

What Do Psychological Tests Suggest about Entrepreneurs?

Sally P. Caird

The reasons for the importance of looking at the application of psychological tests to entrepreneurs include the idea that there is a correlation between economic growth and business formations. This draws attention to the activities of entrepreneurs and methods of identifying and assessing these individuals. This article discusses the results of some psychological tests which have been used with entrepreneurs.

Interest in the application of psychological tests to entrepreneurs stems from interest in exploring the elusive nature of the entrepreneur. Tests may also help to assess participants on enterprise training courses as well as help with the selection of entrepreneurs for training, advice and financial support.

Previous reviews of this area have focused more on definitional issues than on psychological measurement (e.g.[1]). This is important because there are problems in defining and identifying entrepreneurs. The term "entrepreneur" usually refers to innovative, risk-taking business owner-managers. However, some definitions may apply not only to the occupation of business owner-management but to the psychological characteristics associated with entrepreneurial behaviour. The concept of entrepreneur could therefore broadly apply to any individual in any occupation of any status who shows entrepreneurial initiative. For example, there have been studies of so-called social entrepreneurs who set up enterprises in the voluntary sector with aims to benefit society rather than make profits[2].

Clearly, entrepreneurs are not a homogeneous population and there may be different types of entrepreneurs, distinguished by their growth orientation, motivation, type of business, involvement with new technology, association

with business owner-management, and so on. The simplest and most easily operationalized definition of an entrepreneur is a business owner-manager. However, even this definition has limitations because an entrepreneur is a special category of business owner-manager, that is an innovative risk-taker. Although this is less easy to operationalize, it is the definition maintained in this article unless otherwise stated.

The main problems in the psychological testing of entrepreneurs relate to the varying definitions of the entrepreneur, the numerous characteristics attributed to entrepreneurs and uncertainty about the significance of entrepreneurial characteristics. These problems largely account for the main uses of psychological tests with entrepreneurs which are either to explore the nature of the entrepreneur or to assess so-called significant entrepreneurial characteristics.

These problems limit a review of the psychological tests employed with entrepreneurs because the characteristics of entrepreneurial samples are not always clear. However, psychological tests may be useful for identifying entrepreneurial types, distinguishing more from less enterprising individuals and establishing psychological differences between entrepreneurial types with psychological test results.

EXPLORING THE NATURE OF ENTREPRENEURS

The majority of tests used with entrepreneurs could be described as personality tests rather than tests of ability, attainment or aptitude.

This article is partially based on research carried out at the Durham University Business School which published the author's previous work, *A Review of Methods of Measuring Enterprise Attributes* in 1988. She is grateful to Mr C. Johnson for advice given at the time.

The main tests are described below (see Table I). These tests include:

- (1) the Thematic Apperception Test (TAT);
- (2) Edwards' Personal Preference Schedule;
- (3) Honey and Mumford Measure of Learning Styles;
- (4) Jackson's Personality Inventory (JPI); and
- (5) Myers-Briggs Type Indicator (MBTI).

Two traditions of testing have influenced the development of tests. The impressionistic school favours the use of projective measures, such as the Thematic Apperception Test (TAT) which employs unstructured tasks and formats to measure motivation by requesting the subject to invent a story based on test pictures. The influence of the psychometric tradition of testing is more common and may be attributable to reliability problems and the impracticality of scoring procedures in projective testing.

The psychometric approach favours the employment of objective tests, which ask the respondent to rate predetermined scales of test items representing attitudes, preferences or habitual responses. A variety of formats may be used to collect responses. These range from less sensitive true/false or agree/disagree response formats to formats such as the Likert and multiple choice which allow greater flexibility in the response given (see Table I).

The Thematic Apperception Test (TAT)

In McClelland's work, the TAT attempts to measure needs for achievement, power and affiliation by presenting pictures which suggest stories about problems to be solved with boss-subordinate relationships, family and friendship, respectively[3]. This research found that the entrepreneur has high needs for achievement, high needs for power but low affiliation needs, that is the need to relate to others and be approved by them[3]. Similar findings were reported in "The Enterprising Man" when depth interviews and the TAT supported the entrepreneur's high need for achievement and autonomy[17].

Tests may reveal differences between different types of entrepreneurs. When the TAT was used with technological entrepreneurs, it was found that they exhibited moderate rather than high needs for achievement and power with low needs for affiliation[5]. Further results revealed that technical entrepreneurs were heavily orientated towards independence and concerned with meeting challenges more than financial rewards[5].

