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Development and validation of a locus of control scale for the entrepreneurship domain

Leon Schjoedt · Kelly G. Shaver

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Abstract Locus of control has been extensively examined in entrepreneurship research, but with mixed results. This may be due to measurement issues, such as the widespread use of Rotter's (1966) general locus of control scale, which is not domain specific. Not surprisingly, Rotter's scale has been shown to be multidimensional, including personal efficacy. When the first Panel Study of Entrepreneurial Dynamics (PSED I) was constructed in the late 1990s, a measure of locus of control was included. Unfortunately, this scale was also multidimensional. Thus, measurement of the construct may be problematic. Because locus of control continues to be important in organizational research, where it has been found to influence intentions, motivation, satisfaction, and performance, we examined the PSED I dataset to determine whether we could develop a more robust measure after the fact. To this end, we constructed a unidimensional locus of control scale using the sample of nascent entrepreneurs in the

PSED I dataset and validated the scale using two additional samples.

Keywords Entrepreneurs · Locus of control · Scale development · PSED

JEL Classifications L26 · M1 · Y9

1 Introduction

Locus of control is an important construct. Three meta-analyses show that locus of control is an important aspect in work motivation, satisfaction, and performance (Judge and Bono 2001; Ng et al. 2006; Spector 1982). Unlike organizational research, the focus of past empirical research in entrepreneurship, for the most part, was on using locus of control to distinguish entrepreneurs from other organizational groupings that had not started new ventures (e.g., Begley and Boyd 1987; Kaufman et al. 1995). This body of research in entrepreneurship found, apparently consistently, that entrepreneurs have an internal locus of control. However, these studies typically assessed entrepreneurs who had already started and were maintaining businesses, leaving open the possibility that it was demonstrated business success, not a personal predilection, that was implicated in the answers. Another difficulty may be in how the

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concept was measured. For example, Rotter's (1966) I-E scale was intended to be measure of "generalized expectancies" for the control of reinforcement. This scale, however, has been shown in several factor analyses to encompass at least three, sometimes four, different dimensions (e.g., Collins, 1974). Such a generalized measure may not be appropriate for a behavioral domain as relatively narrow as entrepreneurial activity.

While the focus of past empirical research on locus of control in entrepreneurship was on distinguishing entrepreneurs from others (see Furnham 1994; Gartner 1988), researchers have not examined how locus of control influences entrepreneurship in a similar manner that they have done with the motivation, satisfaction, and performance of employees in organizations (see Judge and Bono 2001; Ng et al. 2006; Spector 1982). Indeed, locus of control is one of many personal dispositions that has, over the years, been in favor, been out of favor, and come back into favor as one account for entrepreneurial behavior. Currently, the construct seems to have a renewed following (Rauch and Frese 2007). Locus of control is involved in the formation of entrepreneurial intentions (Krueger 2009; Monsen and Urbig 2009; Monsen et al. 2010), in the start-up process (Herron and Sapienza 1992; Keh et al. 2002; Korunka et al. 2003), and in motivating entrepreneurial behavior (Mueller and Thomas 2001). To avoid past issues pertaining to the measurement of the locus of control construct and, thereby, to overcome the inability to detect differences amongst entrepreneurs, a need exists for a locus of control scale that is reliable, valid, unidimensional, and appropriate for the entrepreneurship domain. This need has also recently been recognized by scholars in their call for improved measures of locus of control (Monsen and Urbig 2009). In an effort to improve measurement of locus of control in future entrepreneurship research, we describe the development and validation of a unidimensional locus of control scale designed to improve the assessment of locus of control in an entrepreneurship context.

Any discussion of the construct needs to begin with the seminal work by Rotter (1966), who described locus of control as "the degree to which persons expect that a reinforcement or an outcome of their behavior is contingent upon their own behavior or personal characteristics *versus* the degree to which

persons expect that the reinforcement or outcome is a function of chance, luck, or fate, is under the control of powerful others, or is simply unpredictable" (Rotter 1990, p. 489, emphasis added). In short, locus of control refers to whether people believe that the outcomes of their actions are under (internal) or beyond (external) their control. This description suggests that locus of control, though generalized, is unidimensional.

Indeed, Rotter's (1966) I-E scale consists of 23 dichotomous forced choice items (plus six filler items), so it is easy to arrive at the conclusion that the dichotomous choices represent end points of a unidimensional scale. Early factor analyses of the I-E scale, however, were not congenial to this view. Specifically, such factor analyses identified from two to four different dimensions assessed with the scale (Collins 1974; Ferguson 1993; Furnham 1986; Lefcourt 1981; Levenson 1974; Paulhus 1983). In response, scholars have developed locus of control scales for specific contexts; these are as varied as economic (Furnham 1986), service (Bradley and Sparks 2002), strategy (Hodgkinson 1992), and work (Spector 1988). Within the field of entrepreneurship, scholars have noted that not all of the dimensions assessed by Rotter's (1966) I-E scale appear to be equally plausible predictors of entrepreneurial behavior (Gatewood et al. 1995; Shaver and Scott 1991). Thus, there appears to be a need for a truly unidimensional locus of control scale appropriate for use in entrepreneurship research.

