Research article

The necessity of targeted aptitude diagnostics for company founders: relationships between personality traits, perceived stress, satisfaction, and performance

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ARTICLE INFO

ABSTRACT

In the course of a growing start-up market and strongly increasing investment volume, investors try to predict the success of a business as precisely as possible in advance. However, when assessing the personality of the founder or founding team, they still rely far too often on their gut feeling, thereby reducing the quality of their decisions. Our study therefore aimed at investigating whether there are any relationships between the founders' personality traits and their performance and thus justifying the need for more targeted and optimized diagnostics in the field of founder personality. With a total of 141 founders, clear correlations between personality traits (conscientiousness, emotional stability) and performance could be demonstrated in the present study. In addition, it became evident that perceived stress is also related to the founders' personality (emotional stability negative, conscientiousness positive) and in turn has a negative effect on performance. Our findings contribute to raising awareness of the importance of personality as a predictor of founders' performance, improving decision-making, and, in the long run, replacing gut feeling as an inappropriate assessment criterion of investors.

1. Introduction

1.1. On gut feeling in the business world

What makes a start-up successful? The ultimate formula for success, with which every founder can bring it from the first idea to Unicorn (a start-up with a market valuation of over one billion US dollars, Aldrich and Ruef, 2018), is highly coveted, but not clearly defined. Nevertheless, it is becoming increasingly important to validly predict the chances of success of a newly founded company, since it is about money, a lot of money. The start-up industry is currently experiencing impressive growth and an enormous upswing - the investment volume of venture capital (VC) investors in Germany alone was 6.2 billion euros in 2019 (Lennartz, 2020), a remarkable 36 percent higher than in 2018 (ibid.). There are around 557,000 new ventures in Germany every year (Metzger, 2018). Investors are therefore dependent on finding valid criteria on the basis of which they can make their investment decisions with clear conscience. In practice, investors have therefore been relying for many years on an intensive, data-supported analysis of internal and external factors, such as the start-up idea (or plan), the presented business plan, the business model or the market and growth potential (Franke et al., 2004). Based on these selection criteria, all applications are filtered during the investment review process (Schefczyk, 2006) via initial screening, personal contact and intensive Due Diligence with subsequent negotiations on terms and conditions. A contract is ultimately concluded for about one to four percent of the submitted business plans (Franke et al., 2004).

These assessment methods are obviously not a success story. Still, about two thirds of all major investments are not successful. They therefore lead to a capital loss or reach the maximum break-even point (Feigl, 2014). What are the causes? If one asks VC investors what they attach the greatest importance to before investing, the answer always contains a reference to the founding team (Lechler and Gemünden, 2003; Horton, 2016 and others). A well-known investor throughout Europe, said: "Empathy is the most important thing for me and when I conclude a deal I always make my gut decision on the basis of the question: Would I like to see this founder again tomorrow morning?" (C. Maschmeyer, Interview by Krenz, 2018, translated from German). This quote illustrates the great dilemma of many investors, venture capitalists and business angels. While the start-up sector is becoming more and more

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technology-oriented - around half of the initial investment capital (2.9 billion euros) is flowing into the high-tech FinTech and mobility sectors alone (Lennartz, 2020) - investors and venture capitalists continue to rely far too often on their gut feeling when making investment decisions in a key area: the personality of the founding team.

Many investors are still carried away by the idea of assessing the start-up potential intuitively, quickly and often solely on the basis of subjective evaluations, conversations and feelings (Brettel, 2002). The possibility and increasing necessity of carrying out potential analyses based on real correlations between personality traits and performance criteria for founders is almost completely ignored (Hell and Gatzka, 2018). Subsequently, characteristics essential for success are often described with euphemisms such as "should be a doer", "must be convincing and credible" (Brettel, 2002) or simply with the question "would I like to see this founder again tomorrow morning [...]" (C. Maschmeyer, see above). However, these evaluation criteria are neither operationalizable nor intersubjectively comparable in terms of their informational value and thus lack any basis for a valid assessment of the chances of success of a founding team or the predictor of personality as a success determinant in the entire process of founding and managing a business.

1.2. Objective of the study

From the aforementioned deficiencies the objective of the present study can be derived. In order to awaken in investors an awareness of the economic significance of a well-founded personality assessment beyond intuition, it is initially necessary to compile research results which prove that established and structured rather than intuitively measured personality traits of a founder prove to be worthwhile predictors and can improve the quality of investment decisions. It must therefore be examined whether there are clear empirical correlations between the founders' personality traits and their performance respectively the chances of the start-up's success.

This article is intended to make a significant contribution to this and thus substantiate the need for more targeted and optimized diagnostics in the field of founder personality. For this purpose, 141 company founders answered a broad questionnaire containing a wide range of objective and subjective success criteria as well as their personality traits. To examine these relationships multiple linear regression analyses (MLR) will be used. In contrast to the few existing findings, which are often not based on clear performance criteria specifically relevant to investors (turnover, growth, goal achievement), performance is described by profound, clearly defined predictors, which allow concrete conclusions to be drawn about the success of the company and provide direct added value for investors. Moreover, the measurement of personality traits with an efficient short scale (BFI-10 by Rammstedt and John, 2007) allows investors to assess whether a standardized, data-based consideration of the founder personality is possible even without extensive and resource intensive testing. In subsequent research, we will work out how such a data-supported potential analysis of the founder or founding team can be designed in order to replace gut feeling as an inadequate assessment criterion and to improve decision-making behavior.

