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PERSONALITY, RESEARCH CREATIVITY, AND TEACHING EFFECTIVENESS IN UNIVERSITY PROFESSORS*

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Two separate studies were undertaken of the personality characteristics associated with research creativity and teaching effectiveness in university psychology professors. In the first study, 52 professors at The University of Western Ontario were evaluated on 29 trait dimensions using four assessment techniques: faculty peer ratings, student ratings, self ratings, and objective questionnaires. A composite criterion of research creativity was generated from publication and citation counts. A composite for teaching effectiveness was created from 5 years of archival data based on formal student evaluations. The personality measures demonstrated considerable convergence across modes of assessment for many traits. In turn, several traits differentiated between most and least creative researchers and most and least effective teachers. A second study, using a self report survey sent to 400 professors in graduate psychology departments at 9 Canadian universities, revealed substantial replications of the findings of Study 1. Limiting ourselves to those personality traits that reliably loaded on Research and Teaching factors in both studies, we may describe the creative researcher as ambitious, enduring, seeking definiteness, dominant, showing leadership, aggressive, independent, non-meek, and non-supportive. The effective teacher is best described as liberal, sociable, showing leadership, extraverted, non-anxious, objective, supporting, non-authoritarian, non-defensive, intelligent, and aesthetically sensitive.

Introduction

The generation, systematization, and transmission of knowledge constitute the primary enterprise of institutions of higher learning. The factors that facilitate these processes, however, are only poorly understood. It is apparent that both individuals and institutions differ widely in the fulfillment of these goals; that is, not everyone

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achieves excellence as a researcher or as a teacher. This paper examines the contribution that knowledge of personality traits makes to understanding individual differences in performance in both research and teaching. Our focus is on university departments of psychology.

The conception of personality traits assumed here is based on the notion of act-frequency[1–3]. Someone who is extreme on a bipolar trait dimension is assumed to engage in a greater frequency of prototypic behaviors characterizing that trait than someone who is moderate. Thus a prototypic behavior for the trait of dominance, for example, may be the issuing of orders; for extraversion it may be attending social gatherings; for aloofness it may be displaying no emotion when meeting a long lost friend. Thus a trait score may be viewed as representing the frequency of engaging in certain classes of behavior. Moreover, we assume there is sufficient cross-situational consistency in these behaviors to make the trait concept useful in explaining behavior (see *Jackson & Paunonen*[4]; *Rushton, Jackson, & Paunonen*[5], cf. *Mischel*[6]). Given these assumptions it is reasonable to expect that personality traits should be linked to individual differences in research and teaching effectiveness.

Previous studies have produced fairly consistent findings with regard to the personality traits associated with successful research and teaching. Let us first consider the research scientist. As *Mahoney*[7] points out, there is a clear consensus apparent in the writings of scientists, and science teachers, of what the ideal scientist should be like. He lists these qualities as objectivity and emotional neutrality, rationality, open-mindedness, superior intelligence, integrity, and a communal, open, and cooperative attitude to the sharing of knowledge. What paragons of virtue! *Mahoney* cites *Knickerbocker*[8] who makes it explicit: "the history of science is as inspiring in its human values as are the legends of the saints" (Ref.[7] p. 350). *Mahoney*[7] then documents the inevitable frailty of the actual before the ideal. His literature review suggests that on many occasions scientists engage in highly emotionally charged ideological battles where personal success and the destruction of opponents is a more accurate picture than "objectivity"; where selective perceptions and distortions qualify the notion of "rationality"; where personal biases lead to editorial rejection of ideas contrary to one's persuasion; where outright deception and fraud sometimes mar the ideal of honest integrity; and where secrecy, suspicion bordering on paranoia, fear, and aggressive competition in the race to be "number one" are as manifest as an altruistic desire to share knowledge and be cooperative.

In addition to such interesting historical accounts, there have been systematic empirical studies of the actual personality characteristics of research scientists. For example, *Terman*'s[9] longitudinal study of genius reports data on 800 men who were divided into categories of scientist and nonscientist based on their majors in college. As measured by ratings made at ages 11 and 30 (for which there was substantial stability

across time), scientists differed from nonscientists in (a) general intellectual curiosity manifest at an early age, and (b) being considerably lower in sociability than average. *Terman* discusses the numerous indices of the latter finding at length and concludes that "the bulk of scientific research is carried on by devotees of science for whom research is their life and social relations are comparatively unimportant" (Ref.[9] p. 7). Cited is the work of *Roe*[10] which had found scientists to have difficulty in interpersonal situations and to be somewhat avoiding of them. Summarizing, *Terman* described *Roe*'s sample of scientists as tending "to be shy, lonely, slow in social development, and indifferent to close personal relationships, group activities or politics" (Ref.[9] p. 7). *Terman* felt that such traits were not defects of personality, for breakdowns were no more common among the scientists than nonscientists. Instead, he suggested, a below average interest in social relations and a heavy concentration of interest in the objective world was a normal departure from average that was decidedly favorable for the professional development of a scientist.

Raymond *Cattell*[11–13] has also investigated the personality profiles of creative scientific researchers in a series of studies. A reliable profile emerged from both qualitative observations based on the study of biographical material and from quantitative psychometric studies of leading contemporary physicists, biologists, and psychologists. Comparison of successful scientists with the normal pupulation on the *Sixteen Personality Factor Questionnaire* revealed the scientists to be decidedly A – (reserved and introverted), B + (intelligent), C + (emotionally stable), E + (dominant), F – (serious minded), G – (expedient), H + (venturesome), I + (sensitive), Q1 + (radical thinking), Q2 + (self-sufficient), and Q3 + (having a strong and exacting self-concept). *Cattell* points out that the personality profiles of the physicists, biologists, and psychologists are close together and form one family. One minor deviation from this was that psychologists were less serious-minded (more F + "surgent"). *Cattell* speculates that, "Possibly this greater surgency accounts for the fact that on the whole psychologists have talked more and progressed less than, say, physicists" (p. 126). The trait on which creative scientists differed most from normal was the A dimension (schizothemia-cyclothemia), with scientific researchers being toward the A – or schizothemia end. Elaborating on this trait, *Cattell* describes the scientists as being skeptical, internally preoccupied, precise, and critical individuals who are exacting and reliable.

