serve to improve the program but would answer calls to evaluate HiPo programs in organizations (Capelli & Keller, 2014). By evaluating programs at different time points and for employees that are at different stages in their careers, it would be possible to better assess HiPo programs and determine when the programs are effective and for whom.

Perhaps HiPo development should be focused on early career or new to the organization employees. If they are not getting adequate developmental experiences when they are new, HiPos could be more likely to seek alternate opportunities or it may be easier for them to make the decision to leave and go somewhere else. Alternately, if there is a limited budget it might suggest that the way to get the greatest return would be to focus the developmental budget on early career HiPos.

Recently, it has been suggested that future turnover research should focus on turnover management strategies and practices in organizations (Hom et al., 2017). These findings certainly suggest that talent management departments would benefit from focusing these retention strategies on early career employees. Future research should explore this and see if it is as beneficial as the results herein suggest by seeking to replicate these findings in other industries and with employees who are not in their first

job. Understanding when development matters the most is critical for effectively tailoring developmental experiences in the workplace and implementing effective solutions in talent management aimed at retaining HiPos.

Lastly, this study also demonstrates the utility of using survival analysis to answer questions with temporal components and to test the temporal or dynamic components of organizational theories. While there have been prior calls to use this analysis (Morita et al., 1993), many studies continue to test hypotheses with analyses that cannot capture time or dynamic predictors (Coats et al., 2015). Researchers have stated that organizational theories and in particular turnover theories are in great need of greater consideration of time (Hom et al., 2017; Kammeyer-Mueller et al., 2005; Ployhart & Hale, 2014). The findings herein demonstrate how using survival analysis can build temporal aspects into theories of turnover, development, and career paths.

Limitations and Future Research

While this study advances our understanding of the importance of appropriately analyzing time in a way that corresponds with theory and informs our understanding on the relationship between development and turnover, there are some important limitations to acknowledge. Specifically, there are potential confounds in the data, data quality concerns for personality variables, and generalizability concerns. Each of these limitations is discussed in turn along with avenues for future research.

While there was a clear relationship between developmental opportunities and turnover, there is a potential for confounds. In the Army, completing schooling may incur additional service time. For example, if a Soldier studies for and receives a master's degree during their service, they incur an additional three years of service. For recent

USMA graduates, that means that instead of being able to leave after five years, their first chance to leave would be at eight years instead. Therefore, from this study it is impossible to determine if the opportunity to go back to school and earn additional degrees leads people to want to stay in the Army or if it makes them feel like they have to stay in the Army. It could be that the opportunity to go back to school makes individuals feel that the organization values them or it could present additional opportunities for them to apply what they learned in a different position within the Army. Alternately, individuals could only stay because they are forced to stay. It is also possible that both of these situations occur and that the reasoning is dependent on the individual. As this question cannot be answered with the present results, more investigation is needed into this area to better understand how formal development such as additional school relates to lower likelihood of turnover.

To better understand the link between development and turnover, the results found in this study should be further incorporated into the turnover process. Future research should seek to further build a link between turnover intention and the cause of turnover to build a more complete understanding of how this process unfolds over time rather than just the final results. Additionally, turnover research could also benefit from incorporating the influence of development in reducing turnover with the varied exit paths.

Related to further investigation of the different exit paths to turnover is further investigation of the underlying cognitive processes related to turnover. For example, this study found that both formal and informal development were related to reduced likelihood of turnover, particularly at earlier career stages. Why would developmental

opportunities matter more earlier rather than later? How are these experiences related to the turnover decision process? A better understanding of how developmental experiences are related to the decision to stay or leave an organization would allow organizations to optimize their development and retention strategies.

Future research should also seek to further explore alternate explanations for the variation in the influence of developmental variables. One way to approach this would be to replicate the same study with West Point graduates from different years. If the same patterns are found across different time periods, this adds support to the idea that both formal and informal development are the most relevant early in an individual's career. Additionally, it would be useful to replicate this study in other organizations or with individuals who are new to an organization but not new to their career. This would help to determine if development is most likely to reduce turnover early in an individual's career or early in their tenure with an organization.

