Differentiating the effects of entrepreneurs' intelligence and educational attainment on venture outcomes

Brian D. Blume
University of Michigan, Flint, Michigan, USA

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Abstract

Purpose – Intelligence or general mental ability (GMA) is a strong predictor of job performance across most occupations, and educational attainment has been shown to be a predictor of entrepreneurial outcomes. However, there has been little research examining the simultaneous effects of entrepreneurs' GMA and educational attainment on their venture outcomes. The purpose of this paper is to examine the impact of these human capital resources on venture performance and survival.

Design/methodology/approach – Using a sample of 234 self-employed entrepreneurs from a longitudinal database, regression analysis was employed to examine the predictors of venture performance. A hazard model was utilized to assess venture survival.

Findings – Entrepreneurs' intelligence influenced venture performance directly and indirectly via educational attainment. Entrepreneurs with higher GMA were subsequently able to obtain more education, and GMA had an indirect, positive influence on venture performance through this additional educational attainment. Findings also demonstrated an inverted-U, curvilinear effect on venture survival for GMA and educational attainment. This indicates that both intelligence and educational attainment should be considered when examining how likely entrepreneurs are to persist or survive in their ventures.

Originality/value – Entrepreneurs with higher GMA had ventures that performed better and obtained more education, which influenced venture survival. These findings suggest that entrepreneurs' intelligence is likely to be an important predictor of venture outcomes, as well as a source of entrepreneurs' human capital acquisition. Therefore, GMA should have a more central role in the human capital discussion within the entrepreneurship literature.

Keywords Cognition, Human capital

Paper type Research paper

Introduction

Human capital has long been considered an important asset that can lead to personal and organizational success (Becker, 1975; Pfeffer, 1994; Ployhart and Moliterno, 2011). Human capital can be defined as the skills and knowledge that individuals acquire through investments in schooling, on-the-job training and other types of experience (Becker, 1975). Human capital has been shown to be an important resource for success in entrepreneurial firms (e.g. Cooper *et al.*, 1994; Florin *et al.*, 2003; Sexton and Upton, 1985; Unger *et al.*, 2011).

There are several reasons provided by the entrepreneurship literature regarding why higher human capital leads to increased venture success (Unger *et al.*, 2011), including an increased capability to exploit opportunities and to acquire additional resources such as financial capital (Brush *et al.*, 2001; Chandler and Hanks, 1998; Parker and van Praag, 2006; Rauch *et al.*, 2005; Shane, 2000). Unger *et al.*'s (2011) recent meta-analytic review examined the relationship between multiple measures of entrepreneurial human capital and different measures of venture success. Their review noted that education (e.g. level, years), experience (e.g. start-up, industry specific and managerial) and to a lesser degree, skills (e.g. management skills) were the most common

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measures of human capital used in the entrepreneurship literature. Overall, Unger *et al.* (2011) found small, significant relationship between these human capital variables and venture success.

Becker (1975) recognized that individuals with higher intelligence or general mental ability (GMA) would tend to invest more in human capital. GMA is the cognitive ability to reason correctly with concepts, solve problems, comprehend surroundings and to learn from experiences (Lubinski, 2004; Schmidt and Hunter, 2004). In discussing the effects of human capital on the growth and failure of newly founded businesses, Rauch and Rijsdijk (2013, p. 935) suggested, "Moreover, cognitive ability could be a variable that accounts for the effects of general human capital because cognitive ability is related to performance […]." Surprisingly, studies regarding the relationship between intelligence and entrepreneurial activity are uncommon (Baum and Bird, 2010; Raffiee and Feng, 2014). In fact, although GMA is an important predictor of how much human capital someone will acquire (Judge *et al.*, 2010; Ployhart and Moliterno, 2011), it has typically not been examined as a predictor variable in studies of the educational attainment of entrepreneurs or the success of their ventures (Dimov, 2017; Raffiee and Feng, 2014).

This has led to a gap in the literature in that there is not a good understanding of the potentially distinct effects of GMA and education on entrepreneurship outcomes. While it is generally accepted that entrepreneurs' education level is positively related to entrepreneurial outcomes (Martin *et al.*, 2013; Unger *et al.*, 2011), the fact that GMA is highly correlated with educational outcomes (Berry *et al.*, 2006) makes it difficult to distinguish between the effects of entrepreneurs' GMA vs their educational attainment on entrepreneurial outcomes. A primary goal of this study is to differentiate between the influence of education and GMA on venture outcomes (i.e. venture performance and survival). Research questions include: does the GMA of entrepreneurs have a direct effect on venture performance, or does GMA only have an indirect influence on performance due to the higher educational attainment that these entrepreneurs might obtain? Also, when both GMA and educational attainment are examined simultaneously, what influence does educational attainment have on venture outcomes? Before discussing specific hypotheses to examine these questions, the theoretical background regarding human capital and research in entrepreneurship area is reviewed, with a particular focus on education and GMA.

Human capital and entrepreneurial outcomes

Several studies demonstrate that a founders' human capital, such as their past employment experience, industry experience and educational attainment, positively influences the ventures they form and success in their ventures (e.g. Bates, 1990; Cooper *et al.*, 1994; Ding, 2011). In a representative study in this area, Bosma *et al.* (2004, p. 228) found support for their hypothesis that, "Higher levels of human capital are associated with stronger performance by business founders." Ding (2011) proposed that the founder's educational background is important to the success of the venture for several reasons. Entrepreneurs learn specialized knowledge and information-processing patterns which enable them to better recognize opportunities in the surrounding environment (Baptista *et al.*, 2014; Shane, 2000). They also could be influenced by the professional values they internalize during the educational process (Ding, 2011). Finally, they could be influenced by shaping the entrepreneur's network of contacts (e.g. student or alumni networks), which could serve as important sources of information and support (Ucbasaran *et al.*, 2008).

Similar arguments could be made for the importance of GMA as an important aspect of human capital (Baum and Bird, 2010; Frese *et al.*, 2007). Key components of intelligence or GMA proposed by an official taskforce of the American Psychological Association include the "ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought" (Neisser *et al.*, 1996, p. 77). As implied by the taskforce, GMA would theoretically be expected

to influence employee and entrepreneurial outcomes for a number of reasons. These include being a precursor to effectively pursuing education, having stronger analytical skills and enabling an entrepreneur to learn more from their experiences (Ding, 2011; Frese *et al.*, 2007; Jensen, 1998; Schmidt and Hunter, 2004).

