



Using digital footprints in entrepreneurship research: A Twitter-based personality analysis of superstar entrepreneurs and managers



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ABSTRACT

Research indicates that individuals' digital footprints, for example in Twitter and Facebook, can reveal remarkably valid information about their personality characteristics. In this study, we use digital footprints to gain insights into the personality of superstar entrepreneurs and managers, a largely understudied population in entrepreneurship research. Specifically, we compare the personality characteristics of 106 of the most influential business leaders employing a computerized text analysis tool based on the individuals' Twitter messages (Receptiviti). Our findings are surprising and indicate that superstar managers are more entrepreneurial in many personality characteristics than superstar entrepreneurs. However, we also found some indications that superstar entrepreneurs seem to show features of a classic "Schumpeterian" entrepreneurial personality with respect to being creative, independent rule-breakers.

1. Introduction

The personality approach is often considered the classic approach in the study of the individual entrepreneur (Hisrich et al., 2007; Schumpeter, 1934). Empirical research has broadly confirmed that a focus on personality characteristics indeed helps to better understand the entrepreneurial mindset (Hisrich et al., 2007; Rauch and Frese, 2007). This follows the general notion in psychological personality research demonstrating the wide-ranging relevance of inter-individual personality differences in explaining differences in human behavior and developmental outcomes, including those in the context of work (Barrick and Mount, 1991; Roberts et al., 2007). When researching the entrepreneurial personality, a topic of particular interest is how entrepreneurs differ from managers (e.g., Stewart and Roth, 2001; Zhao and Seibert, 2006; Brandstätter, 2011).

Existing research on the personality characteristics of entrepreneurs is largely based on subjective self-reports, collected via paper-pencil or online questionnaires. Often, it is also based on surveys of "average" entrepreneurs (i.e., the everyday entrepreneurs within a small business context). In contrast, personality research on highly successful and influential entrepreneurs and managers is rare and often based on anecdotal evidence or case studies (e.g., Isaacson, 2011). This is because it is seldom possible to employ traditional questionnaires to such a prestigious group. However, because these individuals belong to the category of most influential and powerful business leaders, this group of *superstar* entrepreneurs and managers is a particularly interesting research subject (e.g., Baumol et al., 2009; Malmendier and Tate, 2009).

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Recently, a new opportunity emerged that allows an assessment of the personalities of these individuals: digital footprints such as social network sites like Facebook or Twitter. Here, superstar entrepreneurs and managers willingly and voluntarily publish (personal) information to the wider public, thus leaving digital footprints available for research purposes (e.g., Lee et al., 2017). In this study, we apply a new method of personality assessment that is based on a comprehensive language analysis to examine personality characteristics of superstar entrepreneurs and managers. Such online methods have been proven to be important sources in the study of personality traits that can deliver remarkably (and often surprisingly) accurate information about actual personality features (Back et al., 2010; Boyd and Pennebaker, 2015; Kosinski et al., 2013; Yarkoni, 2010). We use a new tool that is designed explicitly to measure personality features of individuals via their language on Twitter (Receptiviti).

This study has two goals. First, we want to gain new insights into the personality features of highly successful superstar entrepreneurs and managers, a hitherto understudied population in entrepreneurship research. In particular, we use univariate and multivariate analyses to empirically assess differences between superstar entrepreneurs and managers across different personality characteristics that have been associated with entrepreneurs in prior research. Second, we want to introduce a new way to assess personality differences in entrepreneurship research by employing a computerized language-based personality assessment tool that analyzes digital footprints.

2. Conceptual framework

2.1. Previous research on the personality of entrepreneurs (vs. managers)

Consistent with a system-approach to personality (McCrae and Costa, 2008), an individual's personality comprises different sets of personality characteristics, such as traits (e.g., the Big Five traits as the leading and best-researched model of personality traits, Digman, 1990) and characteristic adaptations (e.g., skills, orientations, and socio-emotional styles) (see also Obschonka and Stuetzer, *this issue*). We thus focus on personality characteristics related to both aspects, traits and characteristic adaptations. Specifically, we focus on four sets of personality characteristics that previous research has linked to entrepreneurship (i.e., Big Five, achievement-orientation, social style, well-being). In the following, we describe the personality characteristics that we examine in this study, and discuss existing findings from the literature.

2.1.1. Big Five

The Big Five traits comprise Openness (being open to new ideas and new experiences), Extraversion (feeling energized and uplifted when interacting with others or engaging in activity), Conscientiousness (being reliable), Agreeableness (inclined to please others), and Neuroticism (expressing strong negative emotions). Existing meta-analyses describe differences between managers and entrepreneurs with regard to the Big Five. For example, Zhao and Seibert (2006) show that entrepreneurs score higher in Conscientiousness and Openness while scoring lower in Agreeableness and Neuroticism than managers. The results for Extraversion are insignificant. Similar results are obtained by Zhao et al. (2010), who also show that entrepreneurs score higher in terms of Extraversion than managers.

