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Entrepreneurial Mindsets: Theoretical Foundations and Empirical Properties of a Mindset Scale

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Abstract

This study builds on research on mindsets from laboratory research to develop and test a measurement scale for entrepreneurial mindsets. A three-dimensional scale was constructed measuring elaborating mindsets, implemental mindsets, and compulsiveness about business ideas. Exploratory and confirmatory factor analyses support the claim that these three latent variables may be reliably measured. Using two samples of altogether 608 business students enrolled in entrepreneurship and normal business classes, we were able to demonstrate that elaborating mindsets are antecedent to implemental mindsets. Finally, compulsive mindsets about entrepreneurial activities were mediated by implemental mindsets. We argue that compulsivity is part of the notable impression entrepreneurs make on others, and that this is caused by mindsets instead of personality. A discriminant analysis with the big five personality factors supports this as neuroticism is not correlated with entrepreneurial compulsiveness. Other traits are related to mindsets in ways predicted by contemporary research.

Keywords: Entrepreneurial mindsets, personality, elaborating mindsets, implemental mindsets, compulsiveness about business ideas, outcome and processes orientation

Introduction

Schumpeter argued that entrepreneurs, by introducing new combinations of means of production, break with traditions and social norms, and thereby appear somehow special (Schumpeter, 1983). They may also give the impression to others that they are odd, intense, and narrow-minded. Entrepreneurs operate in an uncertain environment characterized by rapid change across several critical variables (Stewart, May, & Kalia, 2008), but despite – or maybe because of – this uncertain environment, there has been considerable research interest in personality traits as explanation for successful entrepreneurial activities (Begley & Boyd, 1987). However, personality has not been shown to substantially explain entrepreneurship (Baum & Locke, 2004), possibly due to methodological weaknesses (Zhao, Seibert, & Lumpkin, 2010). The best case for personality as an explanatory value emerged in a recent

meta-analysis which found that the Big Five personality traits explained 13% of the variance in entrepreneurial intention and 10% of the variance in entrepreneurial performance (Zhao et al., 2010). However, assuming that entrepreneurship activities and success are rooted in individual factors may be better substantiated than personality research suggests. Our contribution is to show how the concept of mindsets is better suited than personality traits to characterize individuals across situations, explaining entrepreneurial activities in a substantial way.

Personality traits are, by definition, assumed to be invariant, requiring high test-retest reliability and inter-rater reliability. Such methodological demands exclude many person-related characteristics of more transient character, leaving only very general dimensions (Chia & Holt, 2008). Striking characteristics of successful entrepreneurs need not necessarily comply with psychometric requirements of test, but may still appear as persistently stable and unique enough to link success (or failure) to individual characteristics (Lent & Brown, 2006). Given the volatility of the entrepreneurial business environment and the assumed stability of personality traits, a more perception-based explanation of entrepreneurs could expand our understanding of the entrepreneurial process (Krueger, Reilly, & Carsrud, 2000). Certain aspects of entrepreneurs' cognition may cause them to act differently from other people (R. A. Baron, 2004). Perceived change in the entrepreneurial business environment has been shown to incite entrepreneurs to search for new opportunities (Stewart et al., 2008). Earlier publications have called for research on the interaction between the external and internal environment and their effect on how entrepreneurs conceive adaptable strategies (e.g., Yang & Chandra, 2009). Mindsets appear to be a promising construct in this respect. Mindsets may be described as malleable strategies that evolve and change in concert with the individual's interaction and experience with their environment (Gollwitzer, 1990). Previous research has conceptualized entrepreneurial mindsets as one single dimension, applying demographic data (Sarasvathy, Simon, & Lave, 1998) or qualitative data (Navis, 2009). More than a century of laboratory research in psychology has shown that forming mindsets is a process ranging from consciously accepting a task through automatic election of the task to perceived situational cues (Gollwitzer, 1990; Humphrey, 1951). Our research question is whether it is possible to create a survey of entrepreneurial mindsets based on experimental research that will show acceptable psychometric properties and explain entrepreneurial activities over and above common personality trait measurements.

To our knowledge, no one has developed a scale that quantitatively measures the intensity of unique mindsets associated with different stages in the process of becoming engaged in entrepreneurial activities. Such a scale may offer the opportunity to measure entrepreneurial mindsets more systematically and to explore a broader content of entrepreneurial mindsets. Additionally, this conceptualization may be used to explain how entrepreneurial mindsets develop in teaching and in practice, and to increase our understanding of the relationship between entrepreneurial mindsets and entrepreneurial activities. Drawing on experimental research on mindsets, we attempt to construct a survey-based approach that may be less obtrusive than laboratory experiments, but that still applies this knowledge to actual real-life entrepreneurial activities.

Theory

The term "entrepreneurship" appears to be hard to define in a precise and unambiguous manner (Sorenson & Stuart, 2008). Increasingly, researchers have turned to

opportunity recognition as a core activity in the entrepreneurial process (Short, Ketchen, Shook, & Ireland, 2010). Some researchers have also defined entrepreneurship as a pattern recognition activity (R. A. Baron & Ensley, 2006) and found mindset or mental frames as key features in the opportunity recognition process (Munoz, Mosey, & Binks, 2011).

