The psycholinguistics of entrepreneurship

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ABSTRACT

We compare data across 24,624 Twitter users to examine differences between entrepreneurs and the general population. Our analyses reveal that entrepreneurs manifest more positive and fewer negative emotions than the general population. Entrepreneurs also communicate more about work, and less about aspects related to personal life. Interestingly, during the early phases of a venture, positive emotions and work concerns increase, while negative emotions and life concerns decrease. Counterintuitively, work and negative emotions are negatively associated. Entrepreneurs express negative emotions 2.26 times less, and these negative emotions reduce by 8% after successful fundraising. Our work has implications for the understanding of work-life balance and of emotions in entrepreneurial contexts.

1. Introduction

When you're in a company, running a company, everything keeps you up at night. It's mainly that you're at a company that's not yet profitable, and you're stressed about everything. [Entrepreneur from our dataset]

Entrepreneurship has been called an "emotional journey" (Cardon et al., 2012). As entrepreneurs build their companies, they face challenges including high uncertainty, work overload, managing individuals, and the need to raise capital (Baron et al., 2013). Thus it is commonly assumed that, along with the higher satisfaction they derive from their accomplishments, entrepreneurs experience higher levels of stress and negative emotions (Schneider et al., 2000). As entrepreneurship is a process of self-organizing it has been shown to be closely associated with well-being (Shir, 2015). Most studies have relied on indicators such as GDP or income to capture the relationship between entrepreneurship and well-being (Wiklund et al., 2016).

Emotions and work-life concerns are important and intertwined facets of well-being. Understanding emotions and work-life concerns of entrepreneurs is important because of three reasons (Baron, 2008). Firstly, research on emotions has shown that they are more salient when a task is highly relevant to an individual, such as in the case of entrepreneurs who are deeply committed to their ideas they experience emotions and concerns more intensely (Delgado-García et al., 2012). Secondly, emotions can impact decision-making when tasks are complex or atypical. Entrepreneurs work in situations that stretch the limits of their cognitive capabilities and hence emotions can serve as in important antecedent to decision-making (Rauch and Frese, 2007). Thirdly, work-life concerns can decrease the likelihood of exploitation of entrepreneurial opportunities (Kirkwood and Tootell, 2008).

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The lack of empirical evidence probing emotions and work-life balance is a major gap in the entrepreneurship literature. The recent study by Patzelt and Shepherd (2011) is one exception, in which the authors systematically study differences in positive and negative emotions between the self-employed and other types of workers. Based on their findings, we expect entrepreneurs to have higher positive emotions and lower negative emotions than the general population, despite their poorer work-life balance. Our first research question in this study is, "Are entrepreneurs, on average, happier than the general population?"

A crucial related question (not covered by Patzelt and Shepherd (2011)) is how entrepreneurial emotions change over time. The temporal aspect is important, as the early phases of a venture are marked by a process of learning and adaptation. In particular, after entrepreneurs have successfully raised money, they enjoy the reassurance of the capital they have secured, but may also face new pressures from investors. Assuming entrepreneurs can indeed cope with the challenges of running a new venture, we would expect their negative emotions to subside over time. We would also expect entrepreneurs to be more immersed in their work, and less committed to leisure and family. Our second research question is, "How do emotions and work-life balance evolve during the fundraising cycle?" Finally, we also expect entrepreneurs to use work as a method for coping with the challenges of a new venture; thus, we expect work to be negatively associated with negative emotions.

To study the emotions and work-life balance of entrepreneurs and the general population, we rely on the language that both groups use. Previous research has shown that language is a robust means for revealing individuals' work-life concerns and emotions (Tausczik and Pennebaker, 2010). We investigate our research questions with a content analysis of Twitter updates ("Tweets"). Twitter data overcomes several limitations of traditional data sources such as surveys, avoiding response and recall biases and offering a real-time window into people's thoughts over long periods (Ritter et al., 2013). Additionally, content analysis of Twitter helps us collect data on our constructs, emotions, and concerns simultaneously.

By understanding how entrepreneurs express emotions and work-life concerns differently from others, we can better understand the affective side of entrepreneurship and obtain a fine-grained view of the temporal evolution of emotions and work-life concerns during key stages of the entrepreneurial process. Our novel, extensive dataset lends itself very well to this exploratory analysis.