As a beginning, it may be appropriate to briefly consider a select few studies on locus of control from the entrepreneurship literature. Brockhaus (1976) compared locus of control of entrepreneurs and managers using Rotter's I-E scale (1966). He found no significant differences between entrepreneurs and managers, although the scores were higher on internal locus of control than most of the scores reported by Rotter (1966). Also using Rotter's I-E scale, Mescon and Montanari (1982) examined 20 franchisees and 31 independent entrepreneurs. Both samples scored higher than a national sample on internal locus of control; with the independent entrepreneurs scoring higher than the franchisees. Using interviews to gather data, Cromie (1987) found that a sample of 69 entrepreneurs scored significantly higher on internal locus of control than a sample of 41 managers. In another study, Cromie and Johns (1983) found that

their two samples of established entrepreneurs and aspiring entrepreneurs scored significantly higher on locus of control than their sample of part-time MBA students who were also managers. Using a multidimensional scale of locus of control, Bonnett and Furnham (1991) found that adolescents—54 males and 53 females between the ages of 16 and 19 years of age—who took action to get involved in entrepreneurial activities scored higher on internal locus of control. Sampling 90 small business owners, Anderson (1977) found a higher level of internal locus of control among the small business owners who rebuilt their businesses after a major disaster. Considered alone, these studies suggest that entrepreneurs tend to have a higher level of internal locus of control than other groups.

Alternatively, some researchers have found no significant differences between entrepreneurs and non-entrepreneurs in terms of locus of control (Begley and Boyd 1987; Chen et al. 1998; Cromie et al. 1992; Gatewood et al. 1995). To complicate matters further, still other researchers have found that entrepreneurs had lower levels of internal locus of control than undergraduate students (Kaufman et al. 1995) and that different types of entrepreneurs had different levels of internal locus of control (Cromie and Johns 1983; Inegbenebor 2007; Korunka et al. 2003). For example, despite the fact that Spector (1982) notes that locus of control seems to influence behavior and that the consequences of the behavior appear to, in turn, affect locus of control, Cromie and Johns (1983) found that aspiring entrepreneurs had significantly higher internal locus of control scores than what these researchers refer to as established entrepreneurs.

Two plausible explanations for this mixed research message suggest themselves. First, it is possible that the divergent results may reflect differences among samples in the way the entrepreneur was defined, i.e., franchisees, small business owners, aspiring entrepreneurs, established entrepreneurs, business founders, and more (see Furnham 1994, for an overview). This lack of consistency in defining “entrepreneur” has also been noted by others researchers (Collins et al. 2004; Kaufmann and Dant 1999). Our work adopts the definition developed in the Panel Studies of Entrepreneurial Dynamics (PSED). Specifically, a nascent entrepreneur is a person who (1) has been active in organizing a business, (2) expects to be an

owner of the business, but (3) does not yet have business income sufficient to pay the organizer’s salary for three months (Gartner et al. 2004).

The second reason for the divergent results may be found in the measures employed to assess locus of control—multidimensional measures of locus of control (e.g., Bonnett and Furnham 1991; Mescon and Montanari 1982), a priori select items from other locus of control measures (e.g., Mueller and Thomas 2001), re-worded items (e.g., Begley and Boyd 1987), and interview items (e.g., Cromie 1987). These examples illustrate that locus of control has been assessed in a variety of ways, which creates an area of debate (Hansmark 2003). One issue shared by many studies on locus of control in entrepreneurship is the limited consideration of psychometric properties of the measures employed. For example, Mueller and Thomas (2001) selected items from Rotter’s (1966) I-E scale without providing any other consideration of the appropriateness of this measure than Cronbach’s alpha, which reportedly ranged from 0.53 to 0.81 depending on the country considered. Also, Bagley and Boyd (1987) chose a select number of items (10 items specifically) from the 23 items in Rotter’s I-E scale (1966). This was done without providing any explanation or justification for the choice of these items. These researchers report that they re-worded several of the ten items chosen from Rotter’s (1966) I-E scale, but they do not provide a list of the items used and only provide an estimate of the internal reliability (a Cronbach’s alpha of 0.70). The relatively widespread neglect of considering psychometric properties of locus of control measures in past entrepreneurship research suggests that some of the prior inconsistencies in findings may have been based on a failure to use the right tool for the job. In response, the purpose of our research is to develop a unidimensional locus of control scale appropriate for the assessment of nascent entrepreneurs.

