

Which Competencies Are Most Important for Creative Expression?

Robert Epstein

American Institute for Behavioral Research and Technology

Victoria Phan

University of California San Diego

In a follow-up to a previously published study (Epstein, Schmidt, & Warfel, 2008), an ethnically-diverse sample of 13,578 people in 47 countries (mainly the United States and Canada) took an online test that measures 4 trainable competencies that have been shown to enhance creative expression in individuals. The new study confirmed that the test has high internal-consistency reliability and reasonably strong predictive validity. Competency scores were good predictors of self-reported frequency of creative expression and moderately good predictors of life satisfaction and professional success. Scores were also substantially higher for people who had had creativity training, and more training was associated with higher scores. Small but statistically significant differences in scores were found for gender (women outscoring men) and race/ethnicity. Of the 4 competencies examined, *capturing* (preserves new ideas as they occur) proved to be the best predictor of self-reported creative expression, followed by *challenging* (takes on difficult tasks), *broadening* (expands one's skills and knowledge), and *surrounding* (arranges stimulating physical and social environments).

Research begun by Epstein in the late 1970s led to the development of Generativity Theory (Epstein, 1985, 1991, 1996a, 1999), a formal theory of creative expression in individuals. The theory and related research suggest that new behavior emerges as previously established behaviors become interconnected and that the process of interconnection is both orderly and predictable. In the laboratory, equations and a computer model derived from the theory have been used to predict novel human and animal behavior moment-to-moment in time.

The theory suggests that creative expression can be accelerated and directed in various ways by altering the number and nature of available repertoires of behavior and by arranging conditions under which

interconnections are likely to occur (Epstein, 1999, 2005). Epstein has shown, moreover, that people can be deliberate about both acquiring relevant repertoires and arranging conditions under which interesting interconnections will occur. He has identified four basic competencies—the core competencies of creative expression—that give people control over this process and thus allow people to increase their creative output, sometimes dramatically so.¹ The four core competencies are: *capturing* (preserves new ideas as they occur, finds

¹*Competency* refers to a functionally-related set of skills that may or may not have been previously expressed. In that sense, the competency domain is far larger than the performance domain. Although the ideal way to measure competence is to sample behavior (McClelland, 1973), test questions that pinpoint behavior can be excellent predictors of such behavior (Boyatzis, 1982; Epstein et al., 2008; Smith & Smith, 2005; Spencer & Spencer, 1993; Wood & Payne, 1998). A test item such as “I’m good at recording my new ideas” would be deficient in this regard, whereas an item such as “I always keep a recording device by my bed at night” (an item from the ECCI-i) does a far better job of pinpointing behavior.

This article is based on a paper presented at the 118th annual meeting of the American Psychological Association, San Diego, California, August 2010.

Correspondence should be sent to Robert Epstein, American Institute for Behavioral Research and Technology. E-mail: re@aibr.org.

places and times where new ideas can be observed easily, and uses dreams and daydreams as sources of ideas), *challenging* (takes on difficult tasks, sets open-ended goals, manages fear and stress associated with failure effectively), *broadening* (seeks training, experience, and knowledge outside current areas of expertise), and *surrounding* (changes physical and social environments regularly and seeks out unusual stimuli or combinations of stimuli).

Creative expression is also affected by factors such as personality traits that are not generally trainable (e.g., Muñoz-Doyague, González-Álvarez, & Nieto, 2008; Prabhu, Sutton, & Sauser, 2008), as well as by work climate and other variables typically under the control of managers or leaders (e.g., Hunter, Bedell, & Mumford, 2007). In that regard, Epstein has also identified eight competencies that leaders need to elicit creativity in others and has developed tests that measure the strength of both the core and managerial competencies (Epstein, 1999; Epstein et al., 2008). In addition, he has developed games and exercises that strengthen these competencies (Epstein, 1996b, 2000, 2011). He has also suggested that focusing on measurable, trainable competencies is an especially practical way of boosting creativity (Epstein, 1996b, 1999, 2000, 2011).

Epstein et al. (2008) conducted two studies demonstrating that a test designed to measure the four core competencies of creative expression—the Epstein Creativity Competencies Inventory for Individuals (ECCI-i)—was both a reliable and valid measuring instrument. The first study involved a racially and ethnically diverse group of 208 business people in Philadelphia, Pennsylvania, and the second, 173 employees of the government of the city of Brea, California. All tests were administered in a classroom environment in written format. The second study also found that 8 months after people had participated in a half-day workshop to strengthen the core competencies, they were on average expressing 55% more new ideas to supervisors than they had before training.

