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Let's put the person back into entrepreneurship research: A meta-analysis on the relationship between business owners' personality traits, business creation, and success

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The role of personality traits in the decision to start a business and to maintain it successfully is discussed controversially in entrepreneurship research. Our meta-analysis builds upon and extends earlier meta-analyses by doing a full analysis of personality traits that includes a comparison of different traits from a theoretical perspective and by analysing a full set of personality predictors for both start-up activities as well as success. Theoretically, our article adds to the literature by matching traits to the tasks of entrepreneurs. The results indicate that traits matched to the task of running a business produced higher effect sizes with business creation than traits that were not matched to the task of running an enterprise, corrected $r = .247$, $K = 47$, $N = 13,280$, and corrected $r = .124$, $K = 20$, $N = 3975$, respectively. Moreover, traits matched to the task produced higher correlations with success, corrected $r = .250$, $K = 42$, $N = 5607$, than traits not matched to the task of running a business, corrected $r = .028$, $K = 13$, $N = 2777$. The traits matched to entrepreneurship significantly correlated with entrepreneurial behaviour (business creation, business success) were need for achievement, generalized self-efficacy, innovativeness, stress tolerance, need for autonomy, and proactive personality. These relationships were of moderate size in general and, moreover, heterogeneity suggested that future research should analyse moderator variables.

Research on personal traits seems to have reached an empirical dead end (Aldrich, 1999, p. 76)

Relationships between personality traits and entrepreneurial behaviour are frequently addressed in entrepreneurship theorizing and research. Yet, a

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deep-rooted scepticism prevails in the entrepreneurship literature about the presence and the strength of this relationship. While some narrative reviews concluded that there is indeed a positive relationship between personality traits and both business creation and business success (Chell, Haworth, & Brearley, 1991; Cooper & Gimeno-Gascon, 1992; Rauch & Frese, 2000), other narrative reviews concluded that there is no such relationship (Brockhaus & Horwitz, 1986; Gartner, 1989; Low & MacMillan, 1988). Recent meta-analyses provided evidence for the predictive validity of personality traits in entrepreneurial research (Collins, Hanges, & Locke, 2004; Stewart & Roth, 2001, 2004b; Zhao & Seibert, 2006) and suggest further analysis of contingencies that impact the size of the relationship. We build upon these meta-analyses and extend the reach of our meta-analysis in the following way: First, we propose to study specific traits, such as achievement motive, rather than broad categories of traits, such as the Big Five, to predict entrepreneurial behaviour. Second, a related point is to ask the question of whether the trait is matched to the task or not. We propose that a good match between traits and the tasks of running a business allows for higher validities in the context of entrepreneurship research than personality traits not matched to entrepreneurship. Third, we study both business creation as well as business success and examine the relationships between personality and entrepreneurship in different contexts—business creation and success. Finally, we intended to be as inclusive in the number of traits studied as the literature allows us to be. The present study attempts to test a full set of traits to provide a complete picture of the relationship between personality and entrepreneurship, which in turn permits us to present an empirical answer to the question of which traits are valid predictors of entrepreneurial success.

Such a meta-analysis has important consequences for theory and model building. If a meta-analysis finds relationships of personality with business success to be important, theories of entrepreneurship must take the dynamics of personality into account, and model building needs to consider personality factors when predicting business success, similar to environmental and industry conditions. Therefore, this article first unfolds the theoretical assumptions that justify a positive relationship between owners' personality traits and entrepreneurial behaviour. Following this, we discuss previous meta-analyses on traits of entrepreneurs before we develop the framework and hypotheses used in the present study.

THE FUNCTION OF PERSONALITY TRAITS IN ENTREPRENEURIAL PROCESSES

Entrepreneurship has been defined using a behavioural definition; for example, the creation of new organizations (Gartner, 1989). A frequently

used behavioural definition of entrepreneurs refers to independent ownership, active management, and/or expressed intention to do so (Stewart & Roth, 2001). Other definitions of entrepreneurship describe tasks, such as the recognition and exploitation of opportunities, as central to entrepreneurship (Shane & Venkataraman, 2000). We included articles in our meta-analysis using a broad behavioural definition of entrepreneurship. On the other hand, we use more specific task descriptions of entrepreneurship, such as the one by Shane and Venkataraman, when discussing the importance of matching personality traits to entrepreneurship.

Personality traits are defined as dispositions to exhibit a certain kind of response across various situations (Caprara & Cervone, 2000); personality traits are also enduring and show a high degree of stability across time (Roccas, Sagiv, Schwartz, & Knafo, 2002). We follow McCrae and Costa (1990) and conceptualize personality traits as propensities to act. Different propensities may facilitate or impede business owners' actions and behaviours. Therefore, we assume that personality traits are predictors of entrepreneurial behaviour (Rauch & Frese, 2000). Kanfer (1992) referred to personality traits as distal variables. Distal dispositions include noncognitive and nonability dispositions that affect behaviour and performance indirectly. Such traits include biological determinants (such as temperament), broad personality factors (such as the Big Five), motives (such as achievement motive), and generalized attitudes and beliefs (such as generalized self-efficacy). Thus, this study uses the term personality traits generally to describe the distal dispositions of entrepreneurs.

Classic economic theorizing has emphasized personality traits to describe entrepreneurs; examples are creativity (Schumpeter, 1935) and risk taking (Knight, 1921; Mill, 1909). Empirical studies on need for achievement provided support for this assumption as business owners have higher values in need for achievement than managers, and need for achievement is positively related to business success (McClelland, 1961). However, subsequent research raised serious doubts as to whether personality plays any role in the start-up phase and for business success. Gartner (1985) argued that entrepreneurs constitute a highly heterogeneous group of people that defies a common definition and, therefore, common predictors; in other words, an "average entrepreneur" does not exist and, therefore, an average personality profile of entrepreneurs cannot be determined. Low and McMillan (1988) argued that personality-based descriptive studies do not help to develop a theory of entrepreneurship (p. 148). Reviewers of the literature have, therefore, suggested to discontinue the search for personality traits in entrepreneurship research (e.g., Aldrich, 1999).