Edwards Personal Preference Schedule (EPPS)

The EPPS is an objective, reasonably reliable, personality test which requests the subject to rank order the importance attributed to the fulfilment of needs[6]. This instrument suggests that needs are ranked, not in the absolute Maslowian hierarchical structure, but uniquely by individuals, according to personal priorities. This implies that when the individual is forced to choose between the fulfilment of various needs, the need which has strongest motivating power will be chosen for fulfilment.

This test found that entrepreneurs exhibited high needs for achievement, autonomy, dominance and change with low needs for deference, order, affiliation and abasement[7]. The need for autonomy was found to be the strongest reason for starting a business[7, p. 6].

On the basis of Watkins' findings, subsequent researchers have reduced the size of the EPPS to include only the items representative of entrepreneurial needs. For example, using the scales of autonomy, achievement and dominance, there were no significant differences found in the results of testing differences between black and white entrepreneurs[8].

Honey and Mumford Measure of Learning Styles

The Honey and Mumford measure of learning styles is a general measure of individual learning dispositions[9]. This test identifies whether individuals have a preference for learning through reflection, theorizing, experimentation or action[9]. The results of this measure show that the most successful growth oriented small business owner-managers have activist and pragmatic learning styles[10]. In other words, this test shows that entrepreneurs prefer to learn through action and experimentation rather than through theory and reflection.

Jackson's Personality Inventory (JPI)

The well-validated JPI is an objective test which measures a number of different characteristics which include innovation, conformity, organization, responsibility and risk taking ([11], see Table I). In comparative studies between entrepreneurs and managers, entrepreneurs scored lower on measures of conformity and interpersonal effectiveness but higher on measures of energy, risk-taking, autonomy, reaction to change and social adroitness[12].

User	Name of test	Characteristic	Format
McClelland [4]; Collins <i>et al.</i> [17]; Dies, [37]; Roberts [5]	Thematic Apperception Test (TAT), McClelland [17]	Need for achievement Need for autonomy Need for affiliation	Open ended-projective test with criteria-based scoring and interpretation
Watkins [7]; Hornaday and Aboud [8]; Begley and Boyd [23]	Edwards Personal Preferences Schedule (EPPS), Edwards [6]	15 Needs – Achievement, Deference, Order, Exhibition, Autonomy, Affiliation, Introspection, Succorance, Dominance, Abasement, Nurturance, Change, Endurance, Heterosexuality and Aggression	Forced multiple choice with systematic rotation of items corresponding to each need Consistency check
Maxon [15]; Roberts [5]; Hoy and Carland [14]	Myers-Briggs Type Indicator, Myers and Briggs [13].	Examines styles of perception and judgement along four dimensions: Introversion/Extroversion Intuition/Sensation Thinking/Feeling Judging/Perception	Structured with variation in Forced Choice Format, e.g. Multiple Choice plus Yes/No etc.
Thorpe and Dyson [10]	Learning Styles Questionnaire, Honey and Mumford [9]	Active/Pragmatic, Reflective Theoretical Learning Styles	Forced choice, Agree or Disagree
Sexton and Bowman [12]; Begley and Boyd [23]	Jackson Personality Inventory, Jackson [11]	Anxiety, Breadth of Interest Complexity, Conformity, Energy Level, Innovation, Interpersonal Effect, Organization, Responsibility, Risk- taking, Self-esteem, Social Adroitness, Social Participation, Tolerance, Value Orthodoxy, Infrequency	Forced choice, Agree or Disagree

TABLE I.
Exploring the Nature of Entrepreneurs

Myers-Briggs Type Indicator (MBTI)

Further insights into the nature of the entrepreneur are offered by the MBTI which attempts to identify the style in which individuals are disposed to operate. The test examines preferred styles of perception and judgement along four dimensions: introversion-extroversion; intuition-sensation; thinking-feeling; judging-perception[13]. The introversion-extroversion dimension identifies whether you prefer to focus more on your inner world on your own or the outer world of people and objects. The intuition-sensation dimension identifies whether you like to look for meanings, patterns and possibilities or the realities and facts of a situation. The thinking-feeling dimension measures whether you make decisions based on objective analysis or your feelings and sympathy for people. The judging-perception dimension identifies whether you prefer to order and control life or flexibly respond to ever-changing opportunities.