Mindsets are conceived as “general cognitive operations with distinct features that facilitate a given task” (Torelli & Kaikati, 2009, p. 233). The concept of mindset goes back to the Würzburg School of psychological research which was founded by Oswald Külpe at the end of the 19th century. The Würzburgers were pioneers in the experimental study of human motivation and higher mental functioning. Their experiments showed that most human thinking happens without images (imageless thoughts), and that most of it also occurs outside of our awareness (Benjafield, 1996; Gollwitzer, 1990; Humphrey, 1951). They named this new category of human thinking “Bewusstseinslage,” literally a “state of mind,” which later was translated into the concept of mindsets (“Einstellung”) (Humphrey, 1951). For a review of the contribution of the Würzburger school, see Gibson(1941) and Humphrey (1951). Külpe studied what he called “abstractions.” One experiment presented four nonsense syllables to subjects for 0.125 seconds. The syllables were colored differently and arranged to form various figures. The subjects watching them were given different instructions in advance – an instruction to observe the number of letters, the color, their approximate location, the figure formed by the letter, the letters themselves with their approximate location or no instruction at all (control condition). The results showed that subjects would single out the features related to their tasks, and unimportant features were rejected from attention. For example, with the task of observing the number of letters, the subjects may be totally unable to report on color and may deny that color has been experienced at all. This is the original meaning of the term “mindset;” the brain is “set” to perceive the world according to predefined criteria (Humphrey, 1951).

The process whereby the mind gets “set” was studied in more detail in Külpe’s laboratory. Watt used the word “Aufgabe” (task) when he investigated the relationships between the task itself and the ensuing mindset, preparing the individual for proper task completion (Humphrey, 1951). His colleague, Ach, observed that the tasks would gradually disappear from consciousness in subjects who participated in his reaction studies. With increased practice, the awareness that a reaction should take place waned when a specific stimulus was present. The task kept being completed even if there was no awareness of it. The waiting period for the stimuli to appear was also reported by the subjects as becoming impalpable and subjects had no phenomenological awareness of inner speech at the time of study. Ach argued that the original purpose is forgotten and the appearance of the stimulus automatically activated the prescribed conduct (Humphrey, 1951).

In this way, mindsets are conceived as automated processing of stimuli, possibly related to stable individual behavioral dispositions, but malleable, and as shown experimentally, a product of experience (Humphrey, 1951). The word “set” in mindset is, strictly speaking, a verb, describing how someone is perceptually prepared or “set” to detect and respond to a given situation (Cohen-Kdoshay & Meiran, 2007). Mental set means that attention sets the mind to respond in a certain manner to particular aspects of stimulation. In turn, stimulus presentation releases the automatic process comprising the set (Cohen-Kdoshay & Meiran, 2007). The object of a mindset is therefore a type of pattern recognition, reminiscent of the concept “stimulus” in behavioristic terminology (Skinner, 1978). The difference is, however, that the concept “mindset” not only describes a response to a given stimulus, but a sensitivity to environmental patterns that imposes percepts on stimuli in an automatic effortless manner.

The Würzburg tradition was largely focused on experimental laboratory research. Obtaining experimental control is harder in applied settings such as classrooms and workplace environments. Looking for ways to develop and empirically test a less obtrusive measure such as an entrepreneurial mindset scale, we turned to the works of Gollwitzer (1990). Combining the Würzburg tradition with Kurt Lewin's distinction between goal setting and goal striving, Gollwitzer argued that goal-oriented behavior is made up of different phases labeled "deliberating," "planning," "acting," and "evaluating." Each phase is characterized by a task that has to be solved, and the overall success of an activity will be dependent on the success of any one of these phases. Gollwitzer's approach is reminiscent of, but more detailed than Dweck's research on mindsets in goal orientation (Dweck, 2006). We use the concept "mindsets" to explore how people arrive at their chosen goal and the applied strategies for goal achievement. Becoming engaged in each of the tasks produces a mindset facilitating task completion – but like all mindsets, these become automated and happen without awareness. We chose to identify the various phases with two distinctly different measures of mindsets called "elaborating" and "implementing" mindsets.

Elaborating mindsets should develop during the initial, deliberating phase. This is the goal-setting phase, answering the "why" questions (Freitas, Gollwitzer, & Trope, 2004), e.g., "why should I become engaged in entrepreneurial activities?" When an elaborating mindset is created, people consider the desirability and feasibility of a goal. Desirability of the outcome is determined by reflecting on its expected value. Feasibility is determined by considering whether the outcome implied by a given wish can be obtained by one's own activities and whether the situational context is facilitating or impeding it. Hence, an open-mindedness toward processing of incoming and stored information may be beneficial. Phenomenologically, the elaborate mindset is characterized by a fluid state (Gollwitzer, 1990), such as "should I, or should I not, become engaged in entrepreneurial activities?" This leads us to *Hypothesis 1*:

Elaborating mindsets may be discernible in subjects through items asking about the frequency of thoughts related to arguments for or against becoming an entrepreneur.