2.1.2. Achievement-orientation

Achievement-orientation, which can be understood as a characteristic adaptation, has been well studied in previous entrepreneurship research. For example, McClelland (1961) argues that individuals with a higher need-for-achievement prefer tasks that require more skill, provide clear performance feedback, and are more challenging. Because these characteristics often refer to entrepreneurial jobs, McClelland (1961) suggests a link between high achievement-orientation and entrepreneurship. This link has been consistently well documented in previous research, which shows that in terms of individual achievement-orientation (e.g., need-for-achievement) entrepreneurs are often higher than others (e.g., Collins et al., 2004; Stewart and Roth, 2001). In their meta-analysis, Stewart and Roth (2001) show that this is particularly true when comparing managers to entrepreneurs.

2.1.3. Social style

Another stream of research indicates that entrepreneurs have better social skills than others (e.g., Baron, 2000; Obschonka et al., 2012). This is because entrepreneurs need to rely on very good social skills in their daily work as entrepreneurial tasks often require perspective-taking, convincing others, leading employees, or evaluating opportunities within a social setting. Hence, the third group of variables addresses the social style exhibited by the entrepreneurs and managers. Social style can be considered a characteristic adaptation that typifies an individual's psychological orientation towards others (see also Wiggins et al., 1989).

2.1.4. Well-being

Finally, we consider individuals' socio-emotional styles. Studies in psychology and entrepreneurship have suggested that emotions and concerns play an important role in individuals' cognition and behavior (e.g., Grégoire et al., 2015; Shepherd, 2003). Previous research indicates that entrepreneurs tend to have a high well-being (e.g., Cardon et al., 2012). For example, Bradley and Roberts (2004) have connected self-employment to higher job satisfaction, leading to more happiness and excitement, and lower levels of depression. Similarly, Patzelt and Shepherd (2011) and Tata et al. (2017) show that entrepreneurs experience more positive and less

negative emotions than the general population. Finally, there is research indicating that entrepreneurs enjoy more job satisfaction than others (Benz and Frey, 2008).

2.2. The present study: expectations on group differences in personality characteristics

We expect to find similar differences between superstar entrepreneurs and superstar managers as we would if focusing on the differences between entrepreneurs and managers in the general population. We have no a-priori assumptions leading us to assume that the personality of superstar entrepreneurs is *fundamentally* different from the personality of “average” entrepreneurs in the general population. If at all, the entrepreneurial personality of superstar entrepreneurs might be even *more* pronounced because it could have been a contributor to their extraordinary success. We thus expect superstar entrepreneurs, compared to superstar managers, to show a more pronounced entrepreneurial personality structure at the Big Five level (i.e., higher scores in Extraversion, Conscientiousness, Openness, and lower scores in Agreeableness and Neuroticism). We also expect superstar entrepreneurs to score higher in terms of achievement-orientation, social skills, and psychological well-being than superstar managers. In other words, we assume that *superstar* entrepreneurs should also show a more entrepreneurial pattern in their (online) personality than *superstar* managers.

3. Method, data, and variables

3.1. Method: language-based personality assessment tools (Receptiviti and LIWC)

Today, it is possible to analyze large amounts of text in an efficient and effective, computer-based way. The most established software to assess language and text for psychological purposes is the software Linguistic Inquiry and Word Count (LIWC) (e.g., Pennebaker et al., 2015). The more than 80 language categories included in LIWC have been empirically linked to such diverse psychological processes as status, dominance, social relationships, and emotionality (Tausczik and Pennebaker, 2010).

In this study, we analyze Tweets using Receptiviti (www.receptiviti.ai). Receptiviti is the commercial variant of the LIWC text analysis platform and quantifies language samples along a large number of psychological metrics using a “top-down” language analysis approach. The Receptiviti platform provides all measures generated by the academic LIWC application as well as several “composite” personality measures, such as thinking styles, social orientations, and so on (Pennebaker et al., 2015). The Receptiviti-specific measures were derived from previous data and findings in past empirical work in the field of psychology. While the algorithms of many Receptiviti measures are proprietary, they have primarily been established incorporating widely-used and well-validated psychometric techniques and principles, including various multi-method approaches that combine standard machine learning procedures (e.g., Witten et al., 2011) with self-report, behavioral, and outcome data as well as domain expertise (Boyd, 2017). Additionally, Receptiviti cleans Tweets by removing language that can or should not be processed by LIWC, like hashtags, links to websites, and Re-Tweets.

We also took a closer look at the validity of Receptiviti by comparing it to traditional ways of assessing an individual’s personality characteristics. Yarkoni (2010) relates LIWC dimensions to the Big Five personality traits measured via well-established questionnaire items. We replicated Yarkoni’s (2010) analysis and related the same LIWC dimensions (which can also be obtained from Receptiviti) he used to the Big Five scores we obtained from Receptiviti. In total, we calculated the correlations of 40 LIWC dimensions with the Big Five. We then calculated the correlations between the results received by Yarkoni’s (2010) Big Five (measured via established questionnaires) and the Big Five values used in this study (measured via Receptiviti). We obtained high correlations (i.e., Openness = 0.65, Conscientiousness = 0.69, Extraversion = 0.40, Agreeableness = 0.66, Neuroticism = 0.78) that underline the validity of the measures used in this study in comparison to traditional, survey-based methods.

