**A Meta-Analysis of the Effects of General Mental Ability and Emotional Intelligence on Entrepreneurial Success.**

**Abstract**

Using meta-analysis, we investigate the extent to which General Mental Ability (GMA) and Emotional Intelligence (EI) predict entrepreneurial success. Based on 65,826 observations, we find that both GMA and EI matter for success, but that the size of the relationship more than twice as large for EI. Our study augments previous meta-analyses on task performance in other workplace settings, where GMA is considered to be more critical than EI, and extends the literature on cognitive and emotional intelligence in entrepreneurship.

**Introduction**

A sizable literature in entrepreneurship examines the impact of individuals’ cognitive (Baron, 2004; Cope, 2005) and emotional abilities (e.g., Baron and Markman, 2003; Cardon, Foo, Shepherd, and Wiklund, 2012; Camuffo, Gerli, and Gubitta, 2012). In particular, general mental ability (GMA) and emotional intelligence (EI) are thought to be important contributors to entrepreneurial outcomes (Shepherd, 2009). GMA has been shown to increase entrepreneurial alertness, enabling entrepreneurs to effectively recognize and exploit entrepreneurial opportunities (Shane, 2000; Shane and Venkataraman, 2000; Westhead, Ucbasaran, and Wright, 2005). EI, on the other hand, helps entrepreneurs make good decisions in the face of emotionally difficult situations, maintain motivation and persistence, and better manage relationships (Cardon et al., 2012; Goleman, 1995; Nambisan and Baron, 2013; Salovey and Mayer, 1990).

 Despite the emphasis on cognitive and emotional factors in entrepreneurship, GMA and EI are seldom examined together in entrepreneurial contexts. In contrast, the relative importance of GMA versus EI in other organizational contexts has been the focus of much prior attention. Work in the area of organizational behavior consistently shows that GMA is a stronger predictor of workplace success, including several meta-analyses (e.g., Joseph, Jin, Newman, and O’Boyle, 2015; O’Boyle, Humphrey, Pollack, Hawver, and Story, 2011). GMA is also highly related to individual success in many domains (e.g. Bridgeman, McCamley-Jenkins, and Ervin, 2000; Fergusson, Horwood, and Ridder, 2005; Kuncel, Hezlett, and Ones, 2001, 2004; Terman, 1925; Terman and Oden, 1959), including entrepreneurship settings (Baron, 2004; Corbett, 2005).

 However, there are several reasons to believe that EI, relative to GMA, might be more important for entrepreneurial success. Managing an entrepreneurial business has been described as an “emotional rollercoaster” (Shepherd, 2003; Shepherd and Cardon, 2009; Shepherd, Wiklund, and Haynie, 2009). Entrepreneurs deal with resource scarcity in highly uncertainty and ambiguous environments (Baker and Nelson, 2005; Knight, 1921; Ucbasaran, Shepherd, Lockett, and Lyon, 2013). Moreover, they must overcome frequent setbacks (Boss, 2010; Fang He, Sirén, Singh, Solomon, and von Krogh, 2018) and become proficient in acquiring resources through effective relationship management (Ciuchta, Letwin, Stevenson, McMahon, and Huvaj, 2018). Thus, it is crucial for entrepreneurs to be proficient in regulating their own emotions. The ability to stay focused and make sound decisions in highly stressful situations and the ability to effectively manage relationships are both enhanced by EI (Mayer, Salovey, and Caruso, 2004; Brown, George-Curran, and Smith, 2003; Lopes et al., 2005; Thompson, Connell, and Bridges, 1988), suggesting the crucial role of EI-based skills for navigating entrepreneurial contexts.

 While prior work has made it clear that GMA is a stronger predictor of workplace success relative to EI (O’Boyle et al., 2011; Joseph et al., 2015), it is not clear if this relationship will hold in the entrepreneurship setting due to unique emotional and interpersonal demands of entrepreneurship (Baron, Tang, and Hmieleski, 2011; Cardon, et al. 2012; Shepherd and Patzelt, 2018; Ucbasaran et al., 2013). Indeed, EI-based skills – including the ability to make sound decisions in emotionally difficult situations, the ability to form and maintain key business relationships, and the ability to maintain motivation in the face of setbacks and failure – are each critical antecedents to entrepreneurial success. In this research, we contemplate the entrepreneurial setting as a potential boundary condition, and ask the following research question; *given the emotional complexities at play in the entrepreneurial setting, will EI be a stronger predictor of entrepreneurial success, relative to GMA?*

 To investigate this research question, we conduct a comprehensive review and meta-analysis of 40 studies containing 65, 826 observations. To test our hypotheses, we first estimate the individual effects of GMA and EI on four outcomes reflecting entrepreneurial success. Then, we use dominance analysis to calculate estimates of the relative importance of GMA and EI in explaining success (Johnson, 2000). We find that both GMA and EI matter for entrepreneurial success, but that the size of the relationship is more than twice as large for EI than for GMA.

 This paper makes two primary contributions to the entrepreneurship and organizational literatures. First, we contribute to the vibrant literature explaining the relative importance of GMA and EI in organizations and add nuance to prior work on intelligence and job success (Gonzalez-Mulé, Mount, and Oh, 2014). Using the entrepreneurship setting, we investigate how this relationship is altered in the extreme organizational context of entrepreneurship. Entrepreneurship is considered an extreme organizational setting (Stevenson, Josefy, McMullen and Shepherd, 2020) because of high ambiguity and extremely high failure rates (Knight, 1921; Ucbasaran et al., 2013), along with its multiple, and sometimes extreme emotional ups and downs (Baron, et al., 2011; Cardon, et al. 2012; Shepherd and Patzelt, 2018). Our theorizing suggests that EI is more strongly related to success relative to GMA in this setting. This contrasts prior work in organizational behavior (Joseph et al., 2015; O’Boyle et al., 2011) and suggests that at least in some organizational contexts, EI is more important than previously considered.

 Second, we contribute to the growing literature on the psychology of entrepreneurship (Frese and Gielnik, 2014; Stevenson, Ciuchta, Letwin, Dinger, and Vancouver, 2018; Uy, Sun, and Foo, 2017; Wood, Williams, and Drover, 2017). By systematically quantifying the effect of GMA and EI on entrepreneurial success, we reconcile ambiguity within the entrepreneurship literature on the relative importance of cognitive and emotional/social abilities (e.g., Baum, Bird, and Singh, 2011; Shepherd and Patzelt, 2018; Sternberg, 2004). Our findings also support and extend entrepreneurial human capital theory (Unger, Rauch, Frese, and Rosenbusch, 2011) by examining the role of two important types of human capital (GMA and EI) in entrepreneurial success. Gartner et al. (1994) suggested a deeper understanding of entrepreneurship involves understanding the role of ability components, including cognitive and emotional abilities. Both cognitive- and emotional-based abilities are thought to aid in entrepreneurial tasks, yet the relative importance that such abilities contribute to entrepreneurial success remains unexplored. Using a meta-analytic approach, and building from human capital models of entrepreneurship (Martin, McNally, and Kay, 2013; Unger et al., 2011), we explain why skills related to GMA and EI are both crucial for entrepreneurial success, yet EI-based skills are relatively more important. Finally, our study contributes to a special issue on advancing strategic entrepreneurship through meta-analysis by illustrating the relative effects of GMA and EI on entrepreneurial success, which has implications for opportunity-seeking and advantage-seeking behaviors.

**Theory and Hypotheses**

One of the central questions posed by entrepreneurship scholars is, why are some entrepreneurs more successful in starting and operating new ventures than others (Shane and Venkataraman, 2000)?[[1]](#footnote-1) Human capital theory has provided a fertile theoretical framework for examining this question (Chandler and Hanks, 1998; Davidsson and Honig, 2003; Dyke, Fischer, and Reuber, 1992; Pfeffer, 1994). Becker (1964) defined human capital as any characteristic that enhances an individual’s effectiveness such as education, experience, knowledge, skills, or abilities. Entrepreneurship researchers have extended human capital theory by examining human capital constructs that contribute specifically to entrepreneurial success (see Martin et al., 2013; Unger et al., 2011). According to these theorists, human capital increases the capability of entrepreneurs to perform critical entrepreneurial tasks (Shane and Venkataraman, 2000). Unger and colleagues defined entrepreneurial human capital as an individual’s education, experience, knowledge, and skills that enable entrepreneurial specific abilities (Unger et al., 2011). Entrepreneurial human capital thus enables entrepreneurs to recognize opportunities, raise capital, solve problems, make good decisions under conditions of uncertainty and risk, and develop social networks.

 Entrepreneurs are individuals that assume personal risk by starting independent firms, or by developing purchased or inherited independent firms (Schumpeter, 1934, 1942; Ucbasaran, Westhead, and Wright 2001). Both cognitive (Shane, 2000; Shane and Venkataraman, 2000; Westhead et al., 2005) and emotional factors (Baron, et al., 2011; Cardon, et al. 2012; Shepherd and Patzelt, 2018) are considered to play an important role in entrepreneurial success. Cognitive factors emphasize the capacity to think abstractly, solve problems and to learn from experience (Kanfer and Ackerman, 1989; Schmidt and Hunter, 2004). Emotional factors focus on the role of affect in entrepreneurship, emphasizing individual differences in the ability to understand and regulate one’s emotions and effectively manage relationships toward the accomplishment of entrepreneurial success (Baron, 2008; Baron, et al., 2011; Cardon, et al., 2012).

**GMA and entrepreneurial success**

GMA is a highly general information-processing capacity that enables reasoning, problem solving, decision making, and other higher order thinking skills (Gottfredson, 1997). GMA is highly stable beginning in childhood (Moffitt, Caspi, Harkness, and Silva, 1993), is not permanently affected by interventions intended to raise it (Jensen, 1998; Spitz, 1986), and has high heritability with low ‘shared environmentability’ by early adulthood (Plomin and Petrill, 1997; Rowe, 1997). The stability of GMA might be one reason it has such consistent relationships to individual success in a variety of domains, including college and graduate school grade point average (Bridgeman et al., 2000; Kuncel et al., 2001), individual income (Fergusson et al., 2005), and career advancement (Kuncel et al., 2004). GMA also enhances an individual’s ability to acquire task-relevant knowledge from experience (Kanfer and Ackerman, 1989; Schmidt and Hunter, 2004). No other individual difference measured to date has as consistently high predictive validities for job success as GMA (Gottfredson, 1997).