When this test is applied to managers, entrepreneurs and intrapreneurs or enterprising

employees, comparisons are limited by the possibility of migration in employment status and activities. However, studies which compared the MBTI profile of managers and entrepreneurs found that entrepreneurs are more intuitive, thinking and perceptive than managers who are more sensing, feeling and judging[14]. However, no significant differences were found on measures of introversion and extroversion[14].

A comparison of entrepreneurs with intrapreneurs (enterprising employees) found that entrepreneurs tend to be introverted, intuitive, thinking and judging types whereas intrapreneurs tend to be extroverted, intuitive, thinking and perceptive[5]. Comparisons between technological entrepreneurs and scientists and engineers found that technological entrepreneurs score more highly on measures of extroversion, intuition, and thinking and perception[5].

The MBTI results support an entrepreneurial orientation towards thinking and intuition because this describes entrepreneurs, technical entrepreneurs and intrapreneurs. However,

intrapreneurs and technological entrepreneurs are extroverted and perceptive, unlike entrepreneurs and managers who are introverted and judging. Roberts' emphasis that perceptiveness describes the inventor might explain why intrapreneurs and technological entrepreneurs are more perceptive than managers[5]. However, non-technical entrepreneurs emerge more judging than perceptive which is not easy to square with definitions of entrepreneurs as innovative business owner-managers. If perceptiveness is indicative of inventiveness which is not descriptive of non-technical entrepreneurs who are innovative, then further work is needed to distinguish concepts such as invention, innovation and entrepreneurship.

ASSESSING SIGNIFICANT ENTREPRENEURIAL CHARACTERISTICS

The application of psychological tests to explore the nature of entrepreneurs has shown that entrepreneurs have the following characteristics: a high need for achievement, autonomy, change, dominance, a low need for deference, abasement, affiliation and order, characteristics of risk taking, energy and social adroitness; a preference for learning through action and pragmatism; and a preference for intuition and thinking.

The administration of any psychological test will create a result and stamp its mould on the respondents. A research study of 300 entrepreneurs is currently underway using a selection of scales from the Minnesota Multiphasic Personality Inventory (MMPI), the Personal Profile System (PPI), the Fundamental Interpersonal Relations Orientation Behaviour Scale (FIRO-B), the Herrmann Brain Dominance Inventory (HBDI) and the Rokeach Value Survey[16]. Claiming that there are similarities between entrepreneurs and sociopaths, the researchers plan to test the hypothesis that entrepreneurs are mildly sociopathic[16].

Whether testing such a hypothesis is useful or not, this work demonstrates that any psychological test may be applied to entrepreneurs. However, the results of the application of psychological tests are most useful for understanding entrepreneurs when those results are correlated with entrepreneurial behaviours and ventures. It is true that there have been few attempts to establish these links, which is a criticism of the use of tests with entrepreneurs. However, despite the heterogeneity of entrepreneurial characteristics and the scarcity of studies which associate the test results with entrepreneurial behaviours and achievements,

there have been attempts to assess so-called significant entrepreneurial characteristics. These so-called significant entrepreneurial characteristics include the high need for achievement, internal locus of control, creative tendency and calculated risk taking.

Need for Achievement (NACH)

McClelland claims that (NACH) is associated with entrepreneurship and economic growth and therefore determines the individual's entrepreneurial potential[4]. Despite unproven associations, McClelland's claims inspired the development of more tests of this need for achievement than other enterprise characteristics (see Table II).

A high NACH is defined as the positive affect aroused in situations which involve competition with a standard of excellence[4]. This is associated with certain characteristics which include self-awareness, planning ability, initiative, problem solving, energy, innovation, determination, motivation[4]skilled risk-taking, responsibility, decision making[4], and superego strength[18].

Internal Locus of Control

An individual with an internal locus of control takes responsibility for successes and failures, attributing outcomes to his or her own ability and effort, unlike an individual with an external locus of control who relates outcomes to task ease or difficulty, luck, fates, powerful others or being in the right place at the right time. Measures of internal locus of control describe the extent to which individuals believe that reinforcements are dependent on their own behaviour[19,20].

This construct is strongly associated with entrepreneurial orientation[21]. Some studies have found that it differentiates entrepreneurs from managers[22]but others have not[23]. However, internal locus of control is also associated with the following set of positive characteristics, many of which may be described as entrepreneurial: insight, initiative, tolerance, dominance, achievement, well-being, assertion, independence, effectiveness, industriousness, sociability and intellectual efficiency[24].