2. Theoretical background and conceptual definitions

2.1. Entrepreneurship and venture capital

Not only the aforementioned investment volume and the economic importance of start-ups have increased considerably, but also the understanding of entrepreneurship has developed continuously over the last decades. While entrepreneurship until the 1990s was simply understood as "the creation of a new business" (Gartner, 1990), founders today are increasingly regarded as innovators and role models (Pott and Pott, 2012) and start-ups as one of the most important drivers of economic growth and innovation (Audretsch and Thurik, 2001).

The economic counterpart to the innovators (founders) are the (venture capital) investors. These offer a substantial opportunity to provide founders with capital beyond debt financing through bank loans (Franke et al., 2004). VC financings are usually temporally limited and equity-financed minority interests in the company (Schefczyk, 2006). In addition, financing is often accompanied by rights of control and participation as well as an at least advisory management function to secure and increase the value of the investments (ibid.). In addition to pure financial support, founders thus receive the structural know-how they need, for example in scaling production or marketing, and selling the product (Franke et al., 2004). In order to be successful as a VC and to make optimum use of both financial and structural resources, it is extremely important for investors to predict the probability of success of a possible investment. As already mentioned, this does however not always succeed.

2.2. Personality of founders

In the course of these efforts, the examination of the founders' personality has received a continuous increase in attention for several years (Brandstätter, 2011). While earlier studies, mainly from the 1980s (e.g., Brockhaus and Horwitz, 1986) did not find significant results, more recent studies and in particular extensive meta-analyses allow other implications. There are now clear findings that confirm various relationships between personality traits and business start-up as well as entrepreneurial success (e.g., Zhao et al., 2010; Rauch and Frese, 2007; Kozubikova et al., 2018). The importance of the personality is here particularly high at the beginning of the founding process (founding intention and realisation, cf. Korunka et al., 2004).

Further studies have also shown that the personality traits of successful founders differ significantly from those of other (non-self-employed) executives and managers. For example, the much-noticed study by Zhao and Seibert (2006) indicates that founders have more conscientiousness and openness as well as less neuroticism and agreeableness compared to managers. Further differences are found in characteristics like locus of control and need for achievement (Rauch and Frese, 2007). From the perspective of venture capitalists (VC), however, the founders' personality still plays only a subordinate role. The few analyses that have already dealt with the assessment of the founding team from the VC's point of view consider primarily acquired skills and demographic factors, such as industry experience, educational direction, educational level or age (Franke et al., 2004), and largely ignore personality traits.

Based on previous research findings and with regard to the limitation of the study to essential, generally valid, and recognized personality traits, we confine ourselves to the five-factor model ("Big Five"; Costa and McCrae, 1992). This has long been established and serves as the most common theory for describing, explaining, and investigating personality and its manifestations (Sur & Ng, 214). It has been replicated several times and validated in different cultures and languages (Costa and McCrae, 1992). In their combination, the five characteristics (emotional stability, conscientiousness, extraversion, agreeableness, and openness) are able to describe the essential characteristics of a person (Costa and McCrae, 1992). They are also considered to be stable over time, consistent and largely genetic (ibid.).

2.3. Performance criteria

Before the relationship between personality and performance can be investigated, the question arises as to how performance can be defined specifically and profoundly at all. In the literature, performance is often used as a term and general determinant of success, but is often not clearly defined and operationalized (Campbell et al., 1996). A definite distinction is therefore not always given. This applies particularly to the performance of founders, which includes not only the professional performance of the founder himself, but also other criteria such as his

leadership performance (and thus in turn the professional performance, satisfaction and motivation of his employees; Uedelhoven et al., 2016), and the success of the business start-up.

In order to capture performance as multi-faceted as possible, but at the same time to be able to clearly delineate it, we do not commit ourselves to a performance criterion as a parameter (e.g., sales target, company growth, etc.) but define performance as the mean value of the achieved quantitative and qualitative goals (cf. measurement of constructs) in the study at hand. This ensures the recording of a broad spectrum of relevant goals derived from the corporate reality and thus offers a decisive advantage over the recording of performance via an established, but strongly theory-oriented performance scale (cf. measurement of the constructs).

An important additional basis for discussion is moreover provided by summarizing the criteria of performance, perceived stress, and satisfaction into the overarching construct of *professional probation* with employees and *leadership success* with managers (and thus usefully also with founders; Uedelhoven et al., 2016). All three areas are decisive for the overall success of the founder and the achievement of the company goals (see below) and are therefore examined individually with regard to their relationships with the performance of the founders.

In addition, it should be pointed out that correlations can also exist within these criteria of professional probation. Such findings could help to identify stress - also among founders - as a performance-reducing factor and satisfaction as a performance-promoting factor and thus strengthen awareness of the negative consequences of stress or the positive effects of satisfaction. Corresponding investigations will be integrated into our study.

The described objectives of the study and the presented constructs result in five research questions to be investigated in the following. Hypotheses were formulated for all relationships, the derivation of which is explained below.

