Person. individ. Diff. Vol. 13, No. 12, pp. 1333–1341, 1992
Printed in Great Britain.

0191-8869/92 $5.00 + 0.00

BRITISH RESEARCH PRODUCTIVITY IN PSYCHOLOGY 1980–1989. DOES THE LOTKA–PRICE LAW APPLY TO UNIVERSITY DEPARTMENTS AS IT DOES TO INDIVIDUALS?

ADRIAN FURNHAM* and CELIA BONNETT
Department of Psychology, University College London, Gower Street, London WC1E 6BT, England

(Received 1 May 1991; received for publication 10 March 1992)

Summary—This study replicated two American studies which set out to look at research productivity in British (university and polytechnic) psychology departments based on publication in the seven BPS journals over the last decade. Composite productivity scores were calculated, rank-ordered, and compared with previous reputational ratings. The correlation between the productivity score and Rushton's [(1989) *The Psychologist, 2,* 64–68] citation score was $r = 0.79$ and his publication score was $r = 0.77$. Despite the fact that quite different methods have been used to rate or rank departmental excellence or output, they seem to show highly significant correlations. The effect of highly productive individuals within departments was considered. The dangers and limitations inherent in this particular productivity count are listed. The results seemed to suggest that the Lotka–Price law of scientific productivity partly applied to departments in that half of all scientific contributions are made by (slightly more than) the square root of the total number of scientific contributors (in this sense psychology departments).

INTRODUCTION

The issue of assessment

Whether they like it or not British academics have been encouraged to grade and classify universities and polytechnics as well as discipline-specific departments within and between institutions. Unused to formal, explicit assessment many academics seem particularly nervous about, and hostile to, being graded despite (or perhaps because) they spend much of their time grading students and peer reviewing journal articles and grant proposals (activities which they know to have low reliability and validity). A central question remains for potential applicants and funding bodies: "What are, or should be, the criteria for evaluating academic excellence or eminence?" Indeed, what are the best performance criteria? This leads, of course, to the vexed and sensitive question of rating or ranking departments according to specific objective or subjective criteria.

Furnham (1990) has argued that academics have reacted in two characteristic ways to being evaluated. One line of thought (the un-cooperative) holds the view that "what can be measured isn't important, and likewise what is critical can't be measured". Despite the fact that they have to be professionally concerned with evaluation and assessment they refuse to relinquish the role of critic for the more helpless position of experimental subject. Arguments revolve around issues such as complexity (to measure a multifaceted concept by one criterion is outrageous), complicity (to measure is to agree to co-operate with those who will eventually destroy the universities) and bias (measurement will be restricted to those explicit criteria which are easy to measure but not necessarily appropriate) as well as reliability and validity.

On the other hand there are those academics who welcome assessment given that it is open, reliable and fair. The issue is recognized to be complex and thus a fairly subtle formula for evaluation must be sought. Rather than agreeing that this process conspires with those who are anti-intellectual or philistine, they would argue that an open, objective method would help prevent random praise or punishment, 'old-boy networks' and corruption. Certainly attempts to rank academic institutions and departments has been met with considerable scepticism (Gillett & Aitkenhead, 1987). Furthermore Gillett (1989) has argued that one needs to distinguish between performance and achievement indicators. Performance refers to the extent to which achievements

*To whom correspondence should be addressed.

are obtained in a cost effective manner: i.e. it relates output (of whatever source) to inputs (resources) of various types. Most of the current indicators however, look only at output or simple achievement numbers irrespective of academic staff, numbers, research resources or the staff–student ratio.

The problem of criteria

The major issue is what criteria are to be used and many have been suggested. For instance *research grant money* has been proposed—the bigger the total research grant, the better the department. This is an attractive proposition (especially to monetarists, university administrators etc.) and it may be argued that only good departments attract the confidence of research bodies or external commercial organizations. Furthermore money is a wonderfully simple comparable metric—i.e. Department A attracted £100,000 last year and Department B took £500,000, therefore B is five times better than A. The trouble with this attractive commercial approach is that it confounds the *means with the ends*. The grant is a means to achieving an end—research results, publications—but no guarantee of it. Grants do not clearly differentiate need—some people need equipment (necessary but not sufficient for research), while others purchase research assistants. Some research requires very little grant money and if this criterion is used some researchers may be forced to get grants they do not need. Gillett (1989) has in fact provided fifteen cogent arguments as to why the decision of a grant-giving agency to fund a research proposal cannot be taken as an impartial vote of confidence in the quality of the academic work. Finally because of the academic *Zeitgeist* (or commercial needs) certain research topics are more or less likely to be funded. Unfashionable or highly innovative research whose time has not yet come may not be funded