The second major limitation is that there is reason for concern about the quality of data for personality variables. While there were no specific hypotheses related to personality variables in relationship to turnover, the relationship between personality and turnover was unexpected and inconsistent. While statistically significant relationships between personality and turnover could reflect actual relationships, it is also possible that these relationships emerged due to idiosyncrasies in this particular data set. Because personality scores were created with analog scales for the NEO Personality Inventory from scales not intended to measure personality, it could limit how representative the personality scores were for individuals in the sample. Further, it is possible that the personality scales computed while the individuals were 18 years old were not predictive

of turnover up to 21 years later when the data collection ended as there is evidence that personality can change with age (Roberts, Walton, & Viechtbauer, 2006). It would be useful to further assess these relationships with actual personality measures as well as repeated personality measures to further explore these relationships and to see if these results replicate.

Third, this study is limited due to the potential lack of generalizability due to the utilization of a military sample. The military as an organization does not reflect many other types of organizations, particularly newer types of organization with less hierarchy. Additionally, developmental experiences in the Army could differ in meaningful ways from developmental experiences in other organizations. It is reasonable to assume that there could be differences between an informal developmental experience such as deployment into an active war zone and a 3-month job rotation. This line of research could benefit from future work that investigates other industries that have additional opportunities and types of development to better understand the influence of development on turnover over time. Further, more varied types of development would allow for a greater understanding of the many and varied ways development could impact turnover.

It would also be useful for future research to further explore these findings in relation to gender. In this study, gender was only a statistically significant predictor when covariates were allowed to vary over time either as time dependent covariates or time dependent coefficients. The two Cox regression models demonstrated some unexpected patterns in the relationship between gender and turnover. Since the number of individuals included is so small ($n=33$), conclusions about the likelihood of females turning over in comparison to the sample of males ($n=215$) is less reliable and should not be interpreted.

However, this is a finding that would be interesting to explore further in future research. Other studies have found that women are more likely to engage in non-traditional career patterns (Clarke, 2013), so it is possible that examining turnover patterns in other groups and industries, such as education, with larger sample sizes could be informative in relation to turnover patterns and career paths across gender.

An additional group that could benefit from additional research would be boomerang employees, or employees who leave an organization but then come back (Shipp, Furst-Holloway, Harris, & Rosen, 2013). These individuals certainly exist in the Army as well as other organizations, and it would be interesting to see how these patterns change during their second tenure with an organization. Further, this research would further improve our limited understanding of boomerang employees' careers (Swider, Liu, Harris, & Gardner, 2017), could extend our understanding of turnover decisions to include return to an organization, and could be an additional way to investigate career paths of HiPo employees.

Lastly, future research should seek to explore the ways in which the analytic technique of choice impacts the results of their studies and changes understanding of temporal components of theory. If appropriate, the incorporation of time or dynamic variables into research designs and analysis stands to offer furthered understanding and increased prediction and explanatory power for organizational researchers and practitioners.

Conclusion

Turnover continues to be a concern for organizations, particularly as it pertains to the loss of HiPo employees. Talent management, employee development, and career paths were identified as literature that could be used to better understand the issue of HiPo turnover in organizations. Incorporating these literatures, as well as the role of time in each content area, led to the identification of likely antecedents of HiPo turnover including individual difference and developmental variables. To fully understand how time could impact results, survival analysis was identified as a statistical technique that could offer insights in the dynamic relationship between the identified covariates and HiPo turnover. Results demonstrated that predictors of HiPo turnover are not stable, but this effect could only be seen when time was incorporated into analyses and when predictors and their influence were allowed to vary overtime. This process demonstrated that developmental variables have the largest relationship to turnover, but that the relationship diminishes over time.

This dissertation demonstrates the value of exploring this complicated issue more fully by approaching it longitudinally and investigating the changes in variables and the influence of those variables at different points in the study. The findings from this study demonstrate how the different ways we collect and subsequently model and test available data can influence the conclusions that are drawn and the inferences that can be made. Therefore, moving forward it will be critical for researchers and practitioners alike to be mindful of the type of data they are collecting and the frequency and timing of such data collections. Capturing data at a single time point can fail to capture the bigger picture of patterns that are unfolding in organizations and limit the ability to appropriately plan

interventions. Moving towards a temporally based perspective can clearly be beneficial for improving understanding of phenomena and continuing to consider time and the influence of time in theories will help to further advance organizational science.