3. Hypotheses and result expectations

3.1. Personality and performance

In the literature, correlations between personality traits and performance criteria have been examined frequently. A wide variety of studies have proven the positive relationship between conscientiousness and performance criteria (e.g., Barrick and Mount, 1991; Linz and Semykina, 2011; Salgado, 1997; Tokar et al., 1998) as well as emotional stability and performance criteria (e.g., Barrick and Mount, 1991; Nyhus and Pons, 2005; Salgado, 1997; Tokar et al., 1998) across all occupational groups and hierarchical levels, including managers. It is therefore obvious to assume the same correlations for founders. Zhao et al. (2010) have identified initial findings on the relationships between start-up success criteria (existence, growth, profitability of the company) and conscientiousness ($r = .19$) as well as emotional stability ($r = .18$). Therefore, the following Hypotheses arise:

Hypotheses 1a and 1b. Founders' conscientiousness (*H1a*) and emotional stability (*H1b*) correlate positively with their professional performance.

For extraversion, different findings exist depending on the activity performed and the occupational group. In the group of executives and managers (one of the five groups defined by Barrick and Mount (1991) and closest to the founders under consideration), however, a positive correlation between extraversion and performance has been demonstrated ($r = .18$, total $N = 11,335$; Barrick and Mount, 1991).

Hypothesis 1c (H1c). Founders' extraversion correlates positively with their professional performance.

With regard to openness, Barrick and Mount (1991) found a weak positive correlation for individual performance criteria ($r = .25$ for training proficiency). We therefore assume:

Hypothesis 1d (H1d). Founders' openness correlates positively with their professional performance.

For agreeableness as the fifth personality trait no correlation is assumed in the target group of company founders. However, this trait - as well as age and gender - is included as a control variable.

3.2. Personality and perceived stress

Over the past decades, perceived stress has been established as a very extensive field of research in its own right (Semmer, 2006). In particular, the personal handling of stress and the coping mechanisms available to the individual (Coping; Semmer and Meier, 2009) are a highly claimed field of observation that cannot entirely be dealt with in this study. Within the framework of these studies, personality traits are repeatedly included, so that findings exist on the relationship between personality and perceived stress. However, managers and founders were rarely the focus of attention.

Previous research results suggest that among the Big Five, neuroticism or emotional stability has the greatest influence on perceptions of stress (Bolger, 1990; Gunthert et al., 1999; Semmer, 2006; Sur and Ng, 2014). The corresponding studies show unanimously high positive correlations between emotional stability and perceived stress across all samples. Von Bernstorff and Nachtwei (2016) also showed that resilient managers experience less stress. Hypothesis 2a illustrates the assumed relationship:

Hypothesis 2a (H2a). : Founders' emotional stability correlates negatively with their individual perception of stress.

With regard to the relationships to other personality traits, the literature base is less extensive. Nevertheless, studies by Eysenck and Eysenck (1987) and Bowling et al. (2005) point to a significantly negative correlation between extraversion and perceived stress. Among other things, it could therefore be shown that introverted people perceive potential stress situations sooner as a strain (ibid.). Initial approaches concerning this relationship among managers suggest the same: extraverted managers experience less stress (von Bernstorff and Nachtwei, 2016). Agreeableness has also received very little attention as a predictor of stress perception, but for the general population a stress-reducing effect of agreeableness can be assumed (Ebstrup et al., 2011). If this correlation also exists among founders, it would open up a new perspective on the assertiveness necessary for founders, which in turn could lead to a higher perception of stress (and thus possibly to a lower performance, cf. Hypothesis 1).

Hypotheses 2b and 2c. Founders' extraversion (*H2b*) and agreeableness (*H2c*) correlate negatively with their individual perception of stress.

Finally, the relationship between conscientiousness and perceived stress among founders is remarkable. While earlier studies among students (Knudstrup et al., 2003) and engineers (Van den Berg and Pitariu, 2005) showed a negative correlation, we found a positive correlation in a preliminary study for managers. As there are no founder-specific studies to date, this result forms the basis of our research. We therefore assume:

Hypothesis 2d (H2d). Founders' conscientiousness correlates positively with their individual perception of stress.

3.3. Relationships between the criteria

3.3.1. Perceived stress and performance

It is largely undisputed and has already been proven many times that perceived stress is primarily negatively related to performance. Basic research particularly goes back to A.T. Welford, who compiled several approaches in 1973. These suggest that a stress-related decrease in motivation and arousal has an effect on performance. According to the model (Inverted-U-Hypothesis, cf. Welford, 1973) both a too low and a too high arousal level (= perceived stress) have a negative effect on

performance. Stansfeld, Rasul, Head, and Singleton (2009), who dealt with executives, were also able to prove that the latter are exposed to the highest risk of psychological problems compared to all other groups (N = 5,497), which also results in performance losses. Clear founder-specific research has not yet been carried out.

According to the above findings, it can be assumed that the perception of stress also has a direct negative effect on the performance of founders. The Hypothesis is therefore as follows:

Hypothesis 3 (H3). Founders' individual perception of stress correlates negatively with their professional performance.