2. Background

2.1. Emotions and work-life concerns

Studies in psychology and entrepreneurship have suggested that emotions and concerns play an important role in judgments, behaviors, and individuals' cognition (Garcia et al., 2013; Grégoire et al., 2015; Hancock et al., 2008; Huy, 2012; Shepherd, 2003). Emotions encompass the general phenomena of subjective feelings of pleasure or displeasure (Cardon et al., 2012). Trait emotionality (i.e. a person's tendency to feel a certain way) and emotional states (i.e. how they feel at a given moment) are the focus of our study (Schachter and Singer, 1962). Emotions can be antecedents of, concurrent with, and/or consequences of the entrepreneurial process (Cardon et al., 2012). It is important to note here that positive and negative emotions are independent dimensions, and negative emotions can dominate positive ones. Work-life concerns are an important facet of most individuals' and entrepreneurs' lives; they can influence their emotions, exist simultaneously with their emotions, or constitute an outcome of their emotions. Work-life concerns have a bidirectional relationship with emotions (Kirkwood and Tootell, 2008). Work-life issues related to occupation, leisure activities, and money are known to impact or trigger emotions (Bolger and Zuckerman, 1995). Previous literature suggests that emotions and work-life concerns are an important part of the entrepreneurial rollercoaster (Cardon et al., 2012). Work-life concerns are an important facet of well-being. For example, the buffering hypothesis suggests that concerns related to family, friends can help decrease negative emotions during stressful times (Cohen and Wills, 1985). Work-life concerns act as the 'buffers' that can dissipate negative emotions (Cohen and Wills, 1985).

The lack of empirical evidence investigating differences in work-life concerns and emotions between entrepreneurs and others is an important gap in current knowledge. To fill this gap, in our study, we focus on four constructs: negative emotions, positive emotions, work concerns, and life concerns.

2.2. Entrepreneurs versus non-entrepreneurs

Entrepreneurial pursuits are marked by high levels of information overload, uncertainty, time pressures, fatigue and strong emotions (Baron, 1998), and entrepreneurs "face these conditions more often and with more intensity than most other people tend to do in their respective professions or endeavors" (Grégoire et al., 2015 p. 16). These have led scholars to believe that entrepreneurs will display higher emotional changes over time than non-entrepreneurs.

The explanations for these could be either due to the fact that entrepreneurs self-select into certain pursuits due to emotional preferences or to face certain challenges. Or that entrepreneurs have certain traits and abilities that help them navigate the entrepreneurial journey. Despite the two different explanations, scholars agree that entrepreneurs will tend to exhibit notable emotional differences vis-à-vis their non-entrepreneurial counterparts (Grégoire et al., 2015).

Many entrepreneurs actively and consciously search for startup opportunities (Patel and Fiet, 2009). Positive emotions such as joy are known to impact tendency to exploit entrepreneurial opportunities (Carver, 2003). Positive emotions increase the likelihood of detecting new changes and opportune circumstances. Previous research has shown that entrepreneurs often experience high levels of passion, an intense positive feeling (Baum and Locke, 2004). Additionally, self-employment leads to higher levels of life satisfaction which also results in more happiness and excitement. Entrepreneurs are typically more optimistic and hopeful (Patzelt and Shepherd, 2011). Hope has been shown to enable goal accomplishment (Blanchflower, 2001; Henry et al., 2004). Entrepreneurs

have a high need for achievement, desire for autonomy and gaining financial rewards. Fulfilling these quests have been shown to allay negative emotions. Negative emotions such as grief, doubt and fear work against entrepreneurial effort (Foo, 2011). Thus we expect entrepreneurs to have higher positive and lower negative emotions than the general population.

Entrepreneurship is an all-consuming career, especially in its early stages. Entrepreneurs are faced with more demands related to finances and achievement of goals than non-entrepreneurs (Delmar and Shane, 2003). This time consuming pursuit also leaves less time for concerns related to leisure, friends or family (Kirkwood and Tootell, 2008). We expect entrepreneurs to have higher work and lower life concerns than the general population.

2.3. The funding journey

Research on emotions and work-life concerns during ventures' early stages is mixed. On one hand, the process of fundraising is a high-stress environment. Founders must divert precious time from managing the startup, prepare pitches, plan finances, and persuade investors (Chen et al., 2009). It is a period of high stress, uncertainty, and time demands. Moreover, success in a new venture can lead to high growth, which can impose significant demands in itself (Baron et al., 2013). On the other hand, positive emotions are viewed favorably by investors (Chen et al., 2009). In the following paragraphs we detail the changes we expect to see in the facets of well-being of entrepreneurs post successful fund-raising.