3.2. Data: identifying superstar entrepreneurs and managers

Our study targets the superstars among the entrepreneurs and managers. Arguably, one positive consequence of focusing on superstars is a reduction of interfering sample heterogeneity. According to Zhao and Seibert (2006), both managers and entrepreneurs belong to the same “enterprising” occupational category and all are superstars in the context of business as they achieved extraordinary success. Davidsson (2016), for example, recommends to focus on narrowly defined samples in such entrepreneurship research to avoid various types of problems arising from heterogeneous groups of individuals.

Nevertheless, identifying superstar entrepreneurs and managers is not an easy task because there is no common or frequently used data source. Thus, previous research in this area has largely drawn on existing lists and rankings by magazines or websites to identify superstars (e.g., Baumol et al., 2009; Lee et al., 2017; Malmendier and Tate, 2009). Often, individual wealth, wages, or working for a successful company is used as a proxy to identify successful individuals. Following in this tradition, we draw on multiple well established and previously used lists to identify our sample of superstar entrepreneurs and managers that use Twitter.

3.2.1. Forbes 400

First and foremost, we draw on the Forbes 400 2016 ranking, which lists the 400 wealthiest US Americans (Forbes, 2016a). The

Forbes 400 is a renowned and well-established data source for identifying wealthy individuals (which we use as an indicator for their success) and has frequently been used in previous research (e.g., Kaplan and Rauh, 2013; Klass et al., 2006). This list is generally acknowledged as displaying “extraordinary individual and entrepreneurial energy” and hence serves as a suitable identifier for superstars (Bernstein and Swan, 2007). The Forbes 400 not only includes information on wealth, but also on the source of the wealth, occupation, and whether the fortune was self-made. We were able to identify the Twitter accounts of 66 of the 400 individuals.

3.2.2. Forbes “America’s richest entrepreneurs under 40”

Because the Forbes 400 ranks individuals according to their wealth, older people are overrepresented. In the 2016 list, only 14 of 400 (= 3.5%) individuals are younger than 40 years. Therefore, we extended our sample by another ranking of Forbes, “America’s richest entrepreneurs under 40 2016” (Forbes, 2016b). This ranking includes the 40 wealthiest entrepreneurs under 40 years, who can also be characterized as superstars because they made considerable wealth in a very short time. It is constructed in the same way as the Forbes 400 ranking. In total, 37 out of the 40 individuals in this list had a Twitter account.

3.2.3. Fortune 500

Finally, we draw on the Fortune 500 list to identify further superstar managers (Fortune, 2016). The Fortune 500, which is published annually since 1990, is a worldwide ranking of companies according to their revenue. Because of this, their CEOs can be described as superstars because they are currently in charge of one of the 500 most successful companies worldwide. A similar approach is chosen by Lee et al. (2017). Also, the Fortune 500 ranking has been used very frequently in previous research (e.g., Feldman and Montgomery, 2015; Shleifer and Vishny, 1986). We were able to identify an additional 53 Twitter accounts, yielding a total sample of 156 Twitter accounts.

Next, we distinguish managers and entrepreneurs among the 156 identified. Thus, we construct a dummy variable that takes a value of 1 for entrepreneurs, and 0 for managers. Manually drawing on information available on every individual, we categorize an individual as an entrepreneur, if the person made their fortune mainly through founding a company or by gaining ownership of an existing company. Conversely, we categorize an individual as a manager, if the person was employed as the CEO of a Fortune 500 company, of which they did not found or gain ownership.¹

Our sample contains several wealthy individuals who we could not characterize based on this criterion. These individuals are included in the Forbes 400 list because of their wealth, but neither obtained their fortune in their own company, nor were the CEO of a Fortune 500 company. For example, our sample contained individuals who inherited most of their fortune. To identify these individuals, we rely on Forbes’ self-made score (Forbes, 2016a). We also exclude individuals who made their fortune outside of a business context (e.g., in sports or as actors). Also, we carefully checked for overlap between the three lists. Finally, Receptiviti requires a minimum of 300 words to generate meaningful results.

In total, we were thus required to exclude 50 accounts. This yielded a balanced final sample of 106 individuals with Twitter accounts whose Tweets we collected, out of which we categorized 57 as (superstar) entrepreneurs and 49 as (superstar) managers. We did not restrict our sample to a certain time frame and extracted all Tweets available in the given profile. In total, our sample consists of 215,252 words (average of 2031 words per individual).