3.3.2. Satisfaction and performance

Satisfaction and performance show a continuous development over the decades. While some earlier studies cannot prove any correlation at all (Brayfield and Crockett, 1955), the importance of satisfaction increases over time. In later studies, direct correlations were increasingly demonstrated. Thus, the meta-analysis of Judge et al. (2001) shows an average correlation between job satisfaction and work performance of .30 with a total of 312 samples. Ziegler, Hagen, and Diehl (2012) confirm this and extend the correlation by the moderating role of job ambivalence.

Nevertheless, previous research has almost completely ignored founders as a relevant group. Only Daily and Near (1999) took on a comparable research question. Although they were unable to establish a link between satisfaction and company performance (in the case of family businesses), they did not consider the performance of the founder himself. Our study therefore represents a new approach that can add an important facet to this discussion. We assume:

Hypothesis 4 (H4). Founders' satisfaction correlates positively with their professional performance.

3.3.3. Stress and satisfaction

To complete the triangular relationship within the construct of professional probation, we investigate the direct relationship between stress and satisfaction in Hypothesis 5. So far, this has mainly been considered in a moderating form and it has been demonstrated, for example, that stress influences the relationship between interpersonal trust and satisfaction (Guinot et al., 2014) or work environment and satisfaction (Hayes et al., 2013) as a moderator. However, direct dependency was not part of these studies. If we take the literature-based Hypotheses 3 (stress reduces performance) and 4 (satisfaction increases performance) as a ground, however, it can be assumed that stress could also directly lead to reduced satisfaction.

Hypothesis 5 (H5). Founders' individual perception of stress correlates negatively with their satisfaction.

4. Method

To approach the objective of the study adequately, an extensive literature research focussing on existing studies of founder personality and performance was conducted. Based on these findings the proper Hypothesis for the present analysis could be identified as described in chapter 3. Hereafter the needed predictors and criteria were integrated into the questionnaire and the main features for the samples of the respondents were identified. The questionnaire, participants and measurements are described in the following.

4.1. Participants and procedure

In order to test the Hypotheses, a questionnaire study was carried out with almost 2,000 managers and founders on competence characteristics and performance criteria. The employed questionnaire was prepared by a research group in the project APPLIED - "Analysis and Prediction of Performance of Leaders, Innovators and Entrepreneurs in the Digital Age"

at BSP Berlin based on empirical findings and practical framework conditions, and covers a wide range of personal, performance-related, and organizational data. In accordance with the guidelines of the institution, no ethical approval is required for anonymous questionnaire studies. The survey of the sample lasted two months from April to June 2018 and took place in the German language area (Germany, Austria, Switzerland). The participants were recruited with the help of personal contacts, via e-mail and via common social networks. As an incentive to participate, all participants had the opportunity to receive the results of the study.

A total of 1,968 managers from all hierarchical levels took part in the survey. The comparatively high drop-out rate of about 44 percent can be explained by the size and complexity of the questionnaire and reduces the number of complete datasets to 1,101. The company founders were extracted from the general managers for use in this study. All other managers were not included. The final sample of this study comprises 141 founders with a broad cross-industry background. As shown in Table 1, the mean age of the 141 founders was 47 years (SD = 12.5). . On average, the founders' companies have existed since 2006, the oldest being founded in 1971 and the newest in 2018.

4.2. Measures

4.2.1. Personality traits

The measurement of personality traits (Big Five) was carried out using the Big-Five-Inventory-10 short form according to Rammstedt and John (2007). The test is a short version of the more detailed Big Five Inventory and contains ten items (two per trait). The processing time is about 1 min (ibid.), which guarantees an efficient, practical recording. The inventory was standardized in 2007 with N = 2,569 participants for the German area and has a satisfactory retest-reliability of .73 - especially considering the short handling time. A discussion regarding the advantages and disadvantages of this strongly condensed test procedure is necessary and is carried out in the implications.

4.2.2. Performance

The measurement of performance is carried out by the founder himself through presentable goals (performance results) and the associated degree of their achievement. The performance results given by the participants could be freely entered and cover an extremely wide range of areas, but are not decisive for the analysis. Rather, the focus is on the subsequent achievement of the respective performance results (in percent), which must be stated, so that direct conclusions can be drawn about the success in achieving the previously self-defined goals. In addition, the general achievement of goals (also in percent) to be stated by the respondent is also recorded. Before the analysis, a total score of the performance is calculated as an index (mean value of all specified performance results).

The recording of performance over several freely selectable performance results enables a broader representation of this construct, which is generally difficult to evaluate, and can also make qualitative goals measurable beyond the usually recorded quantitative turnover or sales figures by means of one's own assessment of goal achievement. This is particularly relevant for the target group of founders, as they usually do not establish concrete goal agreements and face a multitude of challenges and performance requirements on a daily basis. Nevertheless, a lower number of usable datasets was to be expected for the calculations with performance as the criterion, since not all participants gave concrete performance results (alternative answer possibilities were for example to not know the performance results or to have set oneself no performance results as a goal). Thus 111 of the 141 datasets are still available for the calculations of the MLR with performance. Therefore 30 founders did not provide information on the performance indicator. To explain the missing data, a probit model with age and gender of the founders and the firm age was conducted. The results are not significant ($\chi^2 = 1.23$; p = .75), accordingly no variable is clearly causing missing data. The mean

Table 1. Descriptive statistics of the sample.

	n	Min	Max	M	SD
Age	141	21	77	47.0	12.5
Founding year	141	1971	2018	2006	10.4
Index performance	111	5	175	85.5	27.1
Index perceived stress	141	1.0	5.6	3.2	1.0
Index satisfaction	141	1.0	6.0	4.9	1.0
Gender		-	-	-	-
Female	30				
Male	111				

Notes: N = Sample size; Min = Minimum, Max = Maximum, M = Mean, SD = Standard Deviation.
Source: author's own calculation, based on SPSS software.

goal achievement throughout the 111 founders was 85.5 percent (median = 90, SD = 26,9, min = 5, max = 175).