Because GMA is a strong predictor of individual job success and career success (Hunter, 1986), one would expect it to be strongly related to entrepreneurial success. Specifically, we suggest that GMA serves as an important type of human capital by enabling cognitive skills necessary for entrepreneurial success. Indeed, there is theoretical and empirical evidence to support this connection. Baron and Henry (2010) provide a theoretical explanation of the important role cognitive resources associated with perception, information encoding, recall, and metacognition play for entrepreneurial success. GMA is strongly related to these cognitive processes and capabilities (Gottfredson, 1997). This suggests that entrepreneurs with higher GMA will better identify new business opportunities, generate more alternative courses of action, and make superior decisions in ambiguous, time-constrained situations, leading to higher success of the firms they found and operate.
 Research also illustrates how GMA relates to higher cognitive functioning in several other important areas. For example, psychologists have linked GMA to the speed of information processing (Ackerman, 1988; Hunter, 1986), the ability to process complex information (Judge, Klinger, and Simon, 2010), and pattern recognition. These cognitive skills are important for effective opportunity recognition (Baron and Ensley, 2006; Baron and Henry, 2010; Shane, 2003). High GMA individuals have a larger working memory capacity (Oberauer, Süß, Schulze, Wilhelm, and Wittmann, 2000), enabling them to retrieve relevant information, recognize patterns, and apply previously developed solutions to analogous problems. High GMA individuals are more likely to benefit from education and experience, converting them into knowledge and skills that are important for entrepreneurial success (Unger, Keith, Hilling, Gielnik, and Frese, 2009; Unger et al., 2011). High GMA individuals are also better at creative problem solving (Kuncel et al., 2004), and are better able to use prior knowledge to solve problems (Ackerman, 1996; Dragoni, Vankatwyk, and Tesluk, 2011). This ability could aid with overcoming obstacles when organizing and managing new ventures, i.e., managing liabilities of newness (Aldrich, 1999; Shepherd, Douglas, and Shanley, 2000; Starr and Bygrave, 1992; Stinchcombe, 1965). Finally, these cognitive skills should enable entrepreneurs to better produce and evaluate alternative courses of action and formulate effective business plans (Baron and Henry, 2010; Frese et al., 2007; Raffiee and Feng, 2014).

In sum, GMA is an integral component of human capital that enables an entrepreneur to acquire, assimilate and recall information, develop complex and nuanced cognitive schemas and plans, and produce accurate mental models for strategic decisions and actions. These abilities should enable higher GMA entrepreneurs to produce higher entrepreneurial success. Although entrepreneurial success is a multidimensional outcome, with each dimension providing a unique way of understanding success, we have no reason to expect the GMA relation to differ across these multiple outcomes. Formally, we hypothesize:

***Hypothesis 1: GMA positively relates to entrepreneurial success, including (a) financial success, (b) firm growth, (c) firm size, and (d) subjective success.***

**EI and entrepreneurial success**

EI is an individual capability that enables one to (1) monitors one’s own and others’ feelings and emotions, and (2) use this information to understand and regulate one’s emotions and behavior, enabling more effective self-management and the more effective management of relationships with others (Goleman, 1995; Salovey and Mayer, 1990; Schutte et al., 1998; Huy, 1999). The concept of EI has generated interest both in practitioner (Goleman, 1995) and scientific fields (Mayer et al., 2004; Salovey and Mayer, 1990) and research has confirmed the critical role EI plays to individual’s life and workplace success (Brackett, Rivers, and Salovey, 2011).

 High EI individuals are more self-aware, can better regulate their emotions, are better able to self-motivate, and have higher social skills than low EI individuals (Mayer, Salovey, and Caruso, 2004). EI is thus linked to a multitude of individual success outcomes, including steadier career paths and greater likelihood of promotion in organizations (Aydin et al., 2005; Druskat and Wolff, 2001; Dulewicz and Higgs, 2003), leadership effectiveness (Gardner and Stough, 2002; Goleman, Boyatzis, and McKee, 2002) and overall job success (Morehouse, 2007).

 Although EI is a strong predictor of individual job success and career success (Brackett et al., 2011), it is unclear whether this relationship holds in entrepreneurial contexts. We suggest that EI should be included as a human capital predictor of entrepreneurial success based on several associated emotional and social skills. For example, researchers have linked EI to social skills such as accurately perceiving other's needs, making good first impressions, and influencing others in interpersonal interactions (Mayer et al., 2004). These skills are important for developing business networks (Baron and Markman, 2000, 2003; Cardon et al., 2012), which can aid in signaling legitimacy and in acquiring resources necessary for entrepreneurial success (Amit, Glosten, and Muller, 1990; Podolny, 2001; Stuart, Hoang, and Hybels, 1999; Wuebker, Hampl, and Wuestenhagen, 2015). Likewise, EI is linked to being aware of and managing one’s internal states, impulses, and resources (Goleman, 1995, 2002). These skills can enhance creativity and opportunity recognition (Ahmetoglu, Leutner, and Chamorro-Premuzic, 2011; Baron, 2008), aid decision making in emotionally turbulent situations (Baron, 2013), and enable adaptive responses to unpredictable events (Mayer et al., 2004).

 In sum, EI is a crucial human capital factor that enables an entrepreneur to manage his or her own emotions as well as manage relationships with others, allowing them greater influence over many facets of the venture (Baron, 2013; Cardon, Sudek, and Mitteness, 2009). Emotions have a prevalent influence on decision-making, particularly in complex and risky situations (Lerner, Li, Valdesolo, and Kassam, 2015), such as in the context of entrepreneurship. Studies suggest that EI might increase the capability of entrepreneurs to perform critical entrepreneurial tasks such as building business networks, acquire resources, and discovering and exploiting new business opportunities (Aldrich and Zimmer, 1986; Davidsson and Honig, 2003; Gratton and Ghoshal, 2003). As with GMA, we have no reason to expect the EI relation to differ across multiple dimensions of success. Formally, we hypothesize:

 ***Hypothesis 2: EI positively relates to entrepreneurial success, including (a) financial success, (b) firm growth, (c) firm size, and (d) subjective success.***

**Relative importance of EI and GMA for entrepreneurial success**

We have posited the importance of both GMA and EI in explaining entrepreneurial success. However, the question remains as to which of the two might be relatively more important. Earlier we reviewed the evidence suggesting GMA is the most important personal characteristic for individual success in a range of endeavors (Gottfredson, 1997). Meta-analyses have supported this position, showing a stronger zero-order relationship between GMA and job success in comparison to EI and job success (Joseph et al., 2015). Other results in organizational behavior, based on dominance analysis, have also shown GMA to have higher relative importance than EI when both are simultaneously evaluated (O’Boyle et al., 2011). Indeed, some scholars posit that EI has no relationship to individual success over and above GMA (Waterhouse, 2006). Thus, it might be reasonable for scholars to also expect GMA to be more strongly related to success in entrepreneurial contexts compared to EI.

 However, some evidence suggests EI can be effective in certain organizational contexts over and above GMA (Goleman, 1995). For example, EI is thought to matter more in situations that require emotional regulation and relationship building skills, such as upper-level leadership positions (Dulewicz and Higgs, 2003). In the logic of human capital theory, the extent to which entrepreneurs experience success depends on the match between the particular skills and the nature of the tasks performed (Unger et al., 2011). We theorize that under the extreme emotional and interpersonal demands of the entrepreneurial task environment, EI will be relatively more important for success than GMA. In particular, prior research suggests it is important for entrepreneurs to regulate their emotions and manage the ‘emotional rollercoaster’ that is entrepreneurship (Shepherd, 2003; Shepherd and Cardon, 2009; Shepherd et al., 2009). Emotion regulation has been defined as ‘the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions’ (Gross, 1998b, p. 275). Emotion regulation is theoretically related to individual success through the management of affective states that are beneficial to success.

 We expect emotion regulation to help explain entrepreneurial success due to the extreme nature of entrepreneurial tasks. Specifically, entrepreneurs commonly negotiate complex and uncertain environments that can overload their information-processing (Baron, 1998), making decision making more difficult. Likewise, entrepreneurs often expend considerable effort over many years to overcome challenges when establishing and developing firms (Foo, Uy, and Baron, 2009; Nambisan and Baron, 2013), which requires sustained motivation and resilience. Because the resources entrepreneurs seek to mobilize are generally controlled by someone else (Villanueva, Van de Ven, and Sapienza, 2012), entrepreneurs must also be able to successfully engage with external parties by developing and leveraging networks in order to acquire necessary resources (Kotha and George, 2012; Mollick, 2014).

 Thus, we expect EI to be a more critical human capital factor for entrepreneurs due to the extreme emotional demands of the entrepreneurial context. These demands are likely to make EI more strongly related to entrepreneurial success than is GMA. This is because (1) the ability to make sound decisions in emotionally difficult situations, (2) the ability to form and maintain key business relationships, and (3) the ability to maintain one’s motivation in the face of setbacks and failure are each critical antecedents to entrepreneurial success.

 First, entrepreneurs are more likely than other organizational actors to face emotionally difficult high-stress situations (Buttner, 1992). The ability to stay calm and make sound decisions in emotionally or highly stressful situations is enhanced by EI more so than GMA. For example, high levels of EI lead to better overall decision making in tough situations (Brown, George-Curran, and Smith, 2003), whereas low EI individuals have difficulty managing their emotions, which can suppress the use of rational thought (Thompson, Connell, and Bridges, 1988). In contrast, GMA is not significantly related to emotional regulation, and some measures of GMA are inversely related to emotional regulation (Lopes, Salovey, Côté, Beers, and Petty, 2005). In comparison to GMA, we expect that EI will enhance one’s ability to regulate emotions and make better decisions in entrepreneurial contexts (Abraham, 1999, 2004). Specifically, because of the capacity for emotional regulation, high EI individuals experience less stress, with lower levels of stress hormones and other physiological indicators of emotional arousal (Tischler, Biberman, and McKeage, 2002). Since entrepreneurs commonly negotiate treacherous environments that can overload their information-processing (Baron, 1998), and because high EI individuals are better able to manage their emotions in such environments, we expect EI to be relatively more important than GMA for entrepreneurial success based on the ability to make sound decisions in highly emotional task environments.