Other indicators like sheer number of publications, completed PhD's supervised, departmental members who are fellows of recognized societies (FRS, FBS, Phi Beta Kappa) are simply too crude. For instance one can publish extensively in non-reviewed, unheard-of and unread journals that have low standards of acceptance. Equally popularized books that have little or no merit are for some easy to produce and may increase an individual's or a department's profile unfairly. On the other hand learned bodies have various rules and criteria for admittance that do not always reflect our academic standards; others have no society for their particular disciplines. Student applications and course evaluations may reflect geography or economic circumstances in the case of the former or entertainment value in the case of the latter.

If grants, fellowships, publication numbers and student numbers are poor indicators and too problematic as criteria, what can be used? One measure that has been extensively used in North America for over 20 years to measure individuals' and departments' research productivity and impact is the *Citation Count*. This refers to the number of times that an article is cited in the literature. It is argued by many to be objective, reliable, valid and predictive though limitations are always acknowledged (Garfield, 1983, 1988).

Individual differences

Citation counts have been used fairly extensively to rank British psychology departments. Canadian researchers have executed a number of these scientometric assessments (Endler, Rushton & Roediger, 1978; Rushton & Endler, 1977; Rushton, Littlefield, Russell & Meltzer, 1983). The fact that citation counts provide a reliable, sensitive and robust measure of academic productivity means that research has been done on personality and demographic correlates of academic work (Root, 1987). For instance Helmreich, Beane, Lucker and Spence (1978) stressed achievement need correlates of success. Helmreich, Spence, Beane, Lucker and Matthews (1980) in a path analysis of citation counts found sex, needs for mastery at work and competitiveness as well as the established reputation of their graduate and current departments the best predictors. On the other hand Rushton, Murray and Paunonen (1983) found various personality rating correlates of psychologists' total publications and citations over a limited period. Creative, productive researchers tended to be ambitious, enduring, seeking definitiveness, dominant showing leadership, aggressive, independent, non-meek and non-supportive.

To what extent is productivity stable over time? Thanks to the work of Rushton (Rushton & Endler, 1977; Rushton, 1989) it is at least possible to look at the citation counts of the most productive psychologists in Britain.

Table 1 shows the top 25 British psychologists in 1975 and 1985. In all 10 psychologists are on both lists, half of them at London University. The fact that three—Eysenck, Gray and Wilson—are all at the Institute of Psychiatry may lead one to predict that it should do exceedingly well in any publication or citation count mainly due to these three authors all of whom have international reputations. Probably the stability of the most productive would have remained even higher had not a number in the 1975 list migrated (Bruner, Rachman & Pugh).

Certainly the effect highly productive individuals can have on a departmental rating cannot be overestimated, particularly if the department is small. Rushton notes "One of the most critical variables highlights a possible source of causation is the number of 'stars' a department has (for citations >25, for publications >3). It may be that a department's prestige ultimately depends on the number of productive and impactful researchers that it is able to attract and retain. In this analysis, the resultant prestige of the department may eventually attract large numbers of good students and increase income. In turn, this would enable it to attract more well-known

Table 1. The 25 top British psychologists according to the 1975 and 1985 SSCI index