Creative Tendency

The Kirton Adaption-Innovation Inventory (KAI) is one of the few tests of creativity used with entrepreneurs. Although mainly applied to managers in organizations[25], this test looks at creative style rather than ability and suggests that

User	Name of test	Characteristic	Format
Lynn [18]	Lynn's Achievement Motivation Questionnaire, Lynn [18]	Need for achievement	Forced choice – with yes/no response format
Smith [34]	A Quick Measure of Achievement Motivation, Smith [34]	Need for achievement	Forced choice and directive – with yes/no response format
Mehrabian and Bank [31, 43]; Lachman [42]	Measures of Achieving Tendency, Mehrabian and Bank [31]	Need for achievement	Likert scale
Joe [24]; Cromie and Johns [22]; Cachon and Cotton [21]; Begley and Boyd [23]	Internal Locus of Control, Rotter [19]	Locus of control	Forced choice and directive – with yes/no response format
Scanlan [44]	Levenson's Measure of Locus of Control, Levenson [20]	Locus of control	Likert scale
Cachon and Cotton [21]	Kogan-Wallach – 1964 Dilemma Instrument, Kogan and Wallach [27]	Risk taking	Open-ended and multiple choice
Cross [26]	Kirton Adaption-Innovation Inventory, Kirton [40]	Creative style	Likert-type format

TABLE II.
Assessing "Significant" Entrepreneurial Characteristics

creative style may be characterized by an adaptive or innovative mode of problem solving[25]. The creative style of the adapter is to improve within existing structures while the creative style of the innovator is to change the structures themselves and take risks with uncertain outcomes[25]. This would suggest that entrepreneurs should score high on innovative scales or those gaining high scores on innovative scales would seek an entrepreneurial occupation. One study looked at the potential for using the KAI to select potential entrepreneurs from a sample of redundant managers, finding no support for the hypothesis that innovative redundant managers seek the occupation of entrepreneurship[26]. An explanation for this may be that innovators seek employment in innovative companies[26]. Furthermore, a longitudinal study may produce different results as the KAI scores were correlated with preferred strategies rather than actions of managers facing redundancy.

Risk-taking

The Kogan and Wallach measure of risk-taking behaviour has been used with entrepreneurs[27], and was found to correlate significantly with entrepreneurial orientation in student samples[21]. This measure presents 11 areas of uncertainty in which respondents are encouraged

to estimate the extent of risk that they are prepared to take in areas such as work, marriage, health, money, sport, education and so on. However, it may be inappropriate to measure risks taken outside the business context because one study of managers' risk-taking behaviours showed that it was exceptional to find consistency in risk-taking across different situations[28].

GENERAL PROBLEMS WITH TESTS AND TESTING

The first assumption of testing is that psychological characteristics may be measured and that appropriate measurements may be found or developed. If this may be accepted then the next step is to develop, evaluate and employ valid, reliable, sensitive and practical measures. The application of psychological tests to entrepreneurs begs many questions which are discussed below.

Are Tests Employed with Entrepreneurs Validated?

A limited amount of validation work has been carried out on tests which aim specifically to measure entrepreneurial characteristics (see Table III). These tests tend not to be of the standardized, validated genre which are developed along the rigorous procedures for test development

User	Name of test	Characteristic	Format
Boyatzis and Winter [30]	Testing the Entrepreneurial You, Boyatzis and Winter [30]	Specific attributes not identified	Multiple choice
Johnson and Caird [38]	General Enterprising Tendency, Johnson and Caird [38]	Need for Achievement and Autonomy, Calculated risk taking, Creative tendency and locus of control	Forced choice, Agree/disagree
King [41]	King's Behavioural Checklist, King [41]	Achievement, Motivation, Internal locus of control, Risk taking propensity, Problem-solving ability and manipulative skills	Multiple choice
Vicars <i>et al.</i> [45]	General Entrepreneurial Tendency, Vicars <i>et al.</i> [45]	Specific attributes not identified	Likert scale
Freeley [36]	Entrepreneurial Style Profile, Freeley [36]	Motivation, Problem solving, Knowledge, Persistence, Human relations, Active involvement, Variety, Communications, Responsibility, Background Independence, Risk taking	Likert scale

TABLE III.
General Measures

specified by the British Psychological Society[29]. Indeed, some of these tests are basically quizzes[30]. This suggests the advisability of using these tests in a light-hearted way rather than as an aid to making decisions about individual entrepreneurial potential or suitability for business support or training.