The proposal to discontinue the study of personality within entrepreneurship research was based on narrative reviews of the literature. Meta-analysis approaches have argued that it is often hard to detect small but important

relationships with a narrative review (Hunter & Schmidt, 2004): Small relationships are often difficult to detect, because they are masked by frequent nonsignificant findings (often a result of lack of power) and the fact that unreliability of measures may lead to small attenuated empirical correlations (in contrast, a meta-analysis typically corrects for reliability issues). This often leads to a more negative view of the evidence than is called for. All of these (and other) issues might result in a higher incidence of Type II errors (Hunter & Schmidt, 1996; Tett, Jackson, & Rothstein, 1991).

Indeed, recent meta-analytical evidence provides support for the predictive validities of personality traits. Zhao and Seibert (2006) addressed in their meta-analysis multiple traits by coding various personality traits into the five factors of the Big Five model. Results indicated differences between entrepreneurs and managers in conscientiousness, openness to experience, neuroticism, and agreeableness. Other meta-analyses studied the two specific personality traits—risk taking and achievement motive—that are theoretically related to the domain of entrepreneurship. For example, entrepreneurs risk losing their investments in contrast to managers; therefore, they should be high in risk taking (Knight, 1921). Stewart and Roth (2001, 2004a) found small and significant differences in risk propensity between entrepreneurs and managers. Variations in effect sizes were fully explained by different instruments used to measure risk propensity: Objective measures produced higher effect sizes than projective measures. Need for achievement is an additional trait that has been related to economic outcomes and business performance (McClelland, 1961). Two meta-analyses addressed need for achievement of entrepreneurs: The difference between entrepreneurs and nonentrepreneurs was of moderate size ($d = 0.44$ and $d = 0.39$; Collins et al., 2004, Stewart & Roth, 2004b, respectively). Moreover, need for achievement was positively related to success ($r = .26$; Collins et al., 2004). Thus, these meta-analyses show the validities of selected personality variables.

We build our meta-analysis on this prior work and extend the coverage. The previous meta-analyses studied only differences between entrepreneurs and managers (with the exception of Collins et al., 2004). Entrepreneurship theory needs to know not only how entrepreneurs' personality is different from nonentrepreneurs but also whether or not personality traits are related to business success. At present we know this only for one trait—achievement motive, which was studied by Collins et al. (2004). Zhao and Seibert (2006) have presented the most encompassing meta-analysis up to this point. They concentrated on the relationship between personality variables and start-up activities. We complement this study by examining the relationships between traits and success. Zhao and Seibert did not directly analyse the Big Five traits but coded studies according to the five-factor taxonomy. As a consequence, they included both broad and specific traits under the same rubric. More importantly, they did not differentiate according to whether or

not the traits matched the tasks of entrepreneurs (more on this later). This leads to the problem that the relationships may have been underestimated. In one instance, the authors did differentiate between two facets of conscientiousness—the traits of achievement motive and dependability; the results showed that only achievement motive was related to entrepreneurship with d (corrected) = 0.59, while dependability did not show a significant relationship, with d (corrected) = 0.01. These differentiations are washed out when reporting the Big Five category of conscientiousness, which produced a d (corrected) = 0.45. For this and further theoretical reasons (see later), we think that it is necessary to examine specific traits and their relationships with business creation and with business success. Moreover, we think it is necessary to differentiate traits into those that can be theoretically matched to the tasks of entrepreneurs and those that are not matched to these tasks. We propose that a good match between traits and the tasks of running a business allows for higher validities in the context of entrepreneurship research than personality traits not matched to entrepreneurship.

Matching personality traits to the task of entrepreneurship

There is a debate within work and organizational psychology about whether researchers should use broad traits or whether they should rely on specific traits to predict performance. For example, Ones and Viswesvaran (1996) argued that broad big five traits are better predictors of job performance than more specific traits, because specific traits have low reliabilities and criterion related validity. In contrast, another set of authors suggested to differentiate between broad and narrow traits (Barrick & Mount, 2005; Dudley, Orvis, Lebiecki, & Cortina, 2006; Tett, Steele, & Beauregard, 2003). As Barrick and Mount (2005) pointed out, “narrow traits rely on explicit description that may be situated in time, place, or role” (p. 367). The usefulness of specific traits in predicting job performance was supported (Barrick & Mount, 2005; Tett et al., 2003).

We argue in the following for an explicit differentiation of specific traits into those that are “role”-related and those that are not (in the sense of Barrick & Mount, 1991), that is, we ask the question of which traits may be related to the tasks of entrepreneurship. This also follows from a general approach to understand work tasks first and then look at the relevant predictors of performance (Fleishman & Quaintance, 1984) as well as from entrepreneurship research (Baum & Locke, 2004; Collins et al., 2004).

Broad trait taxonomies use personality-based variation to organize specific personality traits into meaningful clusters. As a result, these global traits lose specific criterion-related variance. More specific traits can add to the prediction of a criterion because the best predictors might very well be

specific traits that represent different big five factors rather than many traits from one single factor (Paunonen & Ashton, 2001). An example is the factor conscientiousness, which includes subfactors of achievement striving and dutifulness. A rough analysis of the tasks of entrepreneurs shows that achievement strivings should show positive correlations with entrepreneurial success and start-up activities, while dutifulness should show zero or even negative relationships. If overall conscientiousness is used to predict entrepreneurial success, the two underlying contradictory correlations may lead to an overall small positive correlation. Many studies on small business owners' personality were not theoretically driven, but were descriptive in nature. Because both task-related as well as nontask-related personality variables were mixed together, the overall conclusion often was that there is only a very weak overall relationship between personality and entrepreneurial performance. Thus, links between the personality traits, business start-up, and success need to be explicitly conceptualized (Low & MacMillan, 1988); true effects will be underestimated if one does not select the appropriate personality traits that are more likely to be predictive of entrepreneurship (Johnson, 2003; Tett et al., 2003). Traits that are more likely to predict entrepreneurial behaviour are those traits that match personality with work characteristics (Holland, 1985; Vinchur, Schippmann, Switzer, & Roth, 1998).