References

- ACT. (1997). ACT Assessment: Technical Manual. Iowa City, IA: Author.
- Adamson, S. J., Doherty, N., & Viney, C. (1998). "The meanings of career revisited: Implications for theory and practice." *British Journal of Management*, 9(4), 251-259.
- Aguinis, H., & Edwards, J. R. (2014). Methodological wishes for the next decade and how to make wishes come true. *Journal of Management Studies*, 51(1), 143-174.
- Aguinis, H., & O'Boyle, E. (2014). Star performers in twenty-first century organizations. *Personnel Psychology*, 67(2), 313-350.
- Allison, P. D. (2014). *Event history and survival analysis: Regression for longitudinal event data (2nd Ed)* (Vol. 46). Thousand Oaks, CA: Sage Publications.
- Arthur, M. B., Hall, D. T., & Lawrence, B. S. (Eds.). (1989). *Handbook of career theory*. New York, NY: Cambridge University Press.
- Arthur, M. B., Hall, D. T., & Lawrence, B. S. (1989b). Generating new directions in career theory: The case for a transdisciplinary approach. In M. B. Arthur, D. T. Hall, & B. S. Lawrence (Eds.), *Handbook of career theory* (pp. 7–25). Cambridge: Cambridge University Press.
- Ashkenas, R. (2012). The paradox of high potentials. Retrieved from: <https://hbr.org/2012/04/the-paradox-of-high-potentials>
- Barrick, M. R., & Mount, M. K. 1991. The big five personality dimensions and job performance: A meta-analysis. *Personnel Psychology*, 44: 1–26.

- Barrick, M. R., & Mount, M. K. 1996. Effects of impression management and self-deception on the predictive validity of personality constructs. *Journal of Applied Psychology*, 81: 261–272.
- Barrick, M. R., Stewart, G. L., & Piotrowski, M. (2002). Personality and job performance: Test of the mediating effects of motivation among sales representatives. *Journal of Applied Psychology*, 87(1), 1-9.
- Barrick, M. R., & Zimmerman, R. D. (2005). Reducing voluntary, avoidable turnover through selection. *Journal of Applied Psychology*, 90(1), 159 -166.
- Barrick, M. R., & Zimmerman, R. D. (2009). Hiring for retention and performance. *Human Resource Management*, 48(2), 183-206.
- Baruch, Y. (2004). Transforming careers: from linear to multidirectional career paths: organizational and individual perspectives. *Career development international*, 9(1), 58-73.
- Baruch, Y., & Quick, J. C. (2007). Understanding second careers: Lessons from a study of US navy admirals. *Human Resource Management*, 46(4), 471-491.
- Bass, B. M. (1990). Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications (3rd ed.). New York: The Free Press, A Division of Mcmillan.
- Bell, B. S., Tannenbaum, S. I., Ford, J. K., Noe, R. A., & Kraiger, K. (2017). 100 years of training and development research: What we know and where we should go. *Journal of Applied Psychology*, 102(3), 1-19.

- Boud, D. & Garrick, J. (1999). Understandings of workplace learning. In D. Boud and J. Garrick (Eds.) *Understanding learning at work* (pp. 1-13). New York, NY: Routedledge.
- Boudreau, J. W., Boswell, W. R., Judge, T. A., & Bretz, R. D. (2001). Personality and cognitive ability as predictors of job search among employed managers. *Personnel psychology*, 54(1), 25-50.
- Bureau of Labor and Statistics (2012). The recession of 2007-2009. Retrieved from: https://www.bls.gov/spotlight/2012/recession/pdf/recession_bls_spotlight.pdf
- Burke, E. (2014, July 16). High potential employees: 55 percent set to leave. Retrieved from: <https://www.cebglobal.com/blogs/high-potential-employees-55-percent-set-to-leave/>.
- Burke, L. A. (1997). Developing high-potential employees in the new business reality. *Business Horizons*, 40(2), 18-24.
- Casey, C. (1999). The changing context of work. In D. Boud and J. Garrick (Eds.) *Understanding learning at work* (pp. 1-13). New York, NY: Routedledge.
- Cappelli, P. (1999). Career Jobs are Dead. *California Management Review*, 42(1) 146–167.
- Cappelli, P., & Keller, J. R. (2014). Talent management: Conceptual approaches and practical challenges. *Annual Review of Organizational Psychology and Organizational Behavior* 1(1), 305-331.
- Cascio, W. F. (2000). Managing a virtual workplace. *The Academy of Management Executive*, 14(3), 81-90.