Regarding entrepreneurship entry, advanced educational attainment could both encourage and discourage entrepreneurship (De Clercq and Arenius, 2006; Lofstrom *et al.*, 2014). Greater education generally enhances one's analytical abilities and communication skills, but simultaneously leads to more options for salaried employment, thereby increasing the opportunity costs of pursuing entrepreneurship (Gimeno *et al.*, 1997). Whereas the net effects of educational attainment on venture entry and survival may be less clear (Lofstrom *et al.*, 2014), there is some evidence that educational attainment has a positive effect on venture survival (Gimmon and Levie, 2010). For GMA, there are very few studies that examine the relationship of entrepreneurs' GMA with their venture entry or survival. A notable exception is Raffiee and Feng (2014), who focused on hybrid entrepreneurs who initiate a business while retaining their "day job." With regard to GMA, for entrepreneurs with lower cognitive ability they found that extended stays in hybrid entrepreneurship before committing full-time as an entrepreneur was more likely to reduce the hazard of exiting a venture.

In addition to these studies examining the outcomes of human capital, researchers have emphasized the difference between context-generic and context-specific knowledge, skills and abilities (Ployhart and Moliterno, 2011; Ucbasaran *et al.*, 2008), as well as emphasized the importance of considering the situational relevance of human capital (Unger *et al.*, 2011). GMA could be considered to be one of the most context-generic abilities, as it is relatively stable and endures across time and situations (Jensen, 1998; Ployhart and Moliterno, 2011). Based on the notion of context-specific skills, Brüderl *et al.* (1992) proposed that there is entrepreneur-specific human capital, including variables such as prior self-employment experience. Depending on the type of education and knowledge gained, educational attainment could produce a range of context-generic (e.g. improved analytical skills) and more context-specific skills (e.g. opportunity identification and assessment skills) for entrepreneurs (Brüderl *et al.*, 1992; Ployhart and Moliterno, 2011).

Unger *et al.* (2011, p. 353) noted that, "A process point of view on learning will also acknowledge that, in the face of rapidly changing environments, any specific knowledge is likely to have a decreasing shelf life (Reuber and Fisher, 1999). Some skills and knowledge will even have to be unlearned, that is, replaced by other and better knowledge and skills." This perspective indicates that context-generic abilities like GMA will be important in the process of gaining new context-specific skills (e.g. helping entrepreneurs learn new skills and learn from their experience; Ployhart and Moliterno, 2011). In this way, GMA can be viewed as a context-generic ability that enables entrepreneurs to gain other context-generic (e.g. educational attainment such as a college degree) and context-specific knowledge and skills (e.g. specific knowledge/skills needed to run a business) that enhance the success of their venture (Frese *et al.*, 2007). Despite the importance of GMA as a predictor of human capital resource acquisition and success across nearly every job and occupation (Ployhart and Moliterno, 2011; Schmidt and Hunter, 2004), it has not received sufficient attention within the entrepreneurship literature. This study addresses this gap by differentiating between the effects of entrepreneurs' GMA and educational attainment on entrepreneur outcomes.

Hypotheses

In this section, hypotheses are developed regarding how entrepreneurs' GMA and educational attainment will affect venture performance (see Figure 1 for a summary of these relationships) and venture survival. The assumption made is that the performance of a venture for someone who is self-employed can be measured by the profits/earnings generated by the venture (Rauch *et al.*, 2000; Unger *et al.*, 2011). These profits can be reinvested back into the business

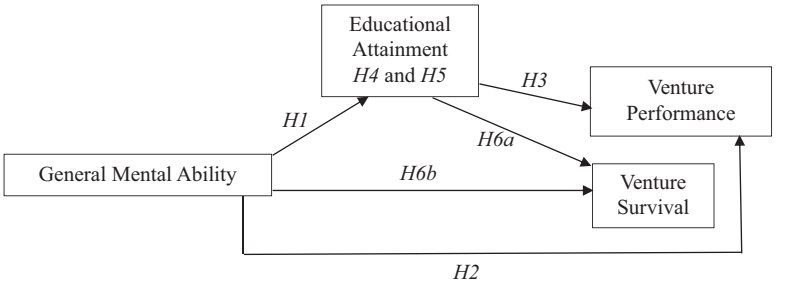

Figure 1.
Hypothesized model

venture or can be distributed to the entrepreneur in two ways. The profits will either be taken out of the business in the form of the salary/earnings of the entrepreneur or be reported as net income of the venture at the end of the year (in which case the self-employed entrepreneur could receive a financial payout from the company). If the entrepreneur chooses to invest money back into the business venture, this would presumably be due to an expectation that the venture will grow and become more profitable, leading to higher earnings in the future. Therefore, a key performance outcome variable measured in this study is the total earnings (in salary and profits) that the self-employed entrepreneur receives from the business venture, which is a direct measure of the performance of the venture (Rauch *et al.*, 2000; Unger *et al.*, 2011). A second important measure of an entrepreneur's success discussed below is the survival of the venture (Brinckmann *et al.*, 2010; Headd and Kirchoff, 2009).

General mental ability (GMA) and educational attainment

While some have argued that education leads to increases in GMA (Ceci, 1991; Ng and Feldman, 2010) and there is some evidence that education may lead to small increases in ability as measured by achievement test scores (Hansen *et al.*, 2004), stronger evidence exists that higher GMA enables individuals to attain higher educational levels (Berry *et al.*, 2006; Judge *et al.*, 2010). For example, GMA measured when individuals were young adults is highly correlated at 0.63 with subsequent education attained over the next 21 years (Berry *et al.*, 2006). In support of this perspective, Ployhart and Moliterno (2011, p. 133) stated that GMA is, "stable throughout adulthood and, hence, is not affected by advanced education or experience."

Past research has demonstrated that GMA is one of the strongest predictors of educational attainment (Berry *et al.*, 2006; Jensen, 1998; Ployhart and Moliterno, 2011). Judge *et al.* (2010) found that growth in human capital acquisition (e.g. education, training) and extrinsic career success occurs more quickly for individuals with high GMA than for individuals with low GMA. More specifically, they found that, on average, those with low GMA obtained less than one additional year of education over the subsequent 27-year period, while those with high GMA obtained 2.5 additional years of education over this time period (Judge *et al.*, 2010). In summary, GMA is an important predictor of how much an individual will increase their human capital, particularly their educational attainment:

H1. An entrepreneur's GMA has a positive effect on his or her educational attainment.

Venture performance

Schmidt and Hunter (2004, p. 3) stated, "Other things equal, higher intelligence leads to better job performance on all jobs. Intelligence is a major determinant of job performance […]. This principle is very broad: it applies to all types of jobs at all job levels." Past research has demonstrated that intelligence or GMA is one of the strongest predictors of job performance, promotion rates and salary (Jensen, 1998; Schmidt and Hunter, 1998).