Numerous other studies of scientific creativity have been carried out by *Taylor & Barron*[14]. *Barron*[15] found creative people, in general, to be cognitively complex (i.e., preferring complexity and imbalance in phenomena), to have a generally more complex personality structure, to be independent in their judgment and less conformist in such social situations as the Asch group pressure situation, to be self assertive and dominant, and to be low in using suppression as a mechanisms for the control of impulses and thoughts (i.e., they forbade themselves fewer thoughts). *Chambers*[16] com-

pared eminent researchers with those not so eminent but matched on other relevant variables. Results indicated the more creative scientists to be more dominant, to have more initiative, to be more self sufficient, and to be more motivated toward intellectual success. *McClelland*[17] found successful scientists to be not only higher on need for achievement, but also to be calculating risk takers in the same way that successful business entrepreneurs are. The risk taking however had to involve physical nature rather than people for he too found scientists to be decidedly avoidant of interpersonal situations. (For example, scientists would much prefer being a lighthouse keeper to being a headwaiter, as measured by Item 324 on the *Strong Vocational Interest Blank.*) *McClelland* also believed that for the scientist, the root of the need for achievement and the source of the scientist's energy was a strong aggressive drive "which is normally kept carefully in check and diverted into taking nature apart" (p. 192).

Four recent studies have provided data on researchers in psychology. *Hirschberg* and *Itkin*[18] found that peer ratings of graduate students in psychology on dimensions such as "achievement motivation", "research competence", and "committment to psychology", predicted both speed in gaining the PhD and whether publications would ensue. *Helmreich, Beane, Lucker,* and *Spence*[19] and *Helmreich, Spence, Beane, Lucker* and *Matthews*[20] found that among academic psychologists, objective self report questionnaire measures of achievement motivation, particularly those concerned with (a) a preference for challenging, difficult tasks and (b) enjoyment of working hard, but not for (c) liking of interpersonal competition and the desire to better others, correlated significantly positively with both number of publications, and number of citations by others of one's work. Finally, *Matthews, Helmreich, Beane* and *Lucker*[21] found, in a survey of 118 male members of the Society of Experimental Social Psychology, that Type A behavior (aggressive, incessantly struggling, time oriented, hostile when frustrated) was associated with superior scientific work as indexed by the number of times that one's work was cited by others.

In summary, the picture that emerges of the successful research scientist is of a person considerably less sociable than average, rather serious minded, intelligent, aggressive, dominant, achievement oriented, and independent. In addition, he or she is cognitively complex, has a radical imagination and a well articulated self concept. In short, the creative person is both "introverted and bold"[22]. In regard to emotional adjustment the picture might be viewed as less clear. While the studies by *Terman*[9] and *Cattell*[11,12] suggest the scientist is assured and emotionally stable, *Cattell*[11] also notes the scientist is more emotionally sensitive than average; and both he and *Roe*[23] discuss the emotional problems the scientist can have as a result of their unusual personality structure as they develop and grow in environments not necessarily supportive of their special nature. Moreover, the research of *Matthews* et al.[21] hints at a lack of emotional stability, at least if Type A behavior is interpreted as such.

In contrast to the profile of the successful researcher, is that of the effective teacher. Although early studies using self report measures of personality failed to provide convincing evidence of a relationship between personality traits and teaching effectiveness, subsequent studies using peer and student ratings of teacher personality traits have been very encouraging. *Costin* and *Grush*[24] studied graduate student assistants conducting discussion groups in a variety of social science subjects, including psychology. Students rated their teachers on personality traits and also evaluated them on classroom skills and supportiveness. Effective teachers were found to be emotionally stable, sociable, ascendant, vigorous, good at personal relations, responsible, and intellectually original.

In a study at a liberal arts college, *Sherman* and *Blackburn*[25] had fifteen hundred students evaluate 108 instructors on personality traits and teaching skills. The assessments were independent both over time (separated by 1 1/2 years) and across raters. Competent teachers were perceived as dynamic, pragmatic, amicable, and highly intellectual. *Murray*[26] investigated the relationship between personality traits and teaching effectiveness among psychology professors using peer ratings from faculty colleagues to assess the personality of the professor and student ratings of the professor's teaching effectiveness. The successful teacher was found to be extraverted, easy going, objective, liberal, warm, and demonstrating of leadership. Finally, *Tomasco*[27] had 316 students representing several disciplines at a liberal arts college rate instructors on both personality and teaching dimensions. Success at teaching was related to the personality characteristics of achievement, affiliativeness, liking for change, endurance, exhibitionism, nurturance, and need for understanding.

In summary, the picture of the successful college teacher is of a person who is a dynamic, sociable, warm, emotionally stable, responsible leader. He or she is also intellectually bright and original. It should be emphasized that these findings have emerged when peer or student ratings of faculty personality have been made but not when the faculty make self ratings of their personalities. We shall return to this point in later discussion.

In the present paper we assess the personality characteristics of research creativity and teaching effectiveness among university psychology professors. Two separate studies were conducted. In the first, using a sample of psychology professors at The University of Western Ontario, we employed four separate assessments of personality: faculty peer ratings, student ratings, self ratings, and scale scores from published personality inventories. In the second study we mailed a survey to 400 psychologists at other leading Canadian universities and report their self ratings of personality in relation to research and teaching effectiveness.

Study 1

Method

Subjects

Participants were 46 male and 6 female full-time psychology professors of varying ranks who were, or recently had been, at The University of Western Ontario. Due to the small number of females, all analyses are collapsed across sex. Each faculty member signed a form agreeing to participate in either part or all of the study. In return, they received a choice of either a small monetary gift ($ 10) or a lottery ticket in a draw for $ 200.

Personality Variables

Based on previous research on personality correlates of research and teaching effectiveness, 29 personality traits were selected for this investigation. Twenty were adapted from the *Personality Research Form*[28] (PRF), an omnibus personality inventory based on H. A. *Murray*'s[29] need definitions. Two traits, extraversion and neuroticism, represented dimensions of the *Eysenck Personality Questionnaire*[30] (EPQ). The EPQ also provides a measure of psychoticism, as well as a validity scale, but these were not used in the present study. Another seven dimensions were those previously found to be useful in H. G. *Murray*'s[26] study of effective teachers.