3.3. Variables: personality characteristics and control variables

3.3.1. Personality characteristics

We focus on four different groups of personality characteristics. Receptiviti measures each of these groups using multiple variables, which are described in Table 1. Specifically, we use the Big Five personality traits to measure an individual’s basic personality traits. Next, we include a group of variables referring to the individual’s working style, which mirrors inter-individual differences in achievement-orientation. In industrial organizational settings, a working style includes one’s typical or preferred method of accomplishing work-related goals and thus directly reflects achievement orientation (e.g., Goh, 1991). We capture this dimension using the variables *power-driven*, *workhorses*, *independent* and *type-A*. The third group of variables addresses the social style exhibited by the entrepreneurs and managers. In this context, social style can be considered as the interpersonal personality characteristic which is operationalized by the variables *social skills*, *insecure*, *cold*, and *family orientation*. The final group of variables refers to well-being. This dimension largely deals with emotional reactivity and resilience, measuring affective personality characteristics from an individual’s language. It includes the variables *adjustment*, *happiness*, and *depression*. The Receptiviti measures occur on different scales. Therefore, the hypothetical minimum and maximum is also displayed in Table 1 for each variable.

3.3.2. Control variables

To test whether potential group differences in personality characteristics between superstar entrepreneurs and managers might be driven by additional variables, we consider a number of control variables. We hand-collected biographical information through web

¹ Because related research (e.g., Lee et al., 2017) often focusses on assessing founder CEOs and non-founder CEOs, we performed an additional analysis using this distinction. However, this reduces our sample by another 15 individuals (to N=91). This is because our sample includes entrepreneurs that founded a company without acting as its CEO. However, we think that these individuals can (and should) be characterized as superstar entrepreneurs. Examples include Nathan Belcharczyk (AirBNB), John Collision (Stripe), Dustin Moskovitz (Facebook), and Brian Acton (WhatsApp). In spite of this argument, we estimated our main model using the reduced sample of founder CEOs. The only statistically significant difference between both groups is in terms of the variable power driven. Like entrepreneurs (and in line with our main findings), founder-CEOs are characterized by a lower degree of power drive, contradicting the findings of previous research.

Table 1
Description of variables.

Variable	Description in Receptiviti (Measures the degree to which a person ...)	Mean	SD	Min.	Median	Max.
<i>Big Five</i>						
Openness	... is open to new ideas and new experiences.	2.212	1.001	−0.407 (−22.5)	2.084	5.782 (50)
Conscientiousness	... is reliable.	2.706	1.653	−0.916 (−32.5)	2.853	5.961 (50)
Extraversion	... feels energized and uplifted when interacting with others or engaging in activity.	4.977	1.653	0.794 (−38.75)	5.074	7.433 (46.25)
Agreeableness	... is inclined to please others.	1.770	1.892	−4.104 (−46.25)	1.997	4.905 (38.75)
Neuroticism	... expresses strong negative emotions.	2.344	2.564	−1.704 (−15)	2.181	9.083 (77.5)
<i>Achievement-orientation</i>						
Independent	... is a non-conformist.	−3.873	1.866	−9.730 (−22.5)	−4.002	2.515 (10)
Power driven	... is driven by the desire for power.	9.347	2.080	3.880 (−10)	9.406	13.100 (22.5)
Type A	... is driven and competitive, intolerant of setbacks.	9.988	1.843	1.855 (−5)	10.182	13.708 (27.5)
Workhorse	... has a strong work ethic vs. preference for leisure and non-work activity.	−0.738	2.043	−6.139 (−17.5)	−0.367	3.217 (7.5)
<i>Social style</i>						
Social skills	... feels at ease with others and is able to navigate social situations.	2.322	1.042	−0.610 (−5)	2.154	4.648 (7.5)
Insecure	... lacks confidence when dealing with others.	−1.064	1.544	−3.713 (−5)	−1.198	3.212 (10)
Cold	... is emotionally unresponsive and has difficulty empathizing with others.	−3.061	1.604	−6.008 (−7.5)	−3.321	1.521 (5)
Family orientation	... values and behaviors are rooted in their sense of family.	2.998	1.004	1.185 (−2.5)	2.797	6.985 (12.5)
<i>Well-being</i>						
Adjustment	... is grounded, able to maintain relationships, and establishes healthy life goals.	2.480	3.336	−5.234	3.247	8.081
Happiness	... is optimistic, upbeat, and happy.	7.721	2.655	0.110	7.732	12.640
Depression	... may have difficulty finding joy in their life.	−1.499	1.478	−4.528	−1.607	2.406

Notes: N = 106. The theoretical minimum and maximum values for every variable differ and are given in parentheses.

searches for each individual. Drawing on related literature (e.g., Dimov and Shepherd, 2005; Lee et al., 2017; Malmendier and Tate, 2009) we control for the individual's *age*, *gender*, *education*, and *tenure* (in years) as CEO or in the company that the individual founded. Because our sample includes individuals who are retired from their respective company (e.g., Bill Gates), we also include a dummy variable that captures whether they are still *active* or not. We control for this because one could argue that those highly successful individuals who are retired from the company they founded might show different scores in some personality characteristics (e.g., achievement-orientation or well-being) because they have a different lifestyle now.