GMA relates directly to the ability to learn, and a key reason that higher intelligence leads to higher job performance is that people who are more intelligent learn more job knowledge and learn it faster. Individuals with higher GMA also benefit more from their past experiences and acquire knowledge more deeply and can better apply information to new situations (Jensen, 1998). Another reason is that more intelligent workers are better able to solve problems that come up on the job (Schmidt and Hunter, 2004).

GMA is most important for performing well in complex jobs because these jobs require the most learning and job knowledge (Schmidt and Hunter, 2004). Professionals and managers typically have higher job complexity in their positions (Hunter, 1980; Schmidt and Hunter, 1998), and entrepreneurs are likely to encounter at least as much complexity in their jobs as managers. For instance, Schjoedt (2009) found that the entrepreneurs reported slightly higher task variety in their jobs than non-founding top managers. Entrepreneurs engage in a number of different activities, including developing products and services, conducting marketing activities, developing customer relationships, managing employees and solving problems with operations, suppliers and customers (Schjoedt, 2009). In addition, considering that entrepreneurs are often exploring uncharted territory and regularly experience novel problems in starting a business, GMA would be expected to be important to effectively handle these issues. Therefore, GMA might be especially important for entrepreneurs to be more effective in their ventures.

Consistent with this reasoning, in a study of African business owners, Frese *et al.* (2007) found that GMA was a predictor of business size and success. In addition, Hartog *et al.* (2010) found that entrepreneurs with higher GMA made more money. For these reasons, an entrepreneur's GMA is expected to be an important predictor of the venture's performance:

H2. An entrepreneur's GMA has a positive, direct effect on venture performance.

Education is likely to have at least two potential benefits for venture performance. First, as discussed in the prior section, there should be a direct effect since entrepreneurs with more education should have gained more knowledge and problem-solving skills that are likely to be beneficial when starting and running a business (Coleman, 2007; Cooper and Gimeno-Gascon, 1992; Cooper *et al.*, 1994). Van Praag *et al.* (2013) found that entrepreneurs have higher financial returns to formal education than non-entrepreneurs. They suggested that this benefit could stem from the fact that, when compared to employees, entrepreneurs face fewer organizational constraints and have more control over how to utilize their human capital.

Second, signaling theory proposes that educational attainment may enable the entrepreneur to gain legitimacy with stakeholders (Gimmon and Levie, 2010; Parker and van Praag, 2006; Spence, 1973; Van der Sluis *et al.*, 2008). Signaling theory was originally developed as an explanation of how job seekers invest in human capital via educational attainment to serve as a signal of their value to potential employers. In a similar way, educational attainment can serve as a signal to stakeholders (e.g. bankers, customers, etc.) that an entrepreneur has higher legitimacy and is more likely to be successful (Backes-Gellner and Werner, 2007; Hsu, 2007; Ulvenblad *et al.*, 2013):

H3. An entrepreneur's educational attainment has a positive effect on venture performance.

Given that those with higher GMA obtain more education (Berry *et al.*, 2006) as proposed in *H1*, educational attainment is expected to mediate the positive effect of GMA on venture performance (see Figure 1). Judge *et al.* (2010) found that educational attainment partially mediated the relationship between GMA and external career success (i.e. income and occupational prestige) for the general labor force. Therefore, in addition to the positive, direct effect that entrepreneurs' GMA has on venture performance; GMA is expected to also have a positive, indirect effect on venture performance via entrepreneurs' educational attainment:

H4. An entrepreneur's GMA has a positive, indirect effect on venture performance via higher educational attainment.

Venture survival

A second dimension of entrepreneurial success examined in this study is venture survival (Brinckmann *et al.*, 2010). This is an important dimension of entrepreneurial success given that an entrepreneur would be more likely to persist in a venture that is profitable or shows good potential (Brüderl *et al.*, 1992). Conversely, an entrepreneur is more likely to terminate a venture that is less profitable. It is frequently observed that many new ventures do not survive more than a few years (Wiklund *et al.*, 2010; Yang and Aldrich, 2012).

Human capital such as educational attainment has generally been found to be important to venture survival (Brüderl *et al.*, 1992; Cooper *et al.*, 1994; Gimmon and Levie, 2010). However, Gimeno *et al.* (1997) noted that while general human capital should improve the performance of a venture, the relationship with survival depends on the relative payoff of the human capital in the venture vs available options outside the venture (i.e. expected income from alternative employment). Similarly, Lofstrom *et al.* (2014) noted that educational credentials can impact the likelihood of entry into entrepreneurship in offsetting ways. They suggested that greater education increases one's options in salaried employment (increasing the opportunity costs of entrepreneurship), but also enhances one's analytical abilities and skills needed to run certain types of ventures. Thus, although entrepreneurs with higher GMA and educational attainment are likely to perform better in their ventures, they may also have higher performance requirements to remain in their venture than those with lower human capital (i.e. an entrepreneur with higher educational attainment is likely to have a higher opportunity cost of remaining in the venture).

Regarding education, Gimmon and Levie (2010) reviewed eight studies that examine the relationship between the founder's education level and venture survival, noting that seven of these eight studies found significant, positive effects. Based on these findings, it appears that educational attainment could positively influence venture survival due to the additional knowledge/skills gained by entrepreneurs as well as the signaling effect from their higher education (Cooper *et al.*, 1994; Gimmon and Levie, 2010). There also may be a positive effect of GMA on venture survival given that entrepreneurs with higher GMA are likely to perform better and have a lower probability of being "forced out" of their ventures (Raffiee and Feng, 2014).

In addition, there may be an interaction effect between GMA and educational attainment, such that entrepreneurs with higher GMA and more education are more likely to survive longer in their ventures. This could occur if higher GMA enables entrepreneurs with higher educational attainment to make better use of their education (i.e. gain and retain more knowledge/skills; Gottfredson, 1997). They will also be better equipped to apply their educational experiences to the problems encountered in the venture (Judge *et al.*, 2010). For example, if two entrepreneurs both obtain the same undergraduate degree from the same university, but one has lower GMA and the other has high GMA, the entrepreneur with higher GMA would likely make better use of his education (Gottfredson, 1997; Jensen, 1998; Judge *et al.*, 2010). This could translate into longer survival for these high-GMA entrepreneurs in their ventures:

H5. There is an interaction between GMA and education when predicting venture survival, such that entrepreneurs with both more education and higher GMA have longer venture survival.

Based on the literature, there is also likely to be non-linear effects (i.e. an inverted-U curvilinear effect) of GMA and education on venture survival (Davidsson and Honig, 2003). When examining the relationship between educational attainment and whether someone was trying to start a new business, Kim *et al.* (2006) found a curvilinear impact of education in that both too little and too much education discouraged attempted entrepreneurship. Within the context of entrepreneurs who have already begun new ventures, this could occur if entrepreneurs with the lowest and highest levels of GMA and educational attainment are

less likely to survive or persist in their ventures. As discussed below, the mechanisms that could cause these entrepreneurs' (i.e. those with the least and most education and the lowest and highest GMA) ventures to be less likely to survive would be different.