2.4. Changes in the facets of well-being after fund-raising

2.4.1. Positive emotions

Baron (2008) suggests that positive emotions "may contribute to capacity for responding effectively in dynamic environments" (p. 334). Strong positive emotions can help decision-makers cope with the high uncertainty, conditions typical for successful entrepreneurs. Additionally, high-tech startups must pass through several rounds of fundraising in order to succeed. Display of positive emotions such as excitement have been known to impact investor decisions favorably (Mitteness et al., 2012). Additionally, since high-tech startups must pass through several rounds of fundraising in order to succeed, we expect entrepreneurs to continue to manifest positive emotions to attract investors. The relationship of deliberate emotional displays of founders and investor outcomes is still unexplored (Cardon et al., 2012). While we do not aim to disentangle, actual emotions from displayed emotions, we expect positive emotions to increase over the course of the funding cycle.

2.4.2. Negative emotions

Previous research has shown that entrepreneurs who are higher in negative emotions such as anxiety tend to discontinue projects (Brundin and Gustafsson, 2013). Success in fundraising can help mitigate stress and negative emotions. This is in line with previous research, which suggests that achieving key goals mitigates negative emotions (Diener, 2000; Rafaeli and Sutton, 1987). Also, as shown in previous research, entrepreneurs could use their passion for their startup to allay negative emotions (Patzelt and Shepherd, 2011). Or reduced negative emotions could free up mental energy and thus entrepreneurs take on more work. Once a startup successfully achieves a round of funding, some uncertainty is reduced, thus reducing negative emotions related to fear, anxiety, grief and embarrassment (Foo, 2011). We expect display of negative emotions to subside over the course of the entrepreneurial journey.

2.4.3. Work-life concerns

Previous research has shown that for high-tech startups post successful first round fund-raising, the need to reach milestones and raise capital increases (Hallen and Eisenhardt, 2012). This period is marked with extreme time-pressures and push to achieve goals. We therefore expect work demands to increase post funding and displays of life concerns to decrease.

3. Methods

3.1. Sample

3.1.1. General population

We focused our data collection on California and used a set of 21,048 Twitter accounts from previous research (Abisheva et al., 2014; Garcia et al., 2014), extracted from a large dataset of Twitter users in the US. The accounts were selected according to their location as indicated on their profiles, using Yahoo! Placemaker to match Californian place names. The oldest Tweet in this dataset was from 2006, and the latest from mid-2013.

3.1.2. Entrepreneurial population

We focused on every startup listed in Crunchbase founded between 2006 and mid-2014 in the San Francisco Bay area of California. We then manually collected the personal Twitter accounts of each startup's founder(s) making sure not to collect company accounts; approximately 80% of founders had personal accounts. Our criteria yielded a sample of 3576 entrepreneurs (dataset for analysis 1). The oldest Tweet in this dataset was from 2006, and the latest from mid-2014.

Given our objective of studying entrepreneurs who were actively working on startups, we focused on those who had raised at least one round of funding. We focused on Twitter data from the single years immediately preceding and following the first year of

fundraising. To ensure enough depth in the data, each of the two years had to yield a minimum of 1500 words per entrepreneur. This criterion resulted in a sample of 480 entrepreneurs (dataset for analysis 2).

From each account (of both types), we removed all hashtags, retweets, links, mentions, replies, etc., leaving only the original content spontaneously written by the user. In line with previous studies, we focused on accounts that yielded over 2000 words in total (Nadkarni and Chen, 2014). Research by Lee et al. (2016) has shown that such Twitter data (founder personal accounts) provides an uncensored and complete picture of individual traits over and above other data sources,

3.2. Linguistic analysis

We analyzed all Twitter data with Linguistic Inquiry and Word Count (LIWC). LIWC counts frequencies of words and word stems and outputs the percentage of words that appear in each category; thus, scores are normalized according to text length. LIWC has been widely used, and hyper validated, in psychology and linguistics, where it has been shown to reliably detect positive and negative emotion words, and to correlate with the human judgment of emotional content (Golder and Macy, 2011; Schwartz et al., 2013; Tausczik and Pennebaker, 2010).