Personality Assessment

Faculty ratings. Each faculty member in the Department of Psychology at The University of Western Ontario was mailed a set of 29 trait adjective names with descriptions and instructions on how to rate several named colleagues using 9-point adjective rating scales. The trait names and brief descriptions are shown in Table 1. The instructions for the ratings emphasized that judgments were to be made relative to other university professors rather than to other people in general. Between 9 and 17 peer ratings were obtained for each of 52 participating professors with a mean return of 11.6 ratings per faculty member.

Student ratings. Course registration forms were used to mail trait definitions and adjective rating scales (as in faculty ratings) to samples of students who had taken an undergraduate psychology course from the professor to be rated. Student ratings were obtained for 43 of the 52 participating professors. The return rate per faculty member ranged from 4 to 14 with a mean of 7.8.

Self ratings and questionnaire assessment. Upon receiving notification of consent to take part in this final assessment technique, individual faculty members were sent self

rating forms (identical to those used for faculty and student ratings), as well as PRF and EPQ test booklets, answer sheets, and instructions. Complete self rating and personality test data were obtained for 32 faculty members.

Academic Performance Measures

Research productivity. The first index of research performance was the total number of publications the faculty member had produced for the four years 1976, 1977, 1978 and 1979, as listed in the *Source Index* of either the *Social Science Citation Index* (SSCI) or the *Science Citation Index* (SCI). Credit was assigned equally for senior and junior authorship.

Research citations. A second research performance measure was defined by the total number of times the faculty member's work was cited over the three years 1977, 1978, and 1979, as indexed in the SSCI for those years. Citation counts refer to the number of times a work is referenced in published articles, and has been used as an index of the impact and quality of the work[31–33]. First authored self-citations were excluded.

Teaching effectiveness. Performance in teaching was determined from archival data collected over the past several years. The University of Western Ontario requires annual, end-of-course student evaluation of instructors in all courses. Ten items concerning various aspects of the teacher and course are rated on 5-point scales, with the last item being a rating of the "overall effectiveness" of the instructor. It was this last item that was used as the criterion of teaching effectiveness in the present study. Overall effectiveness ratings were averaged across all undergraduate courses taught between the years 1974 and 1979 to obtain a single measure of teaching effectiveness for each professor.

Results

Reliabilities of Peer and Student Ratings

Split-half reliabilities were computed for each trait by correlating the mean adjective ratings of odd with even numbered judges across all professors. These reliabilities, corrected by the Spearman–Brown formula, can be seen in Table 1. For the 52 professors judged by their peers, the reliabilities range from 0.60 to 0.90 with a mean of 0.79, indicating substantial consensus among faculty peers in their ratings of colleagues. For the 43 professors judged by their students, reliabilities range from 0.22 to 0.90 with a mean of 0.56. There is, thus, also some consensus among students in their ratings of professors, although less than for peer ratings of professors. This may well have been due to a relative lack of familiarity of students with their professors as a result of the conventional behavioral constraints of the classroom.

Table 1
Split-half reliabilities of peer and student ratings of personality computed across Professor targets for each of 29 personality traits.
(decimals omitted)

Personality trait and trait definition	Raters	
	Faculty (n = 52)	Students (n = 43)
1. Meek (mild mannered; subservient)	73	57
2. Ambitious (aspiring to accomplish difficult tasks; striving, competitive)	88	74
3. Sociable (friendly, outgoing, enjoys being with people)	74	63
4. Aggressive (argumentative, threatening; enjoys combat and argument)	84	62
5. Independent (avoids restraints; enjoys being unattached)	80	48
6. Changeable (flexible, restless; likes new and different experiences)	77	33
7. Seeks definiteness (dislikes ambiguity or uncertainty in information; wants all questions answered completely)	84	22ns
8. Defensive (suspicious, guarded, touchy)	72	56
9. Dominant (attempts to control environment; forceful, decisive)	87	60
10. Enduring (willing to work long hours; preservering, steadfast, unrelenting)	90	52
11. Attention seeking (enjoys being conspicuous, dramatic, colorful)	88	67
12. Harmavoiding (careful, cautious, painavoident)	84	90
13. Impulsive (spontaneous, hasty, impetuous, and uninhibited)	89	31
14. Supporting (gives sympathy and comfort; helpful, indulgent)	84	36
15. Orderly (neat and organized; dislikes clutter, confusion, lack of organization)	77	56
16. Fun loving (playful, easy going, lighthearted; does many things "just for fun")	88	75
17. Aesthetically sensitive (sensitive to sounds, sights, tastes, smells)	80	74
18. Approval seeking (desires to be held in high esteem; obliging, agreeable)	76	42
19. Seeks help and advice (desires and needs support, protection, love, advice)	80	86
20. Intellectually curious (seeks understanding; reflective, intellectual)	78	65
21. Anxious (tense, nervous, uneasy)	60	63
22. Intelligent (bright, quick clever)	89	50

Table 1 (cont.)

Personality trait and trait definition	Raters	
	Faculty (n = 52)	Students (n = 43)
23. Liberal (progressive, seeks change, modern, adaptable)	81	29ns
24. Shows leadership (takes initiative and responsibility for getting things done)	86	54
25. Objective (just, fair, free of bias)	78	48
26. Compulsive (meticulous, perfectionistic, concerned with details)	69	50
27. Authoritarian (rigid, inflexible, dogmatic, opinionated)	70	52
28. Extraverted (has many friends; craves excitment; fond of practical jokes; is carefree, easy-going, optimistic)	90	71
29. Neurotic (a worrier; overly emotional; anxious, moody, and often depressed)	61	71
Mean	79	56

Reliabilities of Measures of Academic Performance

For the 52 faculty members, the mean inter-year stability coefficient for teacher effectiveness ratings from 1974 to 1979 is 0.75; for number of publications from 1976 to 1979 it is 0.60, and for number of citations for 1977 to 1979 the mean correlation is 0.98.