Implemental mindsets are closer to action and should develop during the planning phase. These are made up of thoughts about how, as in "how can I become engaged in entrepreneurial activities?" Implemental mindsets tend to focus on the specifics of where, when, and how to implement a plan, transforming a wish into intention. In contrast to the elaborating mindsets, the implemental mindsets will give rise to closed-mindedness towards incoming and stored information, emphasizing only information relevant for goal achievement. Phenomenologically, this state is characterized by a feeling of determination to fulfill one's wish. "I'm determined to become engaged in entrepreneurial activities; when I perceive an opportunity the strategy for goal attainment will be released" (Gollwitzer, 1990, p. 57). Results from a meta-analysis indicate that forming implemental mindsets enhances the accessibility of specific opportunities as well as automated goal-directed behavior over and beyond barely forming an intention to act (Gollwitzer & Sheeran, 2006). Based on this, we formulate *Hypothesis 2*:

Implementing mindsets may be discernible in subjects through items measuring the degree of closed-mindedness about becoming an entrepreneur.

A central feature of the mindsets in experimental settings is their tendency to become automatic and fade from awareness. While the behavior itself may be perceived by the individual and the environment, it may not be felt to be voluntary (Parks-Stamm, Oettingen, & Gollwitzer, 2010). This is called “compulsiveness” in psychology, a word with clinical connotations such as in the word “obsessive-compulsive disorder.” Automatic behaviors of high frequency are, however, quite common and not restricted to clinical phenomena if the thoughts are not in themselves disturbing. One example is falling in love, where it is found that infatuated couples suffer from compulsiveness about their loved one. They exhibit low levels of serotonin transporters in the bloodstream, i.e., sharing underlying abnormalities like people suffering from a compulsive disorder (Marazziti, Akiskal, Rossi, & Cassano, 1999). Activation of implemental mindsets interestingly appears to remove the influence of personality on behavior (Bargh, Gollwitzer, & Oettingen, 2010). The frequency with which a given behavior is repeated has been called “response strength” (Skinner, 1978). We believe that automated entrepreneurial mindsets with high response strength are the most likely candidates for the obsessed, single-minded appearance of many successful entrepreneurs that observers easily perceive to be personality traits. (consider the case of Steve Jobs, Isaacson, 2011), leading to *Hypothesis 3*:

The response strength of automatic mindsets can be measured by surveying the compulsiveness of thoughts about entrepreneurial activities.

For measurement purposes, one may ask what delineates a “mindset” – what is, logically speaking, the “set” of situations subsumed in a mindset, and how are different mindsets separated? This question is not only of theoretical, but also of practical importance to the usefulness of the mindset concepts. Mindsets may have different objects – in our case entrepreneurial actions – but the mindsets still differ in terms of the activities they arouse. To demonstrate the existence and usefulness of our three-component operationalization of a mindset survey, we need to at least show that the three defining types of mindsets (elaborating, implementing, and compulsiveness) are methodologically discernible (Nunally & Bernstein, 1994). Thus *Hypothesis 4*:

Elaborating, implemental entrepreneurial mindsets and compulsiveness about business ideas will be discernible as stable, statistically independent variables in how subjects think about entrepreneurial activities.

Based on the works of Gollwitzer (1990), we argue that the development of mindsets goes from elaborating to implementing and become compulsive as a function of repeated action. To the extent that personality is related to compulsivity, the influence should be stronger on elaborating than on implementing mindsets, leading us to *Hypothesis 5*:

The three different mindsets will be related so that the relationship between elaborating mindsets and compulsive business ideas will be fully mediated by implemental mindsets.

The 60-item Neuroticism-Extroversion-Openness Five-Factor Inventory (NEO-FFI) was developed to give a concise measure of the personality structure (Costa & McCrae, 1992). NEO-FFI is also one of the most widely used inventories to measure personality. The five basic personality factors described in NEO-FFI are conscientiousness, agreeableness, neuroticism, extroversion, and openness. The conscientiousness dimension describes the individual’s level of achievement motivation, organization and planning, self-control, and acceptance of tradition and norms. The agreeableness dimension describes people’s attitudes

and behavior towards others. Agreeable people are described as trusting, altruistic, cooperative, and modest. Low scorers are characterized as manipulative, self-centered, suspicious, and ruthless. Neuroticism, or emotional stability, describes to what degree people are stable, even-tempered and unaffected by stressful situations.