3.3. Measures

3.3.1. Emotions
We operationalize positive emotions by relying on LIWC's *positive emotion* dictionary, which comprises 407 words (e.g. "love," "nice"). The *negative emotion* dictionary consists of 506 words, subdivided into *anger, sadness*, and *anxiety*. The LIWC categories of positive and negative emotion have also been shown to be relatively independent (Hancock et al., 2008; Quercia et al., 2012).

3.3.2. Work-life concerns
To operationalize the "work" side of the work-life balance, we summed up three constructs from LIWC's "personal concerns" category: *money, work*, and *achievement*. For the "life" element we summed up the *family, leisure, friends*, and *home* categories. These categories have been validated in previous studies with self-reported measures, and have been shown to capture inter-individual differences extremely well (Schwartz et al., 2013).

4. Results

Our results section is divided into two parts, in the first part we want to explore differences in well-being among entrepreneurs and non-entrepreneurs (population differences) and next explore the interaction between the dimensions of well-being (hierarchical linear regression).

In the second part, we first explore differences in wellbeing of entrepreneurs pre and post funding (population differences) and then run a linear regression to understand how these differences might be due to work-life concerns, industry sector, gender or size of the founding team.

4.1. Entrepreneurs vs the general population

We ran the Mann-Whitney U test to compare differences in the LIWC scores for emotions and work-life concerns between Californian entrepreneurs and the rest of the local population (Table 1). This indicated that negative emotions were significantly lower for entrepreneurs (5914.33) than the general population (13,399.53); $Z=-58.22$, $p=5.75E-12$ i.e. 2.26 times less. Also, entrepreneurs express more positive emotions than the general population. These results are consistent with the findings of (Patzelt and Shepherd, 2011). In addition, we also find that entrepreneurs talk much more about work, and much less about life, than the general population.

Linear regressions with positive and negative emotions as dependent variables were also carried out, to better understand the

Table 1
Mann-Whitney U Test to compare differences between entrepreneurs and the general population.

	Sample	N	Mean Rank	Mann Whitney U	Asymp. Sig. (2-tailed)
Positive emotions	0	21,048	12,183.93	34,927,675	0
	1	3576	13,069.25		
Negative emotions	0	21,048	13,399.53	14,753,969.5	0
	1	3576	5914.33		
Work	0	21,048	10,821.58	6,252,848.5	0
	1	3576	21,087.94		
Life	0	21,048	12,683.97	29,815,151.5	0
	1	3576	10,126.07		

Table 2

Linear regression to predict positive and negative emotions separately.

| Variable | Dependent variable: | | | |
| | Log (Positive Emotions) | | Log (Negative Emotions) | |
	1	2	3	4
Entrepreneur (Yes=1, No=0)	0.08*** (0.01)	−0.15*** (0.02)	−0.35*** (0.01)	−0.56*** (0.03)
Work concerns	−0.03*** (0.001)	−0.04*** (0.001)	−0.08*** (0.002)	−0.09*** (0.002)
Life concerns	0.02*** (0.001)	0.02*** (0.002)	−0.10*** (0.002)	−0.10*** (0.002)
Entrepreneur * Work concerns		0.04*** (0.002)		0.03*** (0.003)
Entrepreneur * Life concerns		−0.01** (0.01)		0.005 (0.01)
Constant	1.73*** (0.01)	1.79*** (0.01)	1.36*** (0.01)	1.40*** (0.01)
Observations	24,624	24,624	24,624	24,624
R^2	0.03	0.05	0.27	0.27
Adjusted R^2	0.03	0.04	0.27	0.27
Residual Std. Error	0.32 (df=24,620)	0.32 (df=24,618)	0.48 (df=24,620)	0.48 (df=24,618)
F Statistic	255.54*** (df=3; 24,620)	232.89*** (df=5; 24,618)	2,969.79*** (df=3; 24,620)	1,807.16*** (df=5; 24,618)