In the case of educational attainment, entrepreneurs who have lower educational attainment (e.g. high school degree or less) may not have enough education to provide the necessary skills to survive in their venture (Cooper *et al.*, 1994; Davidsson and Honig, 2003) or to signal to stakeholders that their business is legitimate (Gimmon and Levie, 2010; Spence, 1973). In contrast, those who have very high educational attainment (e.g. masters or professional degrees) may have good alternative employment opportunities and subsequently leave their ventures (Becker, 1975; Gimeno *et al.*, 1997; van Praag, 2003). Signaling theory suggests that this could occur if their more distinguished degrees provide information to employers in the external job market, leading these entrepreneurs to be more likely to be recruited away from their ventures (Spence, 1973). Those with moderate educational attainment (e.g. associate degrees) might not feel the effects of these forces as strongly since they have enough education to provide them with requisite skills and to signal legitimacy, but not so much as to provide highly valuable alternative opportunities of employment in the labor market. Therefore, those entrepreneurs with moderate amounts of education may be more likely to persist in their ventures.

For GMA, these forces are similar to those described in the employee turnover literature as push and pull forces (Jackofsky, 1984; Maltarich *et al.*, 2010). For example, entrepreneurs with lower GMA may be forced to exit their venture due to its poor performance (i.e. a push force), or alternatively entrepreneurs with higher GMA may be more attractive in the general labor market and therefore might also be more likely to leave their venture for a better opportunity (i.e. a pull force). Jackofsky (1984) described how lower performing employees are pushed out of the organization as a result of actual or perceived threat of administrative action. In contrast, higher performers are more likely to experience pull forces, primarily based on market forces that increase workers' opportunities outside of the organization. Given the robust relationship between GMA and performance, Maltarich *et al.* (2010) proposed that push and pull forces will vary across different levels of employee GMA. They found a curvilinear (inverted-U) relationship between GMA and voluntary turnover in jobs with high cognitive demands, such that turnover was highest for those with the lower GMA, but also increased for employees with higher GMA.

Given that entrepreneurs are likely to experience high cognitive demands (Schjoedt, 2009), they may experience similar forces as those reported by Maltarich *et al.* (2010). In the case of an entrepreneur's venture, turnover would translate into exiting the venture or not surviving for as long in the venture. In other words, an inverted-U curvilinear relationship may also exist between entrepreneurs' GMA and venture survival. This would occur if those with lower GMA are most likely to be pushed out of their ventures due to the actual or perceived threat of failure because of their inability to perform well in the venture, while those with the highest ability are pulled or recruited out of their ventures by market-based forces (e.g. opportunities in the traditional labor market). Based on the above discussion, the following hypotheses are proposed:

H6a. There is an inverted-U curvilinear relationship for entrepreneurs' educational attainment when predicting venture survival.

H6b. There is an inverted-U curvilinear relationship for entrepreneurs' GMA when predicting venture survival.

Method

Sample

The sample consists of a subset of individuals enlisted in the National Longitudinal Survey of Youth (NLSY79), a nationally representative sample of 12,686 individuals (Center for

Human Resource Research, 2004). The NLSY79 is administered by the Bureau of Labor Statistics, a branch of the US Department of Labor. NLSY79 participants were interviewed annually from 1979 until 1994, when a biennial interview schedule was adopted.

This study tracks a specific venture of self-employed entrepreneurs. In order to track the performance and survival of the venture over time, it focuses on individuals that began a new business between the years of 1993 and 1997 (as indicated in the NLSY79 survey years 1994 and 1998). This time period was selected to give a large enough sample of entrepreneurs to test the hypotheses and also to enable the tracking of an entrepreneur's venture for at least 10 years through the end of the data collection in 2008. Examining this time period also provided the advantage of sampling individuals in the database who were more mature (between the ages of 29 and 37 in 1994), rather than limiting the sample to only individuals who chose to become entrepreneurs early in their careers (e.g. data from the 1980s in the NLSY79). Using later survey data allowed NLSY79 participants plenty of time to complete their initial educational pursuits (e.g. even those pursuing professional degrees) and for most participants to be in the workplace for about one decade. For the analyses, data from 1993 to 2008 was used, representing a 15-year sample window.

Survey questions in the NLSY79 include a wide range of topics, including questions about employment issues. One NLSY79 survey question asks respondents whether they are self-employed (vs working for a private company, the government, a non-profit organization or a family business). All respondents who began their business between 1993 and 1997 were included in the data set for this study (with the exception of respondents who indicated that they expected their self-employment in the venture to be temporary rather than permanent). In total, there were 234 entrepreneurs that met these criteria and had available data for the control, independent, and at least one of the dependent variables described below. The sample was 53 percent male, 65 percent white and on average was 32.3 years old in 1994.

Independent variables

Educational attainment. Education was coded using the following five levels: less than high school diploma (12 percent); high school diploma (58 percent); associate degree (8 percent); bachelor's degree (16 percent); and master's or professional degree (6 percent). This was measured around the time the entrepreneurs began their business (e.g. 1994).

General mental ability (GMA). The Armed Forces Qualification Test (AFQT) was used as a measure of GMA. The AFQT is a composite score created from selected sections of the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB was administered to NLSY79 participants (16–23 years of age at the time) in 1980 for purposes of developing national norms for the test. The AFQT is a composite of word knowledge, paragraph comprehension, math knowledge and arithmetic reasoning and is highly correlated with other ability measures (Center for Human Resource Research, 2004).

The AFQT composite score was statistically corrected for differences in age (Ing *et al.*, 2014; also see Berry *et al.*, 2006). Each AFQT score was converted into a percentile score between 0 and 100. These age-adjusted AFQT percentile scores were used as this study's measure of GMA.

Dependent variables

Venture performance. Similar to prior research that has examined the entrepreneur's earnings or salary as a measure of performance (e.g. Rauch *et al.*, 2000; Unger *et al.*, 2011), a measure of how well the venture was performing was calculated based on the average income obtained from the venture by the entrepreneur. This income included any salary taken by the entrepreneur from the business venture as well as any profits made by the venture. The income related to the venture was reported by the individual in whatever way was easiest for them (e.g. annual wage earnings and/or net income related to the venture), and then converted

to an hourly rate based on the average number of hours worked in the venture per week. An average hourly rate for the venture was calculated using each time this measure of financial performance was reported (i.e. typically biennially) throughout the life of the venture. For example, if an entrepreneur (who began her venture in 1996 and closed the venture in 2000) reported her income related to the venture in 1996, 1998 and 2000 as $20 per hour, $30 per hour and $10 per hour, respectively, her venture performance average income would be $20 per hour. In this way, an overall indicator of the performance of the venture throughout the life of the venture was obtained. To adjust for inflation, all earnings were adjusted to 2008 dollars using Consumer Price Index data. Due to a positive skew in this variable, the log transformation of venture performance was utilized in the regression equations.