People high in extroversion are gregarious, outgoing, warm, and friendly. They are energetic, active, assertive, and dominant in social situations. Lastly, openness to experience is a personality factor that describes a person who is intellectually curious, imaginative, and creative (Costa & McCrae, 1992). Trait theories assume that the nature and expression of attributes such as interests and preferences will be fairly constant across time and context. The social cognitive perspective takes a rather different approach towards personality and context. Firstly, it assumes that behavior is learned rather than expressing fixed traits (Neck & Houghton, 2006). Secondly, it is concerned with the dynamics and situation-specific aspect of people and their interaction with their environments (Lent & Brown, 2006). The current situation may interact both with people's goals and actions by setting constraints on which goal to pursue and which action to select for goal attainment (Prinz, Aschersleben, & Koch, 2009). In this way the measure of mindsets may capture situation-specific variance treated as noise from a personality measurement approach (Chia & Holt, 2008). Outcomes of previous actions seem stored in memory available to action plans for future goal attainment (Prinz et al., 2009). In this way, mindsets may also develop from practice (Benjamin & O'Reilly, 2011).

Personality may exert influence on several steps in the process of developing mindsets (Neck & Houghton, 2006), but if compulsiveness is due to personality, one would expect a correlation between neuroticism and compulsiveness. Our theory presumes no such connection since we assume compulsion to be a side-effect of entrepreneurial mindset development. Personality could instead be most strongly related to the initial elaborating mindsets. The five factors could then work according to the findings of Zhao and colleagues (2010).

Hypothesis 6:

Neuroticism is not correlated with compulsiveness about business ideas.

Hypothesis 7:

Openness to experience, extroversion and conscientiousness are positively correlated with elaborating mindsets, whereas agreeableness is negatively correlated with elaborating mindsets.

Method

Measure development

We developed 24 items to measure the three entrepreneurial mindsets, following the clinical tradition to measure the intensity and frequency of mindsets (Foa, Kozak, Salkovskis, Coles, & Amir, 1998). To capture the content of the different mindsets we followed the tradition of elaborating and implemental mindsets (Gollwitzer, 1990) and asked the students about their thoughts regarding the desirability and feasibility of becoming engaged in entrepreneurial activities, and their thoughts about how, where, and when they could fulfill their wishes to become engaged in entrepreneurial activities. Accordingly, our measurement instrument was developed to measure students' intensity of elaborating and implemental mindsets and compulsiveness about business ideas.

Elaborating mindsets: We turned to the conceptual domain of elaborating mindsets for developing Likert-scale items regarding people's consideration of the desirability and feasibility of becoming engaged in entrepreneurial activities. In total we developed eight questions. Hence, we asked students how frequently they had experienced thoughts considering the desirability and feasibility of becoming engaged in entrepreneurial activities during the last week. Below are the developed eight items:

1. *I'm considering both positive and negative aspects of becoming engaged in entrepreneurial activities.*
2. *I'm considering whether I have the time to become engaged in entrepreneurial activities.*
3. *I'm considering whether I have the opportunity financially to become engaged in entrepreneurial activities.*
4. *I'm looking for both negative and positive information about becoming engaged in entrepreneurial activities.*
5. *I'm considering whether the timing to become engaged in entrepreneurial activities is right.*
6. *I'm thinking about possible business ideas, and consider becoming engaged in entrepreneurial activities.*
7. *I'm considering whether it is desirable for me to become engaged in entrepreneurial activities.*
8. *When I consider becoming engaged in entrepreneurial activities it sometimes feels right and other times wrong.*

Implementing mindsets: For developing a scale to capture implemental entrepreneurial mindsets we drew on the conceptual domain of implemental mindsets and followed the same procedure as above. We asked how frequently they had experienced thoughts about implementing their goal of becoming engaged in entrepreneurial activities during the last week. Below are the developed items:

1. *I often focus on information that appears relevant to becoming engaged in entrepreneurial activities.*
2. *I feel quite sure that I have or can obtain the necessary know-how to become engaged in entrepreneurial activities.*
3. *I think the right time for me to become engaged in entrepreneurial activities is now.*
4. *I have decided to become engaged in entrepreneurial activities.*
5. *I have a plan/strategy for how to become engaged in entrepreneurial activities.*
6. *When I perceive an opportunity I will seize it up and become engaged in entrepreneurial activities.*
7. *When I think of my business idea, I am determined to become engaged in entrepreneurial activities.*
8. *I have a planned strategy for when to become engaged in entrepreneurial activities.*

Compulsiveness: To develop a scale capturing people's perceived frequency and control of thought about business ideas we adapted an obsessive-compulsiveness scale to an entrepreneurial setting (Foa et al., 1998). We followed the same procedure as above and asked how frequent they had experienced the stated thought or similar thoughts during the last week. Below are the developed items:

1. *In conversations with others I become distracted by business ideas that pop up which I cannot talk about right then.*
2. *I find it hard to control my own thoughts about business ideas.*
3. *My friends and acquaintances have stated that I seem to be excessively interested in business ideas.*
4. *My thoughts about business ideas interfere with other areas of my life.*
5. *I have thoughts about business ideas and I can't get rid of them.*
6. *Before I fall to sleep at night I have thoughts about business ideas.*
7. *I think of business ideas while I do other things.*
8. *I'm very much absorbed in thoughts about business ideas.*

Personality: We used the 60-item version of the NEO (Costa & McCrae, 1992) to measure the big five personality traits.