 Second, it is critical that entrepreneurs form relationships and develop social networks with stakeholders who are external to the firm (Baum, Calabrese, and Silverman, 2000; Ozgen and Baron, 2007; Shane and Cable, 2002). By contrast, in large organizational settings, middle managers need to focus their attention inward, concerning themselves with employees and other internal stakeholders. We expect that EI enhances an individual’s ability to form and maintain key business relationships relative to GMA. Specifically, researchers have linked EI to social skills such as accurately perceiving other's emotions, making good first impressions, and influencing others in interpersonal interactions (Mayer et al., 2004). These skills are important for developing business networks (Baron and Markman, 2000, 2003; Cardon et al., 2012), which can aid in signaling legitimacy and in acquiring resources necessary for entrepreneurial success (Amit et al., 1990; Podolny, 2001; Stuart et al., 1999; Wuebker et al., 2015). GMA by comparison has not been shown to be strongly related to perceiving others’ emotions (Joseph and Newman, 2010). GMA also doesn’t seem to be crucial in forming social networks (Song et al., 2010). Thus, because developing external social relationships is crucial in entrepreneurial contexts, and because EI-based skills are related to such relationship development (whereas GMA is not), we expect that EI is more important in allowing entrepreneurs to form and maintain business relationships that are crucial for entrepreneurial success.

 Third, entrepreneurs expend considerable effort over many years to overcome challenges when developing their firms (Foo et al., 2009; Nambisan and Baron, 2013), which requires sustained motivation and resilience. EI relative to GMA increases the likelihood that an individual can experience sustained motivation in the face of setbacks and failure. For example, EI is linked to exhibiting greater resiliency (Armstrong, Galligan, and Critchley, 2011; Edward and Warelow, 2005), better adaptation in response to rapid change (Huy, 1999; Scott-Ladd and Chan, 2004), responding more positively to failure (Mayer and Salovey, 1993), and better management of adverse life events (Armstrong et al., 2011). In contrast, studies show GMA is not related to resiliency (Sautelle, Bowles, Hattie, and Arifin, 2015), has a negative or non-significant relationship with types of adaptation (Lang and Bliese, 2009), and has no effect on effort and motivation (Gagne and St Pere, 2001). Thus, since sustained motivation and resiliency are important for success in entrepreneurial contexts, and because EI better predicts such motivation and resilience, we expect EI to be a better predictor of entrepreneurial success compared to GMA.

 Taken together, we expect that EI will better enable entrepreneurs to regulate decision-making in emotionally turbulent situations, to form critical external business relationship, and overcome the setbacks and failures that commonly occur in entrepreneurship than will GMA. Since these are critical tasks for entrepreneurs, we expect that when an entrepreneur possesses high EI the entrepreneur is likely to have increased entrepreneurial success. In line with this expectation, prior work in entrepreneurship suggests that an entrepreneur’s ability to regulate their emotions can have a direct impact on entrepreneurial success (Nambisan and Baron, 2013; Cardon et al., 2009). Given the extreme environmental and emotional demands placed on entrepreneurs, we suggest that EI will be relatively more important in explaining entrepreneurial success compared to GMA. Formally,

 ***Hypothesis 3: EI will be relatively more important than GMA in explaining entrepreneurial success, including (a) financial success, (b) firm growth, (c) firm size, and (d) subjective success.***

**Methods**

**Identification of studies**

To identify empirical studies that examined the relation of general mental ability and/or emotional intelligence with entrepreneurial success, we employed several search strategies for the period ending in April, 2018. First, we conducted an electronic search in the following databases: Google Scholar, ABI/Inform, AOM Proceedings (ENT division), ProQuest Dissertations and Theses, Allacademic.com, Babson proceedings, and Southern Management proceedings. To identify studies exploring general mental ability and entrepreneurship, we searched all databases using the term ‘entrepreneur’ combined with combinations of: *otis-lennon mental ability, wechsler adult intelligence scale, wonderlic personnel test, armed forces qualification test, digit span, armed services vocational aptitude battery, armed services vocational aptitude battery, raven's progressive matrices, raven's standard progressive matrices, wechsler adult intelligence scale[[2]](#footnote-2).*

To identify studies exploring emotional intelligence and entrepreneurship, we searched all databases using the term ‘entrepreneur’ combined with combinations of*: emotional quotient inventory, assessing emotions scale, emotional intelligence scale, msceit, emotional intelligence test, emotional intelligence questionnaire.* Finally, to find unpublished studies, we sent a request via the following mailing list: CREIO (Consortium for Research on Emotional Intelligence in Organizations) and the AOM Entrepreneurship Division Listserv. In December 2019 we supplemented these searches with an abstract search of ProQuest using construct terms instead of measures, and another Google Scholar search by measure combined with “entrepreneur”.

In total, our efforts yielded 6,919 studies for potential inclusion.

**Inclusion criteria**

To be included in the meta-analysis, a study had to meet the following criteria: 1. must be an empirical study, 2. the study’s participants must be business owners, 3. the study must have measured and analyzed general mental ability and/or emotional intelligence, 4. the study reported original data that allowed the effect size between general mental ability or emotional intelligence and entrepreneurial success, or it must have provided sufficient information to calculate an effect size, and 5. each effect size needed to reflect a unique, independent sample. Several steps were taken to determine which articles were included in our meta-analysis. First, one of the authors performed an automated search to identify duplicates, resulting in the 6,645 initial records. Second, another author read the abstracts of the 6645 articles, excluding 6,178 articles that did not meet our first and second criteria (3,027 articles were non-empirical, and 3151 articles did not have samples of business owners). Third, one author screened the full text of the 467 remaining articles and excluded 428 articles that did not meet our third and fourth criteria (277 articles did not have necessary measures and another 151 articles did not have usable effect size measures). Fourth, any article that used multiple measures of the same type of success measure were averaged together. Finally, we contacted authors of respective studies whenever specific results were unavailable to us. For these studies, we contacted the main author or listed contact author on the paper. Of the 12 authors contacted, four provided usable data.

 During our screening process we discovered two archival data sets that were utilized by multiple articles within our sample. The first is the National Longitudinal Surveys of Youth 1979 (NLSY79). The NLSY79 is a representative survey of 12,686 individuals who were 15-22 years old when they were first surveyed in 1979. Individuals were surveyed annually through 1994 and have, up to the point of this study, been surveyed every two years. The NLSY79 provides unique information on self-employed individuals, including GMA and entrepreneurial success. The second are data collected by the World Bank Group (WBG), an organization that provides financial and technical assistance to developing countries. The WBG collects information from self-employed individuals, including multiple entrepreneurial success measures. We accessed both datasets through their respective websites (both the NLSY79 and the WBG have publicly accessible datasets). We identified three articles that used these data sets, so to avoid overlapping samples, these three articles were excluded and we retained the NLSY79 and WBG datasets for analysis. Figure 1 describes the steps and details of our inclusion process leading to the 40 articles, 47 samples, 65,826 entrepreneurs, and 71 effect sizes used in the meta-analysis.

--------------- Insert Figure 1 about here ---------------

**Coding procedures**

Each study was coded for effect size, measure type, and entrepreneurial success measures. Because entrepreneurs enter entrepreneurship for a variety of reasons, researchers suggest that typical success measures do not capture what it means to be successful as an entrepreneur (Brush and Wanderwerf, 1992). Venkatraman and Ramanujam (1986) recommended that researchers distinguish between financial and nonfinancial success measures as a way to measure overall success. Financial measures indicate the achievement of the economic goals of the firm, whereas nonfinancial measures capture the firm's broader operational effectiveness. Typical measures used to assess financial success include profit (at any point in time) and growth (increase in revenue during a given time span). Nonfinancial measures of success examine factors such as firm size (number of employees), and subjective ratings of overall success. Subjective ratings are important because while individuals become entrepreneurs for a variety of reasons (e.g. Carland, Hoy, Boulton, and Carland, 1984; Wiklund, Davidson, and Delmar, 2003), they primarily do so for intrinsic reasons, as opposed to extrinsic rewards ([Cooper and Artz, 1995](https://www.sciencedirect.com/science/article/pii/S0883902607000420%22%20%5Cl%20%22bib19)). That is, individuals enter entrepreneurship primarily for the personal satisfaction derived from self-employment (Gimeno, Folta, Cooper, and Woo, 1997) rather than for financial success (Amit, MacCrimmon, Zietsma, and Oesch, 2001). In essence, subjective measures of success measure the extent to which the new venture has met the goals of the entrepreneur (Wach et al., 2016).

 Thus, entrepreneurial success was coded as one or a combination of: financial success (e.g. profit at a single point in time), firm growth (e.g. increase in revenue during a given time span), firm size (e.g. number of employees), and subjective success (e.g. satisfaction with venture performance). We used archival measures and self-report items for each category of success. We focus on these four entrepreneurial success outcomes because of the importance of entrepreneurial success in the field of entrepreneurship (Shane and Venkataraman, 2000). Firm growth is often regard as the metric that best reflects the potential of a new venture (Baum and Locke, 2004; Davidsson, Delmar, and Wiklund, 2006). We measured firm growth using annualized change over time. Firm size, assessed in terms of the number of employees or overall value of firm resources, is particularly important for new firms in the post-launch phase of an entrepreneurial venture (Ling, Zhao and Baron, 2007). To assess financial success of the firm, we focus on venture profitability and related measures of financial success. Finally, we capture subjective success based on entrepreneur or third-party assessments of how well the new venture has met the goals of the entrepreneur or other key stakeholders (Wach et al., 2016). We verified our judgments with an intercoder reliability check for a randomly chosen 10 percent of the articles. Interrater agreement between the two raters was acceptable (kappa = 0.98) (Cohen, 1960). Any disagreement between raters were discussed until full agreement was met.

**Dealing with duplicate cases and nested effect sizes**

We used Wood’s (2008) detection heuristics to determine cases where the same data were reported across multiple outlets (e.g., a Babson conference paper that was later published in an academic journal). When duplicate effects were discovered, we opted for the earlier version of the data. When multiple effect sizes are reported in the same study and intended to be included in the same analysis (e.g., two measures for financial success, such as revenue and profits), either the arithmetic average of the effects or (when possible) a linear composite based on the intercorrelations of the effects and their correlations to the outcomes can be used. Unfortunately, in many of our results, the intercorrelations between entrepreneurial success outcomes were not available resulting in our need to take the arithmetic average. When sample sizes differed across these effects (e.g., pairwise deletion), we retained the smaller of the two sample sizes.