Psychologist	University	Citations
	1975 SSCI	
H. J. Eysenck	London (Inst. Psych.)	537
J. S. Bruner[a]	Oxford	362
M. Argyle	Oxford	136
S. Rachman	London (Inst. Psych.)	113
J. A. Gray	Oxford	90
P. L. Broadhurst	Birmingham	75
D. S. Pugh	London (London Grad. Sch. Bus. Studs)	71
P. Venables	York	70
C. Hutt	Keele	67
R. S. Peters	London (Inst. Educ.)	64
A. M. Triesmann	Oxford	59
N. S. Sutherland	Sussex (Experimental)	56
H. R. Schaffer	Strathclyde	56
N. J. Mackintosh	Sussex (Experimental)	54
H. Tajfel	Bristol	54
N. Moray	Stirling	52
T. G. E. Bower	Edinburgh	50
N. C. Waugh	Oxford	48
R. Lynn	Ulster	47
M. Coltheart	London (Birkbeck College)	45
P. E. Bryant	Oxford	42
G. D. Wilson	London (Inst. Psych.)	42
M. Triesmann	Oxford	41
G. Jahoda	Strathclyde	41
E. K. Warrington	London (Inst. Neurol.)	41
	1985 SSCI	
H. J. Eysenck[b]	London, BPMF	813
J. A. Gray	London, BPMF	251
E. K. Warrington	London, BPMF	180
N. J. Mackintosh	Cambridge	176
J. M. Argyle	Oxford	170
M. Coltheart	London, Birkbeck College	164
P. B. Warr	Sheffield	120
D. A. Booth	Birmingham	101
M. R. Trimble	London, BPMF	97
J. Sandler	London, University College	97
S. B. G. Eysenck[b]	London, BPMF	91
M. W. Eysenck	London, Birkbeck College	90
T. G. E. Bower	Edinburgh	85
O. J. Braddick	Cambridge	83
S. J. Cooper	Birmingham	82
D. N. Lee	Edinburgh	84
G. D. Wilson	London, BPMF	84
C. B. Trevarthan	Edinburgh	73
H. Giles	Bristol	70
H. R. Schaffer	Strathclyde	67
P. H. Venables	York	68
T. W. Robbins	Cambridge	69
L. Weiskrantz	Oxford	64
A. F. Furnham	London, University College	62
E. T. Rolls	Oxford	61
W. Yule	London, BPMF	60

[a]American, only temporarily in Oxford.
[b]Not full time faculty.

psychologists. Thus a feedback process is operative which a sudden reduction in income of maladministration could disrupt". (Rushton, 1989, p. 67.)

Various writers have looked at the productivity of those recognized as geniuses (Simonton, 1985). Analysis of various areas of productivity (the arts and the sciences) shows a highly skewed distribution of creative contribution which some have attempted to express algebraically. Thus Lotka, a demographer developed a law which states: The number of scientists publishing exactly n papers is roughly proportional to n^2, where the proportionality constant varies with the discipline. The law is in fact similar to Pareto's law of income distribution but does not fit the empirical data perfectly. Price (1976) refined this law to what has become known as the Lotka–Price law. It states that half of all scientific publications are made by the square root of the total number of scientific contributors: thus if there are 100 scientists within a given discipline, just 10 of them will account for 50% of all publications. For Simonton (1984) "the inequality of productivity revealed in the highly skewed distributions of creative output to an undeniable law of historiometry" (p. 81). He argues that the relationships between fame and fecundity or quality and quantity occurs because of the "constance probability of success" model of creative productivity; that is the odds that any single contribution will prove successful are constant across researchers and so those researchers who are likely to produce masterpieces (a highly cited, Kuhnian break-through) are those who produce more works altogether.

Departmental ratings

In the most recent analysis Rushton (1989) used the 1985 SSCI citations and publications for 671 members of British psychology departments to count and compare data published 10 years previously based on the 1975 SSCI. This revealed a 9% decrease in staff but a 66% increase in research production and a 42% increase in impact. British academic psychologists amassed 967 publications (up from 582) with a mean of 1.4 (up from 0.8) and 7506 citations (up from 5283) with a mean of 11.2 (up from 7.2). Despite the secular trends and an average staff turnover of 33%, the differences among departments remained relatively constant ($r = 0.81$ for total citations $r = 0.62$ for total publications, $r = 0.40$ for means). Both citation and publication counts were predictive of the 1986 University Grants Commission ratings. One of the best predictors of the UGC ratings was the number of individuals a department had with more than 25 citations ($r = 0.47$). Twenty-six individuals with more than 60 citations were listed. This suggests that the Lotka–Price Law operates for British psychologists and that it may strongly influence departmental ratings.