4.2.3. Perceived stress

The founders' individual perception of stress was recorded via five items on stress criteria in the professional context. Participants were asked to assess their current personal stress perception in relation to their activities, their role as founders, their overall professional situation, and their task-oriented and employee-oriented performance on a six-point scale from 1 (very low) to 6 (very high). In order to ensure the robustness of the variable, an index is formed from the items before the analysis (mean across all assessments). By combining the items into an index, the quality of the variable is significantly improved, as the index is able to represent the widely diversified construct more comprehensively and thus increases its significance. Moreover, the index variable is scaled metrically and therefore usable for regression analyses (Wu and Leung, 2017).

4.2.4. Satisfaction

Satisfaction was recorded and analyzed using the same five items (the founder's current satisfaction with regard to activities and role, professional situation, task-oriented and employee-oriented performance) and based on the same six-point scale, analogous to the perception of stress. The mean of all assessments was used as an index of job satisfaction. In order to be able to exclude any strong outliers in the data, a box plot analysis was performed for all variables used. While stress, performance and personality traits had no relevant outliers, three extreme outliers were removed from the satisfaction index.

5. Results

5.1. Intercorrelations and reliabilities

The intercorrelations of all variables considered are presented in Table 2. For the self-developed scales (performance, stress, and

satisfaction) the internal consistencies were calculated on the basis of Cronbach's alpha. The indices of stress (.90) and satisfaction (.89) recorded via five items were as good as the performance index (.86) recorded via the performance results. The re-test reliability of the employed personality test (BFI-10) given by the authors is .73 (Rammstedt and John, 2007).

When considering the bivariate correlations, it becomes evident that, in addition to the variables examined, the personality traits also show high intercorrelations among themselves. Thus, all personality traits correlate moderately to strongly positively with emotional stability. This methodological weakness can presumably be traced back to the short test version used and is considered in the discussion. In addition, the intercorrelations give first indications for the relationships postulated in the Hypotheses. Thus, emotional stability correlates with all three criteria considered (performance r = .49, p < .01, perceived stress r = -.30, p < .01, and satisfaction r = .20, p < .05). While perceived stress has no further correlations with personality traits, performance correlates with extraversion (r = .37, p < .01), conscientiousness (r = .48, <.01), and openness (r = .26, p < .01). In addition to emotional stability, satisfaction shows correlations with extraversion (r = .21, p < .05) and conscientiousness (r = .25, p < .01).

Intercorrelations also become evident when considering the criteria among themselves. As expected, perceived stress and performance correlate negatively (r = -.19, p < .05), while satisfaction and performance correlate positively (r = .26, p < .01).

5.2. Regression analyses

To examine the Hypotheses, multiple linear regression analyses (MLR) will be used. The pre-requisite tests showed sufficient fulfillment of the requirements to calculate MLR's. To interpret the results, we primarily use the semi-partial correlation (r_{semi}) as there is always a correlation within the predictors which effects the correlation between predictor and criterion. The more the predictor variables intercorrelate, the higher the distortion of the beta correlation. The semi-partial

Table 2. Intercorrelations of the study variables.

Variable	1	2	3	4	5	6	7	8
1. Extraversion								
2. conscientiousness	.50**							
3. Openness	.30**	.34**						
4. Agreeableness	.05	.08	.17*					
5. E. Stability	.55**	.64**	.37**	.23**				
6. Stress	-.13	-.04	-.10	-.13	-.30**	(.90)		
7. Performance	.37**	.48**	.26**	.15	.49**	-.19*	(.86)	
8. Satisfaction	.21*	.25**	.04	-.03	.20*	-.11	.26**	(.89)

Notes: N = 141. Reliabilities (Cronbach's α) of the own variables are found in the diagonal. *p ≤ .05, **p ≤ .01; two-tailed significances; Source: author's own calculation, based on SPSS software.

correlation corrects this problem by explaining only the new variance in the criterion. Hypotheses 1a-d predict positive relationships between the personality traits conscientiousness (H1a), emotional stability (H14b), extraversion (H1c), and openness (H1d) with the performance of founders. The first model of hierarchical MLR is shown in Table 3. This model is used for Hypothesis testing. There is a clear, significant explanation of variance in the model ($\Delta R^2 = .28$; $F_{(4.106)} = 10.19$; $p < .001$). For the individual traits, there are significant correlations for conscientiousness ($r_{semi} = .17$, $p < .05$) and emotional stability ($r_{semi} = .17$, $p < .05$). The hypotheses H1a and H1b can therefore be accepted.