**Meta-analytic technique**

We used procedures outlined in Lipsey and Wilson (2001) to conduct random effects meta-analyses and tests of moderation in the R package metafor (Viechtbauer, 2010) [[3]](#footnote-3). We report the number of included studies (k), the overall sample size (N), and the weighted mean correlation and accompanying standard error and 95% confidence interval. In addition, we include an estimate of the true score variance (τ), Q-statistic, I-squared, and 80% credibility interval. The within group Q-statistic provides a test of whether the observed heterogeneity exceeds the expected heterogeneity of a distribution where only sampling error was operating on effects (i.e., no moderators). The I-squared statistic provides a similar test but avoids the sensitivity to sample size that can bias the significance test of the Q-statistic. The I-squared ranges from zero to one with higher values indicating more true score variance in effect sizes relative to sampling error variance. Finally, where there is true score variance (τ > .00), the credibility interval is an estimate of the degree that the true correlation varies across different subpopulations. For the tests of moderation, we used restricted maximum likelihood meta-regression with the Knapp-Hartung (2003) adjustment, which provides a between group F-statistic to determine if the groups are statistically distinct.

 Given that Hypotheses 3 predicts that EI would have a *relatively* higher effect on entrepreneurial success than GMA, it was important for us to run an analysis that could accurately assess the relative contribution of each predictor in explaining success. This is not possible with traditional regression analysis. A major challenge with regression analysis is that it only accounts for unique variance explained by the predictors in the model. However, predictor variables typically are somewhat correlated with one another, which can strip away potential explained variance of the correlated predictors and make relative comparisons difficult. Fortunately, relative weights analysis allows for the partitioning of the total variance explained into pseudo-orthogonal portions, with each portion representing the relative contribution of one predictor variable. Thus, to test the relative importance of GMA and EI in explaining firm level outcomes, we used techniques outlined in Johnson (2000) and Johnson and LeBreton (2004). Because beta weights cannot accurately estimate relative contribution to total explained variance (Johnson and LeBreton, 2004), Johnson's (2000) epsilon weighting technique was used as it can yield accurate estimates of the relative importance of a set of potentially correlated predictors on an outcome. The estimates from this technique are intuitively meaningful in that they sum to the R2 and can be compared through ratios (Johnson and LeBreton, 2004). For example, a relative importance weight of 0.40 for a predictor is twice as important as another predictor in the model with an epsilon weight of 0.20 and the summation of the relative weights will be equal to the total variance explained. To complete the meta-analytic matrix necessary to test relative importance, we obtained the GMA-EI correlation from O’Boyle et al. (2011).

**Tests of publication bias**

Publication bias occurs when the included studies in a meta-analysis are not an accurate reflection of the entirety of research in a given domain. This may occur because small sample studies or studies with negative results may not be submitted, or accepted for, publication (i.e., the file drawer problem). Best practices in identifying publication bias call for taking a triangulation approach (e.g., Kepes, Banks, McDaniel, and Whetzel, 2012), which is why we conducted three separate tests. The first was Duval and Tweedie’s trim and fill test. This is a test of symmetry that determines if small sample studies with either non-statistically significant effects or effects in the opposite direction of the overall effect are less likely to be included in the meta-analysis as similarly small sample studies finding large effects in the direction of the overall effect.

The second test was cumulative meta-analysis, which first meta-analyzes the largest sample (i.e., most precise) study, followed by the two largest sample studies, etc. The logic of this test is that as the increasingly less precise studies are added to the analysis they should have no discernible effect on the overall estimate. That is, regardless of effect size, there is an equal chance of falling to the left or right of the true parameter (Hunter and Schmidt, 2004). However, if the addition of smaller sample studies begin pulling the overall effect size towards larger magnitudes, this would be evidence that smaller sample studies are more likely to be published or included in the meta-analysis when their effect size magnitude is large and in the predicted direction (Kepes et al., 2012). The third test is Orwin's (1983) fail safe N. Rather than depend on the traditional fail safe N’s reliance on statistical significance, Orwin’s fail-safe N calculates how many null results (ρ = 0.00) would be necessary to reduce the overall effect size estimate below a preset trivial threshold. The threshold chosen for triviality we selected was based on Cohen’s (1988) benchmark for a small correlation (ρ = 0.10). The final test is Egger’s (1997) intercept test, which evaluates the asymmetry of the funnel plot. Essentially this test assesses the extent to which the effect size is related to the sample size. All things equal, there should not be a relationship between the two, but when there is a positive relationship (the intercept is positive and statistically significant), this indicates that small sample studies have disproportionately stronger effect sizes than large sample studies and could indicate publication bias.

**Results**

First, we examine the overall effect of GMA and EI on entrepreneurial success. Second, we report the effect of GMA and EI on each sub-dimension of entrepreneurial success. Third, we show the relative importance of EI in the presence of GMA in explaining entrepreneurial success. Finally, we address potential publication bias and account for potential alternative explanations.

**Overall effect**

As shown in Table 1, the relationship between GMA and entrepreneurial success is positive and significant, yet small by Cohen (1980) standards (ρ = 0.082, 95% CI = 0.035; 0.130). Thus, we support Hypothesis 1. Although in the predicted direction, its magnitude is less than what is traditionally found in GMA-job success research (Chen, Casper and Cortina, 2001; Hunter and Hunter, 1984). Likewise, the relationship between EI and entrepreneurial success is positive and significant (ρ = 0.219, 95% CI =0.152; 0.286), supporting Hypothesis 2. Our findings are similar to previous analysis of the relationship between EI and individual job success in organizational contexts (O’Boyle et al., 2011). However, our findings also indicate that EI has a stronger overall effect on entrepreneurial success than GMA.

--------------- Insert Table 1 about here ---------------

**Effect by entrepreneurial success measure**

As shown in Table 1, EI has its largest relation to the financial dimension of success (ρ =0.335, 95% CI =-0.015; 0.685). EI has its weakest relation on the growth dimension (ρ=0.059, 95% CI = -0.068: 0.185). Both size and growth confidence intervals contain zero, indicating non-significant relationships. EI shows significant relationships with both subjective (ρ=0.294, 95% CI = 0.238; 0.351) and size (ρ=0.113, 95% CI = 0.023; 0.204) dimensions of success. Conversely, GMA has its strongest relationship with subjective dimension of success, although the relationship is non-significant (ρ =0.264, 95% CI = -0.026; 0.551), while showing its weakest relationship with the financial dimension (ρ =0.060, 95% CI = 0.029; 0.091). GMA also has a significant relationship with size (ρ=0.085, 95% CI = 0.032; 0.138) and a non-significant relationship with growth (ρ=0.117, 95% CI = -0.004; 0.237). Furthermore, the biggest difference between EI and GMA came with the financial dimension (Qbetween = 43.93, p<0.001). During our search we also found three papers that measured GMA on firm survival and five papers that measured EI on overall success[[4]](#footnote-4). Survival is measured based on the number of years a venture operates before exiting, as survival is a key indicator of an entrepreneur’s ability to successfully manage their firms (Raffiee and Feng, 2014). Overall success is measured as an aggregate of multiple success measures, such as financial, growth, size and subjective. Although not part of our original hypotheses we tested the impact of GMA on firm survival as a post-hoc analysis and included it in our overall analysis. The relationship between GMA and firm survival was small and not significant (ρ =0.025, 95% CI =-0.037; 0.086). We also included the relationship of EI on overall success in our overall analysis.

**Relative weight analysis**

Results for the relative weight analysis and incremental validity are included in Table 2. In support of Hypothesis 3, EI was relatively more important in explaining overall entrepreneurial success, accounting for 89.1 percent of the explained variance, while GMA accounted for 10.9 percent. While this supports our hypothesis, the degree of variance accounted for by EI in comparison to GMA is surprising given that results from previous studies illustrate GMA as the dominant predictor of success in organizational contexts (Schulte, Ree, and Carretta, 2004). Further, EI showed an incremental contribution of 4.6 percent over GMA while GMA only showed a 0.5 percent increase in incremental validity beyond EI.

--------------- Insert Table 2 about here ---------------

**Analysis of publication bias**

Our analysis revealed little evidence of publication bias for EI. However, GMA showed potential publication bias with trim and fill and cumulative meta-analysis results indicating asymmetry in the predicted direction and right drift, respectively. The funnel plots for EI and GMA are presented as Figure 2 and Figure 3 respectively. For GMA, the trim and fill point estimate was about half that of the observed estimate. The results indicate that small sample studies that do not show positive and statistically significant results are much less likely to be published than small sample studies with significant and positive results. For EI, there were no studies to the left of the mean indicating no discernable evidence of publication bias.

--------------- Insert Figure 2 and Figure 3 about here ---------------

**Robustness and alternative explanations**

Our results differ with those of previous meta-analytic studies, which show GMA as more important than EI as a predictor of success. One possible explanation is that GMA may be more or less important in different types of economies and our results are weighted toward economic environments where GMA matters less. For example, it could be argued that because economically less developed countries depend less on technological innovation as the driver of their economy (Sala-i-Martín, et al., 2012), learning about complex or emergent new technologies will not be the basis for business success. Businesses in such economies often lack basic resources necessary for firm productivity and competitiveness (Sala-i-Martín et al., 2012), creating a kind of resource-induced ceiling effect for the value of the kind of complex technical problem solving and learning capabilities associated with high GMA. Therefore, it is possible that studies in our original analysis that have samples derived from economically or technologically less developed countries are biasing our results in favor of EI.

 Specifically, much of our dataset stems from studies by the World Bank Organization, which are studies predominantly conducted in lower developed economies, such as Indonesia, Bangladesh, Ghana, Kenya, Mexico, and Sri Lanka. Often considered ‘small scale entrepreneurs’ (e.g. Campos et al., 2017) or ‘microentrepreneurs’ (de Mel, McKenzie, and Woodruff, 2008), entrepreneurs in these countries frequently deal with extreme levels of political and institutional uncertainty and high levels of regional poverty. Such instability can lead to suboptimal macroeconomic policies, or even create volatility in policies, which in turn negatively affect macroeconomic performance (Aisen and Jose Veiga, 2010). As a result, entrepreneurs in these regions often cannot legitimize their businesses and thus have no access to credit (de Mel et al., 2008), relying instead on personal capital. Thus, while these entrepreneurs operate businesses in environments indicative of the extreme entrepreneurial contexts we describe earlier, it is possible that GMA is less useful in these lower level economies. To examine the robustness of our findings across different types of economies, we coded our sample of studies based on high vs low median split on GDP[[5]](#footnote-5). The results are that this variable is not moderating either GMA- success or EI- success relationships, adding further evidence of our main argument that EI more strongly relates to entrepreneurial success compared to GMA, regardless of regional differences.