Despite its widespread use and acceptance in scientometric assessment, Chapman (1989) has argued against the use of such indexes. He lists 25 shortcomings, biases, deficiencies and limitations of this method many of which have been shown to have very minor effects, but offered no alternative suggestion as to how to judge psychology departments. No doubt both because of the discomfort with various shortcomings of citation counts, but also to test other scientometric measures, various researchers have looked at measures of such things as actual productivity. Others too have been sceptical about the use of bibliometric tools (Johnes, 1988). Both Cox and Carr (1977) and Howard, Cole and Maxwell (1987) looked at the *productivity* of all American psychology departments based on the number of publications in the 13 journals of the American Psychological Association. Howard *et al.* (1987) reviewed 13 journals from 1976 to 1985 and estimated institutional productivity (i.e. departmental scores) on the basis of frequency and order.

A single-authored article netted that author's institution a single unit of credit. In multiauthored articles, credit was assigned to institutions proportionately:

$$\text{credit} = (1.5^{n-i})/(^{n}\Sigma_{i=1}1.5^{i-1}),$$

where n is the total number of authors and i is the particular author's ordinal position. Hence, second authorship in a co-authored article was given 0.40 credit unit; third authorship in a three-author article, 0.21, and so forth. Full credit was granted for full-length articles; however, half credit was assigned for brief reports and notes. In this latter regard, the productivity estimates differ from Cox and Carr's (1977). What this method does then is calculate, based on journal authors' institutional origins, the productivity over time of those institutions. Composite productivity scores over the 13 journals were then compared with previous reputational ratings of institutions in

psychology (Jones, Lindzey & Coggeshall, 1982; Roose & Andersen, 1970) and also with previous productivity data (Cox & Carr, 1977; Jones *et al.*, 1982). The overall relationship between reputation and productivity was fairly strong. However, departmental reputation was differentially related to productivity in specific journals. A relatively strong overall relationship was noted between past and current productivity, but the degree of stability varied greatly from journal to journal.

Howard *et al.* (1987) found a correlation of 0.84 between their productivity score and reputation based on earlier established research ratings. This was somewhat higher than 0.35 reported by Cox and Carr (1977).

The authors were mindful of the limitations of this study. They note:

> "The rating of institutions of productivity and reputation in psychology is an undertaking fraught with problems. First, one's operational definitions of the various indexes may affect the resulting rank order of institutions considerably. For example, we did not include books or book chapters in our review. Second, the rank order of certain institutions may be affected by a wide variety of factors that may be of interest to the prospective graduate school applicant. In some cases, the addition or attrition of a single very productive faculty member could alter a school's ranking. Also, changes in journal editorships or the emergence of new popular areas of research could affect some schools more than others—especially on the single-journal indexes. Clearly, discretion is needed in the interpretation of these results. Indeed, these very issues may serve as new avenues for future productivity research. The choice of productivity indexes could be examined via generalizability studies, such as those conducted earlier, but in different subfields. Also, the new APA journals could be examined—perhaps in the next productivity review. Finally, perhaps non-journal productivity could be included as yet another index. Mindful of these possibilities, one can approach the current data in several ways. By considering both past and present indexes of reputation and research productivity, one can evaluate various institutions from two distinct but related perspectives. In addition, changes over time on both dimensions can be tracked. Further, by adjusting the productivity ratings for faculty size, it can be seen that a number of small institutions, while they cannot match the larger institutions in faculty numbers, have prolific individual faculty members at work" (p. 985).

METHOD

This study attempted a complete replication of the work of Howard *et al.* (1987) but for the BPS rather than the APA journals. Seven BPS journals: British Journals of: Psychology, Clinical Psychology, Developmental Psychology, Educational Psychology, Mathematical and Statistical Psychology, Occupational Psychology and Social Psychology were investigated. Full issues of the British Journal of Medical Psychology were not available and hence excluded from the analysis. The same formula used by Howard *et al.* (1987) was used to calculate the productivity score. As a reliability check two-raters looked at one of the journals. Reliability agreement was 0.96. It was predicted that the Lotka–Price law applied to departments as well as individuals.

RESULTS AND DISCUSSION

Previous research has tended to ignore polytechnic departments of psychology in this country and also exclusive research units funded by the MRC or ESRC in London, Cambridge or Sheffield. The initial analysis listed all affiliations chosen by the authors.