Previous research has found work experience to be related to entrepreneurial intention, mediated by the subject's entrepreneurial self-efficacy (Zhao, Seibert, & Hills, 2005). Prior research has also found gender to be significantly related to intention to become engaged in entrepreneurial activities, such that men were more likely than women to intend to become engaged in those activities (Zhao et al., 2005). Accordingly, we treated work experience and gender as control variables.

To avoid highly correlated items (Farrell, 2010), we retained and accepted only items with loadings above 0.5 on their intended construct, cross-loadings of less than 0.35 on other factors and a differential of 0.20 or more between included factors. To test the hypotheses we used SPSS 17.0 for initial testing of the psychometric properties of the measurement scale.

Sample

Data were collected from two different samples of students at the Norwegian Business School in Oslo Norway. In the first sample of 285 students, 129 (45.3%) reported to have entrepreneurship or innovation as their major education, the rest (156) reported to be enrolled in non-entrepreneurial education. Their mean age was 22 years and 44.9 % were women. Their mean length of work experience was 4.8 years. In the second sample of 323 students, 21 (6.5%) of the students reported entrepreneurship or innovation as their major, the rest (302) reported to be enrolled in non-entrepreneurial education. Their mean age was 21.8 years and 48 % were women. Their mean length of work experience was 3.9 years. All the data were collected through a questionnaire completed in class. The response rate was 85% for both samples.

Results

Exploratory factor analysis. We used the first sample (N=285) to conduct an exploratory factor analysis. The list of items used, after an explorative analysis and deleting items that failed to meet our criteria outlined above, are presented in Table 1. The means, standard deviations, reliability coefficients, and inter-correlations among the included variables can be read from Table 2.

Table 1: Exploratory factor analysis of the three dimensional mindset scales

Items		Factor 1 Elaborating mindset	Factor 2 Implemental mindset	Factor 3 Compul- siveness
Ela 1	I'm considering both positive and negative aspect of becoming engaged in entrepreneurial activities	.69		
Ela 2	I'm considering whether I have the time to become engaged in entrepreneurial activities	.76		
Ela 3	I'm considering whether I have the opportunity financially to become engaged in entrepreneurial activities	.79		
Ela 4	I considering whether the timing to become engaged in entrepreneurial activities is right	.73		
Ela 5	I'm looking for both negative and positive information about become engaged in entrepreneurial activities	.68		
Im 1	When I think of my business ideas, I am determined to become engaged in entrepreneurial activities		.85	
Im 2	I have decided to become engaged in entrepreneurial activities		.87	
Im 3	I have a plan/strategy for <i>how</i> to become engaged in entrepreneurial activities		.87	
Im 4	I have a plan/strategy for <i>when</i> to become engaged in entrepreneurial activities		.83	
Im 5	When I perceive an opportunity I will size it up and become engaged in entrepreneurial activities		.74	
Com 1	My friends and acquaintances have stated that I seem to be excessively interested in business ideas			.56
Com 2	In conversations with others I become distracted by business ideas that pop up which I cannot talk about right then			.62
Com 3	I find it hard to control my own thoughts about business ideas			.90
Com 4	My thoughts about business ideas interferes with other areas of my life			.76
ALPHAS		.80	.92	.88

Note: N=285. Extraction method: Principal component analysis. Rotation method: Promax with Kaiser Normalization. Rotation converged in 6 iterations

Table 2: Correlations and statistics for variables in the sample used for exploratory factor analysis.

Means (M), Standard Deviation (SD), Reliability Coefficients and Intercorrelations among Study 1 Variables.

	M	SD	1	2	3	4	5
1. Gender	0.55	0.5					
2. Work experience	4.84	3.58	.00				
3. Elaborating	2.81	0.73	.17**	.08	(.80)		
4. Implemental	2.88	1.07	.32**	.13**	.53**	(.92)	
5. Compulsiveness	2.09	0.86	.35**	.16**	.45**	.71**	(.88)

Note. N = 285. Reliability (α) estimates are listed on the diagonal. * $p < .05$.

** $p < .01$

Confirmatory factor analysis. The obtained model was tested by confirmatory factor analysis using Lisrel 8.8 in a second dataset, using the second sample (N=323). The variables were treated as ordinal, polychoric correlations and asymptotic covariance matrix were calculated, and the method of estimation was robust maximum likelihood (RML). The results showed that all items loaded on their intended factor above the recommended minimum of .50. To ensure discriminant validity of the constructs we followed Farrell's (2010) recommendation and performed a paired construct test as part of the confirmatory factory analysis. On the basis of frequently used rules of thumb (Hair, Black, Babin, Anderson, & Tatham, 2006) the confirmatory factor analysis performed on the full-scale three-factor model representing elaborating, implemental mindsets, and compulsiveness about business ideas pointed toward a well- defined measurement model ($\chi^2 [74] = 139.71, p < 0.01; \chi^2/df = 1.89; RMSEA = 0.05; CFI = 0.99; NNFI = 0.99; SRMR = 0.04$). In addition, the paired construct test reported in Table 3 indicated that the hypothesized three-factor model fit the data significantly better than more parsimonious models: where elaborating mindsets and implemental mindsets were set to load on a single factor ($\Delta\chi^2_{[2]} = 217.77, p < 0.01$); where implemental mindsets and compulsiveness about business ideas were set to load on one factor ($\Delta\chi^2_{[2]} = 166.04, p < 0.01$); and where elaborating mindsets and compulsiveness about business ideas were set to load on a single factor ($\Delta\chi^2_{[2]} = 154.76, p < 0.01$). Results of the above analysis give support for Hypotheses 1, 2, 3, and 4.