 Several of our studies also contain samples based on farm businesses. While it is not uncommon for farmers (especially those operating in developing countries) to be considered a special class of entrepreneurs in the literature, such as ‘small entrepreneurs’ (e.g. Sutter, Webb, Kistruck, Ketchen, and Ireland, 2017) or ‘ordinary entrepreneurs’ (Tobias, Mair, and Barbosa-Leiker, 2013), some scholars do not consider farmers to be entrepreneurs. We thus performed a moderation analysis to see if the effects of EI or GMA differed based on farm owners compared to non-farmer samples. We found no effect on the EI estimates, but for GMA the effects were slightly stronger for farmers (ρ = .105) compared to the overall estimates (ρ = .082). Our rationale for this is that both the financial aspects of managing a farm business and the data behind accurate crop planning require a great deal of information processing in modern farming, and thus farmers with higher GMA might be better able to manage the information necessary to operate modern farms and thus perform better than low GMA farmers.

 We also account for a potential alternative explanation for the effect of EI on entrepreneurial success. Previous meta-analyses have shown that self-report measures of EI have considerable overlap with personality constructs, especially emotional stability, extraversion, and conscientiousness (Joseph and Newman, 2010; Joseph et al., 2015). Other meta-analyses have shown that all of the Five Factor Model (FFM) personality traits except agreeableness predict entrepreneurial success (Zhao, Seibert and Lumpkin, 2010). Thus, it is possible that the personality traits and not EI itself accounts for the relationship we find with entrepreneurial success. To test this alternative hypothesis, we combined our results with those from Zhao et al. to determine the relative importance of EI after accounting for the effects of the FFM on entrepreneurial success. To complete the correlation matrix needed to conduct relative importance analysis, we used the meta-analytically derived FFM intercorrelations reported in Van der Linden, Nijenhuis, and Bakker (2010). As with the GMA-EI comparison, we used relative importance analysis (Johnson, 2000; Johnson and LeBreton, 2004) in SPSS 25.0 with a macro provided by Johnson (2001). Results are reported in Table 3. Collectively, EI and the FFM explained a little more than six percent of the variance in success and EI was the dominant factor with a little more than a third (43.4%) of the explained variance attributable to it. Of the FFM factors, openness to experience accounted for the most explained variance (20.5%), and agreeableness had the least (1.8%). Although these results offer further evidence that EI is more strongly related to entrepreneurial success in the presence of other important individual differences, these results should be qualified by the fact that when combining results from past meta-analyses, differences in inclusion criteria, search quality, and second order sampling error can influence results.

Further, our results showing that EI has a stronger overall relationship with entrepreneurial success compared to GMA might be the result of higher efficacy of GMA during early stages of venture development[[6]](#footnote-6). GMA may be most influential in the earliest phases of venture development when potential opportunities must be recognized and ideas for exploiting the opportunity created (Baron and Markman, 2005). Likewise, because older firms have larger available stocks of knowledge than new firms, GMA may matter less in older firms that have already acquired knowledge and can utilize that information rather than having to acquire new knowledge (Chandler and Lyon, 2009). We therefore conducted a moderation analysis to see if firm age moderated the relationship between EI or GMA on entrepreneurial success. Results show that firm age does not moderate either the EI or GMA success relationships. Finally, our results could be a function of the size of the firm[[7]](#footnote-7). Because EI aids in relationship development and leadership skills, EI might matter more as firms acquire more employees. Our analysis however shows that firm size does not moderate the EI or GMA success relationships.

Finally, given that (1) EI showed an overall stronger relationship with success compared to GMA, yet (2) EI and GMA show significant relationships with different subdimensions of success, we wanted to validate whether EI was indeed an overall better predictor of success compared to GMA when considering each sub-dimension of success. We therefore added a robust check that enters in all the effects with EI-GMA and the different success types as predictors. Basically, if controlling for the type of success (financial, subject, etc.) do we still see a notable difference between EI and GMA in terms of their correlations with success? Results show that we do still see the differences and it’s not that much smaller (-.095) than the absolute difference (-.137). In other words, holding type of success constant, GMA has -.095 weaker correlation to success than EI does, offering further support for our overall prediction that EI is a stronger predictor of success in entrepreneurial contexts relative to GMA.

--------------- Insert Table 3 about here ---------------

**Discussion**

**Theoretical implications**

***GMA and EI in organizations: The entrepreneurship context relative to other organizational contexts.*** Using meta-analysis and dominance analysis, we contribute to the debate regarding the relative importance of GMA and EI to workplace outcomes (e.g., Gonzalez-Mulé et al., 2014; Joseph et al., 2015). Our findings reveal that EI is more strongly related to success in entrepreneurial settings than is GMA. This might be considered somewhat surprising given that our results differ from previous meta-analyses in the domain of organizational behavior (e.g., O’Boyle et al., 2011). However, a close assessment of the task environment of entrepreneurs reveals many stark differences from other organizational settings. Utilizing human capital theory, we predicted that since these tasks rely heavily on one’s ability to understand and manage one’s own and others’ emotions, EI would be a critical predictor of entrepreneurial success. We found that both EI and GMA were related to entrepreneurial success, however EI was dominant. Considering our findings in conjunction with other meta-analytic results in the domain of organizational behavior reveals that the entrepreneurship setting appears to be functioning as a boundary condition. Our theorizing suggests one possible explanation is that the *extreme* nature of entrepreneurship (Stevenson et al., 2020) makes one’s ability to manage emotions more important in the domain of entrepreneurship.

Our study also builds on and adds nuance to prior meta-analytic research. Unger and colleagues (2011) meta-analysis found an effect of human capital (coded as an entrepreneur’s knowledge, skills, education, and experience) on venture success of .098. Our results show a very similar effect of GMA on overall entrepreneurial success (ρ = .082). However, Unger and colleagues effect size are slightly larger suggesting that GMA might not account for as much of the knowledge, skills, education, and experience as previously considered.

In addition, Stam and colleagues (2014) found an overall effect of social networks on entrepreneurial success of .211, which is slightly smaller than the overall effect we found for the EI-entrepreneurial success relationship (ρ = .219). Because EI encompasses more than just the ability to develop social networks, one might expect EI to have an overall stronger effect on entrepreneurial success compared to the effect of social networks alone. For example, another reason we suggest that EI is so important for entrepreneurial success is that it is linked with the ability to sustain motivation (Armstrong et al., 2011; Edward and Warelow, 2005), especially when operating in difficult contexts such as entrepreneurship (Armstrong et al., 2011; Mayer and Salovey, 1993). Finally, because of the link between EI and motivation, our results are also comparable with a meta-analysis by Collins and colleagues (2004) that found a positive effect of achievement motivation on entrepreneurial success of .180. This is slightly smaller than the effect we found for the EI-success relationship, which again makes sense given that EI aids in more than just motivation.

Although entrepreneurship is a distinct and extreme setting relative to many other organizational settings, it is not the only extreme context of interest to organizational researchers. For example, research could extend work on the role of emotion in crisis management (e.g. Bartunek, Rousseau, Rudolph, and DePalma, 2006; Myers, 2007; Weick, 1990) by exploring how high EI managers handle the cognitive demands inherent in crisis situations. Crisis situations are typically characterized by intense negative emotions such as anxiety, fear, panic, and desperation (Kayes, 2004; Weick, 1990, 1993). Such negative emotions are likely to impede sensemaking and lead to poor decision making (Weick, 1990), suggesting the important role that EI might play in crisis management. Thus, in the same way that entrepreneurs rely on EI to manage the often extreme emotional ups and downs inherent in entrepreneurship, crisis managers might need to heavily rely on EI to manage response situations.

***Implications for the research on the psychology of entrepreneurship.*** Our findings also reveal important insights related to the underlying psychological mechanisms that drive entrepreneurial success, contributing to an important and growing research conversation (e.g., Frese and Gielnik, 2014; Stevenson et al., 2019; Uy et al., 2017; Wood et al., 2017). By systematically quantifying the effect of GMA and EI on entrepreneurial success, we reconcile ambiguity within the entrepreneurship literature related to the relative importance of cognitive and emotional/social abilities (e.g., Baum et al., 2011; Shepherd and Patzelt, 2018; Sternberg, 2004) leveraging human capital theory. Human capital theory suggests that the effects of human capital often depend on the choice of the success criteria used. Specifically, human capital leads to higher success only if it is applied and successfully transferred to the specific tasks that needs to be performed (Unger et al., 2011). Building on prior human capital research in entrepreneurship (Martin et al., 2013; Unger et al., 2011), we explain why skills related to GMA and EI are both crucial for entrepreneurial success, yet we find that EI-based skills are relatively more important. There are several possible reasons for this, which we explain below.

 First, high EI individuals are better able to adaptively cope with stressors and hassles (Bar-On, 1997; Keefer, Parker, and Saklofske, 2009), and thus derive more joy from everyday circumstances (Liu, Wang, and Lü , 2013). EI has also been linked to better emotional (Dawda and Hart, 2000; Slaski and Cartwright, 2002) and physical and mental (Martins, Ramalho, and Morin, 2010; Schutte et al., 2007) health. This suggests that high EI entrepreneurs would be able to maintain higher levels of overall health despite dealing with the adversities of entrepreneurship, and thus derive more satisfaction from owning and operating their firms compared to low EI entrepreneurs.

Second, high EI individuals are able to foster more constructive and harmonious relationships with others (Goleman, 1995; Salovey and Mayer, 1990), and has been shown to aid in team-oriented tasks (Farh, Seo, and Tesluk, 2012). Prior work reveals that EI enhances leadership ability (e.g. Antonakis, Ashkanasy, and Dasborough, 2009; Goleman, 1995; Zhou and George, 2003). We reason that high EI entrepreneurs excel in relationship-related tasks, are better able to work with others, and thus are better able to grow their ventures through effective leadership skills. Conversely, prior work documents that GMA is a general information-processing capacity that enables reasoning, problem solving, decision making, and other higher order thinking skills (Gottfredson, 1997) that is vital for entrepreneurial tasks related to the acquisition, assimilation and recall of information (Kanfer and Ackerman, 1989). High GMA individuals are also better at creative problem solving (Kuncel et al., 2004), and are better able to use prior knowledge to solve problems (Ackerman, 1996; Dragoni et al., 2011).