In contrast, extraversion ($r_{semi} = .05$, $p = .55$) and openness ($r_{semi} = .04$, $p = .65$) of founders correlate only weakly and not significantly with their performance. The Hypotheses H1c and H1d must therefore be rejected. Model 2 (agreeableness as exploratory personality trait) and model 3 (age and gender as control variables) show no significant results. Moreover, firm age and performance, tested in model 4, correlates significantly ($r_{semi} = .16$; $p < .05$) with 2.9 percent additionally explained variance ($\Delta R^2 = .029$; $F_{(1,102)} = 4.29$; $p < .05$).

In four additional Hypotheses (H2a-c and H2d) we investigate the relationships between personality traits and perceived stress of founders. On the basis of previous research, a negative correlation was assumed for emotional stability (H2a), extraversion (H2b), and agreeableness (H2c), whereas a positive correlation was assumed for conscientiousness (H2d). Table 4 shows the first regression model. A significant explanation of the variance of perceived stress as the criterion could be demonstrated ($\Delta R^2 = .132$; $F_{(4,136)} = 5.18$; $p < .001$). The results show that there is a significantly negative correlation between emotional stability and perceived stress ($r_{semi} = -.32$, $p < .01$). Hypotheses H2a can thus be accepted. Extraversion ($r_{semi} = -.01$, $p = .91$) and agreeableness ($r_{semi} = -.04$, $p = .62$), however, have no relation to the founders' perceived stress Hypothesis H2b and H2c must therefore be rejected.

Finally, we assumed a positive correlation between conscientiousness and perceived stress (H2d). This trend is again confirmed, the results show a significant correlation ($r_{semi} = .20$, $p < .05$), which is why H2d can be accepted. Moreover, no significant results could be obtained in the analysis of the missing personality trait (openness, model 2) and of the control variables (model 3 age and gender, model 4 firm age).

The last three Hypotheses examine the relationships within the criteria of professional probation. The MLR for the criterion performance with the predictors stress (Hypothesis 3) and satisfaction (Hypothesis 4) are shown in Table 5. In both models there is a significant explanation of variance. Accordingly, 3.5 percent of the variance in performance can be explained by perceived stress ($\Delta R^2 = .035$; $F_{(1,109)} = 3.96$; $p < .05$) and a further 5.6 percent by satisfaction ($\Delta R^2 = .056$; $F_{(1,108)} = 6.601$; $p < .05$). It is also evident that there is a significantly negative correlation between perceived stress and performance ($r_{semi} = -.19$, $p < .05$), and a significantly positive correlation between satisfaction and performance ($r_{semi} = .24$, $p < .05$). This corresponds to the correlations postulated in Hypothesis 3 and Hypothesis 4. Control variables (model 3 age, gender and model 4 firm age) show no significant correlations.

Following on from the negative correlation between stress and performance and the positive correlation between satisfaction and performance, we assumed a direct, significantly negative correlation between

stress and satisfaction in Hypothesis 5. Although a negative tendency is detectable, this assumption is not confirmed (shown in Table 6), since no significant results are obtained ($r_{semi} = -.11$, $p = .189$). Hypothesis 5 must therefore be rejected. Furthermore, there is no significant explanation of variance in the model ($\Delta R^2 = .012$; $F_{(1,139)} = 1.74$; $p = .189$).

6. Discussion

With the growing economic importance of start-ups, research has increasingly turned to the topic of entrepreneurship and tried to empirically investigate and prove the numerous predictors of the performance of founders and the success of start-ups. The research questions addressed in our study make an important contribution to this.

The study aimed at investigating the relationships between the personality traits of company founders and important success factors such as their performance, perceived stress, and satisfaction. The results should prove that a more targeted diagnosis of the personality traits of founders as an important predictor apart from the business plan is meaningful and necessary for the success of an investment.

Several significant correlations could be identified. The founder's performance, which was at the core of our study, correlated significantly positively with the personality traits conscientiousness and emotional stability as well as with the firm age (control variable), while perceived stress correlated significantly negatively with emotional stability and positively with conscientiousness. The magnitudes of the significant correlations are stable and fit previous investigations (e.g. Zhao et al., 2010). Within the criteria of professional probation, two of three correlations were confirmed. Performance was negatively correlated with perceived stress and positively correlated with satisfaction at noticeable effect sizes.

The findings thus confirm previous studies that identify personality as a relevant factor influencing performance (Barrick and Mount, 1991; Salgado, 1997) and perceived stress (Bolger, 1990; Sur and Ng, 2014) across all occupational groups and confirm them for the increasingly important group of founders. In addition, it is proven that the consideration of the founders' personality as a predictor of their performance (and their perceived stress) is worthwhile and should be taken into account by investors when assessing a start-up (see practical implications) as well as when further analyzing the causes of company successes. Our findings show that there is a clear mandate for research into the continuation, improvement, and deepening of founder diagnostics and that, in the long run, a personality test needs to be developed with which the personality traits relevant to success can be specifically assessed.

While previous studies on the selection criteria of investors (e.g., Franke et al., 2004) have largely ignored personality and existing studies on the personality of founders (e.g., Zhao and Seibert, 2006; Rauch and Frese, 2007; Zhao et al., 2010) exclude investors as important stakeholders, we have succeeded in combining the interests of both sides through the efficient survey of personality and the well-founded measurement of quantitative and qualitative performance in the study. This requires the use of a resource-conserving measurement method, the suitability of which must also be discussed.