Finally, we control for a set of variables at the Twitter level because we want to rule out effects due to a different usage of Twitter. While novel in the field of entrepreneurship, Twitter is used frequently in the field of computer sciences (e.g., Huberman et al., 2008; Kwak et al., 2010). This research has consistently used two key variables to characterize Twitter usage that we thus include as control variables: the number of followers (i.e., other people who subscribe to your account and receive your messages) and the number of Tweets (i.e., the messages a user posts on Twitter). Because of their skewness, we include the variables in logged form.

4. Analyses and results

4.1. Univariate analysis: *t*-tests

A univariate analysis is displayed in Table 2. We employ two-sided *t*-tests to examine the mean differences in personality characteristics between managers and entrepreneurs. Overall, we find highly significant differences between superstar entrepreneurs and managers for 12 out of 16 variables. This finding by itself indicates strong differences between both groups with regard to their personality assessed via Receptiviti.

4.1.1. Big Five

Managers show significantly higher values of Conscientiousness (3.54) than entrepreneurs (2.05). The effect size (Cohen's *d*) is also large (1.00). Effect sizes above 0.8 can be considered as large, while effect sizes above 1.2 indicate a very large effect (Cohen, 1988; Sawilowsky, 2009). Interestingly, we also find that managers present themselves as more extraverted. With a mean value of 5.99, the difference to entrepreneurs with a mean value of 4.17 is highly significant. Similarly, managers present themselves as more agreeable than entrepreneurs (2.89 for managers vs. 0.88 for entrepreneurs). The effect sizes for both Extraversion (1.30) and Agreeableness (1.25) are very large. Entrepreneurs score higher in the dimension Neuroticism (3.20 for entrepreneurs vs. 1.27 for managers), indicating that entrepreneurs are more likely to express negative emotions.

Table 2
Group differences between superstar managers and entrepreneurs.

	(0) Manager (N = 47)		(1) Entrepreneur (N = 59)		<i>t</i> -test: (1) – (0)	Cohen's d
	Mean	SD	Mean	SD		
<i>Big Five</i>						
Openness	2.141	0.769	2.268	1.157	0.127	0.127
Conscientiousness	3.535	1.449	2.045	1.510	−1.490 ^{***}	1.004
Extraversion	5.985	1.215	4.174	1.516	−1.810 ^{***}	1.301
Agreeableness	2.892	1.191	0.876	1.876	−2.016 ^{***}	1.253
Neuroticism	1.273	2.318	3.197	2.443	1.925 ^{***}	0.806
<i>Achievement-orientation</i>						
Independent	−3.817	1.979	−3.917	1.787	−0.101	0.538
Power driven	10.345	2.086	8.552	1.279	−1.793 ^{***}	0.950
Type A	9.898	1.789	10.059	1.897	0.161	0.087
Workhorse	0.215	1.621	−1.498	2.038	−1.713 ^{***}	0.918
<i>Social style</i>						
Social skills	2.869	0.758	1.885	1.036	−0.984 ^{***}	1.065
Insecure	−1.792	1.416	−0.485	1.398	1.307 ^{***}	0.930
Cold	−3.965	1.261	−2.341	1.487	1.623 ^{***}	1.167
Family orientation	3.128	1.062	2.894	0.952	−0.235	0.234
<i>Well-being</i>						
Adjustment	4.257	2.608	1.065	3.187	−3.192 ^{***}	1.084
Happiness	9.215	2.003	6.530	2.515	−2.685 ^{***}	1.166
Depression	−2.359	1.206	−0.813	1.313	1.546 ^{***}	1.221

Notes: * $p < 0.10$. ** $p < 0.05$.

*** $p < 0.01$.

4.1.2. Achievement-orientation

First, managers present themselves as more power-driven than entrepreneurs. With a mean value of 10.35, they score 1.79 points higher than entrepreneurs. The effect size is also large (0.95). Second, managers present themselves more as workhorses, which indicates that they have a strong work ethic as opposed to a preference for leisure and non-work activity. While previous research has indicated that entrepreneurs should be more achievement-driven, our results contract this notion by indicating that superstar managers, compared to superstar entrepreneurs, seem to be more driven towards achieving success in the workplace.

4.1.3. Social style

With a value of 2.87, managers score higher than entrepreneurs (1.89) in terms of social skills. Furthermore, entrepreneurs' personalities can be characterized as more insecure (−1.79 for managers vs. −0.49 for entrepreneurs) and colder than managers' (−3.97 for managers vs. −2.34 for entrepreneurs). This indicates that entrepreneurs can be described as less confident and emotionally unresponsive in contrast to managers. The effect sizes for those three effects are large (1.07, −0.93, and 1.17). We expected entrepreneurs to score higher with regard to their social style. Again, we find the opposite: managers exhibit a more social style.