Recently, the literature on entrepreneurship has made great strides to define essential parameters or roles of entrepreneurs. For example, entrepreneurs have to detect and exploit opportunities, they have to make rapid decisions under uncertainty and in a resource constraint environment, they have to work harder than most employees, and they have to possess a wide variety of skills, knowledge, and abilities (including, e.g., leadership, management, marketing, and innovating) (Sarasvathy, 2001; Shane, 2003). Examples of traits that are matched to such tasks are need for achievement, innovativeness, proactive personality, generalized self-efficacy, stress tolerance, need for autonomy, internal locus of control, and risk taking. *Need for achievement* implies that one chooses tasks of moderate difficulty, accepts responsibility for results, and seeks feedback on action outcomes. It is important for entrepreneurship because entrepreneurs need to be interested in the tasks that they are doing to perform well. In some of the oldest work on the differentiation between entrepreneurs and managers, McClelland (1961) showed that achievement motive was higher in entrepreneurs. Only if they did well at tasks of moderate difficulty, accepted responsibility for results, and sought feedback on business outcomes were entrepreneurs able to do well (McClelland, 1961). *Innovativeness* assumes a person's willingness and interest to look for novel ways of action (Patchen, 1965). The trait of innovativeness helps entrepreneurs to foster innovations in their firms (Heunks, 1998). Innovation has been one of the core concepts of

Schumpeter's approach to entrepreneurship (e.g., Schumpeter, 1935; see also Drucker, 1993), and innovation is related to business success (Bausch & Rosenbusch, 2005). People high on proactive personality want to influence their environment (Crant, 1996) and proactive personality is a personal disposition for personal initiative behaviour (Frese & Fay, 2001). Proactive personality is important for entrepreneurs because by definition, entrepreneurs have to be self-starting and influence their environment by founding new organizations and by identifying and acting upon opportunities. *Generalized self-efficacy* is important for entrepreneurs because they must be confident in their capabilities to perform various (and often unanticipated) tasks in uncertain situations (Baum & Locke, 2004). We follow the literature to differentiate generalized self-efficacy (a personality concept) from specific self-efficacy (the latter is not a personality trait) (Eden, 1988) and only excluded studies with specific self-efficacy (such as Baum & Locke, 2004). People with high generalized self-efficacy are likely to persevere when problems arise and search for challenges and, therefore, challenging opportunities (Bandura, 1982, 1997); they also show a higher degree of personal initiative (Speier & Frese, 1997); they have higher hopes for success and, therefore, take a long-term perspective (Heckhausen & Schulz, 1995); they also actively search for information (Ashford & Tsui, 1991), which leads to a better knowledge. Therefore, generalized self-efficacy is related to business creation and success (Poon, Ainuddin, & Junit, 2006; Utsch, Rauch, Rothfuss, & Frese, 1999). *Stress tolerance* is important because entrepreneurs typically have a high workload and take financial and personal risks. Stress tolerance is essential because entrepreneurs should not get strained in situations that are typically characterized by high insecurity and pressure. *Need for autonomy* is associated with entrepreneurs' avoidance of restrictive environments; they prefer to make decisions independent of supervisors, to set their own goals and develop their own plans of actions, and to control goal achievement themselves. People high in need for autonomy want to be in control, they avoid the restrictions and rules of established organizations, and thus, choose the entrepreneurial role (Brandstätter, 1997; Cromie, 2000). *Internal locus of control* is related to entrepreneurship because owners must believe that their own actions determine the rewards (business outcomes) they obtain (Rotter, 1966). Since people with a high internal locus of control feel that they are able to control outcomes, they should exert more effort and persistence towards intended outcomes, which, in turn, should help to start an enterprise and to maintain it successfully. In contrast, externally controlled people may be more passive. If one believes that one is not able to control outcomes, one has no reasons to actively change one's environment and to start a firm. Finally, the tasks of entrepreneurship include taking risks, for example, because decisions are made in uncertain situations (Knight,

1921). Therefore, entrepreneurs show *risk-taking propensity* (cf. Stewart & Roth, 2004a).

A theoretical issue in the personality literature relates to the impact of the situation. A truism of psychology has been the dictum by Lewin (1951) that behaviour is a function of the person and the situation. Personality traits can affect behaviour only if the situational constraints allow their expression (Mischel, 1968). Typically, weak situations that are characterized by low structure, little and ambiguous information, and high autonomy allow the expression of individual differences (Hattrupp & Jackson, 1996). In contrast to the work of employees whose organizational settings are usually relatively strongly influenced by institutionalized means, rules, guidelines and reward structures (Davis-Blake & Pfeffer, 1989), there is more room for manoeuvre for business owners. Business owners usually determine decisions, rules, reward structures, and business strategy. This suggests that entrepreneurs act within weak situations because they manoeuvre in situations of high autonomy, low structure, and they have to make decisions based on uncertain and ambiguous information. Therefore, personality traits should be related to business creation and success. In summary, we hypothesize that:

H1: There is a positive relationship between business owners' personality traits and entrepreneurial behaviour (business creation and business success).

H2: Personality traits that are matched to the task of entrepreneurship (need for achievement, innovativeness, proactive personality, self-efficacy, stress tolerance, need for autonomy, internal locus of control, and risk taking) predict entrepreneurial behaviour (business creation, business success) more strongly than traits that are not matched to entrepreneurship.

METHOD

Developing the database

We included studies that defined business owners as independent ownership, active management, and/or expressed intention to do so (Stewart & Roth, 2001). Personality traits were measured at the individual level (therefore, we did not include studies on entrepreneurial orientation). We included all those studies that had some measure of a personality trait and some measure of business success or business creation (see Appendix).

We used five different strategies to identify studies for the meta-analysis. First, we inspected databases: PsycLit/PsycInfo (1806–2006), ERIC (1966–2006), EconLit (1969–2006), ABI/Inform (1971–2006), Dissertation Abstracts Online (1987–2003), Digital Dissertations Online (2004–2006),

and SSCI (1972–2006). Second, we reviewed the past 23 volumes of the *Journal of Applied Psychology*, *Academy of Management Journal*, *Administrative Science Quarterly*, *Journal of Small Business Management*, *Journal of Business Venturing* (1985–2006), and *Entrepreneurship Theory and Practice*. Third, we analysed the conference proceedings of the Academy of Management (1980–2006), International Council of Small Businesses (1993–2005), and Babson-Kauffman Conference (1981–2005). Fourth, we examined article reference lists for other articles that were not identified with the other approaches. Finally, we contacted several research groups that we knew were active in the area and asked for relevant data and unpublished papers. The latter two strategies were particularly useful in identifying unpublished studies, allowing the analysis of both published and unpublished data (an important desideratum of meta-analyses; cf. Hunter & Schmidt, 2004).