2 Methodology

There are three aspects of the current research that allow us to provide a contribution to the study of venture organizing. First, as noted above, the items included in our scale are drawn from a dataset that has a very clear definition of “nascent entrepreneur.” Second, as described below, this dataset is both

nationally representative and free of the hindsight biases that affect other studies of "entrepreneurs." And third, by constructing the scale out of items available in the PSED I, we can ensure that the items chosen are domain specific to business creation. Intuitively, it appears that locus of control may be more important to nascent entrepreneurs as these have not yet been confirmed in their capability to create new ventures where the potential to enhance their locus of control from learning is limited (Spector 1982). The PSED I was chosen as it was designed to provide nationally representative samples of nascent entrepreneurs and of people who were not involved in starting businesses in the USA (Gartner et al. 2004). The data collection procedure is detailed elsewhere (cf. Gartner et al. 2004; Reynolds et al. 2002; Shaver et al. 2001). Of the 11 items that ultimately appear in our study, eight were placed in the PSED I by one of the co-authors, either alone or in collaboration with others. All 11 items were present in the PSED I mail questionnaire. In the present research, Study One, in which we focus on the development of the locus of control scale, is based on the PSED I, whereas Study Two, in which we focus on assessing convergent and discriminant validity, is based on a sample of undergraduate university students.

2.1 Procedure

Establishing scale dimensionality prior to any other psychometric properties is critical in scale development (DeVellis 2003; Netemeyer et al. 2003). One reason for this is the fact that Cronbach's alpha (Cronbach 1951) is not a measure of unidimensionality—it is an estimate of the lower bound of a scale's internal reliability and should only be assessed after unidimensionality has been established (Clark and Watson 1995; Netemeyer et al. 2003). Thus, scale dimensionality was established first by conducting exploratory factor analysis (EFA) on the sample of the (fully autonomous) nascent entrepreneurs from the PSED I data set. The K1 (eigenvalue-greater-than-one rule; Kaiser 1960) is a widely used method to determine the number of factors. An alternative to the K1 approach has been proposed by Velicer (1976)—the Minimum Average Partial (MAP). While being considered more precise than the K1 approach, the MAP approach tends to underestimate the number of

factors to retain (Fabrigar et al. 1999; Zwick and Velicer 1986). The syntax provided by O'Connor (2000) was employed in the MAP approach. Another approach for determining the number of factors is the Scree Plot (Cattell 1966). While the Scree Plot is considered better (more accurate) than the K1 approach, it is somewhat subjective when the number of factors needs to be determined.

Scholars recommend using multiple approaches in conjunction to determine the number of factors (e.g., Fabrigar et al. 1999; Zwick and Velicer 1986). Thus, in the present study, all three approaches (K1, MAP, and Scree Plot) were used to determine the number of factors. Only items loading substantially on one primary factor were retained. This means that items were retained only if their primary loadings were greater than 0.40, there were no secondary loadings greater than 0.40, and the item did not load on two or more factors (DeVellis 2003; Netemeyer et al. 2003; Spector 1992). Lastly, and in addition to confirmatory factor analysis (CFA), EFA was also used to confirm the factor structures across samples as "exploratory factor analysis provides a more rigorous replication test than confirmatory factor analysis" (Saucier and Goldberg 1996, p. 35). The reason for this is that if EFA using different samples of individuals provide similar results, the likelihood that the results are due to other than the factor structure is very small. Separate EFA were conducted on the two samples in Study One.

Reliability was assessed using Cronbach's alpha (Cronbach 1951). Cronbach's alpha estimates internal reliability, or, stated differently, the proportion of the total variance of the scale that attributed to a common source (DeVellis 2003; Netemeyer et al. 2003; Spector 1992). Following the suggestions of Cohen and Cohen (1983) for testing the difference between two independent correlation coefficients, Cronbach's alpha for the locus of control scale developed in this research study for each of the samples was compared. A lack of significant differences in Cronbach's alpha between samples indicates the scale is temporally stable (DeVellis 2003) and the scale is measuring the same construct (DeVellis 2003; Netemeyer et al. 2003).

In Study Two, a multitrait–monomethod approach was employed. The purpose was to determine convergent validity and discriminant validity. The multitrait–monomethod approach is a limited version of

the multitrait–multimethod approach proposed by Campbell and Fiske (1959), where only one method of data collection is used. In line with the approach proposed by Campbell and Fiske (1959), zero-order correlations between measures of conceptually related but distinct constructs were calculated to assess convergent and discriminant validity. Lastly, to test for differences between correlation coefficients, we followed a procedure provided by Cohen and Cohen (1983).