- Cascio, W. F., & Aguinis, H. (2008). Research in industrial and organizational psychology from 1963 to 2007: changes, choices, and trends. *Journal of Applied Psychology, 93*(5), 1062.
- Cascio, W. F., & Aguinis, H. (2008). Staffing Twenty-first-century Organizations. *The Academy of Management Annals, 2*(1), 133-165.
- Chambers, E. G., Handfield-Jones, H., Hanking, S. M., & Michaels III, E. G. (1998). Win the war for top talent. *Workforce, 77*(12), 50-56.
- Chudzikowski, K. (2012). Career transitions and career success in the 'new' career era. *Journal of Vocational Behavior, 81*(2), 298-306.
- Clarke, M. (2013). The organizational career: Not dead but in need of redefinition. *The International Journal of Human Resource Management, 24*(4), 684-703.
- Coats, M.R., Blacksmith, N., Costanza, D.P., & Gartner, M. (2015) *Survival Analysis in Turnover Research: Time Will Tell*. Poster presented at the 30th Annual Conference of the Society for Industrial and Organizational Psychology, Philadelphia, PA.
- Coetzee, M., & Stoltz, E. (2015). Employees' satisfaction with retention factors: Exploring the role of career adaptability. *Journal of Vocational Behavior, 89*, 83-91.
- Collings, D. G., & Mellahi, K. (2009). Strategic talent management: A review and research agenda. *Human resource management review, 19*(4), 304-313.
- Collins, L. M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology, 57*, 505-528.

- Cohen, D. J. (2007). The very separate worlds of academic and practitioner publications in human resource management: Reasons for the divide and concrete solutions for bridging the gap. *Academy of Management Journal*, 50(5), 1013-1019.
- Converse, P. D., & Oswald, F. L. (2014). Thinking ahead: Assuming linear versus nonlinear personality-criterion relationships in personnel selection. *Human Performance*, 27(1), 61-79.
- Conway, N., & Briner, R. B. (2005). *Understanding psychological contracts at work: A critical evaluation of theory and research*. Oxford, NY: Oxford University Press.
- Cortina, J. M., Aguinis, H., & DeShon, R. P. (2017). Twilight of dawn or of evening? A century of research methods in the Journal of Applied Psychology. *Journal of Applied Psychology*, 102(3), 1-17.
- Costa, P. T., Jr., & McCrae, R. R. (1985). The NEO Personality Inventory manual. Odessa, FL: Psychological Assessment Resources.
- Costanza, D. P., & Finkelstein, L. M. (2015). Generationally based differences in the workplace: Is there a there there? *Industrial and Organizational Psychology*, 8(03), 308-323.
- Costanza, D. P., & Finkelstein, L. M. (2017). Generations, Age, and the Space Between: Introduction to the Special Issue. *Work, Aging and Retirement*, 3(2), 109-112.
- Cox, D. R. (1975). Partial likelihood. *Biometrika*, 62, 269-276.
- Cox, D. R., & Oakes, D. (1984). *Analysis of survival data*. London: Chapman and Hall.
- Cox, D. R., and E. J. Snell. 1989. *The Analysis of Binary Data*, 2nd ed. London: Chapman and Hall.

- Deloitte (2017). High potential / HiPo (and maturity model). Retrieved from:
<http://www.berstein.com/Lexicon/details.aspx?id=12845>
- DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of personality and social psychology*, 93(5), 880-896.
- Dickter, D. N., Roznowski, M., & Harrison, D. A. (1996). Temporal tempering: An event history analysis of the process of voluntary turnover. *Journal of Applied Psychology*, 81(6), 705-716.
- Diemer, H. (1917). Causes of " Turnover" Among College Faculties. *The ANNALS of the American Academy of Political and Social Science*, 71(1), 216-224.
- Dries, N., & Pepermans, R. (2008). "Real" high-potential careers: An empirical study into the perspectives of organizations and high potentials. *Personnel Review*, 37(1), 85-108.
- Donnithorne, L. (1993). *West Point Way of Leadership: From Learning Principled Leadership to Practicing it*. New York, NY: Doubleday.
- Eisenberger, R., Armeli, S., Rexwinkel, B., Lynch, P. D., & Rhoades, L. (2001). Reciprocation of perceived organizational support. *Journal of applied psychology*, 86(1), 42-51.
- Eliason, S. R. (1993). *Maximum likelihood estimation: Logic and practice*. Newbury Park, CA: Sage.
- Evans, K. L. (1997). *Estimating personality constructs from archival data* (Technical Report ADA328 816). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