The present study again examines the validity and reliability of the ECCI-i, this time with a large sample of subjects obtained over the Internet. In addition, this study seeks through regression analysis to determine which creativity competencies best predict desirable outcomes related to creative expression.

METHODS

Test Design

The ECCI-i is a 28-item, Likert-scale inventory (5 points labeled *agree* and *disagree* at the extremes) that assesses the four core competencies of creative expression. The

test includes seven items per competency, one of which (for each competency) is a dummy item that can be used to assess consistency of responding as soon as an individual completes the test (Epstein et al., 2008). If the Internal Consistency Score (ICS)—a correlation (Spearman's rho) of scores on the dummy pairs—is low, that suggests the individual was not reading the test carefully or did not understand test items. In that case, he or she can be asked to retake the test. In the present study, the ICS was not used for this purpose.

Items in each of the four competency areas were related to that specific competency. A typical item in the *capturing* category, for example, was, "I always keep a recording device by my bed at night." In the *challenging* category, a typical item was, "I sometimes try to solve problems that, in principle, have no solution." In the *broadening* category, a typical item was, "I often read books from outside my specialty." And in the *surrounding* category, a typical item was, "I redecorate or rearrange my work environment regularly."

Subjects were informed that they were taking a test that "measures four types of skills that help people express their creativity." They were also asked basic demographic questions, along with three criterion questions, each answered on a 10-point Likert scale: "How frequently do you currently express your creativity?" (scale from *rarely* to *frequently*), "How satisfied are you with your life?" (scale from *not at all* to *extremely satisfied*), and "How much success have you had in your professional life?" (scale from *low* to *high*). These questions were administered before the start of the test itself, so that responses would not be affected by the test items. E-mail addresses were also collected, but to preserve subject confidentiality, the e-mail addresses were stored separately from test results and could not be used to identify test takers.

Subjects

Participants were 13,578 people who took the ECCI-i at the Web site <http://MyCreativitySkills.com> between May 29, 2007 and October 31, 2009. Participants were not actively recruited. People presumably found the test through search engines or through links to the test posted at a variety of different websites, including <http://PBS.org>, <http://CNBC.com>, and <http://PsychologyToday.com>. When people took the test more than once, data from only the first test administration were used in this study.

Forty-two point one percent of the subjects were men, and 57.9% were women. The mean age was 36.7 years, with an age range from 9 to 85. The sample was racially and ethnically diverse (73.4% White, 0.6% American Indian, 8.6% Asian, 6.0% Black, 5.0% Hispanic, and 4.7% other, with 1.6% unknown) as well

as diverse in educational background (4.6% no degree, 22.7% high school, 8.3% associates, 38.6% college, 20.0% Masters, and 5.3% Doctorate, with 0.5% unknown). Ninety-one point six percent of the subjects were located in the United States or Canada; 5.4% were from 45 other countries; and 3.0% were from unknown locations.

Procedure

After completing the test, the test taker clicked on a "Submit" button, which produced a detailed report defining the four core competencies and showing his or her total score and score in each competency area.

RESULTS

Adverse Impact

The United States Equal Employment Opportunity Commission (EEOC) provides statistical standards that must be upheld by tests that could be used to hire, fire, or promote employees (US EEOC, 2007, 2010). The EEOC requires that these tests not distinguish groups by race, ethnicity, or gender by 20% or more. This standard was met in the previous study (Epstein et al., 2008), as well as in this study. Scores for women differed from scores for men by only 1.8%, and the maximum difference between any two racial or ethnic groups was 4.6%.

Reliability and Validity

Internal-consistency reliability was moderate: Cronbach's alpha was 0.85, and the Guttman split-half measure was 0.84. In addition, the average ICS was 0.87. Test-retest reliability was not measured (see Discussion).