Convergent Validity of Personality Ratings

The multitrait-multimethod matrix of personality ratings was examined for evidence of convergent validity. These data are shown in Table 2. The highest levels of convergence are found between the two self report forms, i.e., self adjective ratings and PRF/EPQ scale scores (mean = 0.52). The correspondence between personality ratings made by faculty and by student groups (mean = 0.43) and between faculty and self ratings (mean = 0.39) are also substantial for many traits. The correlation of faculty and student ratings with PRF/EPO scale scores were much lower, however (means of 0.30 and 0.18, respectively).

Correlations Among Measures of Academic Performance

Product-moment correlations were computed among the criterion measures of teaching effectiveness, research productivity, and research citations. The measures of research

Table 2
Heteromethod convergent validities of 29 personality traits measured by four methods (Faculty-peer, Student, Self Ratings, and Scale Scores) for a sample of University Professors (Decimals omitted)

Personality trait	Peer-Student (n = 43)	Peer-Self (n = 32)	Peer-Scales (n = 32)	Student-Self (n = 31)	Student-Scales (n = 31)	Self-Scales (n = 32)
Meek	29	59*	17	42*	17	36*
Ambitious	52*	68*	27	17	30	41*
Sociable	60*	60*	47*	36*	21	65*
Aggressive	56*	64*	26	21	−05	48*
Independent	44*	31	27	19	12	37*
Changeable	41*	−07	−02	15	26	39*
Seeks definitness	33*	04	06	−09	02	19
Defensive	24	34	33	−11	−11	51*
Dominant	38*	63*	27	15	01	70*
Enduring	61*	48*	41*	16	18	42*
Attention seeking	55*	44*	33	24	24	64*
Harmavoiding	22	50*	19	03	17	33
Impulsive	50*	27	25	37*	38*	80*
Supporting	49*	55*	37*	21	23	55*
Orderly	38*	62*	65*	11	17	85*
Fun-loving	44*	51*	54*	25	39*	65*
Aesthetically sensitive	16	44*	49*	−06	05	29
Approval seeking	47*	15	17	10	04	66*
Seeks help and advice	41*	36*	37*	−03	31	48*
Intellectually curious	49*	40*	10	15	25	12
Anxious	57*	23	–	30	–	–
Intelligent	48*	50*	–	20	–	–
Liberal	42*	29	–	08	–	–
Shows leadership	46*	64*	–	40*	–	–
Objective	45*	−08	–	−05	–	–
Compulsive	28	21	–	14	–	–
Authoritarian	31*	16	–	−20	–	–
Extraverted	56*	57*	58*	50*	64*	80*
Neurotic	31*	22	12	00	−07	82*
Mean	43	39	30	20	18	52

Note. * $p < 0.05$.

productivity and teaching effectiveness were found to be essentially orthogonal. Teaching effectiveness correlated 0.10 (ns) with number of publications and – 0.24 (ns) with number of citations. This finding is consistent with previous research showing no relationship between research productivity and student ratings of teaching (e.g., Refs.[34–35]). On the other hand, number of publications and citations demonstrated a moderate but significant positive relationship ($r = 0.28$; $p < 0.05$). A similar relationship between productivity and citations has been found in many other studies (e.g., *Endler* et al[31]; *Helmreich* et al[20]; *Rushton & Endler*[36,33]; *Rushton & Meltzer*[37]).

Personality Correlates of Academic Performance

Product-moment correlations were computed between personality trait scores and the three measures of research and teaching effectiveness to examine the relationship between personality and academic performance. These correlations, uncorrected for attenuation due to unreliability, are presented in Table 3.

In order to reduce these data to more manageable proportions and to increase the reliability of the findings, we created aggregated composites of both personality and research indices. The personality aggregate was created by combining the peer and student ratings using standard scores. We carried out no further analyses based on personality self ratings in this first study. A research creativity composite was obtained by combining the number of publications and number of citations measures, again using standard scores. Following these aggregations, we carried out a principal components factor analysis with a procrustes rotation in which the research creativity and teaching effectiveness composites were targeted as separate orthogonal factors (*Schonemann*[38]). The trait loadings are shown in Table 4 and resulting factor plot in Figure 1. We also analyzed these data using stepwise multiple regressions in order to evaluate the *independent* contributions of the traits in the prediction of the criterion.

Research creativity. Eighteen of the personality variables had absolute loadings greater than 0.30 on the research factor. To summarize the relationships found in Tables 3 and 4, and Figure 1, with factor loadings in parentheses, the creative researcher is perceived as compulsive (0.83), seeking definiteness (0.82), ambitious (0.77), enduring (0.75), intelligent (0.72), intellectually curious (0.72), dominant (0.61), orderly (0.58), authoritarian (0.52), non-seeking of help and advice (– 0.51), not fun loving (– 0.50), aggressive (0.42), non-sociable (– 0.40), independent (0.39), showing leadership (0.39), defensive (0.35), not meek (– 0.33), and not supportive (– 0.30) When all 29 personality variables were loaded into the stepwise multiple regression equation to predict the composite measure of research creativity, 8 variables produced significant ($p < 0.10$) reductions in residual criterion variance, resulting in a multiple correlation of 0.90. These variables, with beta weights in parentheses, were: ambitious

Table 3
Correlations of teaching and research effectiveness with ratings of personality for 52 Professors at The University of Western Ontario (decimals omitted)