- Felin, T., & Hesterly, W. S. (2007). The knowledge-based view, nested heterogeneity, and new value creation: Philosophical considerations on the locus of knowledge. *Academy of Management Review*, 32(1), 195-218.
- Fernández-Aráoz, C., Groysberg, B., & Nohria, N. (2011). How to hang on to your high potentials. *Harvard Business Review*, 89(10), 76-83.
- Fisher, B. (1917). How to reduce labor turnover. *The Annals of the American Academy of Political and Social Science*, 71(1), 10-32.
- Finkelstein, L. M., Costanza, D. P., & Goodwin, G. F. (2017). Do your high potentials have potential? The impact of individual differences and designation on leader success. *Personnel Psychology*.
- Frey, M. C., & Detterman, D. K. (2004). Scholastic assessment or g? The relationship between the scholastic assessment test and general cognitive ability. *Psychological science*, 15(6), 373-378.
- Gallardo-Gallardo, E., Dries, N., & González-Cruz, T. F. (2013). What is the meaning of 'talent' in the world of work?. *Human Resource Management Review*, 23(4), 290-300.
- Ghiselli, E. E., & Barthol, R. P. (1953). The validity of personality inventories in the selection of employees. *Journal of Applied Psychology*, 37(1), 18-20.
- Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, 4(1), 26-42.
- Griffeth, R. W., Hom, P. W., & Gaertner, S. (2000). A meta-analysis of antecedents and correlates of employee turnover: Update, moderator tests, and research implications for the next millennium. *Journal of management*, 26(3), 463-488.

- Hall, D. T., & Mirvis, P. H. (1995). The new career contract: Developing the whole person at midlife and beyond. *Journal of vocational behavior, 47*(3), 269-289.
- Headquarters, Department of the Army. (2009). *Leader Development*. Army Regulation 350-100. Washington, DC.
- Headquarters, Department of the Army. (2009). *Officer Active Duty Service Obligation*. Field Manual 6-22. Washington, DC.
- Holtom, B. C., Tidd, S. T., Mitchell, T. R., & Lee, T. W. (2013). A demonstration of the importance of temporal considerations in the prediction of newcomer turnover. *Human Relations, 66*(10), 1337-1352.
- Hom, P. W., Lee, T. W., Shaw, J. D., & Hausknecht, J. P. (2017). One Hundred Years of Employee Turnover Theory and Research. *Journal Of Applied Psychology*, doi:10.1037/apl0000103
- Hom, P. W., Mitchell, T. R., Lee, T. W., & Griffeth, R. W. (2012). Reviewing employee turnover: focusing on proximal withdrawal states and an expanded criterion. *Psychological bulletin, 138*(5), 831.
- Hough, L. M., & Oswald, F. L. (2008). Personality testing and industrial–organizational psychology: Reflections, progress, and prospects. *Industrial and Organizational Psychology, 1*(3), 272-290.
- Huber, G. P. (2011). Organizations: Theory, design, and future. In *APA Handbook of Industrial and Organizational Psychology* (vol 1). S Zedick (Ed.) APA: Washington DC.

- Huselid, M. A. & Becker, B. E. (2011). Bridging micro and macro domains: Workforce differentiation and strategic human resource management. *Journal of Management*, 37(2), 395-403.
- Inkson, K. (2004). Images of career: Nine key metaphors. *Journal of Vocational Behavior*, 65(1), 96-111.
- Jacoby, S. (1999). Are Career Jobs Headed for Extinction? *California Management Review*, 42(1) 123– 145.
- Jacobs, T. O. & Jaques, E. (1990). Military executive leadership. In K. E. Clark, M.B. Clark, M. B. Clark (Eds.), *Measures of leadership* (pp. 281-295). West Orange, NJ: Leadership Library of America.
- Kalbfleisch, J.D. & Prentice, R.L. (1980). *The statistical analysis of failure time data*. New York, NY: Wiley.
- Kammeyer-Mueller, J. D., Wanberg, C. R., Glomb, T. M., & Ahlburg, D (2005). The role of temporal shifts in turnover processes: It's about time. *Journal Of Applied Psychology*, 90(4), 644-658. doi:10.1037/0021-9010.90.4.644
- Kaplan, E. L., & Meier, P. (1958). Nonparametric estimation from incomplete observations. *Journal of the American statistical association*, 53(282), 457-481.
- Karaevli, A., & Hall, D. T (2003). Growing Leaders for Turbulent Times: Is Succession Planning Up to the Challenge *Organizational Dynamics*, 32(1), 62-79. doi:10.1016/S0090-2616(02)00138-9.
- Klein, S., Hawes-Dawson, J., Martin, T. (1991). *Why recruits separate early* (No. RAND/R-3980-FMP). Santa Monica, CA: U.S. RAND.