Finally, GMA should enable entrepreneurs to better produce and evaluate alternative courses of action and formulate effective business plans (Baron and Henry, 2010; Frese et al., 2007; Raffiee and Feng, 2014). Because financial success requires the ability to make effective plans based on the processing of past information, GMA should be specifically related to the revenue or profit of the firm, which our results confirm. Intuitively, GMA should likewise be significantly related to growth, as growth is typically measured as change in finances over time. However, our results show that GMA is significantly related to size. One potential reason for this is that GMA is especially important in complex tasks that require individuals to process new information and to make quick, effective decisions (Hunter and Hunter, 1984; Kanfer and Ackerman, 1989). Moreover, GMA aids in making decisions in uncertain contexts, such as in employee hiring decisions. Decision makers must match the personal attributes of job candidates with the needs and strategies of the hiring firm (Brass, 1995; Guion, 1992) and often must deal with information asymmetries when choosing a candidate (Zhang, 2008). Because GMA aids in assimilating information and making decisions in uncertain contexts, high GMA entrepreneurs could excel in tasks related to hiring decisions and thus are able to better grow their firms.

Overall, our work contributes to what is known about the individual antecedents of entrepreneurial success by providing reliable effect size estimates illustrating the importance of both GMA and EI. Our results add support to overturning an implicit belief that individual differences are not important predictors of entrepreneurial success (Shaver and Scott, 1991). By analyzing GMA and EI together in the same study and illustrating the relative importance of each, our meta-analytic results provide clarity concerning the importance of both cognitive (Shane, 2000; Shane and Venkataraman, 2000; Westhead et al., 2005) and emotional (Baron et al., 2011; Shepherd and Patzelt, 2018) abilities in entrepreneurial contexts. As GMA reflects differences in cognitive capacity, and EI reflects differences in emotional and social abilities, failure to find positive effects for GMA and EI would undermine major entrepreneurship theories that argue cognitive intelligence (Baron and Henry, 2010; Politis, 2005) and emotional intelligence (Baron and Tang, 2009) play important roles in entrepreneurial success.

**Implications of our meta-analytic findings and future research opportunities**

 ***EI, GMA and human capital theory.*** We leveraged human capital theory to motivate our study. Indeed, human capital theory was helpful for explaining the overall effect (i.e. R2) we find for GMA and EI on success. That is, there are likely mediating mechanisms that account for the small overall relationship we find. Previous meta-analysis shows that experience, education, knowledge and skills are linked to entrepreneurial success and that high GMA individuals get more out of experience, education, knowledge and skills (Unger et al., 2011). Thus, high GMA individuals can do more with their experience, education, knowledge and skills, which in turn positively affects entrepreneurial success, suggesting that the effects of GMA on success might flow through this causal chain of factors. This is supported by research suggesting that the influence of GMA on success is due to better acquisition of job-relevant knowledge and skill (Schmidt and Hunter, 2004; Schmidt, Hunter, and Outerbridge, 1986) and is in line with the entrepreneurial learning perspective arguing that the primary mechanism explaining the influence of human capital investments on entrepreneurial success is the acquisition of knowledge and skills through learning (Cope, 2005; Corbett, 2005; Corbett and Hmieleski, 2007). Similarly, meta-analysis has shown that building social networks is linked to entrepreneurial success (Stam, Arzlanian, and Elfring, 2014), and we also know that EI is linked to the ability to develop such social networks. Thus, high EI individuals are better able to develop social networks, which in turn could lead to higher entrepreneurial success, suggesting that the effects of EI in part go through the development of social networks to affect success[[8]](#footnote-8). Future research could investigate whether these potential mediational pathways are direct or indirect, which might help explain why we observe a small overall effect[[9]](#footnote-9).

 ***The role of GMA and EI in opportunity seeking and advantage seeking.*** Our results also inform the literature on strategic entrepreneurship, in particular on opportunity and advantage seeking behaviors. By working toward both opportunity-seeking and advantage-seeking behaviors, firms attempt to create performance advantages by exploiting current competitive advantages and by setting the stage for future success through identifying ideas that will create subsequent advantages (Ireland, Hitt, and Sirmon, 2003; Ireland and Webb, 2007). However, excelling in both behaviors is difficult because each requires very different capabilities. Our theorizing and results suggest that GMA and EI are capabilities that aid in entrepreneurial success and could be more (or less) important for opportunity-seeking (i.e. exploration) vs advantage-seeking (i.e. exploitation) behaviors. Opportunity seeking involves exploring prospective opportunities to identify areas of areas of firm growth. The overall success of opportunity-seeking efforts depends on how new information is absorbed and integrated into existing knowledge. That is, opportunity seeking is inherently a learning process, wherein external knowledge supplements currently held knowledge stocks (Chesbrough, 2003; March, 1991). GMA is linked to better information processing (Ackerman, 1988; Hunter, 1986), the ability to process complex information (Judge et al., 2010), and pattern recognition. This suggests that high GMA entrepreneurs would be better able to recognize opportunities and thus would aid in opportunity-seeking behaviors. Advantage-seeking behaviors involve entrepreneurs taking strategic actions to gain an advantage (Ireland, Hitt, Camp, and Sexton, 2001), which can be difficult given the challenges with entrepreneurship. High EI individuals are better able to regulate their emotions, are more motivated, and exhibit greater resiliency (Armstrong et al., 2011; Edward and Warelow, 2005; Mayer et al., 2004), which could aid in sustained motivation needed for advantage-seeking behaviors. Future research could investigate the extent to which a combination of high GMA and high EI lead to better simultaneous opportunity and advantage seeking behaviors.

**Practical Implications**

The primary practical implication from our study concerns individuals who are interested in pursuing an entrepreneurial career and their ability to develop the knowledge and skills necessary for success. Our findings suggest that EI has a moderately strong relationship with entrepreneurial success, and prior research has shown EI to be highly trainable in individuals (Boyatzis, Baker, Leonard, Rhee, and Thompson, 1995; Boyatzis, Leonard, Rhee, and Wheeler, 1996). This suggests that individuals that seek to develop their EI might also be able to develop related skills for entrepreneurial success. For example, skills such as building business networks (Baron and Markman, 2000, 2003; Cardon, et al., 2012), creativity and opportunity recognition (Ahmetoglu, et al., 2011; Baron, 2008), making good decisions in emotionally turbulent situations (Baron, 2013; Fang He et al., 2018), becoming more coachable (Ciuchta et al., 2018), and enacting adaptive responses to unpredictable events (Mayer et al., 2004), could be developed in aspiring entrepreneurs. Also, while our results suggest the impact of GMA on entrepreneurial success is small compared to the effects of EI, entrepreneurial success is still affected by GMA. Learning is a critical component of entrepreneurial success, and high-GMA individuals learn more from a given amount or type of experience. Given the fact that entrepreneurs often run out of financial resources before they can reach profitability (Cooper and Gimeno-Gascon, 1992; Cooper, Gimeno-Gascon, and Woo, 1994), time is usually a luxury not enjoyed by entrepreneurs. This suggests that low GMA individuals might be at a serious disadvantage when time is a salient factor (e.g., bringing a product to market quickly or raising funds when cash flow is negative).

**Limitations**

Our study has several limitations. First, one limitation of the current research is that we were unable to account for possible interactions between GMA and EI. One form this interaction might take is an enhancement effect such that GMA has a stronger relationship to entrepreneurial success when EI is high. Research has shown that task success is a function not only of the cognitive resources one possesses, but the ability of the individual to bring those cognitive resources to bear on the problem (Kanfer, Ackerman, Murtha, Dugdale, and Nelson, 1994). Strong emotions, positive or negative, are likely to create attentional demands that take the individual’s focus off-task, to the detriment of task success (Beal, Weiss, Barros, and MacDermid, 2005). Effective self-regulatory processes, such as those associated with high EI, should allow one to focus more of one’s cognitive resources on-task even in stressful and emotion-laden circumstances often associated with entrepreneurship, thus strengthening the relationship between GMA and success. Future research could utilize cognitive resource theory (CRT) (Fiedler and Garcia, 1987) to explain potential interaction effects between GMA and EI. CRT suggests that when individuals are under a great deal of stress, their intellectual abilities will be diverted from the task. For entrepreneurs, this suggests that attentional resources that could otherwise be devoted to planning, problem solving, and recognizing and exploiting opportunities are instead focused on dealing with the uncertainty, possible failure, and extreme emotions that come with entrepreneurship (Ucbasaran et al., 2013). It is possible that some high GMA entrepreneurs in our dataset also have low EI and therefore, based on CRT, do not perform well. Indeed, research in other contexts have illustrated that individuals with high levels of cognitive ability perform better when experiencing less stress (Judge, Colbert, and Ilies, 2004), suggesting that the ability to regulate one’s emotions aids in the utilization of high cognitive ability. Thus, an important research question is: does GMA and EI interact such that high GMA entrepreneurs perform poorly because of high stress levels that result from low EI? Following other studies that investigate interactions between cognitive and emotional factors in entrepreneurship (Agnoli et al., 2012; Baron, Franklin, and Hmieleski, 2013), future research could use a combination of survey data and cognitive testing from a sample of business owners to assess the interaction between EI and GMA on entrepreneurial success.

 Our study also did not allow us to code for whether the business was individually owned or team owned. Many new ventures are started by teams and conceivably could be arranged such that one person’s weakness is offset by another’s strength. At the aggregate level, both GMA and EI are positively associated with success (e.g. Devine and Philips 2001; Jordan and Troth, 2004) and team composition has been shown to positively relate to entrepreneurial success (Jin et al., 2017). This suggests that the composition of GMA and EI of entrepreneurial team members could have a significant effect on entrepreneurial success. Entrepreneurs must conduct a wide range of activities when operating their ventures (Lazear, 2005), including opportunity recognition, problem solving, social networking, and leadership. GMA is thought to aid in opportunity recognition and problem solving, and EI is thought to aid in social networking and leadership activities. Given that GMA and EI are important for success, and that team composition also matters for success, this suggests that within entrepreneurial teams a combination of higher and lower GMA/EI levels may be productive insofar as some individuals can be assigned GMA-related tasks, while others can be assigned EI-related tasks. Future research could investigate whether successful entrepreneurial teams have a better balance of GMA/EI compositions compared to unsuccessful entrepreneurial teams.