Academic Performance Criteria	Teacher ratings (1974–1979)				Number of publications (1976–1979)				Number of citations (1977–1979)			
Personality Assessment / Personality Trait	Faculty Ratings (n = 52)	Student Ratings (n = 43)	Self Ratings (n = 32)	Scale Scores (n = 32)	Faculty Ratings (n = 52)	Student Ratings (n = 43)	Self Ratings (n = 32)	Scale Scores (n = 32)	Faculty Ratings (n = 52)	Student Ratings (n = 43)	Self Ratings (n = 32)	Scale Scores (n = 32)
Meek	09	−24	−14	04	−22	16	−19	−25	−36*	−14	−31	05
Ambitious	08	35*	15	18	61*	34*	43*	22	51*	31*	28	−01
Sociable	55*	64*	20	14	−15	−20	01	−17	−10	−33*	−06	−25
Aggressive	−08	−15	13	−15	06	18	04	−13	32*	41*	06	−11
Independent	−07	−12	23	09	15	02	14	36*	31*	13	13	08
Changeable	38*	50*	05	21	08	−03	18	04	−01	−27	08	−13
Seeks definiteness	−08	06	25	17	54*	26	01	−03	42*	24	−53*	−05
Defensive	−31*	−45*	07	00	−17	29	−19	−12	14	44*	01	−21
Dominant	22	−13	50*	37*	37*	23	34	07	44*	43*	20	−12
Enduring	17	34*	21	06	54*	32*	17	30	41*	14	21	00
Attention-seeking	46*	23	23	22	−06	11	−20	−12	01	11	09	−10
Harmavoiding	−31*	−33*	−16	09	09	02	−32	−07	−19	10	−26	00
Impulsive	21	−03	02	00	−22	−18	03	09	−07	−18	−24	−14
Supporting	51*	45*	11	03	−09	−11	−03	−18	−18	−29	−20	−18
Orderly	27	42*	18	07	19	29	−07	02	16	26	−09	07
Fun-loving	44*	45*	02	10	−26	−28	−03	−13	−22	−29	−03	−06
Aesthetically sensitive	35*	23	12	−12	−28*	−04	−20	−02	−22	07	−30	−15
Approvel seeking	37*	27	28	24	23	13	−13	−17	01	01	−19	−22
Seeks help and advice	31*	−13	26	−08	−35*	−09	−16	23	−38*	−24	−46	−29*
Intellectually curious	20	20	20	02	50*	26	59*	09	38*	28	03	−17
Anxious	−27*	−58*	−05	–	−18	11	−03	–	−15	04	−08	–
Intelligent	08	36*	−03	–	49	17	28	–	42*	31*	13	–
Liberal	54*	54*	08	–	02	03	16	–	−11	−08	−06	–
Shows leadership	50*	58*	40*	–	35*	26	07	–	25	07	−01	–
Objective	40*	24	34	–	22	−16	−12	–	−11	−18	−20	–
Compulsive	14	16	16	–	32*	37*	−33	–	24	40*	−12	–
Authoritarian	−27*	−42*	05	–	07	33*	04	–	22	47*	−21	–
Extraverted	56*	46*	07	29	−07	−09	02	−14	−17	−19	−06	−06
Neurotic	−10	−43*	06	08	−23	18	−07	−16	−13	13	−04	03

*$p < 0.05$.

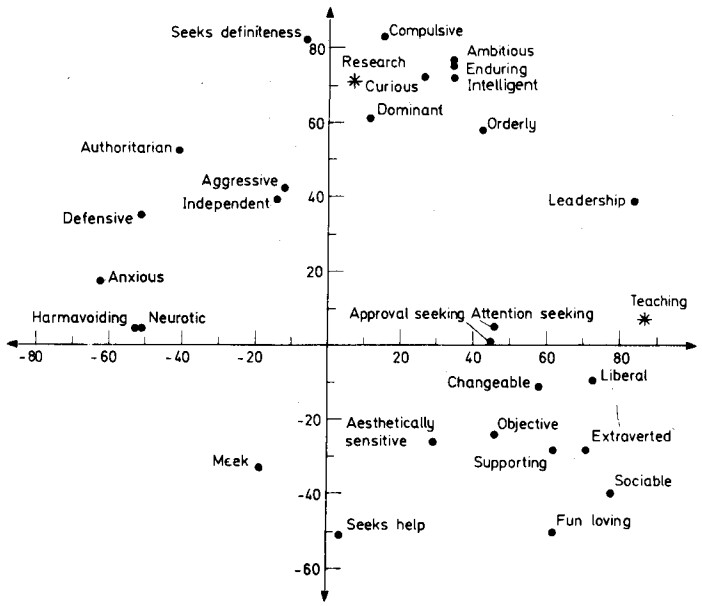

Figure 1. Plot of factor pattern coefficients of personality traits on dimensions of research creativity and teaching effectiveness for study 1. Only those traits with absolute values of greater than 0.30 on either factor are shown.

(0.77), anxiety (– 0.84), approval seeking (0.51), defensiveness (0.60), objectivity (0.57), showing leadership (– 0.30), harmavoiding (0.37), and sociability (– 0.59).

Teaching effectiveness. Twenty of the personality variables had absolute loadings greater than 0.30 on the teaching factor. To summarize the relationships found in Tables 3 and 4, and Figure 1, the effective teacher is perceived as demonstrating leadership (0.84), sociable (0.78), liberal (0.73), extraverted (0.71), supportive (0.62), fun loving (0.62), non-anxious (– 0.62), changeable (0.58), low in harmavoidance (– 0.52), non-defensive (– 0.51), not neurotic (– 0.51), attention seeking (0.46), approval seeking (0.45), objective (0.46), orderly (0.42), low in authoritarianism (– 0.41), ambitious (0.34), intelligent (0.34), enduring (0.34), and aesthetically sensitive (0.30). When the 29 personality variables were loaded into the stepwise multiple regression equation to predict the composite measure of teaching effectiveness, 3 variables (each significant at $p < 0.10$) produced a multiple R of 0.81. The variables, with beta weights indicated in parentheses, were: sociableness (0.48), orderliness (0.44) and anxiety (– 0.31).

Table 4
Loadings of personality variables on research creativity and teaching effectiveness factors (decimals omitted).