Criteria for inclusion and exclusion of studies. Results of meta-analyses depend on which studies are included or excluded (compare, e.g., the controversy by Miner & Raju, 2004, and Stewart & Roth, 2004a). Therefore, we attempted to be very careful in developing our criteria for the inclusion of studies. First, since we attempted to study independent samples, we carefully checked that each sample was included only once in our analysis (only the most recent publication was analysed when we found more than one publication on a sample). For example, we excluded Miner, Smith, and Braker (1989), because the sample overlapped with the longitudinal analysis published in 1994 (Miner, Smith, & Braker, 1994). Second, we included only studies that reported statistics that could be transformed into the r statistic. Forty-eight studies were excluded because they did not contain sufficient statistical information to compute effect sizes (e.g., only significant relationships or only multivariate statistics were reported). Third, we did not include studies reporting only significant results (e.g., Lerner, Brush, & Hisrich, 1997; Singh, 1989). Fourth, we chose not to estimate effect sizes from approximate p values ($p < .05$, etc.; e.g., Hull, Bosley, & Udell, 1980); while it is possible to estimate effect sizes from exact p values, transforming approximate effect sizes can lead to wrong effect size estimates. Fifth, we included studies that reported results on some personality measure even if the study itself did not explicitly focus on a personality approach; for example, we included Heunks (1998), because he included a creativity measure, Gatewood, Shaver, and Gartner (1995), because they used an internal locus of control scale, and Robinson, Stimpson, Huefner, and Hunt (1991), because their measure is conceptually related to personality research and was specifically developed for the context of entrepreneurship. Sixth, single item measures of owners' traits were excluded because of unreliability problems. Finally, laboratory studies were not included.

Final sample. Our final meta-analytic database consisted of 116 independent samples from 104 different articles that met the criteria for inclusion and provided the necessary information for computing the statistics (with an overall N of 26,700). Of these, 62 studies dealt with business creation and 54 studies tested relationships between owners' traits and business success. Twenty-seven studies came from sources other than peer-reviewed journals.

Coding procedure. We used ratings from a group of experts for matching traits to the tasks of entrepreneurs. We asked 10 subject matter experts from business studies and entrepreneurship to code how far traits were related to the task of entrepreneurs. Experts were five professors and five PhD students from the US, Europe, and Australia who had done research in the area of entrepreneurship. We chose these experts because they were qualified to rate the relevance of a particular trait for entrepreneurship. The experts received a short introductory letter explaining the rating; they were asked to code the 51 different traits studied in the articles identified for our meta-analysis (Table 1). Specifically, they indicated on a 5-point rating scale the importance of each trait with regard to entrepreneurship. We only analysed traits that showed high interrater agreement (James, Demaree, & Wolf, 1993). The cut-off point for interrater agreement was $rwg \geq .70$ (Lance, Butts, & Michels, 2006). The rwg of optimism was a little lower ($rwg = .69$); however, it was near enough to the cut-off point of .70 to include it in the analysis. We defined traits being matched to entrepreneurship when experts indicated them to be as important or very important for entrepreneurship (a mean rating of 4.0 and above). Table 2 displays the results of the expert coding: 11 traits were consistently coded as being task related and 12 traits were coded as being not task related. It is interesting to note that some traits (e.g., tenacity, passion for work) have not been studied frequently enough to be able to include them into separate meta-analyses for personality traits matched to the task of entrepreneurship. Moreover, some traits frequently discussed in entrepreneurship research, such as internal locus of control and risk taking, were not included in Table 2 because experts disagreed considerably on their relevance for entrepreneurship. Although the variability of expert judgements with regard to internal locus of control and risk taking was high, we included these traits in the analysis reported in Table 4 because these two traits have been frequently suggested in the literature.¹

The coding of the type of entrepreneurial behaviour consisted of two categories: business creation and success. *Business creation* consisted of

¹Internal locus of control was included 50 times in the literature reviewed here and risk taking 35 times.

TABLE 1
Traits studied in articles identified

Need for achievement	Flexibility
Internal locus of control	Protestant work ethic beliefs
Risk-taking propensity	Optimism
Innovativeness	Rigidity
Need for autonomy	Self-confidence
Stress tolerance	Proactive personality
Self-efficacy	Self-esteem
Need for dominance	Goal orientation
Tolerance for ambiguity	Tenacity
Sobriety	Higher order need strength
Type-A behaviour	Creativity
Practicality	Enthusiasm
Openness to experience	Need for affiliation
Extraversion	Scepticism
Emotional stability	Self-reliance
Conscientiousness	Dogmatism
Delay of gratification	Impulsiveness
Discipline	Endurance
Conservatism	Conformity
Neuroticism	Future orientation
Expedience	Aggressiveness
Forthrightness	Passion for work
Shyness	Norm orientation
Tough-mindedness	Originality
Trustworthy	Benevolence
Humility	

TABLE 2
Results of the expert coding: Traits matched to entrepreneurship and traits not matched to entrepreneurship

<i>Matched</i>	<i>Mean</i>	<i>Interrater reliability (rwg)</i>	<i>Not matched</i>	<i>Mean</i>	<i>Interrater reliability (rwg)</i>
Self-efficacy	4.6	.76	Optimism	3.8	.69
Proactive personality	4.7	.88	Extraversion	3.1	.73
Tenacity	4.4	.87	Conscientiousness	3.7	.88
Need for achievement	4.5	.75	Rigidity	1.9	.73
Stress tolerance	4.2	.80	Creativity	3.5	.75
Goal orientation	4.2	.80	Self-reliance	3.7	.77
Need for autonomy	4.3	.88	Dogmatism	1.5	.75
Innovativeness	4.3	.77	Conservatism	1.3	.88
Endurance	4.1	.73	Forthrightness	3.2	.80
Flexibility	4.2	.91	Shyness	1.0	1
Passion for work	4.6	.87	Norm orientation	1.9	.73
			Conformity	1.5	.75

studies comparing business owners to other populations. The latter category consisted mainly of managers, but also of employees, students, nonfounders (e.g., heirs), or of a representative sample of the population. Since the comparison group “other populations” consists of quite heterogeneous occupations, we tested whether there are differences in the overall effect of personality traits for the comparison between owners versus managers and owners versus nonmanagers and found that the effect sizes were of similar size ($z = 0.975$, ns). A typical example for business creation is the study of Cromie and Johns (1983), which compared a random sample of 42 founders of independent businesses with 41 middle and senior managers and found that entrepreneurs had higher values in internal locus of control. Finally, studies addressing *business success* usually conceptualized personality traits as predictors of business outcomes. For example, Box and White (1993) studied 93 founders of independently owned enterprises and reported a positive correlation between internal locus of control and business success (average annual employment growth).