3 Study One

3.1 Sample

The PSED I data set contains responses from 830 nascent entrepreneurs and 431 individuals selected for participation in a representative comparison group; a total of 1,261 individuals. A complete description of the PSED I is provided by Gartner et al. (2004) and will not be repeated here. A telephone interview was designed to screen out individuals whose businesses had produced positive cash flow sufficient to cover a salary for the owner for over 3 months. Despite this screening, the PSED I data set contains six respondents who should have been excluded on this basis. These six were eliminated from consideration. An additional seven nascent entrepreneurs were excluded from

consideration as they reported that more than 50% of their proposed business would be owned by another business, meaning their proposed venture was essentially a captive company. Lastly, 32 business owners in the comparison group, which is supposed to represent people who are not entrepreneurs, were eliminated. These 45 respondents were excluded from consideration in the present study, reducing the pool of 1,261 respondents to a sample of 1,216 respondents (Carter et al. 2003; Shaver et al. 2001). This sample is the one described as Row G in Table C5 of Reynolds and Curtin (2004).

The first panel of Table 1 shows that the reduced sample of 1,216 respondents consisted of 817 nascent entrepreneurs and 399 individuals in the comparison group. Of the 817 nascent entrepreneurs, 715 were ‘fully autonomous’ and 102 were ‘partially autonomous.’ The fully autonomous nascent entrepreneurs expect that none of their new venture will be owned by a business entity, whereas the partially autonomous nascent entrepreneurs expect that between zero and 50% of their proposed business venture will be owned by a non-person business entity. The PSED I data set includes data from both the telephone interview and the mail questionnaire. Because the items of interest for the present research were all in the mail questionnaire, the sample was reduced to the 871 who returned mail questionnaires—shown in the second panel of Table 1. Of the returned mail questionnaires, 38 respondents failed to answer the

Table 1 Number of respondents

	Respondent group			Comparison group	Total		
	Nascent entrepreneurs						
	Fully autonomous	Partially autonomous	All nascent entrepreneurs				
Total sample							
Females	346	53	399	223	622		
Males	369	49	418	176	594		
Total	715	102	817	399	1,216		
Returned mail questionnaire							
Females	245	41	286	173	459		
Males	235	32	267	145	412		
Total	480	73	553	318	871		
Answered all 11 questions							
Females	236	37	273	164	437		
Males	227	32	259	137	396		
Total	463	69	532	301	833		

items of interest for the present study, which reduced the effective sample to 833 cases shown in the third panel of Table 1. The 833 individuals who provided data for the present study included 463 fully autonomous nascent entrepreneurs and 301 individuals in the comparison group (the 69 partially autonomous nascent entrepreneurs were not considered in Study One as their locus of control might have been influenced by the ownership and requirements of the non-person business entity).

As mentioned earlier, the PSED I data set is nationally representative of the USA. This is only when post-sampling stratification weights based on the (then) most recent data from the U.S. Census Bureau's Current Population Study are employed (Curtain and Reynolds 2004). Following the procedure outlined by Schjoedt and Shaver (2007), the post-sampling stratification weights were adjusted as the initial sample of 1,261 was reduced by elimination of particular respondents and by non-response to the mail questionnaire items of interest. This was to ensure that the sum of weights matched the number of respondents involved in each comparison. For example, the weights in the present study were adjusted so that the sum of weights for the male group of the fully autonomous nascent entrepreneurs was 227 (the number of such respondents who actually answered the questions of interest—see third panel in Table 1) rather than 369 (the number of such respondents found in the initial sample of 1,216—see first panel Table 1). All of the results in the present study are based on recomputed post-sampling stratification weights, thereby making the sample nationally representative of the USA.

3.2 Items

All of the items considered in Study One stem from the PSED I mail questionnaire. These 11 items are listed in the Appendix with their respective PSED identifiers. In the PSED I, items were included to assess locus of control (items 1, 2, and 3; described by Shaver 2004), entrepreneurial expectancies (items 4, 5, 6, 7, and 8; described by Gatewood 2004), and entrepreneurial intensity (items 9, 10, and 11; described by Liao and Welsch 2004). Other items that were considered assessed level of life satisfaction (Johnson et al. 2004) and job stress (Ford and Matthews 2004); these were single item measures.

In any large-scale survey research, investigators must balance the need to have multiple items to assess any concept against the problems of non-response when a mail questionnaire becomes unwieldy. The general strategy of those responsible for the original design of PSED I was to maximize the latter, at the potential expense of the former. Fortunately for our purposes, Scarpello and Campbell (1983) concluded that single-item measures are preferable to summed facet measures when assessing overall satisfaction, one of the measures used in our research. The purpose for including satisfaction and stress in the present study was to assess whether overall satisfaction and stress were correlated with locus of control in a similar manner as found in previous research. Thus, the use of such single-item measures was considered to be appropriate. With unlimited time and money, respondents would have been asked many items bearing on all scales included in the present research. As anyone who has successfully completed such research will acknowledge, however, time and money are never unlimited. The result is that investigators must 'make do' with the best that they have available—and our research is no different. All items were assessed using a 5-point Likert-type response format—from 'completely untrue' to 'completely true' or from 'completely disagree' to 'completely agree.' The use of a 5-point Likert-type response scale is considered to be appropriate as March and Richards (1986) found that different response formats do not influence locus of control results.