Personality trait	Research factor			Teaching factor		
	Study 1	Study 2	Mean	Study 1	Study 2	Mean
1. Meek	− 333	− 372	− 353	− 177	− 271	− 224
2. Ambitious	766	659	713	343	− 095	124
3. Sociable	− 400	− 067	− 234	783	384	584
4. Aggressive	424	345	385	− 124	− 135	− 130
5. Independent	387	333	360	− 136	− 027	− 082
6. Changeable	− 105	077	− 014	583	146	365
7. Seeks definiteness	821	328	575	− 061	− 230	− 146
8. Defensive	345	114	230	− 506	− 334	− 420
9. Dominant	613	372	493	108	− 101	004
10. Enduring	753	458	606	338	030	184
11. Attention seeking	054	059	057	460	− 129	166
12. Harmavoiding	041	− 140	− 050	− 520	− 258	− 389
13. Impulsive	− 270	− 068	− 169	088	− 323	− 118
14. Supporting	− 282	− 286	− 284	617	301	459
15. Orderly	577	221	399	424	007	216
16. Fun loving	− 501	− 055	− 278	624	137	381
17. Aesthetic sensitivity	− 262	− 259	− 261	293	399	346
18. Approval seeking	011	− 155	− 072	445	− 270	088
19. Seeks help	− 514	− 180	− 347	040	− 111	036
20. Curious	718	− 192	263	258	476	367
21. Anxious	167	− 154	007	− 624	− 413	− 519
22. Intelligent	722	022	372	339	502	421
23. Liberal	− 093	− 096	− 095	728	506	617
24. Leadership	387	428	408	841	308	575
25. Objective	− 239	− 101	− 170	461	409	435
26. Compulsive	832	040	436	152	− 124	014
27. Authoritarian	519	− 183	168	− 411	− 440	− 425
28. Extraverted	− 278	011	− 134	711	342	527
29. Neurotic	038	− 386	− 174	− 508	− 272	− 390
30. TEACHING	065	− 075	− 005	866	587	727
31. RESEARCH	705	817	761	065	− 075	− 005

Study 2

This study was carried out to determine whether the relationships found with 52 faculty members at The University of Western Ontario in Study 1 could be generalized to faculty at other universities. For this purpose, a survey was sent to 400 faculty members at 9 leading psychology departments in Canadian universities.

Method

Subjects

All psychology faculty members with the rank of Associate or Full Professor at the English speaking Canadian Universities of Toronto, McGill, McMaster, York, British Columbia, Alberta, Manitoba, Queens and Dalhousie were individually mailed a 6 page "self report information form". These universities were chosen because they maintain active graduate departments, and their faculty were, therefore, potentially involved in both teaching and research. These universities (along with The University of Western Ontario) are listed as the top 10 research departments in psychology in Canada[39] and are distributed evenly throughout 100 of the most important psychology departments in the United Kingdom and the United States[31]. They should, thus, be fairly representative of psychology departments and psychology professors, at least in North America. The most current university catalogs available were used to identify faculty members to be contacted at each university.

Seventy-nine (20%) of the original sample responded in some manner or another. However only 69 (17%) of the original sample returned the forms sufficiently completed to be usable for data analysis. There were 68 male and 1 female respondents and thus, as in Study 1, we collapsed across sex.

The Survey Instrument

A covering letter explaining the purpose of the study, a 6-page "self report information form", and a prepaid, pre-addressed return envelope, were included in the materials mailed to faculty members.

The self report form was to be completed anonymously. It consisted of 66 items related to the amount of time and liking for a variety of academic duties including research, teaching, administration, applied, and community work. In addition the respondents were asked to rate themselves on a percentile basis, on the 29 personality variables used in Study 1. The instruction was "Subjectively, I would rate myself relative to other Canadian university psychology professors at the following percentiles for the following traits." There followed the 29 trait names, the trait definitions, and a place for the ranking headed "Percentile." The information sheet also asked the respondents to report on a variety of objective indices including publication and citation data and, if available, percentile scores on undergraduate teaching evaluations.

Results

Personality Variables

The distributions of the 29 self ratings were roughly normal with a mean percentile across all the 29 traits of 55 and a standard deviation of 21. As might be expected, the more socially desirable traits were rated higher than the less socially desirable traits. Thus the average respondent felt that he or she was at the 80th percentile on intelligence and at the 26th percentile on authoritarianism.

Academic Performance Measures

Research effectiveness. Four questions were selected that seemed appropriate as measures of research effectiveness. These were: (a) total number of publications, (b) mean number of publications in last 5 years, (c) number of hours spent on research, and (d) rated enjoyment of research. Each of these four were significantly positively related to each other, with a mean correlation of $r = 0.36$ ($p < 0.01$). The four measures of research effectiveness were aggregated into a composite.

Teaching effectiveness. From the items of the questionnaire, we chose three to represent the "good" teacher. These were concerned with (a) receiving favorable ratings from students, (b) enjoying teaching undergraduates, and (c) number of hours spent supervising undergraduates. These items were positively related to one another: good ratings correlated $r = 0.48$ ($p < 0.001$) with enjoying teaching, and $r = 0.25$ ($p < 0.05$) with hours supervising undergraduates. The latter two intercorrelated $r = 0.25$ ($p < < 0.01$). In order to increase the reliability of the measure of teaching effectiveness, these three measures were aggregated into a composite by averaging standard scores for each respondent. As in study 1, there was no relationship between the measures of teaching and research performance, suggesting that they are orthogonal.

Personality Correlates of Academic Performance

As in Study 1, in order to discover the relationships between personality traits and research and teaching effectiveness, we computed product-moment correlations between personality and performance indicators. A principal components factor analysis with a procrustes rotation in which research and teaching effectiveness composites were targeted as separate orthogonal factors was carried out. The resulting factor loadings for this second sample are shown in Table 4 and are plotted in Figure 2. We also analyzed these data using stepwise multiple regressions. Finally we examined the degree of congruence between the factor pattern matrices of Study 1 and Study 2.