Meta-analytic procedure

We employed the meta-analytic procedures suggested by Hunter and Schmidt (2004), utilizing Schwarzer's (1989) and Borenstein and Rothstein's (1999) computer software. To allow comparisons between different analyses, all effect sizes were transformed into “ r ” statistics. We first calculated the N -weighted average correlations and their 95% confidence intervals. Each weighted correlation was then corrected for attenuation (corrected r , based on reliabilities). This correction was applied to traits and success variables. Since many studies did not provide information about reliabilities, we aggregated data on reliabilities for each subset of analyses and applied this aggregate to the analysis.

To assess the variability of the weighted correlations, we calculated the observed variance, the sampling error variance, and the residual variance. We computed the observed variance of the weighted correlation to provide an estimate of the variations in the correlations. To assess heterogeneity of weighted correlations, we also calculated sampling error variance. We assumed homogeneity of effects, if 75% or more of the observed variance could be explained by sampling error variance (Hunter & Schmidt, 1990). Some of our analyses were based on a small number of studies, causing a second order sampling error. If the observed effect sizes of these studies happened to come very close to the expected value, the observed variance ended up being smaller than the sampling error variance. Still, the correct conclusion in such cases is that all observed variance could be accounted for by sampling error variance (Hunter & Schmidt, 1990). If results indicated heterogeneity, we coded the studies further into subsets and tested for the

categorical moderator. A variable is commonly classified as a moderator when the population effect size varies from subset to subset and the residual variance average is lower in the subsets than for the effect as a whole (Hunter & Schmidt, 1990). For testing the significance of a moderator effect, we analysed differences in the weighted correlations by using a *z*-test as a critical ratio (Hunter & Schmidt, 1990, p. 348).

RESULTS

Hypotheses tests

Hypothesis 1 proposed that personality traits would relate to entrepreneurial behaviour, such as business creation and success. Results displayed in Table 3 supported this hypothesis—personality measures were significantly positively correlated with both business creation, corrected $r = .190$, and business success, corrected $r = .195$. Since the lower boundaries of the 95% confidence intervals were greater than zero, these effects were significant. The magnitude of the effects was moderate (Cohen, 1977). Additionally, the analyses revealed heterogeneity, suggesting the presence of moderators.

Hypothesis 2 suggested that personality traits that are matched to the task of entrepreneurship are better predictors of entrepreneurial behaviour than traits not matched to entrepreneurship. In line with Hypothesis 2, effect sizes for business creation were higher for traits matched to the task of entrepreneurship than for traits not matched to the task of running a business, corrected $r = .247$ and $r = .124$, respectively. The difference in the weighted correlations was significant $z = 2.83$, $p < .01$. Hypothesis 2 was also supported regarding the relationship between personality traits and business success (Table 3). The corrected relationships with success were $r = .250$ for traits matched to entrepreneurship and $r = .028$ for traits not matched to the task, and the difference in the weighted correlations was significant, $z = 5.37$, $p < .01$. The effect size of traits not matched to the task of entrepreneurship was not significant, as the lower boundary of the confidence interval was below zero. Heterogeneity of effect sizes, however, indicated the presence of other moderator variables. Therefore, we tested for the relationship between personality traits matched to the task of entrepreneurship and different types of entrepreneurial behaviour (Table 4). Traits that were directly and significantly correlated with success were innovativeness, corrected $r = .273$; proactive personality, corrected $r = .270$; and generalized self-efficacy, corrected $r = .247$, while stress tolerance was consistently related to business creation, corrected $r = .104$. Thus, for some traits, we found direct relationships with specific entrepreneurial behaviours that were not moderated by other variables.

TABLE 3
Results for relationships between traits and entrepreneurial behaviour

	<i>K</i>	<i>N</i>	<i>r_w</i>	<i>S_o</i>	<i>S_e</i>	<i>Sp</i>	% variance due to sampling error	Corrected <i>r</i>	95% confidence interval	Significance test of moderators
All personality traits with business creation	62	18835	.161	.0232	.0031	.0199	13.51	.190	.123–.199	0.45
All personality traits with success	54	7865	.149	.0270	.0066	.0202	24.45	.195	.105–.193	
Moderator analyses										
Traits matched to task with business creation ¹	47	13280	.213	.0216	.0032	.0180	15.02	.247	.171–.255	2.83**
Traits not matched to task with business creation ²	20	3975	.104	.0204	.0050	.0154	24.30	.124	.041–.166	
Traits matched to task with business success ¹	42	5607	.238	.0306	.0067	.0239	21.93	.250	.185–.291	5.37**
Traits not matched to task with success ²	13	2777	.027	.0106	.0047	.0059	44.45	.028	–.029–.083	

K = number of studies. *N* = overall *N*. *r_w* = sample weighted mean correlation. *S_o* = observed variance, *S_e* = variance due to sampling error, *Sp* = residual variance. Corrected *r* = corrected for low reliabilities. ***p* < .01. ¹Traits included here are displayed in Table 2, Column 1. ²Traits included here are displayed in Table 2, Column 4.