When tests which are poorly validated are administered, it becomes difficult to appraise results. If you cannot depend on the validity of a test then you cannot depend on the validity of results, which could be a mere artefact of the test and have no reflection on reality. Extensive validation studies have been carried out on many of the tests presented in Tables I and II. However, confirming that tests reliably measure what they claim to measure is a laborious, time-consuming proof. A valid test should:

- look valid to the users (face validity);
- discriminate between those tested with it (discriminant validity);
- correlate with other psychological tests which measure the same characteristics (concurrent validity);
- predict relevant behaviours (predictive validity);

- repeat results with repeated administrations on the same people and differentiate real personal change from test unreliability (reliability).

Are the Assumptions about Human Nature and the Personality Valid or Testable?

All psychological tests are based on some theoretical understanding or assumptions about human nature which are frequently unproven. For example, the assumption underlying the Thematic Apperception Test is that fantasy and overt behaviour are directly related. The predictive validity of the instrument depends on the view that fantasy (which is measured) represents behaviour or provides a preview of behaviour (which is unmeasured). However, it is possible that fantasy does not reflect the personality of the subject. Furthermore, fantasy may act as a substitute for behaviour rather than an indicator of behaviour.

There is a tendency for tests to simplify the measurement of the personality by using formats which may make artificial distinctions between personality characteristics. Some psychological tests are designed to assess, perhaps fallaciously, personality characteristics as opposites. For example, Mehrabian's measure of achieving

tendency forces the respondent to choose between the importance of fulfilling certain needs, thereby implying some polarity between the need for achievement or affiliation; the need to achieve or to avoid failure; the need for challenge or for superiority; the need for challenge or security[31]. Furthermore, the Kirton Adaption-Innovation Inventory (KAI) measures adaption, which is defined as the proclivity to do things better, and innovation, which is defined as the proclivity to do things differently, and polarizes them on a continuum. In either case it may not be demonstrable that these are valid polarized dimensions.

Does the Test Measure What It Claims to Measure?

The valid measurement of any characteristic fundamentally depends on the definition of the concept. For example, with the need for achievement, there is some confusion because this construct may be erroneously identified with ordinary motivation to reach any goal and assessed as such[32]. Originally the construct of achievement motivation was coined to describe the striving to achieve specifically difficult and challenging goals to high personal standards of excellence[4]. Varying conceptions of this construct have led to poor concurrent validity between the numerous measures of this construct[33].

Does the Test Appear to Measure What It Claims to Measure?

It is important that tests appear to measure what they aim to measure, that is indicate face validity. For example, Lynn's scale has been validated by showing that recognized high achievers score highly on it[18]. However, it appears to have face validity given that it suggests that the high achiever has a difficulty in relaxing on holiday, irritation with a lack of punctuality or efficiency, a dislike of waste, difficulty in forgetting about work, a preference for competent rather than congenial partners and a propensity to strive to be the best[18, p. 529]. These items seem intuitively likely to reflect a high need for achievement, thereby suggesting face validity.

Do the Test Constructs Validly Reflect the Complexity of the Psychological Characteristic Being Measured?

Test development is limited by how little is known about the nature of personality. However, with some tests no attempt is made to reflect what

is known about psychological characteristics. For example, measures of single needs, such as the need for achievement, are crude when one considers the amount of work carried out on motivation theory and research[18,34]. The problem with measures of single needs is that even if the person receives a high score they may have needs that are more motivating than the need to achieve. For example, on Smith's scale a respondent may feel that it is more true than false "that the feeling of a job well done is a great satisfaction" but may still have a stronger need for change or affiliation, and so on (see[34]).

The complexity of personality characteristics are rarely represented in tests. For example, the complexity of risk-taking behaviour has not been measured by psychological tests. Atkinson's exploration of the relationship of motivation to risk-taking reveals that risk-taking behaviour is a function of the strength of the motive to achieve or avoid failure, the expectancy and probability of success or failure, and the incentive value of success or the avoidance of failure[35].

Does the Format of the Test Allow for a Valid Response which is Capable of Discriminating among Subjects?