Research. Ten of the personality variables had absolute loadings greater than 0.30 on the research factor. To summarize the relationships found in Table 4 and Figure 2,

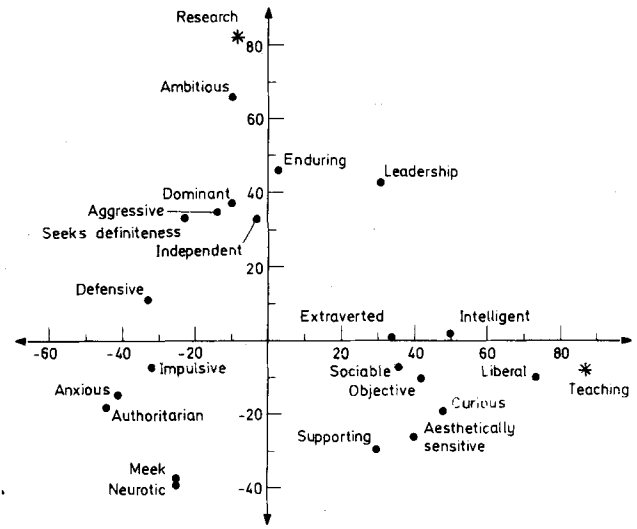

Figure 2. Plot of factor pattern coefficients of personality traits on dimensions of research creativity and teaching effectiveness for study 2. Only those traits with absolute values greater than 0.30 on either factor are shown.

with factor loadings in parentheses, the effective researcher perceives himself as ambitious (0.66), enduring (0.46), showing of leadership (0.43), low in neuroticism (– 0.39), dominant (0.37), not meek (– 0.37), aggressive (0.35), independent (0.33), seeking of definiteness (0.33), and non-supportive (– 0.30). When the 29 personality variables were loaded into a stepwise regression equation to predict the composite measure of research effectiveness, 6 variables produced a multiple R of 0.67. These variables, with beta weights indicated in parentheses, were: ambitious (0.34), compulsive (– 0.36), supportive (– 0.31), endurance (0.38), orderly (0.28), and approval seeking (– 0.18).

Teaching. Thirteen of the personality variables had loadings greater than 0.30 on the teaching factor. To summarize the relationships found in Table 4 and Figure 2, the effective teacher perceives himself as liberal (0.51), intelligent (0.50), curious (0.48), non-authoritarian (– 0.44), objective (0.41), low in anxiety (– 0.41), aesthetically sensitive (0.40), sociable (0.38), extraverted (0.34), non-defensive (– 0.33), low in impulsivity (– 0.32), showing of leadership (0.31), and supporting (0.30). When the 29 personality variables were loaded into a stepwise regression equation to predict the composite measure of teaching effectiveness, 2 variables produced a multiple R of 0.35. These were liberal (beta = 0.24) and intelligent (0.22).

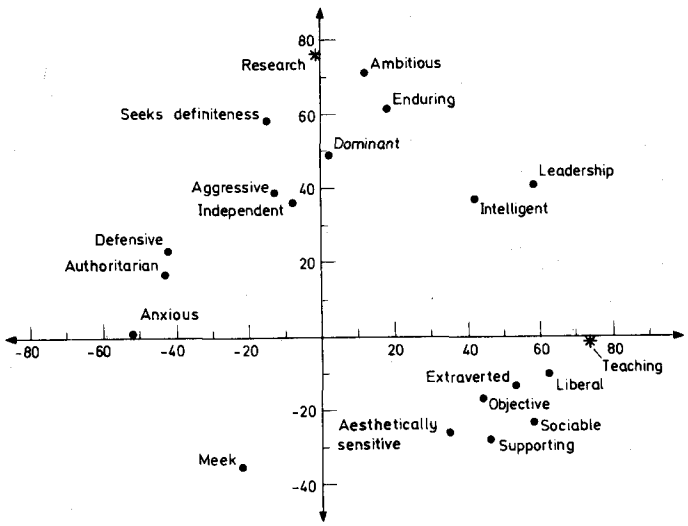

Figure 3. Plot of mean factor pattern coefficients of personality traits on dimensions of research creativity and teaching effectiveness, averaged across study 1 and 2. Only those traits with absolute values of greater than 0.30 on either factor in both studies are shown.

Congruence Between Study 1 and Study 2. Coefficients of congruence (Ref.[40] p. 343) were calculated between the corresponding research factor loadings for studies 1 and 2, followed by the same analysis for the teaching factors. For the research factor the coefficient was 0.64 and for teaching it was 0.74.

Table 4 presents the mean loadings of the 29 personality traits on the Research and Teaching factors and Fig. 3 plots these for traits which loaded 0.30 or greater in both studies. This procedure allows us to characterize nine traits of the creative researcher with some degree of confidence as ambitious (0.71), enduring (0.61), seeking definiteness (0.58), dominant (0.49), showing leadership (0.41), aggressive (0.39), independent (0.36), not meek (– 0.35), and non-supportive (– 0.30). The effective teacher may be described on eleven traits as liberal (0.62), sociable (0.58), showing leadership (0.58), extraverted (0.53), low in anxiety (– 0.52), objective (0.44), supporting (0.46), non-authoritarian (– 0.43), not defensive (– 0.42), intelligent (0.42), and aesthetically sensitive (0.35).

General discussion

To summarize the two studies, we have found replicable personality correlates of research and teaching effectiveness among psychology professors. Limiting ourselves to those nine personality traits that loaded 0.30 or greater in both studies we may charac-

terize the creative researcher as ambitious, enduring, seeking definiteness, dominant, showing leadership, aggressive, independent, not meek, and non-supportive. Eleven personality traits loaded 0.30 or higher in both studies to characterize the effective teacher as liberal, sociable, showing leadership, extraverted, low in anxiety, objective, supporting, non-authoritarian, not defensive, intelligent, and aesthetically sensitive. In addition to the replicated traits, one or other of the studies found the researcher also to be low in sociability, intelligent, curious, compulsive, orderly, not seeking of help, not fun loving, authoritarian, defensive, and non-neurotic. Similarly, other traits found for the effective teacher included fun loving, changeable, low in harmavoidance, low in neuroticism, intellectually curious, enduring, orderly, attention seeking, ambitious, non-impulsive, and approval seeking. It is interesting to note that the constellations of traits defining the creative researcher and the effective teacher are approximately orthogonal. While the one cluster suggests independence, achievement orientation, dominance, and striving to create cognitive order, the other denotes an easier-going, intelligent liberality. The only trait that effective researchers and teachers shared in common was leadership. The one on which researchers and teachers were opposite was supportingness, with researchers being low and teachers high.

Needless to say, no one should make the mistake that because a fairly clear personality profile emerges of both effective researchers and effective teachers that all effective researchers or teachers conform to these profiles. Striking exceptions can be found. As *Cattell*[11] noted, although many scientists have historically been recognized as less sociable than average, *Leibnitz* and many other creative scientists were as fully at home in the social free-for-all of court circles as in the laboratory. *Murray*[41] has noted that the personality characteristics of effective teachers can vary depending upon the level of the student being taught (graduate students tend to rate the "researcher personality" as more effective a teacher). Nonetheless, the mean differences found here support and extend the exiting literature. The profiles of the successful research scientist and teacher emerging from the literature cited in the introduction to this paper correspond closely to the present findings.