* $p < 0.1$.
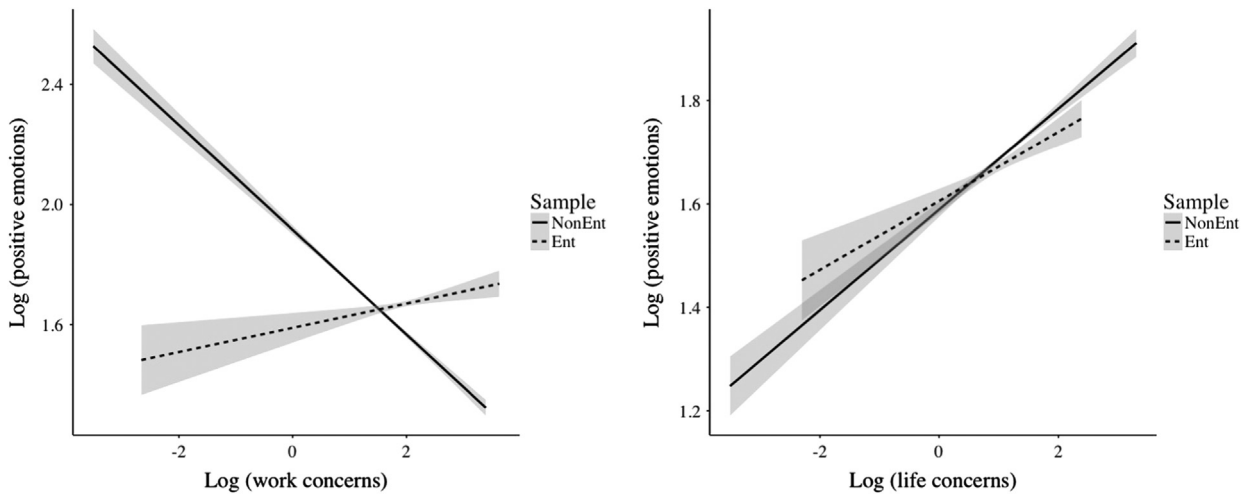** $p < 0.05$.
*** $p < 0.01$.

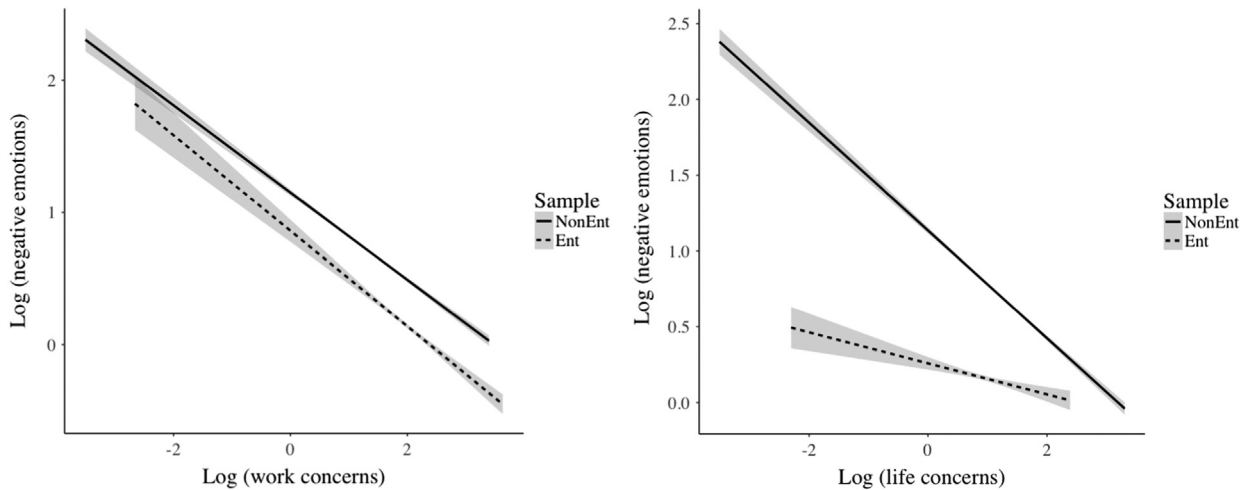**Fig. 1.** Interaction plots of positive emotions and work-life concerns.

Fig. 2. Interaction plots of negative emotions and work-life concerns.

Table 3
Descriptives and correlations of entrepreneurs who received funding.

		Mean	Std. D	1	2	3	4	5	6	7	8
1	Prefunding_posetiveemotions	5.27	1.31	1							
2	Prefunding_negetiveemotions	1.48	0.52	−0.16**	1						
3	Postfunding_posetiveemotions	5.57	1.49	0.68**	−0.16**	1					
4	Postfunding_negetiveemotions	1.42	0.49	−0.16**	0.61**	−0.22**	1				
5	Prefunding_work	6.38	2.17	0.04	−0.33**	0.04	−0.25**	1.00			
6	Postfunding_work	6.61	2.08	0.02	−0.31**	0.03	−0.23**	0.76**	1.00		
7	Prefunding_life	2.71	0.91	0.01	−0.09	0.04	−0.17*	−0.12**	−0.07	1.00	
8	Postfunding_life	2.50	0.91	−0.01	−0.04	0.05	−0.16**	−0.11*	−0.15**	0.56**	1.00
	N=480										

** Correlation is significant at the 0.01 level (2-tailed).

relationship between work-life concerns, affect and entrepreneurship (Table 2). We do find confirmation of the same findings as in Table 1, additionally we find that interaction effects of work and life concerns with emotions to be statistically significant (Figs. 1 and 2). For example, the relationship between entrepreneurs and positive emotions is positively correlated with work whereas for non-entrepreneurs this relationship is negative.