Table 3. Results of the multiple linear regression analysis: performance as criterion, personality traits as predictors.

Model 1	B	SE B	β	r_{semi}	p
(Absolute term)	19,738				
Conscientiousness	3.502	1.692	.26*	.17*	.041
Emotional Stability	4.160	2.000	.26*	.17*	.040
Extraversion	.966	1.615	.06	.05	.551
Openness	.793	1.764	.04	.04	.654

Notes: N = 111, *p ≤ .05; **p ≤ .01, two-tailed significances; $R^2 = .278$; $F(4,106) = 10.19$; $p = .000$; ($R^2_{adj.} = .250$). Source: author's own calculation, based on SPSS software.

Table 4. Results of the multiple linear regression analysis: perceived stress as criterion, personality traits as predictors.

Model 1	B	SE B	β	r_{semi}	p
(Absolute term)	4,362				
Emotional Stability	-.292	.074	-.45**	-.32**	.000
Extraversion	-.007	.060	-.01	-.01	.906
Agreeableness	-.039	.080	-.04	-.04	.624
Conscientiousness	.156	.064	.26*	.20*	.015

Notes: N = 141, *p ≤ .05; **p ≤ .01, two-tailed significances; R^2 = .132; $F_{(4,136)}$ = 5.18; p = .000; ($R^2_{adj.}$ = .107). Source: author's own calculation, based on SPSS software.

Table 5. Results of the multiple linear regression analysis: performance as criterion, perceived stress and satisfaction as predictors.

Model		B	SE B	β	r_{semi}	p
1	(Absolute term)	100.302				
	Perceived Stress Index	-4.680	2.352	-.19*	-.19*	.049
2	(Absolute term)	64.934				
	Perceived Stress Index	-3.948	2.311	-.16	-.16	.090
	Satisfaction Index	6.704	2.609	.24*	.24*	.012

Notes: N = 111, *p ≤ .05; **p ≤ .01, two-tailed significances; model 1: R^2 = .174; $F_{(1,107)}$ = 3.355; p = .035 ($R^2_{adj.}$ = .021); model 2: R^2 = .132; $F_{(1,106)}$ = 12,451; p = .001; ($R^2_{adj.}$ = .116). Source: author's own calculation, based on SPSS software.

Table 6. Results of the linear regression analysis: satisfaction as criterion, perceived stress as predictor.

Model 1	B	SE B	β	r_{semi}	p
(Absolute term)	5.221				
Perceived Stress Index	-.108	.082	-.11	-.11	.189

Notes: N = 141, *p ≤ .05; **p ≤ .01, two-tailed significances; R^2 = .012; $F_{(1,139)}$ = 1.74; p = .095; ($R^2_{adj.}$ = .005). Source: author's own calculation, based on SPSS software.

6.1. Methodological implications

In addition to content-related implications, the methodological findings regarding the suitability of the BFI-10 short form by Rammstedt and John (2007) for recording personality traits are also of relevance for research. It must be noted that a large number of validated aptitude diagnostic procedures are available for the assessment of personality. However, the vast majority of these instruments are complex and expensive - for both researchers and companies. This is of particular importance in the previously neglected field of founder diagnostics. Investors in particular would be dependent on a fast and efficient procedure if they wanted to take the founder's personality into account in their investment decisions. A detailed personality test would not only cause additional costs but would also be a time-consuming and logistical effort that should not be underestimated in the context of the already extensive investment review process (Schefczyk, 2006). The advantages of short scales are thus obvious. The applied Big-Five-Inventory-10 can be completely answered within about 1 min and analyzed just as quickly. It is therefore extremely resource-saving, efficient, and practical.

Nevertheless, short scales remain controversial with regard to their validity and meaningfulness. Since each personality trait is captured by only two items, the complex construct of personality cannot be represented in its entirety by the short scale, but only as tendencies. The lack of a differentiated assessment of the personality can have an effect on the correlations to be determined. If it can be proven in advance that there are constant, unambiguous correlations between personality traits and the success or performance of founders, as our study contributes, a detailed analysis of all personality facets would not be absolutely necessary. Thus, already rough tendencies (as the BFI-10 indicates) could supply valuable knowledge, which can be used as an evaluation criterion of investors as well as a starting point for a suitable coaching of the

founders. Since a large number of other variables (the criteria used in this study, demographic variables, and other work-related factors) were recorded alongside the personality traits in our questionnaire, the BFI-10's handling effort also corresponds to the methodological conditions for assessing personality traits in business practice. Short scales could therefore be a compromise, especially for investors and founders, between the meaningful assessment of personality beyond gut feeling as an unequivocally relevant influencing factor on the one hand and a limited amount of time and money spent on Due Diligence on the other.

6.2. Practical implications

Beyond the value of scientific knowledge, the obtained results thus provide valuable practical implications. The analyses show that there are significant correlations between the personality traits and the performance of a founder. The effects found (.26 for conscientiousness and emotional stability) clearly go beyond a negligible context and the measurement methods used for robust indices with a combination of several items also contribute to the fact that the results can be classified as significant beyond the boundaries of science. In future, personality must therefore be considered as a meaningful criterion in the assessment of companies and founders.