Table 2 shows the rank order of the departments with regard to their total score. A total score is a measure of productivity based on rank-ordered, institutional affiliation of BPS journal authors. A number of observations could be made. Firstly that three research units are listed in the top twenty. This is not surprising since they are fairly large well funded units that are engaged in full-time research unencumbered by the chores of teaching undergraduates. Indeed, some would argue that the research units have somewhat under-performed given their exclusive remit to research. However it is interesting to note that, as always, London's Institute of Psychiatry leads the list. This cannot be attributed to the remarkable output of people like Eysenck, Gray and Wilson who are there because all three rarely publish in BPS journals. Secondly it is noticeable how much higher universities score compared to polytechnics. Only three polys are in the top 50 and occupy most of the lower positions. This could be attributable to a number of factors such

Table 2. A productivity table of ranks for psychology departments in all universities, polytechnics and colleges of further education in the U.K. and Eire from their publications in BPS journals from 1980–1989

Institution	Total	Ranks	Institution	Total	Ranks
London Univ. Inst. of Psy.	46.08	1	City Poly.	5.40	45.5
Sheffield Univ. MRC SAPU	41.34	2	Lanchester Poly.	5.40	45.5
Oxford	35.95	3	UMIST	5.29	47
Exeter	30.81	4	Glasgow Tech.	5.28	48.5
Sussex	29.49	5	Reading	5.28	48.5
Cambridge Univ. MRC APU	28.03	6	Durham	5.00	50
London Univ. UCL	24.68	7	Newcastle	4.80	51
Leicester	21.70	8	Hatfield Poly.	4.74	52
London Univ. Birkbeck	18.97	9	City	4.68	53
Birmingham	18.45	10	Wales Univ. Swansea	4.57	54
Lancaster	17.91	11	Loughborough	4.40	55
Manchester	17.18	12	Wales Univ. Bangor	4.40	56
Nottingham	15.80	13	Newcastle Poly.	4.32	57
Sheffield	15.40	14	Bath	4.12	58
Aberdeen	13.29	15	Manchester Univ. Harc	3.80	59
Liverpool	12.00	16.5	Southampton	3.77	60
London Univ. MRC CDU	12.00	16.5	Brunel	3.60	61.5
Dundee	11.88	18	Ulster Poly.	3.60	61.5
London Univ. RHBNC	10.92	19	Poly. Central London	3.46	63
Plym. Poly./Poly. SW	10.79	20	Trinity and All Saints	3.40	64
Kent	10.53	21	UWIST	3.22	65
Nelp/Pel	10.41	22	Manchstr Poly.	3.12	66
York	10.20	23	St Andrews	3.09	67
London Univ. Goldsmiths	10.08	24	Liverpool Poly.	2.00	68.5
Glasgow	9.80	25	Preston Poly.	2.00	68.5
Wales Univ. UCC	9.72	26	Leeds Poly.	1.05	70
Strathclyde	9.52	27	Bolton IHE	1.01	71
Ulster	9.34	28	Aberdeen Univ. MRC Unit	1.00	76
Cambridge	9.04	29	Barking Tech.	1.00	76
Bristol	8.81	30	Bradford	1.00	76
Hull	8.53	31	Coventry Poly.	1.00	76
Keele	8.30	32	Ealing CHE	1.00	76
Edinburgh	7.71	33	Salford	1.00	76
Lancashire Poly.	7.60	34	St Andrews Univ. MRC Unit	1.00	76
Stirling	7.13	35	Sunderland Poly.	1.00	76
Surrey	7.00	36	Sheffield City Poly.	1.00	76
Aston	6.60	37.5	Solihull Tech.	1.00	76
Belfast	6.60	37.5	Huddersfield Poly.	0.60	83.5
Warwick	6.23	39	Ports Poly.	0.60	83.5
Leeds	6.21	40.5	Sheffield Poly.	0.60	83.5
Sussex Univ. MRC Unit	6.21	40.5	Thames Poly.	0.60	83.5
London Univ. LSE	6.13	42	Lancaster Poly.	0.47	86
East Anglia	5.79	43	Trent Poly.	0.40	87
Open Univ.	5.41	44			

as heavier teaching load of polytechnic lecturers or their remit to practical applied issues rather than theoretical research. Another, more obvious explanation, concerns the relative size of polytechnic psychology departments to university departments, as they are on average much smaller.