In correlational studies it is impossible to specify clear causality. One possibility is that success and reinforcement at teaching fosters the "teacher personality." Similarly, success at research may lead to escalating standards resulting in a person who must necessarily strive harder to achieve them, eventually culminating in the "researcher personality." Certainly a great deal of social learning occurs throughout graduate school and, indeed, throughout an academic career. As cases in point, *Murray* and *Lawrence*[42] showed that teaching effectiveness among university professors could be enhanced through a program of speech and drama lessons, and *Boice*[43] increased the writing productivity of researchers using behavior modification techniques.

There is, of course, no need to take a unidirectional view of causality. Reciprocal causal interaction undoubtedly occurs, and there are good reasons to suppose that, to a great extent, the direction of causality is from personality traits to effectiveness in research and teaching. Many of the personality traits implicated here appear to have substantial heritabilities associated with them, to be noticeable at a fairly early age, and have long term stability over the life-span[44–46]. Thus creative researchers and effective teachers may be partly "born" and partly "made." In other words, it is as likely that people selectively choose their academic niches as it is that they are shaped by them. A strong version of this position would be that personality may constrain, or predispose one to a certain kind of academic life. To deny a highly affiliative person his or her sociability for long hours alone in the laboratory may be more difficult than similar proscriptions for a less sociably inclined, more independently tempered colleague. Similarly, it may well be harder for the ambitious, task oriented person seeking ultimate definiteness, to spend long hours helping and counselling students than for his or her less rigid, more nurturant colleagues.

The variables related to achievement motivation or ambition emerge as strong predictors of research effectiveness in the present study. This replicates the findings of *Helmreich* et al[19,20] and *Matthews* et al[21]. Ambitiousness in the achievement motivation sense, seems to have been a somewhat neglected variable in recent years and perhaps it is time to reconsider its potential utility and implications for prediction. For example, a recent study by *Ray & Singh*[47] found that achivement motivation predicted the yields per acre of Indian farmers who were recipients of international aid. Also, leadership which appeared as a pivotal trait loading positively on both teaching and research might merit further study.

In regard to previous discussion concerning the emotional stability of the researcher, this study found that successful researchers have average or low scores on anxiety and neuroticism (although not as low as the successful teacher). Thus successful researchers would appear to be emotionally stable.

An interesting question for future research is that of sex differences. In both of the present studies with combined N of 121 there were only 7 females. Working on the assumption that the personality characteristics associated with being an effective researcher or teacher are the same in women as in men, we combined the small number of females with the males, rather than discard them. It is, of course, well recognized that women are less represented in academic science than in the general population, or even in graduate programs in psychology[48,49]. Whether this is in any way related to the personality characteristics outlined here is a challenging question. Is there a selection for the aggressive research scientist personality (independent, ambitious, dominant, etc.) in research oriented graduate programs? Are these characteristics more likely to occur in one sex (or group) than another?

Regarding the interrelationships among the measures of university performance, it is interesting to note the nonsignificant relationship between research and teaching. There has been frequent conjecture as to whether this relationship is positive, zero, or negative, and proponents of either view can be heard in faculty club conversations. Our data suggest that teaching and research measures are orthogonal. Being good, bad, or indifferent at one activity has very little implication for performance at the other. We did find a positive correlation between the number of publications a person produces and the number of citations he or she gains, a relationship also reported by others (e.g., *Endler* et al.[31]; *Helmreich* et al.[20]; *Rushton & Endler*[36,33]). One characteristic often noted about the highly impactful worker is immense productivity, a characteristic found in art, music, and literature, as well as science[50,51].

We realize there are several shortcomings in both our predictor variables and our criteria. In study 1 it was only the ratings made by others that were predictive of performance. In the main the self ratings and objective personality questionnaires were not predictive (Table 3), even though there was some degree of convergent validity for these self ratings (Table 2). We attribute this lack of predective validity of self ratings to the fact that they were not made anonymously. Even for a sophisticated sample such as academic psychology professors, evaluation apprehension may have led to distortion or a restriction of range effect. Other studies that have employed non-anonymous self ratings within academic departments have also found poor predictability (*Murray*[52]). Those that used ratings by faculty or students, however, were quite successful (e.g., *Costin & Guish*[24]; *Sherman & Blackburn*[25]). In study 2, where we collected self ratings anonymously these proved fairly useful.

The SSCI and SCI publication criteria also have problems associated with them. They omit coverage of most books or chapters in books and each publication is treated as equal. Thus a book review receives the same weight as a *Psychological Review* paper. Our use of the SSCI citation counts attempted to correct for this latter problem, at least inasmuch as citations reflect the scholarly impact of the work[31–33]. Still there are problems with our measure of SSCI citations. For example, citations are only to first authors. Also, citations are usually to articles that have been out for several years so that the younger faculty in our study will be underrepresented on this particular measure. Finally, of course, citations will not be perfectly related to the quality of work.

In regard to teacher ratings, although the year to year reliabilities have been well established, the dissociation of ratings of "overall effectiveness" from general evaluative influences (e.g., halo effects) has not been definitely determined, nor has the relationship between these judgments and actual student achievement. In fact, teacher evaluations similar to those used in this study have been found to be unrelated to student achievement in some research (e.g., *Murray*[53]); although the weight of evidence from

published sources suggests at least a modest positive correlation between teacher ratings and amount learned by students[52].

In summary, we recognize that our measures of personality traits on the one hand and of academic performance on the other are imperfect. Despite these imperfections, we have found meaningful empirical associations among these measures that were replicable across our two studies and are congruent with previously published literature. One possibility for subsequent research might be to carry out a prospective, as opposed to retrospective, study of personality traits and academic performance. Perhaps personality measures of graduate students could be used to predict their future accomplishments. A beginning to that sort of approach has been reported by *Hirschberg* and *Itkin*[18].

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