- Koenig, K. A., Frey, M. C., & Detterman, D. K. (2008). ACT and general cognitive ability. *Intelligence, 36*(2), 153-160.
- Kristof-Brown, A. L., Zimmerman, R. D., & Johnson, E. C. (2005). Consequences of individuals' fit at work: A meta-analysis of person-job, person-organization, person-group, and person-supervisor fit. *Personnel psychology, 58*(2), 281-342.
- Laurence, J. H., Naughton, J., & Harris, D. A. (1996). *Attrition Revisited: Identifying the Problem and Its Solutions* (No. FR-PRD-95-01). Arlington, VA: U.S. Army Research Institute.
- Liao, H., Chuang, A., & Joshi, A. (2008). Perceived deep-level dissimilarity: Personality antecedents and impact on overall job attitude, helping, work withdrawal, and turnover. *Organizational Behavior and Human Decision Processes, 106*(2), 106-124.
- Lim, B. C., & Ployhart, R. E. (2006). Assessing the convergent and discriminant validity of Goldberg's International Personality Item Pool: A multitrait-multimethod examination. *Organizational Research Methods, 9*(1), 29-54.
- Lee, T. W., Burch, T. C., & Mitchell, T. R. (2014). The story of why we stay: A review of job embeddedness. *Annual Review of Organizational Psychology and Organizational Behavior, 1*, 199-216.
- Lee, T. H., Gerhart, B., Weller, I., & Trevor, C. O. (2008). Understanding voluntary turnover: Path-specific job satisfaction effects and the importance of unsolicited job offers. *Academy of Management Journal, 51*(4), 651-671.
- Lee, T. W., & Mitchell, T. R. (1994). An alternative approach: The unfolding model of voluntary employee turnover. *Academy of Management Review, 19*(1), 51-89.

- Lepak, D. P., & Shaw, J. D. (2008). Strategic HRM in North America: looking to the future. *The International Journal of Human Resource Management*, 19(8), 1486-1499.
- Lewis, R. E., & Heckman, R. J. (2006). Talent management: A critical review. *Human resource management review*, 16(2), 139-154.
- Liu, D., Mitchell, T. R., Lee, T. W., Holtom, B. C., & Hinkin, T. R. (2012). When employees are out of step with coworkers: How job satisfaction trajectory and dispersion influence individual-and unit-level voluntary turnover. *Academy of Management Journal*, 55(6), 1360-1380.
- Maltarich, M. A., Nyberg, A. J., & Reilly, G. (2010). A conceptual and empirical analysis of the cognitive ability–voluntary turnover relationship. *Journal of Applied Psychology*, 95(6), 1058.
- Martin, J., & Schmidt, C. (2010). How to keep your top talent. *Harvard Business Review*, 88(5), 54-61.
- Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: a research review. *International Journal of Training and Development*, 19(1), 1-17.
- Maurer, T. J., & Chapman, E. F. (2013). Ten years of career success in relation to individual and situational variables from the employee development literature. *Journal of Vocational Behavior*, 83(3), 450-465.
- McDonnell, A. (2011). Still fighting the “war for talent”? Bridging the science versus practice gap. *Journal of Business and Psychology*, 26(2), 169-173.

- McDonnell, A., Collings, D. G., Mellahi, K., & Schuler, R. (2017). Talent management: a systematic review and future prospects. *European Journal of International Management*, 11(1), 86-128.
- Milan, L. M., Bourne, D.R., Zazanis, M. M, & Bartone, P. T. (2002). *Measures collected on the USMA Class of 1998 as Part of the Baseline Officer Longitudinal Data Set (BOLDS)* (Technical Report 1127). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Military Leadership Diversity Commission (2010). Officer retention rates across the services by gender and race/ethnicity. Arlington, VA: Military Leadership and Diversity Commission.
- Mills, M. (2011). *Introducing survival and event history analysis*. Thousand Oaks, CA: Sage Publications.
- Mitchell, T. R., & James, L. R. (2001). Building better theory: Time and the specification of when things happen. *Academy of Management Review*, 26(4), 530-547.
- Mobley, W. H. (1977). Intermediate linkages in the relationship between job satisfaction and employee turnover. *Journal of Applied Psychology*, 62, 237–240.
- Mobley, W. H. (1982). *Employee turnover: Causes, consequences, and control*. Reading, MA: Addison Wesley.
- Moore, D. F. (2016). *Applied Survival Analysis Using R*. Switzerland: Springer International Publishing.
- Morita, J., Lee, T., & Mowday, R (1993). The regression-analog to survival analysis: A selected application to turnover research. *Academy of Management Journal*, 36(6), 1430-1464.