Since unstructured procedures have proven to be inappropriate in every selection context (Nachtwei and Schermuly, 2009), it is not sufficient to assess personality solely on the basis of subjective evaluations. Rather, a sound procedure must be used that is capable of validly assessing personality traits.

At the same time, investors in particular are dependent on using an economic, resource-efficient procedure that does not burden the already extensive selection process any further. Thus, every employee of a VC company already has to assess around 100 business plans per year in the

rough check (Röhr, 2018). Around 20 percent of the founders are finally invited to a personal pitch (Franke et al., 2004). For larger VC companies, this adds up to up to 400 live pitches per year.

Our analyses show that it is not absolutely necessary to use a fully comprehensive, complex, and expensive measuring instrument in practical applications, but that tendencies can be derived with little effort that allow conclusions to be drawn about the manifestations of the most important personality traits. An efficient test procedure can be easily integrated into the existing investment review process.

Additional relationships that have been identified also permit important practical conclusions to be drawn. In particular, the negative correlation between perceived stress and performance opens up an important new perspective on the relationship between founder and investor. While stress is increasingly recognized as a strain and a threat to health (Semmer and Meier, 2009), it is still part of founders' everyday lives. Founders are under constant strain due to their own demands but also due to the expectations and requirements of investors. Our results show that too much stress no longer has a positive effect but reduces the founders' efficiency. It is therefore crucial for investors to find a balance and to not entirely pass on their own pressure for success to the founders in the portfolio. In addition, these recommendations can be supported by the positive relationship between satisfaction and performance. This illustrates that personal satisfaction is ultimately a success factor, even for founders, and must therefore not be ignored by investors.

6.3. Limitations and future research

The design of the conducted study shows methodological as well as content-related limitations.

First of all, it should be noted that the employed questionnaire is a survey instrument specially developed by the APPLIED research group based on empirical findings and practical circumstances. This method has some advantages over previous studies. For example, the recording of the empirically founded and yet standardized data is carried out in real entrepreneurial practice with a broad sample of founders and not under laboratory conditions.

At the same time, in addition to the integration of existing, validated scales (BFI-10), new, previously unvalidated scales and indices without a norm sample were used, which means that the quality criteria cannot always be perfectly reconstructed. Following on from this, it should be noted that indices were created for all three investigated criteria (performance, perceived stress, satisfaction) according to a previously defined pattern. Even if the calculated internal consistencies are very good (Cronbach's Alpha between .86 and .90), it is not possible to determine to what extent a different composition (e.g., through a weighted index) or a completely separate consideration of individual aspects would have influenced or changed the results. In methodological terms, the recording of performance over several performance results to be stated by the subjects themselves and the associated degree of goal achievement offers great potential compared to the frequently encountered, simple recording of overall goal achievement over a single item. Thus, performance was recorded methodically correct under real conditions and yet broadly diversified. The presentation as an index of individual performance results enables a broader spectrum of different (quantitative and qualitative) goals to be taken into account beyond the simple achievement of sales targets. The concrete goals stated by the founders range from enhancing a wide variety of business ratios to qualitative goals like increasing quality, employee-related goals, such as further training and value culture, to individual founder goals, such as a higher income or individual development.

Despite the optimized recording, however, it is still not possible to assume that the performance will be recorded in full, as founders in particular face a multitude of challenges every day that cannot be completely recorded within the scope of the (up to) five comparatively spontaneously stated performance results. Moreover, it should be noted that the individual difficulty of the goals varies, and a subjective

character remains. This may affect the comparability. The starting point for future investigations can thus be the comparison of the employed methods and calculated indices with conventional methods of performance recording as well as the standardization of the measurement methods and items used. Furthermore, the sample size of the present study is sufficient to show valid results, however, the findings should be substantiated in further studies with a larger sample size. Also moderating factors, which are not examined in the present study, due to its cross-sectional design, should be taken into account.

Contentwise, it should be critically noted that no consideration is given to external assessments, as recommended generally (Schuler, 2014). In addition, the personality is described in the present paper exclusively through the entirety of the Big Five traits. Although the Big Five form the most recognized and most frequently used personality model, are often replicated, and are validated in various cultural circles (Costa and McCrae, 1992), they are also viewed critically in the literature (e.g., Barrick and Mount, 1991). In order to establish valid aptitude diagnostics for founders, the aim of further investigations must be to determine which personality traits outside the Big Five contribute to the variance explanation of success and performance in founders and how these can be recorded and analyzed. It should be mentioned in excerpts that comparable studies show that performance motivation and risk appetite (Uedelhoven et al., 2016), locus of control (Rauch and Frese, 2007) or ambiguity tolerance (Herman et al., 2010), among others, seem promising.

7. Conclusion

Overall, it can be concluded that the importance of the personality as a promising and important predictor for the performance of the founder and the success of the company has been confirmed by our study. This leads to an explicit mandate for both further research and entrepreneurial practice to recognize the founder's personality as a relevant criterion for the success of a company, to collect it with valid procedures beyond gut feeling, and to consider it as a decision parameter in the selection process.

Declarations

Author contribution statement

L. Fichter: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

C. Von Bernstorff: Conceived and designed the experiments; Performed the experiments.

S. Rohrmann: Conceived and designed the experiments.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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