Venture tenure and survival. For the purposes of this study, venture tenure is defined as the length of time that the entrepreneur remains with the venture (van Praag, 2003). Venture survival is a binary dummy variable indicating whether the venture was still in existence at the end of the data collection period.

Control variables

The following were control variables since prior research indicates that they could impact new venture performance or survival (e.g. van Praag, 2003).

Sex. Prior studies have demonstrated that female-owned businesses tend to underperform male-owned businesses, although recent research has questioned this finding (Robb and Watson, 2012).

Age. Although the age range was restricted in this database, it was included as a control variable since older individuals had more time to obtain education, and education was expected to be related to venture outcomes. The entrepreneur's age in 1994 is reported.

Race. Race was examined as white vs minority (e.g. Hispanic and African-Americans) since past research has found that non-minority-owned businesses tend to outperform minority-owned ventures (Robb, 2002).

Self-employment entrepreneur experience. Past research has demonstrated a positive effect of entrepreneurial experience on venture performance and survival (Unger *et al.*, 2011). For each year of the survey, respondents were asked if they were self-employed. If respondents indicated that they were self-employed in any of the years prior to when they began the venture of interest, they were coded as having self-employment experience (0/1 dummy code). In total, 49 percent of the sample had prior self-employment entrepreneurial experience before beginning the venture of interest.

Full-time vs part-time in venture. The average amount of time per week devoted to a venture could influence venture outcomes (e.g. Cron *et al.*, 2006; Raffiee and Feng, 2014). Respondents reported the average number of hours per week that they spent working in their venture. Not all of the self-employed entrepreneurs worked on their ventures on a full-time basis. This could be because they were not working full-time (i.e. only worked 25 h per week) or because they were working at other jobs in addition to their venture. The number of hours that respondents reported working in their venture was reported. If the entrepreneur reported working an average of 30 or more hours per week at any time during the tenure of the venture, it is coded as full-time. Otherwise, the entrepreneur was coded as working part-time in the venture. Based on this criterion, 85 percent of the sample worked full-time in the venture.

Industry. The industry that entrepreneurs began their business in was reported and coded in the data set using 1980 Industrial Classification System (US Bureau of the Census, 1980). Based on these codes, six different dummy variables were utilized representing the following industry groups: agriculture/manufacturing/transportation, construction, trade (including retail stores), business and repair services (including data processing services and automotive repair), personal services (e.g. cleaning services, beauty shops) and

professional services (e.g. physician or legal services). The coding of these industries is very similar to van Praag (2003), who noted the importance of controlling for industry-related variables when examining venture outcomes.

Industry experience. Research has shown that experience of the business owner in the same industry in which a new business is started improves a firm's chances of survival and firm performance (Bosma *et al.*, 2004; van Praag, 2003). The respondents indicated which industry they had begun their venture in. These historical employment data were utilized to determine the extent to which they worked in the same industry as the one in which they were beginning their venture. This experience in the industry was coded as: 0 – no experience (23 percent of sample); 1 – one or two years of experience (27 percent of sample); and 2 – three or more years' experience (50 percent of sample).

Analyses

In order to test the hypothesized model in Figure 1, Hayes' (2013) Process macro in SPSS was utilized to examine the proposed direct and indirect effects on venture performance (MacKinnon *et al.*, 2012; Preacher and Kelley, 2011). The GMA and educational attainment variables were mean-centered before entering them into the regression equations[1]. All the industries were entered in the regressions except for the personal services industry, so this industry provides the baseline and the other industries are compared to it.

Survival analysis is a collection of statistical procedures for which the outcome variable of interest is the time until an event occurs (Harrell, 2001), in this case the time until the entrepreneur exits the venture. A hazard model (i.e. Cox's, 1972 regression) is utilized to examine the predictors of venture exit or survival (Anavatan and Karaoz, 2013; van Praag, 2003). Cox's regression is commonly used in the turnover literature (e.g. Lyness and Judiesch, 2001; Sims *et al.*, 2005). It is designed for use with dependent variables that are dichotomous (i.e. venture survival) and also incorporates the venture tenure, measured continuously (Sims *et al.*, 2005). In addition to the control variables outlined above, venture performance was also included as a control variable in the Cox regression ran in SPSS.

Results

The correlations among study variables are presented in Table I. Similar to prior research (Berry *et al.*, 2006; Judge *et al.*, 2010), GMA and educational attainment were found to be highly correlated ($r = 0.63$). Individuals with higher educational attainment were less likely to have self-employment experience ($r = -0.17$). Self-employed entrepreneurs in personal services industries had the lowest venture performance ($r = -0.28$) and had shorter tenure in their ventures ($r = -0.19$), while entrepreneurs in the professional services industries had the highest income from their ventures ($r = 0.23$). In addition, entrepreneurs with higher GMA were more likely to begin businesses in professional service industries ($r = 0.32$) and less likely to begin businesses in personal service industries ($r = -0.12$). Consistent with expectations, males were much more likely than females to work in the construction industry ($r = 0.43$), whereas females were much more likely than males to begin businesses in the personal services industry ($r = 0.45$).

Table II contains the regression results to test *H1–H4*. With educational attainment as the dependent variable, the results indicate that those who have self-employment experience obtained less education ($B = -0.38$, $p < 0.01$). In addition, those who work in the professional services ($B = 0.65$, $p < 0.01$) and business repair and services ($B = 0.44$, $p < 0.05$) industries also have more education than those working in personal services. GMA has a significant, positive relationship ($B = 0.20$, $p < 0.01$) with educational attainment, supporting *H1*. The variance explained for educational attainment was 0.48.