Table 3: Results of confirmatory factor analysis

Model	Chi-square	df	RMSEA	CFI	NNFI	SRMR
Three factors	139.71	74	0.05	0.99	0.99	0.04
Two factors, collapsing elaborate and implemental mindsets	357.48	76	0.11	0.97	0.96	0.09
Two factors, collapsing implemental mindsets and compulsiveness	305.75	76	0.10	0.97	0.97	0.07
Two factors, collapsing elaborate mindsets and compulsiveness	294.47	76	0.08	0.98	0.97	0.06

Note: N=323

To test Hypothesis 5, we merged data from samples 1 and 2, yielding a new dataset of 608 respondents. The average factor loadings for items on the three factors were calculated and used in the analysis. To test for the meditational influence of implemental mindsets on the relationship between elaborating mindset and compulsiveness about business ideas, the criteria of Baron and Kenny (1986) were applied. Results of regression analyses are shown in Table 4.

Table 4: The mediating influence of implemental mindsets on the relationship between elaborating mindsets and compulsiveness about business ideas

	Step 1	Step 2	Step 3
	Compulsiveness	Implemental Mindset	Compulsiveness
1. Gender	.43**	.57**	.15**
2. Work Experience	.05*	.05**	.02*
3. Elaborating	.47**	.66**	.18**
4. Implemental	----	----	.43**
R ²	.32	.39	.51
F	95.22	127.69	156.32
ΔR^2	----	----	.19**

Note. N = 608. * p < .05. **p < .01.

Step 1 shows that elaborating mindsets were significantly related to compulsiveness about business ideas ($\beta = .47, p < .001$). In step 2 it was found that elaborating mindsets were significantly related to implemental mindsets ($\beta = .47, p < .001$). In step 3, results indicated that implemental mindsets were significantly related to compulsiveness about business ideas when controlled for elaborating mindsets ($\beta = .43, p < .001$). By including implemental mindsets as a mediator, the influence of elaborating mindsets on compulsiveness about business ideas was significantly reduced from $\beta = .47$ to $\beta = .18$ ($p < .001$). The mediation path was also found to be significant by a Sobel test ($p < .001$). The mediation relationship appears to be more strongly related to compulsiveness about business ideas than the direct influence of elaborating mindsets. This finding indicates that most students' entrepreneurial mindsets develop from elaborating to implemental to compulsiveness about business ideas. This gives partial support for Hypotheses 5.

Testing mediation with observed variables analysis is criticized for not adjusting for measurement errors in the measured variables (Fabrigar, Wegener, MacCallum, & Strahan, 1999). As a result, it has been shown that regression analysis may arbitrarily inflate the strength of the path in mediation models. Accordingly, it is recommended to conduct a latent variable analysis combined with regression analysis to adjust for measurement error in the measured variables (Ledgerwood & Shrout, 2011). Therefore, we performed a mediation analysis in Lisrel 8.8. A chi-square differences test gave support for the results from the regression analysis. The non-significant difference in chi-square ($p > .05$) indicates that implemental mindsets partly mediate the relationship between elaborating mindsets and compulsiveness about business ideas, again partly supporting Hypothesis 5.

Supplemental analyses. Given that mindsets form and evolve in interaction with the environment, the relationship between the three entrepreneurial mindsets could change due to the respondent's line of study. Testing this, we created a dataset consisting only of students enrolled in entrepreneurial or innovational education ($N=150$) and repeated the above analysis. The ensuing results were equal to the above, again supporting Hypothesis 5.

Personality trait influence. The hypothesized relationships between personality factors and mindsets (Hypotheses 6 and 7) were tested in data from sample 2 ($N=323$) by regression analysis. Means, standard deviations, reliability coefficients, and correlation among the variables included in this analysis are shown in Table 5.

Table 5: Means (M), Standard Deviation (SD), Reliability Coefficients and Intercorrelations among variables used to study the relationship between personality and mindsets.