The predictive validity of the test is suggested by significant positive correlations between total scores and a number of self-reported variables. Most important, test scores were good predictors of the subjects' estimates of how frequently they expressed creativity (Spearman's $\rho = 0.52^{***}$).² Test scores were also associated with both life satisfaction ($\rho = 0.25^{***}$) and professional success ($\rho = 0.26^{***}$). In addition, test scores were substantially higher among people who had had creativity training

²Nonparametric statistical tests such as Spearman's rho, the Mann-Whitney U, and the Kruskal-Wallis H are used throughout this study because scores on the ECCI-i lie on an ordinal scale. The triple asterisk is used to signify a significance level (p) of less than 0.001. The double asterisk is used to signify a significance level (p) of less than 0.01. A single asterisk is used to signify a significance level (p) of less than 0.05. Unless otherwise indicated, all test scores are reported as a percentage of total correct rather than as raw scores.

(Mann-Whitney $U = 1.3E + 07^{***}$, $M_{Yes} = 64.8$, $M_{No} = 58.8$) and were positively correlated with the number of training hours ($\rho = 0.22^{***}$).

Demographic Differences

Small but significant effects were found for age ($\rho = 0.05^{***}$) and education ($\rho = 0.07^{***}$, Kruskal-Wallis $\chi^2 = 81.5^{**}$, $M_{None} = 59.1$, $M_{HighSchool} = 58.8$, $M_{Associates} = 60.7$, $M_{Bachelors} = 60.1$, $M_{Masters} = 61.9$, $M_{Doctorate} = 62.3$), as well as for race and ethnicity ($\chi^2 = 19^{**}$, $M_{Whites} = 60.3$, $M_{Blacks} = 60.2$, $M_{Hispanics} = 60.0$, $M_{Asian} = 59.5$, $M_{AmerInd} = 61.5$, $M_{Other} = 62.1$).

Women outscored men on three of the four competencies (*capturing*: $U = 21,343,370^{***}$, $M_{Males} = 53.0$, $M_{Females} = 54.6$; *broadening*: $U = 21,424,260^{***}$, $M_{Males} = 73.8$, $M_{Females} = 75.2$; *surrounding*: $U = 19,019,204^{**}$, $M_{Males} = 51.9$, $M_{Females} = 57.6$), as well as on total score ($U = 2.1E + 07^{***}$, $M_{Males} = 59.7$, $M_{Females} = 60.8$), and men outscored women in one competency area (*challenging*: $U = 18,828,772^{***}$, $M_{Males} = 60.2$, $M_{Females} = 55.6$).

Competency Differences

Generally speaking, subjects scored relatively high on only the *broadening* competency ($M = 74.6$), which suggests that people see value in extending their knowledge and skills into new areas. Scores in the other three competencies were low (*capturing*: $M = 53.9$; *challenging*: $M = 57.6$; *surrounding*: $M = 55.2$), as was the average total score ($M = 60.3$; Figure 1).

Regressions and Factor Analysis

The relative value of the four competencies was determined using linear regressions. All four of the

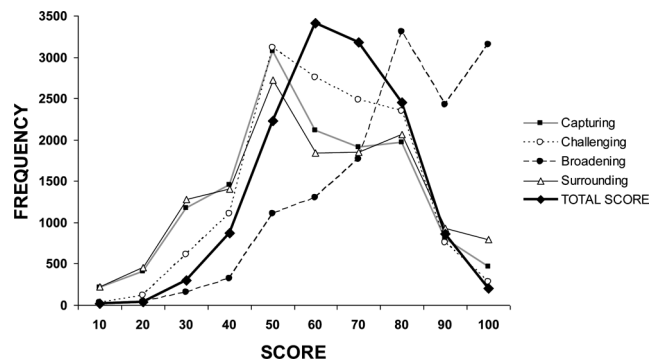


FIGURE 1 Frequency distribution of competency scores and total score on the ECCI-i, shown in intervals of 10 percentage points. The curve for total score is bell shaped and roughly symmetrical around a mode of 60.4. The curves for three of the competencies—*capturing*, *challenging*, and *surrounding*—are also roughly bell shaped, but the scores are more widely dispersed. Scores skew higher only for the *broadening* competency (dashed line with solid circles).