With venture performance as the dependent variable, the variance explained was 0.29. All of the variance inflation factors for the variables in the model were lower than 2.5,

Table I.
Means, standard deviations, and intercorrelations among variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. GMA																	
2. Educational attainment[a]	0.63																
3. Self-employment experience[b]	−0.04	−0.17															
4. Full-time venture	−0.06	−0.03	0.10														
5. Male	0.03	−0.07	0.11	0.33													
6. Race – white	0.39	0.18	−0.03	−0.08	0.07												
7. Age in 1994	0.11	0.16	−0.04	0.03	−0.11	0.03											
8. Industry experience[c]	0.04	0.06	0.24	−0.05	−0.05	0.05	−0.09										
9. Personal services	−0.12	−0.12	−0.08	0.05	−0.45	−0.13	0.07	−0.03									
10. Agriculture, manufacturing and transportation	−0.13	−0.11	−0.04	0.05	0.21	−0.02	−0.02	−0.13	−0.19								
11. Construction	−0.12	−0.20	0.08	0.16	0.43	0.03	−0.06	0.04	−0.25	−0.20							
12. Trade	−0.05	−0.07	−0.02	−0.17	−0.11	−0.05	−0.07	−0.01	−0.16	−0.13	−0.18						
13. Business and repair services	0.06	0.09	0.12	−0.08	0.01	0.09	−0.02	0.09	−0.21	−0.17	−0.23	−0.15					
14. professional Services	0.32	0.38	−0.05	−0.05	−0.12	0.06	0.09	0.02	−0.24	−0.20	−0.27	−0.17	−0.22				
15. Venture tenure[d]	0.08	0.06	0.23	0.15	0.33	0.16	0.00	0.01	−0.19	0.06	0.14	−0.04	0.03	0.01			
16. Venture survival[e]	0.12	0.11	0.13	0.17	0.33	0.09	0.01	−0.02	−0.20	0.05	0.10	0.01	−0.01	0.07	0.79		
17. Venture performance	0.32	0.34	0.03	0.02	0.15	0.17	0.03	0.09	−0.28	0.01	−0.05	−0.04	0.12	0.23	0.16	0.14	
Mean	48	1.48	0.49	0.85	0.53	0.65	32.3	1.27	0.19	0.13	0.21	0.10	0.16	0.21	6.62	0.28	26.14
SD	30.4	1.09	0.50	0.36	0.50	0.48	2.24	0.81	0.39	0.34	0.41	0.30	0.37	0.40	4.71	0.45	28.79

Notes: $n = 234$, except for correlations involving venture tenure and venture survival ($n = 224$), venture performance ($n = 229$) and the correlation between venture performance and both venture tenure and venture survival ($n = 219$). [a]Educational attainment (coded 0 – no high school diploma; 1 – high school diploma; 2 – associate degree; 3 – bachelor's degree; 4 – master's degree or higher); [b]Self-employment experience (0 – No; 1 – yes); [c]industry experience (0 – no experience; 1 – one or two years of experience; 2 – three or more years' experience); [d]tenure in years of venture; [e]survival of venture to the end of the data collection period (0 – no; 1 – yes). Correlations |0.13| to |0.17| are significant at $p < 0.05$; correlations |0.18| and higher are significant at $p < 0.01$

	Estimate	95% CI	SE	*t*
Direct effects (DV: education attainment)				
Constant	−1.37*	(−3.01, 0.26)	0.83	−1.66
Agriculture, manufacturing and transport → education	0.18	(−0.24, 0.61)	0.22	0.85
Construction → education	0.01	(−0.040, 0.41)	0.21	0.03
Trade → education	0.09	(−0.34, 0.52)	0.22	0.41
Business and repair services → education	0.44**	(0.05, 0.83)	0.20	2.25
Professional services → education	0.65***	(0.29, 1.01)	0.18	3.59
Age → education	0.04	(−0.01, 0.08)	0.02	1.49
Industry experience → education	0.12*	(−0.02, 0.26)	0.07	1.68
Self-employment experience → education	−0.38***	(−0.60, −0.16)	0.11	−3.36
Full-time venture → education	0.19	(−0.14, 0.52)	0.17	1.15
Male → education	−0.14	(−0.42, 0.15)	0.14	−0.95
Race (white) → education	−0.16	(−0.40, 0.08)	0.12	−1.29
H1: GMA → education	0.20***	(0.16, 0.24)	0.02	9.72
Direct effects (DV: venture performance)				
Constant	0.99***	(0.25, 1.73)	0.37	2.64
Agriculture, manufacturing and transport → performance	0.32***	(0.13, 0.51)	0.10	3.32
Construction → performance	0.34***	(0.16, 0.52)	0.09	3.68
Trade → performance	0.31***	(0.12, 0.51)	0.10	3.21
Business and repair services → performance	0.36***	(0.18, 0.53)	0.09	3.99
Professional services → performance	0.34***	(0.17, 0.50)	0.08	4.06
Age → performance	−0.00	(−0.02, 0.02)	0.01	−0.21
Industry experience → performance	0.02	(−0.05, 0.08)	0.03	0.51
Self-employment experience → performance	−0.01	(−0.11, 0.09)	0.05	−0.19
Full-time venture → performance	−0.03	(−0.17, 0.12)	0.07	−0.38
Male → performance	0.12*	(−0.01, 0.24)	0.06	1.80
Race (white) → performance	−0.01	(−0.12, 0.10)	0.06	−0.15
H2: GMA → performance	0.03**	(0.01, 0.05)	0.01	2.51
H3: Education → performance	0.06*	(−0.00, 0.12)	0.03	1.92
Indirect effect				
H4: GMA → education → performance	0.012**	(0.00, 0.02)	0.006	1.95

Table II.
Regression results related to venture performance[a]

Notes: $n = 229$. The log transformation of venture performance was utilized. Unstandardized coefficients are reported. [a]For educational attainment, $R^2 = 0.48$ and adjusted $R^2 = 0.45$; for performance, $R^2 = 0.29$ and adjusted $R^2 = 0.25$. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

indicating that multicollinearity was not a concern (Hair *et al.*, 2009). The results from this model indicate that, when compared to entrepreneurs who begin businesses in the personal services industry, entrepreneurs in all five other industries (i.e. agriculture/manufacturing/transportation; construction; trade; business and repair services; and professional services) have ventures that perform significantly better. None of the other control variables had a significant effect on venture performance, including self-employed entrepreneurial experience or experience in the industry in which the venture was started in (although "male" had a marginally significant effect of $B = 0.12$, $p = 0.07$). GMA has a positive, direct effect ($B = 0.03$, $p < 0.05$) on venture performance, supporting *H2*. Educational attainment had only a marginally significant direct effect on venture performance ($B = 0.06$, $p = 0.06$), so *H3* is not supported. The indirect effect of GMA on venture performance via educational attainment was significant ($B = 0.01$, $p < 0.05$), so *H4* is supported.