4 Study One: results and discussion

As the focus of this research study (especially the focus in Study One) was to develop a locus of control scale for use in future entrepreneurship research, the sample of 463 nascent entrepreneurs provided the basis for identifying the factor structure—the first step in scale development after identifying potential scale items (DeVellis 2003; Netemeyer et al. 2003).

To estimate the number of factors based on the EFA results, the K1 approach (eigenvalue > 1) was used initially. The K1 approach showed that three factors were present in the 11 items considered. The Scree Plot showed that two or three factors were inherent in the 11 items. Results of the MAP approach (using the syntax provided by O'Connor

2000) showed that only one factor was present. This was expected as the MAP approach tends to underestimate the number of factors to be retained (Fabrigar et al. 1999; Zwick and Velicer 1986). As both the K1 approach and the Scree Plot showed that three factors were inherent in the data, while the MAP approach showed that only one factor should be retained, the three-factor structure was considered to be the most appropriate.

To interpret these factors, an additional EFA was conducted with an orthogonal (VARIMAX in SPSS; SPSS, Chicago, IL) rotation. Only items loading substantially on one factor were retained. This means that items were retained only if their primary loadings were greater than 0.40, there were no secondary loadings greater than 0.40, and the item did not load on two or more factors (DeVellis 2003; Netemeyer et al. 2003; Spector 1992). Based on these considerations, four items loaded on one factor that appeared to represent a locus of control measure. These items and their factor loadings are presented in Table 2.

Exploratory factor analysis employing the 11 PSED-items on the sample of 301 individuals in the comparison group of the PSED I was conducted. Similar to the sample with nascent entrepreneurs—using the K1 rule, Scree Plot, EFA with orthogonal rotation, and retaining items loading substantially on only one factor—the results from the comparison group showed the same four items loaded on one factor as they did for the sample of nascent

entrepreneurs. These factor loadings are also provided in Table 2. The similarity between the results from the sample of nascent entrepreneurs and the comparison group indicates that the likelihood that the results are due to other than the factor structure is very small (Saucier and Goldberg 1996).

For both the nascent entrepreneurs and the comparison group, items 1 (no trouble making and keeping friends), 2 (almost certain to make plans work), 3 (worked hard when I get what I want), and 9 (can do anything I set my mind on) loaded on one factor. The wording of items 1, 2, 3, and 9 seem to be suggestive of a locus of control scale, which indicates that items 1, 2, 3, and 9 have face validity. Further, according to Shaver (2004), items 1, 2, and 3 were designed to measure locus of control in the PSED I. These three items (items 1, 2, and 3) were select items from Paulhus' (1983) sphere-specific measures of perceived control. As Shaver notes, the three items came from two separate spheres: item 1 from Paulhus' interpersonal control subscale and items 2 and 3 from Paulhus' personal control subscale. This overlap between the items from Paulhus' measures and our scale together with wording of the four items indicates that our locus of control scale has content validity.

As the wording of items 2, 3, and 9 appears to relate to a unidimensional locus of control scale, whereas item 1 originates from Paulhus' interpersonal subscale, we also needed to determine empirically if item 1 should be excluded from our locus of control scale. In addition to the conceptual considerations, the elimination of item 1 was supported empirically as Cronbach's alpha (Cronbach 1951) substantially increased when item 1 was eliminated. Additional empirical support for the elimination of item 1 was provided by CFA. Confirmatory factor analyses were conducted with and without item 1 to determine if item 1 should be part of our locus of control scale. For both samples of 463 nascent entrepreneurs and 301 members of the control group, CFA with items 2, 3, and 9 (and without item 1) showed that the model based on items 2, 3, and 9 fit the data well (for the 463 fully nascent entrepreneurs: goodness-of-fit index = 0.99, adjusted goodness-of-fit index = 0.97, RMS-error-of-approximation = 0.046; for the control group of 301: goodness-of-fit index = 0.98, adjusted goodness-of-fit index = 0.96, RMS error-of-approximation = 0.058) and that the

Table 2 Factor loadings^a on entrepreneurs' locus of control items by sample

Items ^b	Nascent entrepreneurs ^c N = 463	Comparison group N = 301
1	0.69	0.60
2	0.73	0.62
3	0.61	0.57
9	0.50	0.69
Eigenvalue	1.19	1.40
% of var.	10.8	12.7

^a Only factors with eigenvalues above 1.00 and factor loadings above 0.40 are shown; Varimax-rotated factor loadings are shown

^b Item numbers refer to the item numbers listed in the Appendix

^c Nascent entrepreneurs are the fully autonomous nascent entrepreneurs

scale based on items 2, 3, and 9 fit the data better than when item 1 was included in the scale. Based on these conceptual and empirical reasons, item 1 was not included in our locus of control scale. Thus, items 2, 3, and 9 constitute a locus of control scale appropriate for entrepreneurship research (these three items are in bold lettering in the Appendix).