TABLE 1
Factor Analysis: Rotated Component Matrix

Item	Component 1	Component 2	Component 3	Component 4	Component 5
16	0.708				
5	0.702				
18	0.566				
27	0.507				
12	0.505				
7	0.431				
20	0.344				
19		0.685			0.309
24		0.643			0.336
13		0.626			
11		0.591			
14		0.430	0.370		
4		0.359	0.536		0.335
15			0.840		
25			0.834		
21		0.359	0.536		
17				0.729	
23				0.725	
2				0.521	
9				0.419	
1					0.634
3					0.573
26			0.318		0.390
6	0.346				0.385

Notes. Extraction Method was Principal Component Analysis. Rotation Method was Varimax with Kaiser Normalization. Factor loadings under 0.30 are not shown.

competencies proved to be predictive in the regression models. *Capturing* was the most predictive competency when predicting self-reported frequency of creative expression (*capturing*: $\beta = 0.31^{***}$; *challenging*: $\beta = 0.15^{***}$; *surrounding*: $\beta = 0.15^{***}$; *broadening*: $\beta = 0.05^{***}$), but *challenging* was most important when predicting both life satisfaction (*challenging*: $\beta = 0.22^{***}$; *surrounding*: $\beta = 0.15^{***}$; *capturing*: $\beta = -0.03^*$) and professional success (*challenging*: $\beta = 0.21^{***}$; *surrounding*: $\beta = 0.12^{***}$; *broadening*: $\beta = 0.05^{***}$; *capturing*: $\beta = -0.03^{**}$).

A factor analysis yielded five interpretable components closely related to the four core competencies of creative expression: (a) expanding knowledge, (b) seeking inspiration from new or unusual stimuli, (c) creating a stimulating environment, (d) seeking challenge, and (e) recording solutions to difficult problems (Table 1).

DISCUSSION

Although the results of this study support the conclusions drawn by Epstein et al. (2008), that study involved face-to-face contact with subjects, whereas this study was conducted on the Internet. Although Internet-based research is rapid and economical, it is also limited in

some respects. Subjects in this study were self-selected, and self-selection can bias a sample. In this study, for example, 63.9% of the subjects had at least a college degree; in the general population in the United States, only about 27% of adults have completed their college education (US Census Bureau, 2010). In Internet research, one also cannot be certain of the accuracy of demographic information or even of the integrity of test results, although some studies suggest that subjects might be more honest, on average, when taking a computer-administered test than when taking a person-administered test (Kaplan & Saccuzzo, 2009).

Moreover, because the identities of our subjects were unknown, there was no way to measure concurrent validity or test-retest reliability. Future studies will ask subjects if they would be willing to take additional tests; that will allow us to conduct various kinds of follow-up research, at least with a self-selected subset of our sample. These limitations aside, converting the survey to an online format allowed for its rapid administration across a large, demographically-diverse sample of people worldwide.

One of the more notable findings in this study concerned gender differences, with women outscoring men in three of the four competency areas, and particularly on the *surrounding* competency. This is consistent with the finding that, on average, women may be more aware than men of the effects that physical and social surroundings have on behavior (Flaherty & Richman, 1989; Wilson & Stokes, 1983). Men outscored women substantially in only one competency area—*challenging*—which is consistent with the finding that, on average, men may be more prone to risk-taking and challenge-seeking than women (e.g., Gerard, Fischbeck, Gengler, & Weinberg, 2007).

This study also suggests that *capturing*—preserving new ideas as they occur—has special value in increasing creative expression. Of the four competencies, it was by far the best predictor of self-reported creative output. Elsewhere, Epstein has noted that teaching people strategies for preserving their new ideas can dramatically increase creative expression, sometimes increasing the volume of new ideas by a factor of 10 or more (Epstein, 2000). On the other hand, and as one might expect, *capturing* was a poor predictor of self-reported life satisfaction and professional success. These variables were best predicted by the *challenging* competency, suggesting that some degree of challenge-seeking is important for satisfaction and success in life (cf. Friedman & Martin, 2011).

Finally, the fact that the test scores in this study were generally low suggests that a vast reservoir of untapped creative potential could easily be released through creativity competency training and, in particular, simply by teaching people to be more conscientious about paying

attention to and recording their new ideas. Other studies have long shown that various kinds of creativity training, and especially training that improves problem-solving skills, has the potential to enhance creative expression (Epstein, 2011; Ma, 2006; Torrance, 1987); this study now joins the Epstein et al. (2008) study in suggesting that creativity competency training may also be valuable in this regard.