	M	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	0.52	0.5										
2. Work Experience	3.89	2.98	-.10									
3. Neuroticism	2.58	0.62	-.29**	-.05	(.84)							
4. Extroversion	3.78	0.51	-.15**	.23**	-.25**	(.81)						
5. Openness	3.35	0.55	-.16**	.17**	.12*	.17**	(.78)					
6. Agreeableness	3.43	0.49	-.36**	.07	-.034	.15**	.06	(.73)				
7. Conscientiousness	3.71	0.53	-.09	.11*	-.29**	.29**	.06	.23**	(.82)			
8. Elaborating	2.59	0.80	.14**	.20**	-.05	.16**	.18**	-.17**	.07	(.83)		
9. Implemental	2.38	0.99	.20**	.27**	-.13*	.17**	.20**	-.18**	.17**	.61**	(.92)	
10. Compulsiveness	1.81	0.75	.16**	.22**	-.08	.20**	.23**	-.15**	.15**	.57**	.65**	(.84)

Note. N = 323. Reliability (α) estimates are listed on the diagonal. * p < .05. **p < .01

The results of the regression analyses are shown in Table 6.

Table 6: The relationship between big five personality factors and entrepreneurial mindsets

	Model 1	Model 2	Model 3
	Elaborating Mindset	Implemental Mindset	Compulsiveness
1. Gender	.26**	.43**	.30**
2. Work Experience	.05**	.08**	.40**
3. Neuroticism	.04	-.03	.05
4. Extroversion	.21*	.18	.22*
5. Openness	.23**	.33**	.28**
6. Agreeableness	-.26**	-.35**	-.23**
7. Conscientiousness	.09	.30**	.20*
R ²	.14	.22	.17
F	7.1	12.9	10.33

Note. N = 323. * p < .05. **p < .01.

Model 1 in Table 6 shows relationships between the big five personality factors and the intensity of elaborating mindsets ($R^2=0.14$, $F=7.05$, $p<0.001$). Extroversion and openness were found to be significantly related to the intensity of the subjects' elaborating mindsets ($\beta=.21$, $p<0.05$, $\beta=.23$, $p<0.05$ respectively), and agreeableness was found to be negatively related to the intensity of elaborating mindsets ($\beta= -.26$, $p<0.05$), controlling for gender and

work experience. Results also indicated that neuroticism and conscientiousness were not significantly related to intensity in elaborating mindsets ($\beta=.041$, $p>0.05$, $\beta=.088$, $p>0.05$ respectively).

Model 2 in Table 6 shows how personality factors related to the intensity of implemental mindsets ($R^2=0.22$, $F=12.86$, $p<0.001$). Openness and conscientiousness were significantly related to the intensity of implemental mindset ($\beta=.33$, $p<0.001$, $\beta=.30$, $p<0.05$ respectively), and agreeableness was found to be negatively related to the intensity of elaborating mindsets ($\beta= -.35$, $p<0.05$), controlling for gender and work experience. Results also indicated that neuroticism and extroversion were not significantly related to intensity in implemental mindset ($\beta= -.034$, $p>0.05$, $\beta=.18$, $p>0.05$ respectively). All these findings support Hypothesis 7.

Lastly, Model 3 in Table 6 shows the model for the relationship between the big five personality factors and compulsiveness about business ideas ($R^2=0.22$, $F=12.86$, $p<.001$). Extroversion, openness and conscientiousness were found to be significantly related to compulsiveness about business ideas ($\beta=.22$, $p<.05$, $\beta=.28$, $p<.001$, and $\beta=.20$, $p<.05$ respectively), and agreeableness was found to be negatively related to the compulsiveness about business ideas ($\beta= -.23$, $p<0.05$), controlling for gender and work experience. Results also showed that neuroticism was not significantly related to compulsiveness about business ideas ($\beta= -.045$, $p>0.05$). This supports Hypothesis 6, indicating that neuroticism is not related to compulsiveness about business ideas.

Discussion

The purpose of this study was to build on laboratory research and clinical work to develop a measurement scale for entrepreneurial mindsets. Based on available theory and research, we devised a three-dimensional scale consisting of the intensity of elaborating mindsets, implemental mindsets, and compulsiveness about business ideas. After establishing an original scale of 24 items, exploration with EFA and CFA led us to reduce the number of items to 14 with acceptable psychometric properties.

The three subscales seem to measure reliably different intensities in the types of mindsets related to entrepreneurship and business ideas. The important part of this study is not the content of the mindsets as much as the distinction between the different types. Elaborating mindsets are a necessary initial step towards entrepreneurial activities, a phase where the would-be entrepreneur considers arguments for and against embarking on entrepreneurial activities. This phase is necessary to initial learning activities such as formal education, a kind of open-minded reflective thinking (Dewey, 1958). In contrast, implementing mindsets are characteristic of closed- or narrow-mindedness necessary to planning of specific actions. Implementing mindsets are less easily influenced by formal teaching methods, since they are easily automatized and related to practice – more like a type of tacit knowledge (Polanyi, 1969). Finally, compulsiveness is a sign that mindsets are not only automatized, but intense and strongly characteristic of the person (Payne, Youngcourt, & Beaubien, 2007).