The issue of test format is important for the question of whether tests are sensitive to individual differences. Many of the tests employed with entrepreneurs favour a limited response format, such as a forced choice agree/disagree or true/false response format[18,34]. This format may produce reliable results and offer a practical way to score responses but may not be very sensitive or discriminating.

Some balance is needed between reliability and sensitivity. However, some flexibility in response formats is important to prevent tests from stamping a mould on the subjects. Tests of specific characteristics which use a limited-choice response format allow the subjects little opportunity to offer a creative response which is reflective of their individuality (see Tables I-III). The results of such tests may be superficial and may contribute little to understanding the entrepreneur's nature.

Forced-choice response formats may be less valid and sensitive than more open-ended response formats; true/false, and agree/disagree formats being more limiting than the Likert scales which encourage respondents to indicate the extent of their agreement or disagreement with attitudinal test items along measures of intensity or multiple choice formats which offer the respondent more flexibility in response (see Tables I-III).

From the vantage point of sensitive measurement the projective method employed with the TAT has the advantage because it is open ended. Respondents are required to create a story in response to a set of pictures in their own style. There are scoring criteria to assess the responses. For example, measures of the need to achieve include whether the respondent defines a problem; express a desire to solve it; anticipates difficulties; anticipates sources of help; and considers the consequences of success or failure. Unfortunately, the laborious nature of scoring results reveals a practical disadvantage for an otherwise sensitive measure. So although open-ended tests may be more sensitive they tend to be less practical and reliable than more objective tests.

Are the Test Items Transparent in the Implications and Indicative of Socially Desirable Responses?

Test item transparency is an additional problem present in many of the tests applied to entrepreneurs. For example, Lynn's measure of the need for achievement requests respondents to reply yes or no to the following question: "Have you always worked hard in order to be among the best in your own line?" [18, p. 529]. The subject does not have to think too hard about what response they ought to give, irrespective of whether they choose to present that response.

On the other hand, test item transparency may sometimes be so obscured that the test item fails (or appears to fail) to measure what it aims to measure. For example, in "Testing The Entrepreneurial You", it is not obvious that it is more entrepreneurial to daydream about being "detective who has solved a difficult case", than "a millionaire floating on a yacht" [30, p. 52]. But the test scoring procedure judges that it is more entrepreneurial to daydream about being a detective rather than a millionaire.

Sometimes the socially desirable response to test items is transparent which may undermine the value of test items. For example, one test item in a measure of the need for achievement is "Do you like to get drunk?" and a negative response indicates an entrepreneurial response [18]. Transparent items suggestive of social desirability limit the sensitivity and validity of a measure. This is especially the case when tests are used in threatening circumstances, such as recruitment when the results have far reaching implications.

Most general measures of entrepreneurial characteristics (Table III) are transparent and require respondents to assess themselves. Objectivity cannot be claimed in the results

because responses may depend on respondents' confidence, self-awareness, honesty and perception of the self-assessed test. Hence Freeley's claim that the rather transparent self-assessment test "Entrepreneurial Style Profile" predicts the success of those who plan to start a business, may depend on the self-awareness and honesty of the respondents [36].

DISCUSSION

The results of applying psychological tests shows that entrepreneurs have the following characteristics: a high need for achievement, autonomy, change, dominance; an internal locus of control; characteristics of risk taking, energy and social adroitness; a preference for learning through action and experimentation; and a preference for intuition and thinking.

The validity of these results depends on the validity of the tests and many issues to do with test validity have been discussed. The application of well-validated tests to entrepreneurs may enhance understanding, especially if the results were correlated with small-firm start-ups, business type and growth, and financial success. Surprisingly there are very few studies which attempt to link the results of psychological tests with the activities of the entrepreneurs.

As well as the application of validated tests to entrepreneurs, there have been attempts to develop specific measures of entrepreneurial characteristics (see Table III). The issue of whether a new test is needed is worth considering. Few well-validated psychological tests measure all the characteristics which have been highlighted as entrepreneurial. So specific measures of entrepreneurial characteristics could have greater power to discriminate within and between entrepreneurs and other groups. Unfortunately, such tests tend not to be rigorously developed or well validated. This means that when these tests are employed there is a genuine dilemma over whether the test results reflect genuine findings about the entrepreneur or the quality of the test.

Tests of specific entrepreneurial characteristics may be useful for testing out models or hypotheses about the entrepreneur. However, in order to achieve this aim, extensive test validation studies are prerequisites for interpreting test results. Without proper validation such tests are useful only for casual purposes. Though a well-validated measure of entrepreneurial characteristics could offer a sensitive discriminating measure which could be useful in the study of entrepreneurs, the labour cost of test validation is a disadvantage.