4.1.4. Well-being

In contrast to previous research, the variables in this group indicate that managers have a higher well-being than entrepreneurs. Managers are more adjusted, which reflects that they are more grounded and have healthy life goals (4.26 for managers vs. 1.07 for entrepreneurs, effect size 1.08). Also, managers appear more happy and optimistic (9.22) than entrepreneurs (6.53) (effect size 1.17). Finally and in line with the other variables, managers present themselves as less depressed (−2.36) than entrepreneurs (−0.81) (effect size 1.22).

4.2. Multivariate analysis: logistic regression

To assess whether these effects persist when controlling for important demographic variables, we use a logistic regression to predict the likelihood of being a superstar entrepreneur vs. manager (Table 3). In addition, Table A1 (Appendix A) presents the zero-order correlations between the variables.

With regard to the Big Five, we find that Openness has a positive effect ($p < 0.05$) while Conscientiousness has a negative effect ($p < 0.05$) on the likelihood of being a superstar entrepreneur. While we saw no significant group differences in Openness in the univariate analysis, this regression analysis delivered the expected effect. In turn, the negative effect of Conscientiousness replicates

Table 3

Logistic regression (dependent variable: Entrepreneur 0/1).

Variable	Model 1 Logit (SE)	Model 2 Logit (SE)	Model 3 Logit (SE)	Model 4 Logit (SE)
Age	−0.058 (0.026)**	−0.045 (0.022)**	−0.044 (0.023)*	−0.055 (0.025)**
Gender (male)	1.747 (1.545)	2.644 (1.448)*	1.493 (1.415)	1.844 (1.457)
Education: MBA	−1.886 (0.846)**	−1.759 (0.761)**	(0.808)**	−1.572 (0.794)**
Education: Tec/Sci	−1.795 (0.881)**	−1.093 (0.750)	−1.218 (0.755)	−0.987 (0.768)
Education: Dropout	0.651 (1.184)	1.163 (1.118)	0.174 (0.979)	0.847 (1.048)
Active	1.383 (0.973)	0.569 (0.818)	1.474 (0.915)	1.267 (0.960)
Twitter: Followers (log.)	0.745 (0.194)***	0.674 (0.179)***	0.649 (0.171)***	0.648 (0.173)***
Twitter: Tweets (log.)	−0.636 (0.272)**	−0.354 (0.218)	−0.414 (0.220)*	−0.391 (0.225)*
<i>Big Five</i>				
Openness	1.191 (0.573)**			
Conscientiousness	−0.987 (0.432)**			
Extraversion	−0.410 (0.340)			
Agreeableness	−0.234 (0.401)			
Neuroticism	−0.060 (0.205)			
<i>Achievement-orientation</i>				
Independent		0.320 (0.176)*		
Power driven		−0.603 (0.207)***		
Type A		0.263 (0.211)		
Workhorse		−0.216 (0.224)		
<i>Social style</i>				
Social skills			−0.339 (0.405)	
Insecure			0.514 (0.294)*	
Cold			0.512 (0.370)	
Family orientation			−0.287 (0.373)	
<i>Well-being</i>				
Adjustment				−0.246 (0.191)
Happiness				−0.408 (0.186)**
Depression				0.255 (0.407)
Pseudo-R ² (Log likelihood)	0.529 (−34.257)	0.455 (−39.689)	0.473 (−38.338)	0.508 (−35.788)
Chi ² (sig.)	77.071***	66.208***	68.909***	74.010***

Notes: N = 106.

* p < 0.10.

** p < 0.05.

*** p < 0.01.

the univariate analysis that shows superstar entrepreneurs to score lower in this trait. Other than in the univariate analysis, the other Big Five traits do not show any significant effects.

With regard to achievement-orientation, we find that independence has a positive effect ($p < 0.1$), and being power-driven a negative effect ($p < 0.01$), on the likelihood of being a superstar entrepreneur. The positive effect of independence is in line with our expectations, even though the univariate assessment did not show significant group differences. However, the negative and significant effect of power-driven, which is consistent with our univariate analysis, is particularly counterintuitive because entrepreneurs are usually characterized by a higher achievement-orientation as represented by a higher pursuit of power.

With regard to social style we find that being insecure in social interaction has a negative effect on the likelihood of being a superstar entrepreneur ($p < 0.1$). This finding is consistent with the results of our univariate assessment. Again, this finding contradicts previous research that has underlines the fact that entrepreneurs are, in general, characterized by higher levels of social capabilities when dealing with others.

Finally, with regard to well-being the regression analysis reveals that happiness has a negative effect on the likelihood of being a superstar entrepreneur ($p < 0.05$). Again, this finding is in line with our univariate analysis but largely contradicts previous research that has frequently underlined that entrepreneurs seem to enjoy higher levels of happiness than managers.

Taken together, the multivariate results largely underline our univariate findings: Superstar managers appear more entrepreneurial than superstar entrepreneurs, with the exception of the effects of Openness and independence in the regression analyses, which are in line with our initial expectations.