REFERENCES

- Boyatzis, R. (1982). *The competent manager: A model for effective performance*. New York: Wiley.
- Epstein, R. (1985). Animal cognition as the praxist views it. *Neuroscience and Biobehavioral Reviews*, 9, 623–630.
- Epstein, R. (1991). Skinner, creativity, and the problem of spontaneous behavior. *Psychological Science*, 6, 362–370.
- Epstein, R. (1996a). *Cognition, creativity, and behavior: Selected essays*. Westport, CT: Praeger.
- Epstein, R. (1996b). *Creativity games for trainers*. New York, NY: McGraw-Hill.
- Epstein, R. (1999). Generativity theory. In M. A. Runco & S. Pritzker (Eds.), *Encyclopedia of creativity* (pp. 759–766). New York, NY: Academic Press.
- Epstein, R. (2000). *The big book of creativity games*. New York, NY: McGraw-Hill.
- Epstein, R. (2005). Generativity theory and creativity. In M. A. Runco & R. S. Albert (Eds.), *Theories of creativity* (Rev. ed., pp. 116–140). Cresskill, NJ: Hampton Press.
- Epstein, R. (2011). Exercises. In M. A. Runco & S. Pritzker (Eds.), *Encyclopedia of creativity, 2nd edition* (pp. 480–487). San Diego, CA: Academic Press.
- Epstein, R., Schmidt, S. M., & Warfel, R. (2008). Measuring and training creativity competencies: Validation of a new test. *Creativity Research Journal*, 20, 7–12.
- Flaherty, J., & Richman, J. (1989). Gender differences in the perception and utilization of social support: Theoretical perspectives and an empirical test. *Social Science & Medicine*, 28, 1221–1228.
- Friedman, H. S., & Martin, L. R. (2011). *The longevity project: Surprising discoveries for health and long life from the landmark eight-decade study*. New York, NY: Penguin.
- Gerard, D., Fischbeck, P. S., Gengler, B., & Weinberg, R. S. (2007). An interactive tool to compare and communicate traffic safety risks: Traffic STATS. *Journal of the Transportation Research Forum*, 46, 87–102.
- Hunter, S. T., Bedell, K., & Mumford, M. D. (2007). Climate for creativity: A quantitative review. *Creativity Research Journal*, 19, 69–90.
- Kaplan, R. M., & Saccuzzo, D. P. (2009). *Psychological testing: Principles, applications, and issues* (7th ed.). Belmont, CA: Cengage Learning.
- Ma, H.-H. (2006). A synthetic analysis of the effectiveness of single components and packages in creativity training programs. *Creativity Research Journal*, 18, 435–446.
- McClelland, D. (1973). Testing for competence rather than “intelligence”. *American Psychologist*, 28, 1–14.
- Muñoz-Doyague, M. F., González-Álvarez, N., & Nieto, M. (2008). An examination of individual factors and employees’ creativity: The case of Spain. *Creativity Research Journal*, 20, 21–33.
- Prabhu, V., Sutton, C., & Sauser, W. (2008). Creativity and certain personality traits: Understanding the mediating effect of intrinsic motivation. *Creativity Research Journal*, 20, 53–66.
- Smith, M., & Smith, P. (2005). *Testing people at work: Competencies in psychometric testing*. Oxford, UK: Blackwell.
- Spencer, L. M., & Spencer, S. M. (1993). *Competence at work: Models for superior performance*. New York, NY: Wiley.
- Torrance, E. P. (1987). Teaching for creativity. In S. G. Isaksen (Ed.), *Frontiers of creativity research: Beyond the basics* (pp. 189–215). Buffalo, NY: Bearly Limited.
- US Census Bureau. (2010). *2010 American community survey 1-year estimates*. Retrieved January 11, 2012, from <http://www.census.gov/acs/www/>
- US Equal Employment Opportunity Commission. (2010). Employment tests and selection procedures. Retrieved December 10, 2011, from http://www.eeoc.gov/policy/docs/factemployment_procedures.html.
- US Equal Employment Opportunity Commission. (May 16, 2007). Commission meeting of May 16, 2007: Transcript. Retrieved December 10, 2011, from <http://www.eeoc.gov/eeoc/meetings/archive/5-16-07/transcript.html>.
- Wilson, D. G., & Stokes, J. P. (1983, August). *Gender differences in social support*. Presentation at the 91st Annual Convention of the American Psychological Association, Anaheim. Retrieved January 11, 2012 from: <http://www.eric.ed.gov/ERICWebPortal/detail?accno=ED237864>
- Wood, R., & Payne, T. (1998). *Competence based recruitment and selection: A practical guide*. New York, NY: Wiley.