The Cox regression results to examine the hypotheses with venture survival are reported in Table III. The log likelihood for the model was 1,465.59 and the overall χ^2 was 64.10 (significant at $p < 0.01$). For ventures in the data set, the average life expectancy of a venture was 6.61 years, which is consistent with prior research on venture survival (Yang and Aldrich, 2012). While the

Predictor	*b*	Hazard ratio Exp(*b*)	95% CI of hazard ratio
Agriculture, manufacturing and transportation	−0.22	0.80	0.43–1.51
Construction	0.04	0.90	0.55–1.97
Trade	−0.09	0.78	0.48–1.73
Business and repair services	−0.08	0.92	0.52–1.63
Professional services	−0.19	0.83	0.47–1.46
Age	−0.03	0.97	0.90–1.05
Industry experience	−0.05	0.95	0.77–1.18
Self-employment Experience	−0.46***	0.63	0.45–0.89
Full-time venture	−0.40	0.67	0.42–1.06
Male	−0.90***	0.41	0.26–0.64
Race – white	−0.33	0.72	0.49–1.05
Venture performance	−0.00	1.00	0.99–1.01
General mental ability (GMA)	−0.02	0.98	0.91–1.06
Education	−0.28**	0.76	0.60–0.96
H5: GMA × education	−0.11**	0.89	0.81–0.99
H6a: education^2	0.31***	1.36	1.11–1.66
H6b: GMA^2	0.04**	1.04	1.01–1.07

Notes: $n = 224$. Log likelihood: 1,465.59; overall χ^2: 64.10. **$p < 0.05$; ***$p < 0.01$

Table III.
Cox regression results predicting venture exit

majority (i.e. 161/224 or 72 percent) of entrepreneurs in the sample exited their ventures, 63 ventures (28 percent) were still in business at the end of the data collection period.

A negative β from the Cox regression results indicates that the independent variable reduces the likelihood of the event (exiting the venture), which indicates that the variable leads to longer venture survival. As seen in Table III, entrepreneurs who were male ($B = -0.90$, $p < 0.01$) and those who had self-employment experience ($B = -0.46$, $p < 0.01$) were more likely to survive longer in their ventures. In support of *H5*, there was a significant interaction effect between education and GMA ($B = -0.11$, $p < 0.05$), indicating that those with more education and higher GMA were less likely to exit their ventures. The Cox regression results in Table III were utilized to plot three separate curves for low, mean and high educational levels across a range of cognitive ability (i.e. ±1 standard deviation). Figure 2 demonstrates these predicted curvilinear effects as indicated by the

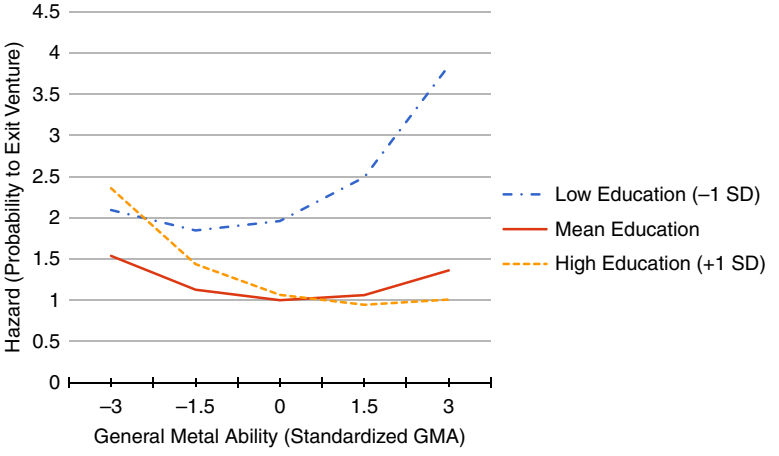

Figure 2.
Influence of general mental ability and educational attainment on venture survival

significant squared terms for educational attainment ($B = 0.31$, $p < 0.01$) and GMA ($B = 0.04$, $p < 0.05$), providing support for *H6a* and *H6b*. The curves in Figure 2 show a U-shaped, curvilinear effect on venture exit, which translates to an inverted-U, curvilinear effect of educational attainment and GMA on venture survival (i.e. a lower probability to exit translates to longer venture survival).

Discussion

For this sample of self-employed entrepreneurs, when both GMA and educational attainment were examined simultaneously, GMA influenced venture performance directly and indirectly via educational attainment. This indicates the importance of GMA as a context-generic human capital variable for entrepreneurs and supports the view that higher GMA should be viewed as an important resource to enable entrepreneurs to succeed in their ventures (Frese *et al.*, 2007; Hartog *et al.*, 2010). In addition, this study also demonstrates that entrepreneurs with higher GMA were able to obtain more education in subsequent years, and GMA also had an indirect, positive influence on venture performance through this additional educational attainment. This provides evidence that GMA is likely a primary antecedent or source of entrepreneurs' human capital acquisition (Ployhart and Moliterno, 2011; Rauch and Rijsdijk, 2013). Therefore, GMA should be more central to the human capital discussion in the entrepreneurship literature and theoretical models that include GMA should be developed.

Some prior research has demonstrated that context- or entrepreneurship-specific human capital (e.g. industry-specific experience or entrepreneurship experience) has a stronger, direct influence on firm performance than more context-generic investments such as education (Bosma *et al.*, 2004). While this could be true in some instances, this perspective also could underestimate the indirect influence that context-generic human capital resources such as education and GMA (Ployhart and Moliterno, 2011) may have on entrepreneurship outcomes. In other words, this study suggests that research on venture outcomes should consider both the direct and indirect effects that a context-generic human capital variable such as an entrepreneur's GMA has on venture outcomes.

With regard to venture survival, Figure 2 illustrates entrepreneurs' probability to exit the venture given differing levels of educational attainment and GMA. Those with high levels of education and high GMA were the least likely to exit (or most likely to survive). This could be due to the additional knowledge and skills gained via the education process and/or the added legitimacy that the higher degree afforded the entrepreneur (Cooper *et al.*, 1994; Gimmon and Levie, 2010). These entrepreneurs with higher GMA are also likely to effectively use their education to benefit their ventures (Gottfredson, 1997).

The curves in Figure 2 generally illustrate an inverted-U, curvilinear effect of educational attainment and GMA on venture survival. For example, consider entrepreneurs with average levels of education (i.e. high school diploma or an associate degree). This curve for mean-education level demonstrates that those with the lowest and highest GMA are less likely to continue with the venture (i.e. less likely to survive) when compared to those with average GMA. This is likely due to entrepreneurs with the lowest GMA being "pushed out" of their ventures because of a limited ability to handle the complex demands of operating a new business (Cooper *et al.*, 1994; Davidsson and Honig, 2003). Conversely, those with average education and higher GMA may be more likely to be "pulled-out" of their ventures due to better opportunities in the general labor market. This finding supports the theoretical reasoning that the relationship with survival depends on the relative payoff of the entrepreneur's human capital while operating within the venture vs the options available outside the venture (Gimeno *et al.*, 1997; Rauch and Rijsdijk, 2013). In addition, while caution should be exercised in comparing the lines in Figure 2 to each other since these contrast effects were not hypothesized or statistically examined for

significance, those with low levels of education and high GMA seem to be very likely to exit their venture (i.e. least likely to survive). This outcome was not necessarily anticipated, and future research is necessary to examine possible explanations. Overall, these findings indicate that studies examining venture survival should consider curvilinear effects of context-generic human capital resources.