5. Conclusion

5.1. Discussion of the main findings

The aim of our study was to test whether the personality of superstar entrepreneurs and managers shows systematic differences,

where superstar entrepreneurs should be more entrepreneurial in their personality than superstar managers. As a first general finding, we observe large effect sizes in the univariate analysis, which signal remarkably strong group differences between the personalities of superstar entrepreneurs and managers. This indicates that the two groups indeed differ, which is also confirmed in the multivariate analyses. With regard to the direction of these group differences, we found a rather surprising picture that converged in the univariate and multivariate analyses: Superstar managers appear considerably *more* entrepreneurial than the actual superstar entrepreneurs in various personality characteristics. We offer two explanations for this finding:

The first explanation is based on differences between managers and entrepreneurs. First, managers might more actively use Twitter as a tool for impression management (e.g., Leary and Kowalski, 1990). Previous research indicates that digital footprints of individuals often reflect actual personality and that individuals' online and offline personalities are very similar (e.g., Back et al., 2010; Gosling et al., 2011; Kosinski et al., 2013). While this may be true for the “average” individual, prior research has indicated that Twitter is often used to manage impression or as a public relations tool for individuals of public interest, for example among politicians (Jackson and Lilleker, 2011; Saffer et al., 2013). The use of Twitter to form impressions and generate publicity also became evident in the recent US presidential election, where Donald J. Trump successfully used Twitter as a tool to gain momentum during his campaign (Financial Times, 2016). Therefore, it could be that superstar managers use Twitter to create an entrepreneurial online personality. Because there is a very close link between a company's CEO and the company he reflects, an entrepreneurial image may thus positively and very directly reflect back on the company. Managers might see Twitter thus more as a strategic communication channel with which to promote brands (Fischer and Reuber, 2014). In contrast, entrepreneurs may not engage very heavily in impression management (at least from a business perspective) and therefore appear more average.

Second, the surprising results could be due to our focus on superstars instead of average entrepreneurs and managers. This largely understudied group could for example be characterized by extremely entrepreneurial managers, and more relaxed entrepreneurs who have already proven that they are successful and hence do not care about how they present themselves that much anymore. Even superstar CEOs are still in a very dependent position as they are employed by a company and are held accountable and pressured by various shareholders and stakeholders. Therefore, they may have an incentive to present themselves as competitive and as driven as possible and use Twitter to create a convincing image for shareholders and stakeholders. This may not be true for entrepreneurs to a similar extent. Because they have proven that they are very successful individuals with the founding of a company, they are now more independent and feel less pressure to present themselves in a way that shareholders and stakeholders find attractive.

In contrast to the unexpected results, there was also support for a number of expected effects. First, in our univariate analysis, we found lower Agreeableness among superstar entrepreneurs compared to superstar managers. These lower levels in Agreeableness mirror competition and some sort of rule-breaking attitude, which is a classic entrepreneurial trait distinguishing the “Schumpeterian” entrepreneurs from the others (Obschonka et al., 2013). Maybe we see this “Schumpeterian” personality feature in our analysis because we focus on highly influential entrepreneurs who managed to achieve extraordinary entrepreneurial success in the modern, highly competitive, and innovation-driven economy (Block et al., 2017). Second, superstar entrepreneurs had higher levels in Openness and independence in the regression analysis. This again fits the “Schumpeterian” personality of the highly influential entrepreneur, who is creative, open-minded, innovative, and seeks independence.

5.2. Limitations and avenues for future research

Our study is not without limitations. The use of other methods to assess the personality of superstar entrepreneurs and managers is important to test the validity of our results. Also, this is the first study that uses Receptiviti as a tool to extract psychological traits in entrepreneurship research directly from Twitter. This novel approach opens up various avenues for future research that could, for example, further compare the extracted information to classical or novel approaches.

Also, the possibility that some of the Twitter accounts in our sample are professionally managed limits the meaningfulness of our results. For example, it could be that the accounts of managers are more often professionally managed by a firm's marketing department, explaining the very careful construction of a highly public entrepreneurial style profile for marketing reasons. Unfortunately, there is no way to objectively assess whether this is the case for a specific account or not. Also, we argue that even if the account is managed professionally, the marketing department has the intention to be as authentic as possible and thus tries to recreate the individual's personality. Finally, Lee et al. (2017) describe superstar CEOs' Tweets as “unfiltered, personal, and spontaneous” that provide a unique opportunity for research, as our study shows.

Appendix A

See Table A1.