TABLE 4
Relationships between particular personality traits and different types of entrepreneurial behaviour

<i>Personality characteristic</i>	<i>K</i>	<i>N</i>	<i>r_w</i>	<i>S_o</i>	<i>S_e</i>	<i>S_p</i>	<i>Corrected r</i>	<i>% variance due to sampling error</i>	<i>95% confidence interval</i>	<i>Sig. test</i>
Need for achievement with Business creation Success	29 31	8698 4115	.188 .232	.0108 .0411	.0031 .0068	.0057 .0338	.219 .304	28.94 16.52	.150–.226 .161–.303	$z^1 = 1.16$
Innovativeness with Business creation Success	15 7	4620 800	.196 .203	.0197 .0052	.0030 .0081	.0164 .0000	.235 .273	16.45 157.23	.125–.267 .150–.256	$z^1 = 0.15$
Proactive personality with Success	5	679	.201	.0062	.0068	.0000	.270	110.09	.124–.278	
Generalized self-efficacy with Business creation Success	8 11	2250 1331	.335 .205	.0377 .0101	.0028 .0077	.0347 .0024	.378 .247	7.44 75.46	.201–.470 .146–.265	$z^1 = 1.79$
Stress tolerance with Business creation Success	6 11	1325 1282	.090 .157	.0004 .0161	.0045 .0082	.0000 .0078	.104 .198	1034.42 51.18	.073–.106 .081–.231	$z^1 = 1.71$
Need for autonomy with Business creation Success	11 8	4256 843	.252 .126	.0246 .0262	.0023 .0093	.0223 .0168	.312 .164	9.24 35.42	.159–.344 .013–.238	$z^1 = 1.70$
Locus of control with Business creation Success	24 23	5648 3959	.157 .098	.0199 .0093	.0041 .0057	.0158 .0036	.188 .134	20.37 61.43	.100–.213 .059–.138	$z^1 = 1.68$
Risk taking with Business creation Success	18 13	8863 1744	.086 .079	.0111 .0172	.0020 .0074	.0091 .0097	.102 .103	18.06 43.17	.037–.135 .008–.15	$z^1 = 0.16$

K = number of studies. *N* = overall *N*. *r_w* = sample size weighted mean correlation. *S_o* = observed variance, *S_e* = sampling error variance, *S_p* = residual variance. Corrected *r* = corrected for reliabilities. ¹difference in *r_w* between business creation and success.

Post hoc tests

Although we did not have any specific hypotheses, we performed post hoc analyses on business creation and success. We did this because future research might be interested in the differential prediction of these criteria in the entrepreneurship literature. Table 3 displays that the overall correlations between personality traits and business creation and between personality traits and success were of similar size, $z = 0.45$, *ns*. Additionally effect sizes of type of entrepreneurial behaviour (business creation and success) did not differ for need for achievement, innovativeness, generalized self-efficacy, stress tolerance, need for autonomy, internal locus of control, and risk taking (Table 4). These traits predicted different entrepreneurial behaviours in a similar way.

We also compared the two categories of business success: key informant ratings and organizational performance measures. Key informant ratings included mainly global self-ratings of success, satisfaction, and external ratings (e.g., by the interviewer). These measures shared subjective assessment of nonfinancial success measures. Measures of organizational performance included information about financial outcomes, such as accountant-based measures, and growth. These subdimensions partially overlap, both theoretically and statistically (cf. Combs, Crook, & Shook, 2005). Our post hoc analyses revealed that key informant ratings of success produced higher effect sizes than measures of organizational success. The difference in the size of correlations was significant for generalized self-efficacy, $z = 3.82$, $p < .01$, and stress tolerance, $z = 3.82$, $p < .01$.

Since our study included both published and unpublished data, we performed post hoc analyses to test whether publication bias had an impact on the proposed relationships. Results indicated that publication bias had an impact on the hypothesized relationships with business creation. Peer-reviewed publications, $rw = .142$, $N = 16,032$, $K = 55$, reported smaller effect sizes than studies not published in peer-reviewed journals, $rw = .245$, $N = 2803$, $K = 7$, for personality differences between owners and other populations, $z = 2.81$, $p < .01$. The effect sizes of the relationship between personality traits and success were not different for peer-reviewed studies, $rw = .143$, $N = 5942$, $K = 37$, as compared to other publications, $rw = .167$, $N = 1931$, $K = 17$, $z = 0.60$, *ns*.

DISCUSSION

Aldrich (1999, p. 76) argued that research on personality traits seemed to have reached an empirical dead end because the correlations between personality traits and entrepreneurial behaviour were too small to matter. Others concurred with him on this verdict (Brockhaus & Horwitz, 1986;

Gartner, 1989; Low & MacMillan, 1988)—all of these conclusions were based on narrative reviews. Our meta-analysis paints a different picture of the relationships between personality traits and entrepreneurial behaviour: First, we found that business owners' personality traits were positively related to business creation and business success (Hypothesis 1), with corrected r s of .190 and .195, respectively. While the size of these relationships is only moderate (Cohen, 1977), it is about the same size as the correlation between personality and performance in general (Barrick & Mount, 1991) and the correlation between personality traits and both leadership emergence and leadership effectiveness (Judge, Bono, Ilies, & Gerhardt, 2002). Thus, entrepreneurship research needs to take personality as seriously as research on employees' personality has done.

Once we differentiated between traits that are matched to the task of entrepreneurship and traits not matched to the task of entrepreneurship, we found higher correlations for personality traits matched to entrepreneurship than for traits not matched to the task of entrepreneurship (Hypothesis 2). In addition, the correlation between a particular personality trait and entrepreneurial behaviour can be as high as, e.g., $r = .378$ (generalized self-efficacy with business creation) and $r = .304$ (need for achievement with success)—this seems to us to be a clear verdict against the general conclusion that personality traits are not important in entrepreneurship research.

It may be useful to compare our results with the study by Zhao and Seibert (2006), as our study replicates their findings on business creation and extends the breadth of coverage by including specific traits and other outcome variables, such as business success (please note that Zhao and Seibert use d instead of r — d needs to be roughly divided by two to get at the equivalent size of the correlations r , cf. Hunter & Schmidt, 2004). Similar to Zhao and Seibert, our meta-analysis also finds that personality is related to business creation (and our results are similar in size with a correlation of .190, which is roughly equivalent to the d of .45). More importantly, we find that those traits that are matched to the tasks of entrepreneurs showed significantly higher relationships than those that are not. For example, need for achievement show relatively high correlations, as shown by other meta-analyses as well (Collins et al., 2004; Zhao & Seibert, 2006). Since specific personality traits have high validity, specific personality traits can add to the prediction of entrepreneurial behaviour (Paunonen & Ashton, 2001).