Given that this study found GMA to have a prominent influence on entrepreneur outcomes and that GMA has a high correlation with educational attainment, this suggests that certain effects attributed to educational attainment could have been influenced by GMA for studies that do not include or measure GMA (Rauch and Rijsdijk, 2013; Van der Sluis *et al.*, 2008). If this is the case, research that has demonstrated the positive relationship between education level with both venture performance and survival (Cooper *et al.*, 1994; Davidsson and Honig, 2003; Unger *et al.*, 2011) may be indicative that these entrepreneurs are more successful because of their higher intelligence, rather than solely due to their higher educational attainment. Therefore, researchers can gain a better understanding of entrepreneurs' human capital and its influence on venture outcomes by assessing both educational attainment and GMA.

Practical implications

These findings have implications for the screening process used by financial institutions when determining in which entrepreneurial ventures to invest. While entrepreneur characteristics such as prior entrepreneurial experience are often utilized in these decisions (Hall and Hofer, 1993), the entrepreneur's GMA is typically not assessed. Since the entrepreneur's GMA is likely to influence venture performance as well as the acquisition and utilization of human capital throughout the lifetime of the venture, financial institutions could consider screening entrepreneurs and/or the founding management team of the proposed venture by assessing their GMA (Frese *et al.*, 2007). This would follow the relatively common practice in other industries of using intelligence as part of the selection criteria for managerial and professional positions (Schmidt and Hunter, 1998, 2004). This type of screening that includes an assessment of cognitive ability (along with other entrepreneur characteristics such as personality) is already being utilized by financial institutions in emerging markets (Klinger *et al.*, 2013; De Mel *et al.*, 2008).

In addition, anecdotal accounts often imply that entrepreneurs who do not attend college or who drop-out of college to begin their own business (e.g. Bill Gates, Michael Dell and Steve Jobs) can be as financially successful as those who receive a college degree (Greenberg, 2009). Based on this study, this may especially be the case for those with higher GMA. However, it should also be recognized that the data presented here indicate that, on average, increased educational attainment leads to better venture outcomes among self-employed entrepreneurs. The results from this study of general educational attainment should not be confused with studies that focus on education and training directly related to entrepreneurship, which has also been shown to have positive effects on entrepreneurship outcomes (Martin *et al.*, 2013).

Limitations

As with all studies, this study has limitations. While the NLSY79 archival database enabled a longitudinal study, it also prevented a determination of why entrepreneurs may have decided to leave their ventures. In addition, there were some missing data and some variables were not able to be measured as precisely as they could have been. For example, self-employment experience was only able to be examined as a dichotomous variable rather than obtaining a more detailed measure such as the number of years of experience or the quality of this experience (e.g. see Gabrielsson and Politis, 2012). Therefore, the non-significant relationships between venture performance and context-specific human capital variables such as self-employment experience and industry experience could be due to these relatively "blunt" measures.

However, self-employment entrepreneurial experience was predictive in the Cox regression analysis (i.e. it had a positive effect on venture survival), and the study utilized very precise measures of the human capital variables GMA and educational attainment, which were the key variables in the study. In addition, the findings of the study may not generalize to entrepreneurs beginning larger-scale or venture-capital backed businesses since this database examined individuals who became self-employed entrepreneurs in ventures that typically included just themselves or a few other employees.

Future research

When considering human capital theory, GMA is likely to influence one's education, experiences, and skills (Rauch *et al.*, 2005) as well as the ability to acquire general or specific human capital (Becker, 1975). In other words, the examination of human capital within entrepreneurship is incomplete without taking GMA into consideration since GMA is likely to influence many of these areas. For example, similar to the hypothesized mediating effect of GMA on education, GMA could have indirect and/or moderating effects on the value that entrepreneurs would be able to gain from their entrepreneurial or industry experience (i.e. the ability to effectively learn from this experience and utilize this experience to increase venture performance) (Gottfredson, 1997; Judge *et al.*, 2010). While it may be difficult to obtain a measure of GMA from an IQ test from entrepreneurs, other assessments such as an entrepreneur's American College Testing or Scholastic Assessment Test score could be utilized (Frey and Detterman, 2004; Schmitt *et al.*, 2009). Overall, additional research is needed to better understand the role that GMA plays in the human capital development of entrepreneurs.

In addition, a notable finding is that the industry that the entrepreneur began the venture in had an impact on the venture performance (van Praag, 2003). As would be expected, entrepreneurs in personal services industries had the lowest income, while entrepreneurs in the professional services industries had the highest income from their ventures. Although this finding is intuitive, the significant correlations of both GMA and educational attainment with these industries indicate that some industries appear to have higher "cognitively loaded" barriers to entry. These findings are consistent with Lofstrom *et al.* (2014), who found that wealth and educational background of entrepreneurs predisposed them to make different industry choices due to the different rewards available to them and the different entry barriers they faced. Future research could examine whether those with lower levels of GMA are less likely to participate in certain industries, and whether they are therefore more likely to begin businesses in industries where entrepreneurs have lower earning potential.

This is also one of the first studies to demonstrate curvilinear effects for GMA and education on venture survival. Future research examining context-generic human capital variables and venture survival should consider curvilinear relationships. This research can build on the push and pull forces described in the employee turnover literature (Jackofsky, 1984; Maltarich *et al.*, 2010). Whereas context-generic variables might be likely to demonstrate these curvilinear relationships, context-specific human capital variables may be less likely to have curvilinear effects since they may not be as valuable outside the entrepreneurship context (e.g. prior entrepreneurship experience), which would reduce the pull force on the entrepreneur to leave the venture.

Conclusion

This study demonstrates the importance of the GMA for entrepreneurs and their venture performance and survival. While there is substantial and well-developed research on the importance of GMA across most occupations and jobs (Hunter, 1980; Schmidt and Hunter, 1998), hopefully this study will encourage additional research examining this important context-generic human capital resource, the interaction of GMA with other context-specific human capital resources, as well as its impact on entrepreneurial outcomes.

Note

1. In addition, to create a scale that is similar to the other variables and more appropriate for the regression analyses, the GMA variable (i.e., percentile score) was divided by 10. Therefore, when interpreting the regression analyses, a 1 percent change in the GMA variable corresponds to a decile change in the dependent variable.

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Corresponding author
Brian D. Blume can be contacted at: blume@umflint.edu