Cronbach's alpha was 0.59 for the sample of nascent entrepreneurs and 0.54 for the comparison group. Even though Cronbach's alpha is lower than what could be desired, the Cronbach's alphas should be considered in relation to the fact that an estimate of Cronbach's alpha is influenced by the number of scale items and constitutes the lower bound of the internal reliability estimate (Hair et al. 1998; Miller 1995). The difference in Cronbach's alpha between the two samples was not significant (n.s., $z = 0.989$; Cohen and Cohen 1983), which indicates that the scale's internal reliability is stable across samples (Miller 1995). The Cronbach's alpha for the locus of control measure developed for the PSED I (item 1, 2 and 3; Shaver 2004) was 0.51 for the nascent entrepreneurs and 0.47 for the comparison group. Comparing the results regarding Cronbach's alpha show a significant improvement in Cronbach's alpha for the locus of control scale for the nascent entrepreneurs ($z = 1.743$, $P \leq 0.05$; Cohen and Cohen 1983) but not for the comparison group ($z = 1.148$, n.s.; Cohen and Cohen 1983). Thus, the locus of control scale developed in this research represents a superior measure psychometrically as it has a significantly higher Cronbach's alpha than the locus of control measure developed for the PSED I and has an appropriate level of internal reliability for a three-item scale that is stable across samples.

As noted above, in the 'normal' world of psychological assessment, one should be suspicious of a three-item scale designed to measure a particular construct. In the 'real' world of survey research, however, when every single item asked takes a minimum of 10 seconds, and per-minute charges are substantial, the goal is to measure a target concept thoroughly, but *efficiently*.

Table 3 shows the means, standard deviations, and zero-order correlations between our locus of control measure and life satisfaction and job stress for the nascent entrepreneurs and the comparison group. The correlations for the sample of nascent entrepreneurs show that our locus of control measure was significantly associated with both life satisfaction and job

Table 3 Means, standard deviations, and zero-order correlations for the sample of nascent entrepreneurs and the comparison group

	M	SD	1	2	3
Mean (M)			4.13	3.95	3.03
Standard deviation (SD)			0.86	0.89	1.09
Locus of control (1) ^a	4.12	0.53		0.22****	0.06
Life satisfaction (2) ^b	3.96	0.88	0.24****		0.13*
Job stress (3) ^c	3.09	1.09	0.13**	0.09*	

Correlations for the sample of 463 fully autonomous nascent entrepreneurs are below the diagonal and the correlations for the 301 in the comparison group are above the diagonal; Two-tailed correlations

* $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$, **** $P \leq 0.0001$

^a Locus of control is measured by the locus of control scale for the entrepreneurship domain, which is the scale under development in the present study

^b Johnson et al. (2004)

^c Ford and Matthews (2004)

stress, indicating our locus of control scale has convergent and concurrent validity (DeVellis 2003; Netemeyer et al. 2003). As the locus of control measure using our scale 'behaves' in a way consistent with the construct it is purposed to measure, the locus of control scale appears to have construct validity (Cronbach and Meehl 1955).

In sum, the results from Study One show that our locus of control scale has face, content, translation, concurrent, and construct validity which, in turn, indicates that the scale also has criterion validity (DeVellis 2003; Netemeyer et al. 2003; Spector 1992). It should also be noted that our locus of control has superior psychometric properties (being unidimensional and having an improved Cronbach's alpha) than the locus of control scale developed for the PSED I. In effect, the three-item locus of control scale developed here is a parsimonious, reliable, and valid measure of entrepreneurs' locus of control.

5 Study Two

Study Two was conducted to assess the convergent and discriminant validity of the locus of control measure using our scale.

5.1 Sample

We sampled undergraduate students enrolled in a senior-level capstone course at a Midwestern public university. They participated in a survey on a voluntary basis. Of the 119 students participating in the study, 42 students (35%) had or were currently taking one or more entrepreneurship courses, seven students (6%) were majoring in entrepreneurship, and two students (2%) had entrepreneurship as a minor. Unfortunately, given the ratio of questions-to-be-asked to numbers-of-respondents, it was not possible to examine the results separately for the entrepreneurship students versus the rest of the students. Forty-nine students (41%) were female and 70 (59%) were male. The majority of students were either 21 or 22 years of age (104 students, 87%); the remaining students were in their twenties, with one exception. The average age was 22 years.