- Mount, M. K., Barrick, M. R., Scullen, S. M., & Rounds, J. (2005). Higher-order dimensions of the big five personality traits and the big six vocational interest types. *Personnel Psychology*, 58(2), 447-478.
- National Research Council. (2015). Measuring human capabilities: An agenda for basic research on the assessment of individual and group performance potential for military accession. Committee on Measuring Human Capabilities: Performance Potential of Individuals and Collectives, Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- Noe, R. (2010). Employee training & development (6th Ed.). Boston, MA: McGraw-Hill.
- Noe, R. A., Wilk, S. L., Mullen, E. J., & Wanek, J. E. (2014). Employee Development: Issues in Construct Definition and Investigation of Antecedents. In J. K. Ford, S. W. J. Kozlowski, K. Kraiger, E. Salas, & M. S. Teachout (Eds.) *Improving Training Effectiveness in Work Organizations*, (pp.153-189). New York, NY: Psychology Press.
- Ng, T. W., Sorensen, K. L., Eby, L. T., & Feldman, D. C. (2007). Determinants of job mobility: A theoretical integration and extension. *Journal of Occupational and Organizational Psychology*, 80(3), 363-386.
- O'Connell, M., & Kung, M. C. (2007). The Cost of Employee Turnover. *Industrial Management*, 49(1), 14-19.
- Ployhart, R. E., & Hale, D. Jr., (2014). Human resource management is out of time. In A. J. Shipp & Y. Fried (Eds.), *Time and Work Vol. 2* (pp. 76-96). New York, NY: Psychological Press.

- Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management*, 36(1), 94-120.
- Putter, H., Fiocco, M., & Geskus, R. B. (2007). Tutorial in biostatistics: competing risks and multi-state models. *Statistics in medicine*, 26(11), 2389-2430.
- Putka, D. J., & Bradley, K. M. (2008). *Relations between Select21 predictor measures and first-term attrition*. Arlington, VA: U.S. Army Research Institute.
- Raju, N. S., & Brand, P. A. (2003). Determining the significance of correlations corrected for unreliability and range restriction. *Applied Psychological Measurement*, 27(1), 52-71.
- Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: a review of the literature. *Journal of Applied Psychology*, 87(4), 698-714.
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological bulletin*, 132(1), 1-25.
- Rodrigues, R. A., & Guest, D. (2010). Have careers become boundaryless? *Human Relations*, 63(8) 1157-1175.
- Rousseau, D. (1995). *Psychological contracts in organizations: Understanding written and unwritten agreements*. Thousand Oaks, CA: Sage Publications.
- Rousseau, D. M. (1996). Changing the deal while keeping the people. *The Academy of Management Executive*, 10(1), 50-59.
- Russell, C. J. (2013). Is it time to voluntarily turn over theories of voluntary turnover? *Industrial and Organizational Psychology*, 6(2), 156-173.

- Rynes, S. L. (2007). Let's create a tipping point: What academics and practitioners can do, alone and together. *Academy of Management Journal*, 50, 1046–1054.
- Salgado, J. F. (2002). The Big Five personality dimensions and counterproductive behaviors. *International Journal of Selection and Assessment*, 10(1-2), 117 - 125.
- Savickas, M. L. (2002). Reinvigorating the study of careers. *Journal of Vocational Behavior*, 61(3), 381-385.
- Schmidt, F. L. (2002). The role of general cognitive ability and job performance: Why there cannot be a debate. *Human performance*, 15(1-2), 187-210.
- Shaw, J. D., Delery, J. E., Jenkins, G. D., & Gupta, N. (1998). An organization-level analysis of voluntary and involuntary turnover. *Academy of management journal*, 41(5), 511-525.
- Shipp, A. J., & Cole, M. S. (2015). Time in individual-level organizational studies: What is it, how is it used, and why isn't it exploited more often? *Annual Review Organizational Psychology and Organizational Behavior*, 2(1), 237-260.
- Shipp, A. J., Furst-Holloway, S., Harris, T. B., & Rosen, B. (2014). Gone today but here tomorrow: Extending the unfolding model of turnover to consider boomerang employees. *Personnel Psychology*, 67(2), 421-462.
- Singer J and Willett J (2003) *Applied Longitudinal Data Analysis*. New York, NY: Oxford University Press.
- Silzer, R., & Church, A. H. (2009). The pearls and perils of identifying potential. *Industrial and Organizational Psychology*, 2(4), 377-412.