4.2. Entrepreneurial expressions over the funding cycle

To investigate how emotions and work-life concerns evolve during entrepreneurship, we focused on entrepreneurs one year before the year of successfully receiving funding and one year after. Correlations and descriptives are reported in Table 3. We ran a Wilcoxon signed ranked test, and found that positive emotions and work concerns increased during the funding cycle, while negative emotions and life concerns decreased 8% and 11% (Table 4). As entrepreneurs progress through the development of a new venture, concerns related to home and leisure decrease the most, while concerns related to achievement increase the most. Concerns for families and friends are reduced, but not as much as leisure. Finally, concerns related to money increase. A separate analysis indicated that concerns related to money were lowest in the year before funding and highest in the year during funding, decreasing again in the year following funding.

5. Discussion

On one hand, entrepreneurship has been linked to the need for achievement, the locus of control, passion, and excitement. On the other hand, it has also been linked to high stress, loneliness, and grief (Patzelt and Shepherd, 2011). We strengthen the findings of Patzelt and Shepherd (2011) by replicating their study in a completely different context and obtaining the same result—i.e., entrepreneurs do express significantly lower negative emotions, and significantly higher positive ones, than the general population. Our results for entrepreneurs over time also are consistent with previous studies of the enhancing effect of positive emotions on entrepreneurs (Patzelt and Shepherd, 2011). One possible explanation for our results is the attraction component of the ASA (attraction-selection-attrition) theory (Schneider et al., 2000). This theory suggests that individuals are attracted to specific careers—for example, "to the romance of being an entrepreneur" (Baron et al., 2013). These individuals hence have a better career fit, and experience more positive emotions and fewer negative ones.

Entrepreneurs' work-life balance can offer interesting insights into their affect. For example, concerns related to work were negatively associated with negative emotions. Despite leisure being positively correlated with positive emotions, entrepreneurs expressed significantly less about leisure as they embarked on the funding journey, which could reflect that they had entered a "flow state" as previously studied in the literature (Komisar, 2000; Rai, 2008). We could also conceive work concerns to be a form of coping mechanism, which helps entrepreneurs stay upbeat. Finally, achievement of key goals reduces negative emotions, which we see as entrepreneurs successfully complete their fundraisings.

Despite the richness of Twitter data, our generalizability is restricted to the age group of twitter users (which ranges between 15 and 50 years) and the Californian population. Future work can explore other geographic locations and can look at the tendency to

Table 4
Wilcoxon signed ranked samples test to compare differences among entrepreneurs, pre- and post-funding.

Category	Z	Asymp. Sig. (2-tailed)
Postfunding_posetiveemotions - Prefunding_posetiveemotions	−5.847[a]	0
Postfunding_negetiveemotions - Prefunding_negetiveemotions	−2.768[b]	0.006
Postfunding_work- Prefunding_work	−3.682[a]	0
Postfunding_life - Prefunding_life	−6.278[b]	0

[a] Based on negative ranks.
[b] Based on positive ranks.

engage in entrepreneurship by controlling for demographic factors and using emotions and work-life concerns as predictors. Additionally, since we were interested in nascent entrepreneurs who were actively working on their startups, we focused on those who had achieved first-round funding. Further studies can explore emotional differences among those who have endured unsuccessful fundraisings, or who are in the middle stages of fund-raising.

Through this study, we contribute to the entrepreneurship field both methodologically and empirically. Methodologically, we propose social media sources as excellent opportunities for researchers to study the emotions, cognition, and personalities of entrepreneurs over time. Empirically, we confirm previous findings and extend them to track emotions longitudinally, during the early stages of an entrepreneurial venture, and by doing so we offer potentially new constructs for the field. Work seems to contribute to lower negativity for entrepreneurs; perhaps it really is true that "an entrepreneur's life is their work, and their work is their life."

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