5.2 Measures

The survey instrument included the three-item locus of control scale we developed in Study One and the following other scales: general locus of control (Levenson 1981), general self-efficacy (Chen et al. 2001), self-esteem (Rosenberg 1965), and neuroticism (Eysenck and Eysenck 1968). While general self-efficacy and self-esteem are related but distinct constructs, neuroticism is unrelated to locus of control (see Judge et al. 2002), thereby providing the opportunity to assess convergent validity and

discriminant validity (Campbell and Fiske 1959). Participants reported their agreement on a 5-point Likert-type scale from 1—‘disagree strongly’ to 5—‘agree strongly.’ In addition, items pertaining to the respondents’ participation in entrepreneurship courses, their major, minor, sex, and age were included in the survey instrument.

6 Study Two: results and discussion

Table 4 shows the means, standard deviations, and correlations for the sample of university students. The locus of control scale we developed appears to have convergent validity as our locus of control measure has a strong correlation ($r \geq 0.6$; DeVellis 2003; Netemeyer et al. 2003) with a measure of general locus of control ($r = 0.65$, $P \leq 0.0001$) and a moderate correlation ($0.3 \leq r \leq 0.5$; DeVellis 2003; Netemeyer et al. 2003) with the conceptually related but distinct measures of general self-efficacy ($r = 0.51$, $P \leq 0.0001$) and self-esteem ($r = 0.50$, $P \leq 0.0001$). Our locus of control scale also appears to have discriminant validity by virtue of its weak ($r \leq 0.3$; DeVellis 2003; Netemeyer et al. 2003) relationship with the conceptually unrelated measure of neuroticism ($r = -0.16$, n.s.). The magnitude and significance of the correlations show our locus of control scale has convergent validity and discriminant validity (DeVellis 2003; Netemeyer et al. 2003).

The results presented in this study demonstrate that our locus of control scale intended for use in

Table 4 Means, standard deviations, and correlations for the student sample

Scales	M	SD	# of items	1	2	3	4
ELOC (1) ^a	4.22	0.44	3				
GLOC (2) ^b	3.73	0.36	8	0.65****			
GSE (3) ^c	4.16	0.35	8	0.51****	0.44****		
SE (4) ^d	4.12	0.46	10	0.50****	0.41****	0.40****	
N (5) ^e	2.52	0.69	12	-0.16	-0.19*	0.01	-0.52***

n = 119; Pearson correlations; Two-tailed correlations

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$; **** $P \leq 0.0001$

^a Locus of control for the entrepreneurship domain

^b General locus of control (Levenson 1981)

^c General self-efficacy (Chen et al. 2001)

^d Self-esteem (Rosenberg 1965)

^e Neuroticism (Eysenck and Eysenck 1968)

future entrepreneurship research is stable across samples in terms of dimensionality and reliability. The results also show that our locus of control scale has face, content, translation, concurrent, construct, criterion, convergent, and discriminant validity. In sum, the three-item locus of control scale developed in this research using nascent entrepreneurs is a parsimonious, unidimensional, reliable, and valid measure of locus of control.

7 Limitations

From the perspective of scale construction, the primary limitation of this research has to do with the size of the initial item pool. We were not able to begin with 50, 100, or 300 separate items with face validity for developing our locus of control scale, as one might when starting with a relatively 'captive' sample of undergraduate or graduate students. Rather than take any sample with a large number of items, we elected to use a large sample of exactly the right sort of people, despite the fact that this limited the number of available items. Additionally, because we began with items written for other purposes, we could not alter the wording for any of the items. The comparison group in Study One and sample of university students in Study Two give us some level of confidence that the wording is clear to people who are not engaged in entrepreneurial startups.

The second major limitation of the work is based on the number of items finally chosen. Three items is not a large number, even under the present circumstances. Normally one expects a psychological scale to include 10–30 items, even for single-construct unidimensional scales. On the other hand, the value of a short scale—at least where entrepreneurs are concerned—is often a good thing. In a telephone survey, time is money. Even in a mail survey, space is at a premium. Create a scale that is too long, and the return rate will suffer, sometimes dramatically. What we have accomplished, then, is to create a scale that is likely to be used in entrepreneurship research, especially research using the PSED I data set as our locus of control scale has superior psychometric properties than the scale initially intended for research using the PSED I (Shaver 2004). This shows that this limitation might actually turn out to an advantage. Unfortunately, none of these items appeared in PSED II.