Table A1
Correlations.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
(1) Entrepreneur																								
(2) Age	-0.25 [*]																							
(3) Gender (male)	0.10	-0.09																						
(4) Education: MBA	-0.38 [*]	0.14	-0.26 [*]																					
(5) Education: Tec/Sci	-0.04	-0.08	0.03	-0.02																				
(6) Education: Dropout	0.25 [*]	-0.24 [*]	-0.01	-0.27 [*]	-0.22 [*]																			
(7) Active	-0.13	-0.21 [*]	-0.01	0.24 [*]	-0.01	-0.08																		
(8) Twitter Followers (log.)	0.40 [*]	0.09	-0.12	-0.19 [*]	0.12	0.15	-0.34 [*]																	
(9) Twitter: Tweets (log.)	0.24 [*]	-0.14	0.01	-0.31 [*]	-0.16	0.16	-0.13	0.47 [*]																
(10) Openness	0.06	0.25 [*]	0.02	0.11	0.05	-0.14	-0.19 [*]	0.13	0.00															
(11) Conscientiousness	-0.45 [*]	0.30 [*]	-0.05	0.35 [*]	0.05	-0.28 [*]	0.15	-0.12	-0.35 [*]	0.37 [*]														
(12) Extraversion	-0.55 [*]	0.09	-0.14	0.31 [*]	0.04	-0.13	0.27 [*]	-0.23 [*]	-0.27 [*]	-0.22 [*]	0.57 [*]													
(13) Agreeableness	-0.53 [*]	0.11	-0.07	0.25 [*]	0.03	-0.13	0.32 [*]	-0.28 [*]	-0.24 [*]	-0.29 [*]	0.55 [*]	0.80 [*]												
(14) Neuroticism	0.37 [*]	0.03	0.07	-0.27 [*]	0.00	0.10	-0.36 [*]	0.12	0.16	0.16	-0.57 [*]	-0.67 [*]	-0.66 [*]											
(15) Independent	-0.03	0.20 [*]	0.08	0.11	0.00	-0.15	0.02	-0.11	-0.09	0.47 [*]	0.34 [*]	-0.23 [*]	-0.02	-0.01										
(16) Power driven	-0.43 [*]	0.21 [*]	0.00	0.20 [*]	0.12	-0.13	0.08	-0.13	-0.27 [*]	0.23 [*]	0.78 [*]	0.50 [*]	0.52 [*]	-0.37 [*]	0.20 [*]									
(17) Type A	0.04	0.05	0.02	0.00	-0.01	0.04	-0.22 [*]	0.15	-0.11	0.25 [*]	0.16	-0.07	-0.37 [*]	0.21 [*]	-0.24 [*]	0.27 [*]								
(18) Workhorse	-0.42 [*]	0.37 [*]	-0.09	0.35 [*]	0.02	-0.25 [*]	0.08	-0.18	-0.37 [*]	0.36 [*]	0.83 [*]	0.48 [*]	0.52 [*]	-0.46 [*]	0.33 [*]	0.66 [*]	0.11							
(19) Social skills	-0.47 [*]	0.16	-0.18	0.25 [*]	0.06	-0.14	0.26 [*]	-0.16	-0.26 [*]	-0.16	0.53	0.88 [*]	0.78 [*]	-0.56 [*]	-0.16	0.47 [*]	-0.13	0.43 [*]						
(20) Insecure	0.42 [*]	-0.07	-0.05	-0.20 [*]	-0.09	0.16	-0.30 [*]	0.25 [*]	0.30 [*]	0.05	-0.75 [*]	-0.61 [*]	-0.75 [*]	0.73 [*]	-0.31 [*]	-0.70 [*]	0.14	-0.55 [*]	-0.57 [*]					
(21) Cold	0.50 [*]	-0.09	0.18	-0.30 [*]	-0.05	0.14	-0.29 [*]	0.18	0.27 [*]	0.26 [*]	-0.58 [*]	-0.84 [*]	-0.80 [*]	0.66 [*]	0.26 [*]	-0.52 [*]	0.06	-0.47 [*]	-0.75 [*]	0.63 [*]				
(22) Family orientation	-0.12	-0.01	-0.09	-0.02	-0.07	-0.11	-0.01	0.07	0.07	-0.16	-0.04	0.25 [*]	0.01	-0.10	-0.61 [*]	-0.16	0.20	-0.06	0.16	0.21 [*]	-0.31 [*]			
(23) Adjustment	-0.48 [*]	0.10	-0.09	0.35 [*]	0.03	-0.20 [*]	0.31 [*]	-0.15	-0.20 [*]	-0.03	0.76 [*]	0.76 [*]	0.73 [*]	-0.86 [*]	0.10	0.56 [*]	-0.15	0.68 [*]	0.62 [*]	-0.72 [*]	-0.76 [*]	0.10		
(24) Happiness	-0.50 [*]	0.09	-0.08	0.18	0.08	-0.09	0.17	-0.20 [*]	-0.28 [*]	-0.44 [*]	0.46 [*]	0.87 [*]	0.77 [*]	-0.54 [*]	-0.32 [*]	0.49 [*]	-0.07	0.38 [*]	0.77 [*]	-0.56 [*]	-0.78 [*]	0.23 [*]	0.62 [*]	
(25) Depression	0.52 [*]	-0.13	0.03	-0.26 [*]	-0.10	0.13	-0.22 [*]	0.21 [*]	0.22 [*]	0.01	-0.65 [*]	-0.77 [*]	-0.73 [*]	0.78 [*]	-0.08	-0.59 [*]	0.15	-0.58 [*]	-0.72 [*]	0.71 [*]	0.62 [*]	-0.02	-0.80 [*]	-0.66 [*]

Notes: N = 106.

* p < 0.05.

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