Need for achievement and risk taking showed similar effect sizes as those found in the previous meta-analyses on these two traits of entrepreneurs (Collins et al., 2004; Stewart & Roth, 2001, 2004a, 2004b). Since our approach enabled us to study several traits, we found additional traits that are important predictors of entrepreneurial behaviour: innovativeness, proactive personality, generalized self-efficacy, stress tolerance, need for

autonomy, and internal locus of control were related to entrepreneurial behaviour.

Interestingly, two traits that have been studied relatively frequently in entrepreneurship research—internal locus of control and risk taking—were not coded to be well matched to the tasks of entrepreneurs by the experts in our expert survey. Internal locus of control might be important not only for entrepreneurs but also for other occupations such as managers or politicians. Similarly, running a business with a risky strategy may be good for quick success but also for early failure. Our meta-analysis showed, indeed, that the effect sizes of entrepreneurial risk taking and internal locus of control were relatively small (corrected from $r = .031$ to $.103$ for risk taking, and from $r = .012$ to $.188$ for internal locus of control).

While previous meta-analyses focused only on differences between entrepreneurs and nonentrepreneurs (with the exception of Collins et al., 2004), our study design enabled us to test whether or not traits are differentially related to different types of entrepreneurial behaviours: business creation and business success). Some authors argued that personality traits affect the decision to start an enterprise more strongly than subsequent business success, because the impact of the individual business owner decreases with increasing size of the enterprise (Begley & Boyd, 1987; Frese, van Gelderen, & Ombach, 2000). However, our results, as well as the meta-analysis by Collins et al. (2004), challenged this proposition. Traits, such as need for achievement and generalized self-efficacy were valid predictors of both business creation and business success in the same way.

Theoretical implications

Our results indicate that a few carefully selected personality traits can predict well entrepreneurial behaviour. While there is evidence that the common variance of traits contribute to entrepreneurial behaviour (Zhao & Seibert, 2006), our results suggest that traits matched to the task of entrepreneurs produce specific variance that contribute to the prediction of entrepreneurial behaviour. Indeed, the traits that matched to entrepreneurial tasks, such as generalized self-efficacy, proactive personality, innovativeness, and achievement motives, are the factors most strongly related to entrepreneurial behaviour. Since these matched traits belong to different big five factors, they share little common variance and, therefore, need to be exploited separately. Unfortunately, there are a number of important entrepreneurship-related personality factors that scholars of entrepreneurship have only started to be interested in, but that have not been addressed in enough studies to be included into a meta-analysis. Our expert survey revealed that some traits, such as passion for work and tenacity (Baum &

Locke, 2004), might be important for running a business; they were not studied frequently enough to be included into a meta-analysis. Other examples are cognitive and perceptual processes (Baron, 2004), such as cognitive alertness (Busenitz, 1996; Kirzner, 1997), and practical intelligence (Sternberg, 2004). Therefore, exploring additional task matched traits may be a fruitful avenue for future research.

Beyond the increments in the behavioural prediction, the use of such matched traits can lead to important advances in the explanation of entrepreneurial behaviour, because it is possible that a single trait can have differential relationships with different types of entrepreneurial behaviour. For example, while opportunity recognition depends on cognitive properties, the decision to exploit an opportunity involves traits, such as risk taking and optimism. At the same time, such traits do not necessarily increase the probability of success because they limit realistic forecasts of the future (Shane & Venkatamaran, 2000). Other scholars have called for a process view of entrepreneurship and argued that the impact of specific traits vary through the process (Baron, 2007; Baron & Markman, 2005). While the empirical evidence is preliminary and inconsistent at present, exploring the role of task-matched traits on different entrepreneurial behaviours should be tested in future research.

Moreover, future research needs to address processes and conditions that affect the relationship between personality traits and entrepreneurial behaviour. Our approach of matching traits to the tasks of entrepreneurs may lead away from a pure static orientation in personality. We agree with Mischel and Shoda (1998) that a good personality description takes into account not just trait components but also mediational processes. For example, Herron and Robinson (1993) argued that motivation is a mediator through which personality traits determine entrepreneurial behaviour. Other processes mediating the effects of personality traits include intentions, goals, and self-regulatory processes (Barrick, Mitchell, & Stewart, 2003; Baum, Frese, & Baron, 2007; Frese et al., 2000). In entrepreneurship research, such mediating processes are rarely studied and, therefore, there is too little literature available to summarize mediating processes in a meta-analysis. Exceptions are Baum and Locke (2004), who identified situation-specific motivation (goal setting, specific self-efficacy) as a mediator in the relationship between personality traits and business success, or Frese, Krauss, et al. (in press), who used active planning as a mediator for personality-success relationships in small-scale enterprises. Similarly, tests on cognitive processes and heuristics are in our view a useful approach to studying the relationship between personality traits and success (e.g., Baron, 2004; Busenitz, 1996; Palich & Babgy, 1995). For example, risk-taking propensity might lead to overoptimistic heuristics and, as a consequence, to the decision to start a business venture.

Future research should address the impact of situational conditions in the sense of Personality \times Situation interactions (Magnusson & Endler, 1977). Personality traits can affect behaviour only if situations are relevant and not constrained to allow the expression of individual differences (Mischel, 1968). Thus, potential moderators are environmental constraints (Dess & Beard, 1984; Herron & Robinson, 1993), such as the economic situation at the time of study, the demands of the specific industry, or the stage in the business life cycle (Baron, 2007). Unfavourable environments (e.g., decreasing demands, high competition) may constrain the expression of individual differences. Favourable environments (e.g., growing markets and demands) may allow the expression of individual traits, for example, owners with a high need for achievement may be able to pursue more opportunities than owners with a low need for achievement. Size of business is another factor that might also moderate the effects of personality traits: In very small companies the owner can determine decisions, goals, and company culture (van Gelderen, Frese, & Thurik, 2001) and in larger businesses, the influence of the business owner decreases and, therefore, organization-level entrepreneurship becomes more important than the individual traits of the business owner. Unfortunately, there is lack of research and theory on the relevant context conditions as moderators, both in work and organizational psychology (Barrick et al., 2003) and in entrepreneurship research. However, identifying moderators is all the more important as we called for the use of task-matched traits and, as a consequence, we linked personality to the situation of entrepreneurship.