 Another potential limitation is that one of our robustness checks relied on the correlation from O’Boyle et al. (2011) There is always the risk that by combining estimates from different meta-analyses, that some bias can exist. However, the GMA-EI correlations from O’Boyle et al. (2011) have been compared against other GMA-EI estimates (i.e., Joseph and Newman, 2010; Joseph et al., 2015) and very little difference between these estimates have been found. Further, we ran an analyses with estimates from these alternative meta-analyses and results were largely unchanged. Yet, there still is the possibility that the GMA-EI relation varies across different populations and perhaps entrepreneurs are one such group where the effect is substantially stronger or weaker than the overall estimate from O’Boyle et al. (2011). Thus, we stress the need for more entrepreneurship work that measures both GMA and EI in order to capture the magnitude of the relation within the ENT context.

 A final potential concern is that GMA showed substantial publication bias, indicating that small sample studies that do not show positive and statistically significant results were much less likely to be published than small sample studies with significant and positive results. The effects of publication bias have been shown to lead to an upward bias in effect size (Borenstein, Hedges, Higgins, and Rothstein, 2009). However, the unique insight from this study is the vast difference in effect size and relative importance of EI compared to GMA in explaining entrepreneurial success. Thus, any correction in the effect of publication bias on GMA (i.e. decrease the effect size) would only magnify this difference, increasing the robustness of our findings. A related limitation is regarding the datasets upon which our meta-analysis relied. Notably, a large portion of our GMA sample stems from the World Bank Group studies investigating entrepreneurs in economically limited circumstances, resulting in possible range restriction issues on the financial dimensions of success from these studies. Further, since these studies included GMA but not measures of EI, this could have biased our results against GMA. Our robustness checks address some of these concerns, however future research should still include more GMA research on entrepreneurs in economically developed countries.

**Conclusion**

A growing body of research establishes GMA as more important factor for individual success compared to EI, suggesting that GMA would likewise be more important for entrepreneurial success. However, given that decision making under stress, sustained motivation and resilience, and network building are crucial components of entrepreneurship, we hypothesized that EI would be relatively more important in explaining entrepreneurial success than GMA. Our meta-analysis confirmed this, suggesting the relative importance of emotional factors in entrepreneurship is more than previously understood. Results differ from previous meta-analyses in the domain of organizational behavior that established a stronger relationship between GMA and job success compared to EI and job success (Joseph et al., 2015; O’Boyle et al., 2011). The results support the importance of GMA and EI for entrepreneurial success, yet highlight EI as having a stronger relationship with success in entrepreneurial contexts.

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**Appendix**



***Figure 1***

***Identification process flowchart***

**Table 1**

**Overall effect size and effect size by success type.**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Analysis | k |  N |  ρ |  SE |  95% CI | Qwithin |  I2 |  τ |  80% CV |  Fb/w |  |
| EI Overall | 17 | 3719 | 0.219\*\*\* | 0.032 | 0.152; 0.286 | 58.66\*\*\* | 72.86 | 0.105 | 0.072; 0.365 |  |
| GMA Overall | 30 | 62107 | 0.082\*\* | 0.023 | 0.035; 0.130 | 225.39\*\*\* | 96.16 | 0.115 | -0.071; 0.236 | 11.13\*\* |
| EI-Financial | 4 | 1059 | 0.335 | 0.110 | -0.015; 0.685 | 17.27\*\*\* | 91.83 | 0.192 | -0.027; 0.698 |  |
| GMA-Financial | 17 | 44524 | 0.060\*\*\* | 0.015 | 0.029; 0.091 | 87.28\*\*\* | 86.51 | 0.051 | -0.011; 0.131 | 43.93\*\*\* |
| EI-Growth | 4 | 353 | 0.059 | 0.040 | -0.068; 0.185 | 1.68 | 0.00 | 0.000 | -0.006; 0.124 |  |
| GMA-Growth | 12 | 11144 | 0.117† | 0.055 | -0.004; 0.237 | 160.04\*\*\* | 96.23 | 0.182 | -0.143; 0.376 | 0.18 |
| EI-Size | 5 | 1191 | 0.113\* | 0.033 | 0.023; 0.204 | 5.24 | 0.15 | 0.003 | 0.063; 0.164 |  |
| GMA-Size | 15 | 39047 | 0.085\*\* | 0.025 | 0.032; 0.138 | 112.91\*\*\* | 94.34 | 0.088 | -0.038; 0.208 | 0.03 |
| EI-Subjective | 6 | 1643 | 0.294\*\*\* | 0.022 | 0.238; 0.351 | 4.78 | 14.36 | 0.024 | 0.247; 0.342 |  |
| GMA-Subjective | 5 | 809 | 0.264† | 0.104 | -0.026; 0.551 | 35.29\*\*\* | 90.17 | 0.217 | -0.107; 0.632 | 0.16 |
| GMA-Survival | 3 | 19704 | 0.025 | 0.014 | -0.037; 0.086 | 5.16 | 60.53 | 0.021 | -0.022; 0.072 |  |

**Table 2**

**Relative weight analysis and incremental validity**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | EI Model | GMA Model | Combined |  |  |  |  |
| Predictor | B(SE) | B(SE) | B(SE) | ΔR2 | raw RW | RW as % of R2 |  |
| EI | 0.219(0.073)\*\* |  | 0.215(0.073)\*\* | 0.046\*\* | 0.047 | 89.1% |  |
| GMA |  | 0.082(0.074) | 0.073(0.073) | 0.005 | 0.006 | 10.9% |  |
| R2 | 0.048 | 0.007 | 0.053 |  |  |  |

Note: Harmonic mean = 181





Orwin FSN = 21

TandF = trimmed 0 studies

Cumulative meta-analysis = stable/slight left side drift indicating potential PB

***Figure 2.***

***EI funnel plot***





Orwin FSN = NA (observed effect less than small effect threshold of r = .10)

TandF = trimmed 6 studies, RE-point = 0.048

Cumulative meta-analysis = right side drift indicating potential PB

***Figure 3.***

***GMA funnel plot***

 **Table 3**

 **Relative weight analysis for FFM-EI supplementary analysis**

|  |  |  |
| --- | --- | --- |
| Predictor | Raw RW | RW as % of R2 |
| EI | 0.029 | 43.4% |
| Neuroticism  | 0.008 | 12.6% |
| Extroversion | 0.002 | 2.7% |
| Open to Experience | 0.014 | 20.5% |
| Agreeableness  | 0.001 | 1.8% |
| Conscientiousness | 0.013 | 19.0% |
| R2 | 0.067 |  |
|  |  |  |
|  |  |  |