More effort should be made to correlate the results of psychological tests with entrepreneurial behaviours and activities. In addition, competence approaches offer the possibility of more holistic assessments because they seek to identify the knowledge, skills and behaviours, as well as the psychological characteristics, of groups such as entrepreneurs. The use of psychological tests in conjunction with other approaches to assessment could be more enlightening than the development of new psychological tests which aim specifically to measure entrepreneurial characteristics. This offers the possibility of exploring patterns in entrepreneurial competence and their behavioural correlates.

□

References

1. Palmer, M., "The Application of Psychological Testing to Entrepreneurial Potential", *California Management Review*, Vol. 13 No. 3, Spring, 1971, pp. 32-8.
2. Young, D.R., *If Not For Profit, For What? A Behavioural Theory of the Non-Profit Sector Based on Entrepreneurship*, Lexington, MA, 1983.
3. McClelland, D.C., "Business Drive and National Achievement", *Harvard Business Review*, Vol. 40 No. 4, July/August 1962, pp. 99-112.
4. McClelland, D.C., *The Achieving Society*, 2nd ed., Van Nostrand, Princeton, NJ, 1968.
5. Roberts, E., "The Personality and Motivations of Technological Entrepreneurs", *Journal of Engineering and Technology Management*, Vol. 6, 1989, pp. 5-23.
6. Edwards, A., *Manual for the Edwards Personal Preference Schedule*, The Psychological Corporation, New York, NY, 1959.
7. Watkins, D.S., "Entry into Independent Entrepreneurship - Toward a Model of the Business Initiation Process", paper presented at Joint Seminar on "Entrepreneurship and Institution Building", Dansk Management Centre, Copenhagen, May 1976.
8. Hornaday, J.A., and Aboud, J., "Characteristics of Successful Entrepreneurs", *Personnel Psychology*, Vol. 23, 1970, pp. 47-54.
9. Honey, P. and Mumford, A., *The Manual of Learning Styles*, Peter Honey, Maidenhead, Berkshire, 1986.
10. Thorpe, R. and Dyson, J., "The Future of Management Education and Training for the Development and Growth of Small Firms", unpublished paper presented at the Eleventh Small Firms Policy Research Conference, November 1988, pp. 17-19.
11. Jackson, D., *Jackson Personality Inventory*, Research Psychologists Press, New York, NY, 1976.
12. Sexton, D. and Bowman, N., "Validation of a Personality Index: Comparison of Characteristics of Female Entrepreneurs Managers, Entrepreneurial Students and Business Students", *Frontiers of Entrepreneurial Research*, Babson Center for Entrepreneurial Studies, Wellesley, MA, 1986.
13. Myers, I. and Briggs, K., *Myers-Briggs Type Indicator*, Consulting Psychologists' Press, Palo Alto, CA, 1976.
14. Hoy, F. and Carland, J., "Differentiating between Entrepreneurs and Small Business Owners in New Enterprise Formation", *Frontiers of Entrepreneurial Research*, Babson Center for Entrepreneurial Studies, Wellesley, MA, 1983.
15. Maxon, J., "Creating New Ideas", *Management Decision*, Vol. 26 No. 4, 1988, pp. 40-3.
16. Winslow, E. and Solomon, G., "Entrepreneurs Are More Than Non-Conformists: They Are Mildly Sociopathic", *The Journal of Creative Behaviour*, Vol. 21 No. 3, 1987, pp. 149-61.
17. Collins, O., Moore, D. and Unwalla, D., *The Enterprising Man*, University of Michigan, Ann Arbor, MI, 1964.
18. Lynn, R., "An Achievement Motivation Questionnaire", *British Journal of Psychology*, Vol. 60 No. 4, pp. 295-34.
19. Rotter, J.B., "Generalised Expectancies for Internal Versus External Control of Reinforcement", *Psychological Monographs*, 1966, pp. 1-27.
20. Levenson, H., "Distinctions within the Concept of Internal-External Control: The Development of a New Scale", paper presented at the Meeting of the American Psychological Association, Honolulu, 1972.
21. Cachon, J.C. and Cotton, G., "Assessing the Entrepreneurial Orientation of Undergraduate Business School Students, Following An Entrepreneurial Experience: A Model", Paper No. 58, School of Commerce & Administration, Laurentian University, Sudbury, Ontario, 1987.