Psychometric analyses of these mindsets indicated that they are three distinct latent variables, and related to each other in a meaningful way. Entrepreneurial mindsets appear to develop sequentially from elaborating through implemental mindsets to compulsiveness about

business ideas. This stepwise development is in line with what has been described in a previous study (Munoz et al., 2011).

There may be a weak, direct relationship between elaborating mindsets and compulsiveness. A few people seem to develop a compulsive urge to become entrepreneurs without possessing the resources contained in the implementing mindsets. Compulsive elaborating mindsets would support the distinction between a process-oriented versus an outcome-oriented approach towards entrepreneurial activities (Watkins-Mathys, 2011). Process-orientation helps people develop implemental entrepreneurial mindsets, allowing swift and effortless reactions to perceived business opportunities (Gollwitzer & Sheeran, 2006). Hence, they actually become engaged in entrepreneurial activities. People who apparently cannot control frequent thoughts about business ideas but lack a strategy for how to become engaged in entrepreneurial activities are obsessed with the outcome instead of the necessary steps to get there.

The sequential development of entrepreneurial mindsets was confirmed in a sample of students enrolled in an entrepreneurship class, indicating that the suggested sequential development holds across different contexts. If we are right in our assumption about the underlying model of mindset development, samples such as ours will have measured individuals that are in different phases of this development. It is interesting to speculate that different types of experience – classroom teaching, practice, work experiences and exposure to role models – may have different effects on people depending on the timing of their development. Given that mindsets develop and change as individuals interact with their environment (Axelrod & Cohen, 1999), we suggest that our entrepreneurial mindset scale could be applied to investigate how entrepreneurial mindsets develop as a function of contextual variables. Such research will also respond to a call in the literature to investigate the relationship between context and goal setting and goal striving (Bargh et al., 2010).

At any rate, our study seems to support our claim that entrepreneurial mindsets are more strongly related to work experiences and learning activities than to stable personality traits. This does not mean that personality is unimportant. Four of the factors in the big five personality inventory (openness, extroversion, consciousness, and agreeableness) relate to the three different entrepreneurial mindsets in a predicted manner, consistent with previous research. Particularly interesting is the fact that openness to experience is a factor that explains most of the variance in entrepreneurial intention and entrepreneurial performance, emphasizing the role of innovative thinking at an early stage. Also in line with previous research, agreeableness appears to be a consistent and significant negative related to the three different mindsets (Zhao et al., 2010).

Entrepreneurs have always had a reputation for odd behavior, not being like everyone else (Baum & Locke, 2004; Carlyle, 2001, orig. 1841). We strongly think that automatic compulsions to become engaged in entrepreneurial activities, particularly the close-minded determination associated with implementing mindsets, are observable to people around the entrepreneur and used as perceptual foundations for the attribution of “specialness.” Our data do indeed support this existence of driven, repetitive thought patterns in people with strong implemental mindsets. By creating and empirically testing a compulsiveness scale in an entrepreneurial setting, we have put entrepreneurs back into the context of their daily operations, showing that they are a product of daily activities rather than driven by some abnormal characteristics. In fact, neuroticism was the only personality trait that did not correlate systematically with mindsets, nor with compulsiveness. Compulsiveness, usually

assumed to be a psychological disorder, may actually turn out to be an asset in an entrepreneurial context.

Future research

Our intention with this study has only been to establish a measurement scale with a rational and psychometric quality. We see many possible applications for future research, including, of course, independent explorations of cross-sample validation. One important development will be to investigate whether, and possibly how, mindsets as measured here may or may not predict entrepreneurial activities and outcome. We will also be using this measure to further investigate the relationship between work experience and education. Since elaborating mindsets are linked to declarative knowledge, we suspect that much education remains directed at this kind of mindset, possibly to the neglect of developing implementing mindsets. It may even be possible that education can disturb already established implementing mindsets and induce doubt instead of action. We hope in the future to be able to show the relevance of the three types of mindset scales for education and practice.

Limitations

We believe that our two samples are of adequate sizes, but they are only populations of bachelor students. Even if we cross-validated the scales on two different student populations, age and culture may pose challenges to the model.

Also, both samples were studied cross-sectionally. Lack of control for time and other variables could distort the patterns and create artificial support for the hypothesized relationships between the three types of mindsets and/or personality variables.

One final comment concerns common method variance, which is by some scholars, argued to be a problem in cross-sectional studies of this kind (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), and others have argued that concern about common method variance is overestimated when strong theoretical arguments can be made for the appropriateness of the measures (Conway & Lance, 2010). Surveys of mindsets conforming to common norms have been developed in clinical (Foa et al., 1998) and in goal-achievement settings (Dweck, 2006).

A recent meta-analysis by (Gollwitzer & Sheeran, 2006) does not indicate that self-reported measures are particularly prone to inflation by common methods. In the expansion of the above arguments, personal goal and applied strategies for goal attainment may be best understood by the individuals holding them, and may not be so easily captured by direct observation (Bargh et al., 2010). Still, the only way to know for sure whether common method variance is a problem for our measure, is to improve the study design to be robust even on this account.

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