The third limitation pertains to the focus of the present study on the development of a locus of control scale for use in entrepreneurship research. Consistent with research in which scales are developed and validated in organizational research (e.g., Hodgkinson 1992; Spector 1988), the present research did not include a qualitative review or quantitative meta-analysis of research on locus of control in the entrepreneurship literature. While such second-order analysis might be deemed desirable and useful, the purpose of the present study precluded such a review and meta-analysis. While considering the entrepreneurship literature on locus of control, we noticed that qualitative reviews were only found in the form of brief summaries of individual studies as part of providing an overview of the trait approach in entrepreneurship (e.g., Furnham 1994; Gartner 1988). Also, we did not identify any quantitative meta-analysis published on locus of control in entrepreneurship. Considering the importance of locus of control in forming entrepreneurial intentions (Krueger 2009; Monsen and Urbig 2009; Monsen et al. 2010), in the start-up process (Keh et al. 2002; Korunka et al. 2003), and in motivating entrepreneurial behavior (Mueller and Thomas 2001), it seems timely for researchers to undertake a quantitative meta-analysis of locus of control in entrepreneurship. Thus, the third limitation provides an opportunity for future research.

8 Conclusion

The concept of locus of control continues to receive attention from entrepreneurship researchers because it is considered to be important in individuals' motivation and intentions to start new ventures (Shane et al. 2003). In the past, however, entrepreneurship research involving locus of control has too often suffered from one or more of three problems. First, across previous studies, 'entrepreneur' has been variously defined as a person with a successful business, a franchisee, or a student in a graduate or undergraduate entrepreneurship track. Second, and usually out of necessity, the respondents have been obtained from convenience samples and tested by the same people who recruited them. Third, it has only rarely been possible to use measures known to be valid for the target respondents. The contribution of

our research is to solve all three of these problems at once.

When the respondents are chosen from membership lists of Chambers of Commerce, voluntary associations of companies in particular industry clusters, or even through paper or online searches, the respondents have been *in business* and *successful enough* to have found their way into the list. If such people are asked, for example, "when you get what you want, is it usually because you have worked hard for it?" their answers are likely to be a version of "you betcha!" Does this answer, in this context, reveal secrets about the person's internal motivation? Does it represent the individual's reflection on what it has taken to get this far? Does it measure some of each? If, however, the respondent entrepreneurs are only *in the process* of organizing their businesses and have essentially no business outcomes on which to base a judgment, the answer is more likely to reflect the individual's underlying dispositions. That is the value of developing a scale based on respondents in the PSED I.

Social psychological research has often been criticized for being 'the psychology of the college sophomore,' largely because those are the people who are available for testing. Indeed, many Introductory Psychology courses include a requirement that the students participate in a certain number of hours of research (or, if they choose to opt out, write a short paper instead). Despite their ready availability, these students are not often a 'convenience sample' in the sense it is used in entrepreneurship research. Why? Because the students are typically not recruited for specific research projects, but rather have the opportunity to select which of many projects they will use to fulfill their research requirements. By contrast, respondents in entrepreneurship research are recruited specifically for a particular study, usually by the investigator (or people associated with the

investigator) who will conduct the research. This process may or may not introduce response biases: the problem is that one cannot determine whether biases have been introduced. Again, this is a general problem solved by constructing a scale based on respondents to the PSED I. These individuals were selected through random digit dialing, and all questions were asked by professional survey research firms. When the post-sampling weights are applied (as they were in the present study), the respondents comprise a nationally representative sample that has no connection one way or another with any of the participating researchers.

Finally, by constructing the scale based on asking questions of nascent entrepreneurs, we can have real confidence that the resulting three-item scale is specific to that target population. Whether or not our scale proves useful in predicting success of entrepreneurial organizing, or entrepreneurial success in other venues, at least we can be confident that it is unidimensional, free of selection and experience biases, and appropriate for the target population. Because of the limitations we discussed earlier, we will not claim that we have created the perfect tool for assessing locus of control among entrepreneurs. On the other hand, we have shown it to be reliable, valid, and psychometrically sound. That may well make it the best tool so far.

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Appendix

Table 5 Items from the PSED mail questionnaire considered in the present study.

No.	Item	PSED item no.
1	I have no trouble making and keeping friends.	QL1h
2	When I make plans I am almost certain to make them work.	QL1i
3	When I get what I want, it is usually because I worked hard for it.	QL1j
4	If I work hard, I can successfully start a business	QK1a

Table 5 continued

No.	Item	PSED item no.
5	If I start a business, it will help me achieve other important goals in my life.	QK1c
6	Overall, my skills and abilities will help me start a business.	QK1d
7	My past experience will be very valuable in starting a business.	QK1e
8	I am confident I can put in the effort needed to start a business.	QK1f
9	I can do anything I set my mind on doing.	QL1a
10	There is no limit as to how long I would give maximum effort to establish my business.	QL1e
11	My personal philosophy is "do whatever it takes" to establish my own business.	QL1f

Note All the items considered are from the PSED mail questionnaire. This questionnaire and the 501-page codebook for the project can be found at <http://www.psed.isr.umich.edu>. The three items (no. 2, 3, and 9) that comprise the Locus of Control scale developed in this paper are in bold font

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