22. Cromie, S. and Johns, S., "Irish Entrepreneurs – Some Personal Characteristics", *Journal of Occupational Behaviour*, Vol. 4, 1984, pp. 318-24.
23. Begley, T. and Boyd, D., "Psychological Characteristics Associated with Performance In Entrepreneurial Firms and Smaller Businesses", *Journal of Business Venturing*, Vol. 2, 1987, pp. 79-93.
24. Joe, V.C., "Review of the Internal-External Control Construct as a Personality Variable", *Psychological Reports*, No. 28, 1971, pp. 619-40.
25. Kirton, M., "Adaptors and Innovators in Organizations", *Human Relations*, Vol. 33 No. 4, 1980.
26. Cross, M., "Kirton Adaption-Innovation Inventory: Selecting Potential Entrepreneurs from Redundant Managers", paper presented to the British Psychological Society's Occupational Psychology Conference, 6-8 January 1982.
27. Kogan, N. and Wallach, M., *Risk-taking: A Study in Cognition and Personality*, Holt, Rinehart & Winston, New York, NY, 1964.
28. MacCrimmon, K. and Wehrung, D., "A Portfolio of Risk Measures", *Theory and Decision*, Vol. 19, 1985, pp. 1-29.
29. Professional Affairs Board, "Technical Recommendations for Psychological Tests", *Bulletin of the British Psychological Society*, Vol. 33, 1980, pp. 161-4.
30. Boyatzis, R. and Winter, D., "Testing the Entrepreneurial You", cited in Harris, M., "The Entrepreneurs: Do You Have What It Takes", *Money*, March, 1978, pp. 26-7.
31. Mehrabian, A. and Bank, L., *A Manual for the Mehrabian Measures of Achievement Tendency*, University of California, Los Angeles, CA, 1975.
32. Erwee, R. and Pottas, C., "Locus of Control and Achievement Motivation of Managers", *Psychologia Africana*, Vol. 21, 1982, pp. 79-102.
33. Weinstein, M.S., "Achievement Motivation and Risk Preference", *Journal of Personality and Social Psychology*, Vol. 13, 1969, pp. 153-72.
34. Smith, J.M., "A Quick Measure of Achievement Motivation", *British Journal of Social and Clinical Psychology*, Vol. 12, 1973, pp. 137-42.
35. Atkinson, J., "Motivational Determinants of Risk Taking Behaviour", *Psychological Review*, Vol. 64 No. 6, 1957, pp. 359-72.
36. Freeley, J., *Entrepreneurial Style Profile*, Long Island University, New York, NY, 1986.
37. Dies, R., "Development of a Projective Measure of Perceived Locus of Control", *Journal of Projective Techniques and Personality Assessment*, No. 32, 1968, pp. 487-90.
38. Johnson, C. and Caird, S., *The Measure of General Enterprising Tendency*, Durham University Business School, 1988.
39. Kahl, J., "Some Measures of Achievement Orientation", *American Journal of Sociology*, Vol. 70, 1965, pp. 669-81.
40. Kirton, M., *Kirton Adaption Innovation Inventory*, Occupational Research Centre, 1987.
41. King, A., "Self-Analysis and Assessment of Entrepreneurial Potential", *Simulation and Games*, Vol. 16 No. 4, 1985, pp. 397-416.
42. Lachman, R., "Towards Measurement of Entrepreneurial Tendencies", *Management International Review*, Vol. 20 No. 2, 1980, pp. 108-16.
43. Mehrabian, A. and Bank, L., "A Questionnaire Measure of Individual Differences in Achieving Tendency", *Educational and Psychological Measurement*, Vol. 38, 1978, pp. 475-80.
44. Scanlan, T.J., "Self Employment as a Career Option: An Investigation of Entrepreneurs from the Perspective of Hollands' Theory of Career Development and Levenson's Measure of Locus of Control", PhD dissertation, University of Illinois, 1979.
45. Vicars, W., Jauch, L. and Wilson, H., "A Scale to Measure General Entrepreneurial Tendency", 40th Annual Conference Paper, *Academy of Management*, Southern Illinois University, Detroit, MI1980.

Sally P. Caird is a Research Fellow at the Centre for Technology Strategy, the Open University, Milton Keynes, UK.