Practice implications

Our findings suggest that practitioners may consider task-specific personality traits as criteria for decision making. The effect sizes are high enough to provide practical utility that may accumulate over time (Collins et al., 2004). To illustrate this point, consider the fact that the effect sizes for the task-related traits are as high as the effect sizes for the following medical diagnostics: conventional x-rays and tooth cavities ($r = .36$), or cardiac tests and prediction of death or myocardial infarct within 1 week of vascular surgery ($r = .20$) (Meyer et al., 2001). These correlations are sizeable enough to draw practical conclusions in medicine and they should be considered sizeable enough to influence practice in entrepreneurship. For example, people interested in starting a business may evaluate their traits and use this information to support their career choice and to match themselves to the task of running a business or to decide on partners who compensate for their weaknesses. Similarly, government agencies may use task-specific traits to select potential entrepreneurs more successfully. For example, in 1994 the German Government aimed to support entrepreneurship by introducing

the so-called Ich-AG. One of the most important criteria for attending the programme was a formal registration of unemployment. Our results would suggest using, at least additionally, achievement motivation and innovativeness as criteria for attending the programme. Moreover, it would be interesting to research what amount of variance of the task-matched traits can be changed through training. Generalized self-efficacy can be increased by training (Eden & Aviram, 1993). How much does changing personal initiative lead to changes in proactive personality (Frese, Glaub, Gramberg, Hass, Friedrich, & Solomon, 2007)? Finally, banks or venture capitalists may consider task-matched traits for guiding investment decisions.

Meta-analytical evidence may not only help to identify predictors that can guide the decisions of practitioners but also provide information about the importance of a particular predictor. For example, need for achievement produces higher effect sizes than risk taking and, therefore, should receive a higher weight in the decision-making process. However, at the same time, it is important to consider task-specific traits as only one selection criteria. Given the large body of empirical findings suggesting that factors other than traits of business owners affect entrepreneurial behaviour, valid selection criteria must include other individual differences variables as well as nonpersonality variables, such as strategies, cognitive ability, and environment, which are additional predictors of success (Campbell, McCloy, Oppler, & Sager, 1993).

Limitations

Our meta-analysis is based on cross-sectional correlations and, therefore, we cannot rule out alternative explanations. First, third variables may produce spurious correlations, for instance, cognitive ability may contribute to a higher degree of need for achievement and thus the correlation of need for achievement and business creation may be due to more highly intelligent people starting more firms. Second, most studies do not allow strong conclusions to be drawn regarding the causal path of effects. There is evidence for a genetic component in many personality variables (Jang, Livesley, & Vernon, 1996) and a high test–retest stability across adult life (Roberts & DelVecchio, 2000), which suggests that personality traits probably affect subsequent entrepreneurial behaviour. However, not all of personality is genetically determined and there is some part of the variance of personality traits that can change because of success as well. Thus, we cannot rule out reverse causality: Starting a business successfully may lead to the changes in personality traits (e.g., business success may increase entrepreneurs' generalized self-efficacy). Entrepreneurship scholars need to employ more longitudinal studies to determine the direction of causation empirically. Future studies should also look into the issue of the

intercorrelations between the various personality factors and examine an explicit predictive regression model that includes several task-matched personality predictors.

A further limitation is the fact that many studies included in the meta-analysis are biased towards successful enterprises: Studies that compared entrepreneurs with other populations usually consisted of samples of entrepreneurs that survived until the time of data collection and, thus, compared “successful” entrepreneurs with other populations. Moreover, studies analysing relationships between personality traits and success usually do not provide data about businesses that failed. However, this bias works against the proposed hypotheses because there is reduced variance in the independent variable. For example, if need for autonomy makes an individual more likely to start up a business, the variance in need for autonomy would be reduced when predicting business success. Variance restriction would result in smaller effect sizes (Hunter & Schmidt, 2004). Therefore, this limitation contributes to a conservative estimate of the relationship between personality traits and entrepreneurial behaviour.

Our meta-analysis attempted to link personality traits to the criterion entrepreneurial behaviour. For this purpose, we asked expert judges to rate personality traits as to the match to entrepreneurship. This approach has strengths but also weaknesses. The experts used to establish our framework may have been biased. For example, the experts may have known the empirical literature and may have judged traits as important for entrepreneurship accordingly. We suggest that future research should use a sophisticated task analysis to match traits to entrepreneurial behaviour (cf. Markman, 2007). For example, extraversion has been shown to be important for success in salespeople but not in other occupations (Vinchur et al., 1998). In a similar way, the tasks of the entrepreneurs could be matched to predictors.

Another concern relates to the issue of aggregation. We aggregated data on success and presented overall effect sizes based on these aggregations. While we share such an approach with narrative reviews, meta-analysis provides some useful tools to test the issue of aggregation. For instance, we were able to show that our overall results are valid for different comparison groups (managers vs. “others”). However, our post hoc analyses revealed that key informant ratings produced higher effect sizes than measures of organizational performance. Future studies on personality need to include different measures of success.

Finally, we used a broad definition of entrepreneurship as ownership and active management of business ventures (Stewart & Roth, 2001). This definition is frequently used although some scholars defined entrepreneurship more narrowly (Gartner, 1985; Carland, Hoy, Boulton, & Carland, 1984). While there were not enough studies in our meta-analysis to tackle

this question, definitional issues can, in principle, be fruitfully analysed within the meta-analytic framework.

CONCLUSION

The importance of considering the personality traits of business owners for becoming successful business owners has been shown in this study. The relationships are of small and moderate size, and there is evidence that future studies should search for moderators. We suggest the development of a fuller contingency theory of owners' personality traits (along the lines of Situation \times Traits interactions; cf. Magnussen & Endler, 1977). However, some relationships are quite large (e.g., between generalized self-efficacy and success). Therefore, models of entrepreneurial success should include owners' personality traits as supplemental variables. Otherwise, these models will be misspecified. In other words, entrepreneurship research cannot develop a consistent theory about entrepreneurship if it does not take personality variables into account as well.

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