- Silzer, R., & Church, A.H. (2010). Identifying and assessing high-potential talent: Current organizational practices. In R. Silzer & B.E. Dowell (Eds.), *Strategy Driven Talent Management* (pp. 213-280). San Francisco, CA: Jossey-Bass.
- Silzer, R., & Dowell, B.E. (2010). Strategic talent management matters. In R. Silzer & B.E. Dowell (Eds.), *Strategy Driven Talent Management* (pp. 3-72). San Francisco, CA: Jossey-Bass.
- Slichter, S. H. (1919). *The turnover of factory labor*. New York, NY: D. Appleton & Company.
- Sticha, P. J., Dall, T. A., Handy, K., Espinosa, J., & Hogan, P. F. (2003). *Impact of the Army Continuing Education System (ACES) on Soldier Retention and Performance: Data Analyses*(No. FR-03-14). Alexandria, VA: U.S. Army Research Institute.
- Society for Human Resource Management (2015, December 9). Today's top human capital challenges: retaining talent, engaging employees, and providing competitive compensation and benefits. Retrieved from: https://www.shrm.org/about-shrm/press-room/press-releases/pages/human_capital_challenges.aspx
- Society for Industrial and Organizational Psychology (2003). Principles for the Validation and Use of Personnel Selection Procedures, Fourth Edition. Bowling Green, OH: Society for Industrial and Organizational Psychology, Inc.
- Spell, H. B., Eby, L. T., & Vandenberg, R. J. (2014). Developmental climate: A cross-level analysis of voluntary turnover and job performance. *Journal of vocational behavior*, 84(3), 283-292.

- Steel, R. P. (2002). Turnover theory at the empirical interface: Problems of fit and function. *Academy of Management Review*, 27(3), 346-360.
- Sturman, M. C., & Trevor, C. O. (2001). The implications of linking the dynamic performance and turnover literatures. *Journal of Applied Psychology*, 86(4), 684-696.
- Sullivan, S. E., & Baruch, Y. (2009). Advances in career theory and research: A critical review and agenda for future exploration. *Journal of management*, 35(6), 1542-1571.
- Swider, B. W., Liu, J. T., Harris, T. B., & Gardner, R. G. (2017). Employees on the rebound: Extending the careers literature to include boomerang employment. *Journal of Applied Psychology*, 102(6), 890-909.
- Tabachnick, B.G. & Fidel, L.S. (2013). Survival/Failure Analysis. In B. G. Tabachnick & L.S. Fidel (Eds.) *Using Multivariate Statistics, 6th ed* (pp. 612-680). Upper Saddle River, NJ: Pearson.
- Trevor, C. O., Gerhart, B., & Boudreau, J. W. (1997). Voluntary turnover and job performance: Curvilinearity and the moderating influences of salary growth and promotions. *Journal of applied psychology*, 82(1), 44-61.
- Tulgan, B. (2001). Winning the talent wars. *Employment Relations Today*, 28(2), 37-51.
- United States Army (2006). Posture Statement: A campaign quality army with joint and expeditionary capabilities. Retrieved from:
https://www.army.mil/aps/06/01_index.html
- United States Military Academy (2017). West Point Admissions. Retrieved from:
<http://www.usma.edu/admissions/SitePages/Home.aspx>

- Van Iddekinge, C. H., & Ployhart, R. E. (2008). Developments in the criterion-related validation of selection procedures: A critical review and recommendations for practice. *Personnel Psychology*, *61*(4), 871-925.
- Van Maanen, J., & Barley, S. R. (1984). Occupational communities: Culture and control in organizations. In Staw, B. M. (Ed.). *Research in organizational behaviour*. Vol. 6 (pp.287–365). Greenwich, CT: JAI Press.
- Vernez, G., & Zellman, G. L. (1987). *Families and mission: A review of the effects of family factors on Army attrition, retention, and readiness* (No. RAND/N-2624-A). Santa Monica, CA: RAND.
- Vogel, R. M., & Feldman, D. C. (2009). Integrating the levels of person-environment fit: The roles of vocational fit and group fit. *Journal of vocational behavior*, *75*(1), 68-81.
- Woo, S. E., Chae, M., Jebb, A. T., & Kim, Y. (2016). A Closer Look at the Personality-Turnover Relationship: Criterion Expansion, Dark Traits, and Time. *Journal of Management*, *42*(2), 357-385.
- Zimmerman, R. D. (2008). Understanding the impact of personality traits on individuals' turnover decisions: A meta-analytic path model. *Personnel Psychology*, *61*(2), 309-348.