**Table 4**

**List of studies by success measure**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Cite | N | GMA or EI | Measure | Success Measure | Success Measure Details | ρ |
| Walton, 2016 | 31 | EI | EQ-i 2.0 | Financial | Cash flow |  0.026 |
| Walton, 2016 | 31 | EI | EQ-i 2.0 | Growth | Growth in market share and sales |  0.190 |
| Ngah and Salleh 2015  | 51 | EI | Wong and Law’s (2002) | Subjective | Satisfaction with firm performance |  0.039 |
| Camuffo et al., 2012  | 53 | EI | ECI 1.0 | Overall Success | Composite of number of patents and certifications, quality of strategic success, and trend in profitability over 3 years |  0.192 |
| Boss, 2010 | 73 | EI | Wong and Law’s (2002) | Overall Success | Composite of sales and employee growth | -0.010 |
| Yitshaki, 2012  | 99 | EI | Assessing Emotions Scale  | Growth | Composite of sales and employee growth |  0.027 |
| Solomon et al., 2014 | 111 | EI | ECI 1.0 | Growth | Composite of revenue and employee growth | -0.015 |
| Solomon et al., 2014 | 111 | EI | ECI 1.0 | Size | Number of employees |  0.090 |
| Zhou and Bojica, 2017  | 112 | EI | Assessing Emotions Scale | Financial | Profit |  0.170 |
| Zhou and Bojica, 2017 | 112 | EI | Assessing Emotions Scale | Growth | Composite of revenue and employee growth |  0.120 |
| Zhou and Bojica, 2017 | 112 | EI | Assessing Emotions Scale | Size | Number of employees | -0.080 |
| Zhou and Bojica, 2017 | 112 | EI | Assessing Emotions Scale | Subjective | Satisfaction with firm performance |  0.358 |
| Rhee and White, 2007  | 161 | EI |  ECI 1.0 | Size | Number of Employees | 0.148 |
| Muthembwa et al., 2019 | 131 | EI | Goleman (1998) | Overall Success | Profitability, Sales, and Growth | 0.390 |
| Yoon et al., 2019 | 134 | EI | ESM (Boyatzis and Goleman, 2001) | Size | Number of Employees | 0.090 |
| McLaughlin, 2012 | 307 | EI | Wong and Law’s (2002) | Subjective | Satisfaction with firm performance | 0.482 |
| Ward, 2016 | 269 | GMA | Miller Analogies Test (MAT) | Growth | Increased number of clients | -0.330 |
| McLaughlin, 2012 | 307 | EI | Wong and Law’s (2002) | Financial | Composite of growth (market share, cash flow, sales) and business volume (earnings, sales, net worth) | 0.246 |
| Al Muam et al., 2018 | 403 | EI | MSCEIT | Overall Success | ROI, sales growth, and market share | 0.330 |
| Al Mamun et al., 2018 | 403 | EI | Assessing Emotions Scale | Subjective | Satisfaction with firm performance | 0.289 |
| Ingram et al., 2017 | 431 | EI | Wong and Law’s (2002) | Size | Number of employees | -0.020 |
| Ingram et al., 2017 | 431 | EI | Wong and Law’s (2002) | Overall Success | Composite of sales growth, cash flows, market share growth, return on sales, return on investments, return on assets and profit growth | 0.160 |
| Udimal et al., 2019 | 450 | EI | Wang and Law’s (2002) | Subjective | Satisfaction with firm performance | 0.240 |
| McKenzie and Sansone, 2019 | 748 | GMA | Digit Span Recall | Size | Number of Employees | 0.016 |
| McKenzie and Sansone, 2019 | 748 | GMA | Digit Span Recall | Financial | Yearly revenue | 0.037 |
| McLaughlin, 2012 | 609 | EI | Wong and Law’s (2002) | Subjective | Satisfaction with firm performance | 0.334 |
| McLaughlin, 2012 | 609 | EI | Wong and Law’s (2002) | Financial | Composite of growth (market share, cash flow, sales) and business volume (earnings, sales, net worth) | 0.497 |
| Frese et al., 2007 | 87 | GMA | Ravens | Growth | Percentage increase or decrease in profit, customers, and sales business growth | 0.100 |
| Frese et al., 2007 | 87 | GMA | Ravens | Size | Composite of number of employees and equipment value | 0.165 |
| Frese et al., 2007 | 87 | GMA | Ravens | Subjective | External rating of firm performance | 0.490 |
| Unger et al., 2009 | 90 | GMA | Ravens | Growth | Percentage increase or decrease in customers,sales, and profits over 3 years | 0.070 |
| Gielnik, 2010 | 98 | GMA | Ravens | Size | Number of employees | 0.070 |
| Gielnik, 2010 | 98 | GMA | Ravens | Growth | Percentage increase or decrease in profits, sales, and customers | 0.135 |
| Gielnik, 2010 | 100 | GMA | Ravens | Size | Composite of last month’srevenues, the current overall value of the business, the value of the assets, and thenumber of employees | 0.080 |
| Barsky, 2010 | 109 | GMA | High School SAT | Subjective | Satisfaction with firm performance | -0.023 |
| Alibhai et al., 2017 | 119 | GMA | Digit Span Recall and Ravens | Financial | Profit | 0.178 |
| Frese et al., 2007 | 126 | GMA | Digit Span Recall | Growth | Percentage increase or decrease in profit, customers, and sales business growth | 0.190 |
| Frese et al., 2007 | 126 | GMA | Digit Span Recall | Size | Number of employees | 0.210 |
| Frese et al., 2007 | 126 | GMA | Digit Span Recall | Subjective | External rating of firm performance | 0.500 |
| Ray and Singh, 1980 | 200 | GMA | Ravens | Growth | Percentage increase of decrease in production | 0.463 |
| Austin et al., 2001 | 207 | GMA | Ravens | Subjective | Satisfaction with entrepreneurial career | 0.090 |
| Frese et al., 2007 | 280 | GMA | Connecting Numbers | Growth | Percentage increase or decrease in profit, customers, and sales business growth | 0.120 |
| Frese et al., 2007 | 280 | GMA | Connecting Numbers | Size | Composite of number of employees and equipment value | 0.040 |
| Frese et al., 2007 | 280 | GMA | Connecting Numbers | Subjective | External rating of firm performance | 0.240 |
| Singh Ray, 1980 | 300 | GMA | Ravens | Growth | Yearly increase in production | 0.199 |
| Singh, 1983 | 320 | GMA | Ravens and Sentence Completion | Size | Land size | 0.142 |
| McKenzie and Woodruff, 2015 | 332 | GMA | Digit Span Recall | Size | Number of employees | 0.039 |
| McKenzie and Woodruff, 2015 | 333 | GMA | Digit Span Recall | Financial | Monthly profit | -0.010 |
| McKenzie et al., 2009-2011 | 626 | GMA | Digit Span Recall and Ravens | Financial | Sales | 0.078 |
| McKenzie et al., 2009-2011 | 626 | GMA | Digit Span Recall and Ravens | Growth | Increase in employee size | 0.024 |
| McKenzie and Woodruff, 2008 | 654 | GMA | Maze | Financial | Profit | -0.075 |
| NLSY Dataset | 671 | GMA | AFQT | Financial | Revenue | 0.052 |
| Djankov et al., 2007 | 788 | GMA | Digit Span Recall | Survival | Firm still operating at time of study | 0.053 |
| Ahmetoglu, 2015 | 792 | GMA | NRT-20 | Financial | Revenue | -0.050 |
| Ahmetoglu, 2015 | 792 | GMA | NRT-20 | Growth | Number of businesses created | 0.300 |
| Ahmetoglu, 2015 | 792 | GMA | NRT-20 | Size | Number of businesses operating | 0.350 |
| Mensmann and Frese, 2019 | 903 | GMA | Ravens | Financial | Profits last month | 0.100 |
| McKenzie and Woodruff, 2008-2014 | 1281 | GMA | Digit Span Recall and Ravens | Size | Number of employees | -0.005 |
| McKenzie and Woodruff, 2008-2014 | 1315 | GMA | Digit Span Recall and Ravens | Financial | Sales | 0.071 |
| McKenzie and Woodruff, 2008-2014 | 1722 | GMA | Digit Span Recall | Financial | Sales | 0.049 |
| McKenzie and Woodruff, 2008-2014 | 1724 | GMA | Digit Span Recall | Size | Number of employees | 0.032 |
| Giné and Mansuri, 2014 | 2532 | GMA | Digit Span Recall | Financial | Sales | 0.185 |
| McKenzie and Woodruff, 2008-2014 | 3496 | GMA | Digit Span Recall and Ravens | Financial | Monthly profit | 0.091 |
| McKenzie and Woodruff, 2008-2014 | 3510 | GMA | Digit Span Recall and Ravens | Size | Number of employees | 0.070 |
| de Mel et al., 2005-2010  | 3517 | GMA | Ravens | Financial | Sales | 0.033 |
| McKenzie et al., 2008-2010  | 3724 | GMA | Digit Span Recall and Ravens | Survival | Firm still operating at time of study | 0.041 |
| de Mel et al., 2005-2010 | 4010 | GMA | Ravens | Size | Total land owned | 0.068 |
| McKenzie et al., 2008-2010 | 4087 | GMA | Digit Span Recall and Ravens | Financial | Monthly profit | 0.048 |
| McKenzie et al., 2008-2010 | 4266 | GMA | Digit Span Recall and Ravens | Size | Number of employees | 0.063 |
| Kusumawardhani et al., 2019 | 5196 | GMA | Ravens | Financial | Profits | 0.095 |
| Kusumawardhani et al., 2019 | 5196 | GMA | Ravens | Size | Number of Employees | 0.012 |
| McKenzie and Woodruff, 2008-2014 | 8181 | GMA | Digit Span Recall and Ravens | Financial | Monthly profit | 0.086 |
| McKenzie and Woodruff, 2008-2014 | 9552 | GMA | Digit Span Recall and Ravens | Size | Number of employees | 0.075 |
| Hessels et al., 2020 | 9838 | GMA | Digit Span Recall | Financial | Income | 0.043 |
| McKenzie and Woodruff, 2008-2014 | 15171 | GMA | Digit Span Recall and Ravens | Size | Number of employees | 0.050 |
| McKenzie and Woodruff, 2008-2014 | 15192 | GMA | Digit Span Recall and Ravens | Survival | Firm still operating at time of study | 0.005 |

1. The outcome of interest in this meta-analysis is entrepreneurial success which is widely regarded as a critical component of entrepreneurship research (Sarasvathy, 2004; Ward, 2004). We include multiple measures of entrepreneurial success reflecting the multidimensional nature of the construct (Brush and Vanderwerf, 1992; Wach, Stephan, and Gorgievski, 2016). [↑](#footnote-ref-1)
2. Google Scholar has a maximum return of 1,000 results per search. When searches exceeded 1,000, we added in the qualifier of (regression OR correlation OR "p value"). Since nearly all empirical research fit for a meta-analysis would include at least one of these terms somewhere in the manuscript, this had the general effect of eliminating popular press works, theoretical papers, qualitative studies, etc. As a sensitivity test, we compared the results of several searches that returned less than a 1000 results and then added the qualifier from above. The addition of the qualifier did not result in any usable studies from those broader searches without the qualifier from being excluded (i.e., everything usable in the broad search was also included in the restricted search). [↑](#footnote-ref-2)
3. The dominant meta-analytic paradigm in entrepreneurship is psychometric meta-analysis (Hunter and Schmidt, 2004). However, we did not choose this procedure for two reasons. First, the chief advantage of psychometric meta-analysis is the ability to correct for statistical artifacts such as unreliability and range restriction. In our data, a large percentage of the samples did not report the needed information to make these corrections locally and the global corrections via artifact distributions with the limited number of samples that reported necessary information would likely have been strongly influenced by second order sampling error. Second, psychometric meta-analysis weights by sample size and many of our samples were quite large (in excess of 2000). The relationship between sample size and sampling error is asymptotic. Accordingly, the difference in precision (and thereby study weight) for sample sizes of, for example, 100 versus 200 can be substantial, but the difference in precision between a sample size of 2000 and 4000 is considerably less, ceteris paribus. Lipsey and Wilson procedures weight by the inverse variance and include a tau-squared component in the calculation of study weight. While larger studies are still weighted considerably more than smaller studies, this procedure reduces the likelihood of one or two extremely large studies dominating the analysis. As a sensitivity test, we did check to see if the two approaches yielded differences in substantive conclusion and found they did not. Psychometric MA estimates were slightly higher for EI (increase of 0.02) and slightly lower for GMA (decrease of .03). [↑](#footnote-ref-3)
4. When we conducted our literature review and subsequently developed our hypothesis, we did not find that survival was a key success metric. However, as we began coding our data, we realized that survival was often operationalized as a success variable and so we decided to include it in our measures. Because we did not originally hypothesize about survival as a success metric, we did not feel comfortable adding it to our hypotheses development post-hoc. Thus, while we came to understand that survival should be included as a success metric, we decided to leave it out of the hypotheses development and mention it’s inclusion in our results section. [↑](#footnote-ref-4)
5. While there were multiple options on coding, this was based on what we believed to be the most logical split and that met basic regression assumptions. Coding for GDP alone was way too skewed and would have almost certainly created heteroscedacity and non-normal residuals, and the other option (high-low development with mean split on GDP) was problematic because of the aforementioned GDP skew. [↑](#footnote-ref-5)
6. The average firm age in our sample is 7.8 years. [↑](#footnote-ref-6)
7. The average firm size in our sample is 11.82 employees [↑](#footnote-ref-7)
8. EI also has motivational and emotional components that could likewise have mediation pathways. For example, motivation could lead to increased action, and emotional regulation could lead to better decision making, which in turn could affect entrepreneurial success. [↑](#footnote-ref-8)
9. It is also important to note that the influence of GMA and EI on entrepreneurial success is not a one-time occurrence. Rather, there are repeated opportunities for the GMA and EI of an entrepreneur to affect the human capital and social network processes discussed above during the course of business ownership. Simulations have demonstrated that factors that appear to have small effects can have dramatic consequences when repeated over time (Martell, Lane, Emrich, 1996). Thus, while our meta-analysis found GMA and EI to explain a small amount of variance in entrepreneurial success, the implication is that the skills that accompany GMA and EI could have a cumulative effect over time. [↑](#footnote-ref-9)