Thirdly it should be pointed out that total productivity scores are highly positively skewed with the 1st department having nearly twice the score of the 7th and four times that of the 18th. This certainly suggests that there are sharp distinctions between output of various departments. Fourthly those scores were significantly lower than those for American departments but this may be accounted for by the fact that the APA publishes nearly twice as many journals as the BPS. Finally, the top 10 departments/units in the country account for nearly 40% of the total productivity. Four of the 10 are London University Colleges, 2 are MRC units and the rest university departments.

The Lotka–Price law would suggest that the first departments ($\sqrt{87}$) should account for 50% (± 370) of the total score (as calculated by the formula). This was not the case, for the first 9 departments accounted for just under 40% of the total score. In fact the first 16 departments accounted for half of the score of the total 87 departments. Thus although the Lotka–Price law did not receive full support the trend was certainly in that direction.

Is productivity (as measured by the Howard *et al.*, 1987, formula) correlated with citation and number of publications in other journals? In order to answer this question, Rushton's (1989) data on university department citation and publications were correlated with the productivity scores. These data are based on 47 British departments of psychology.

Table 3. Scientometric information on 47 British departments of psychology

Departments	Productivity	Rank	Citations	Rank	Publications	Rank
Aberdeen	13.29	14	97	24	8	37.5
Aston	6.6	32	36	43	11	31
Birmingham	18.45	9	314	5	42	4
Bradford	1.0	45	47	38	9	35.5
Bristol	8.81	26	156	14	12	28.5
Cambridge	9.04	25	511	3	29	13
Dundee	11.88	16	85	28	14	26.5
Durham	5.0	38	95	25	6	43.5
Edinburgh	7.71	29	294	8	19	20.5
Exeter	30.81	3	286	9	36	7.5
Glasgow	9.8	21	65	30	9	35.5
Hull	8.53	27	42	41	10	33.5
Keele	8.3	28	90	26	17	23.5
Kent	10.53	18	59	32	19	20.5
Lancaster	17.91	10	240	11	41	5
Leeds	6.21	35	135	18	14	26.5
Leicester	21.7	6	159	13	31	12
Liverpool	12.0	15	106	21	10	33.5
London—						
Birkbeck	18.97	7	295	7	27	14
Inst. of Psych.	46.08	1	863	1	86	1
Goldsmiths	10.08	20	53	33.5	12	28.5
Inst. of Ed.	18.52	8	43	40	15	25
RHBNC	10.92	17	44	39	17	23.5
UCL	24.68	5	404	4	61	2
LSE	6.13	36	53	33.5	8	37.5
Manchester	17.18	11	127	20	18	22
Newcastle-upon-Tyne	4.8	39	52	35.5	2	45
Nottingham	15.8	12	191	12	34	10
Oxford	35.95	2	668	2	32	11
Queens College, Belfast	6.6	33	50	37	23	15.5
Reading	5.28	37	89	27	23	15.5
St Andrews	3.09	44	144	17	11	31.0
Sheffield	15.4	13	299	6	36	7.5
Southampton	3.77	42	38	42	7	40.5
Stirling	7.13	30	17	45	35	9
Strathclyde	9.52	23	151	15	7	40.5
Surrey	7.0	31	98	23	22	17.5
Sussex	29.49	4	250	10	44	3
Ulster	9.34	24	104	22	37	6
Wales—						
Bangor	4.4	41	52	35.5	6	43.5
Cardiff	9.72	22	128	19	22	17.5
Swansea	4.57	40	78	29	11	31
UWIST	3.22	43	34	44	7	40.5
Warwick	6.23	34	63	31	7	40.5
York	10.21	19	147	16	20	19

Three correlations were computed:

- Productivity and Citations $r = 0.79$
- Productivity and Publications $r = 0.78$
- Citations and Publications $r = 0.77$

Pearson product moment correlations between actual scores tended to be higher than Spearman who correlates between ranks, but both were highly significant. These correlations suggest that there is a considerable amount of agreement between all measures of excellence, indicating reliability of ranking.

As soon as any attempt to rank order departments are made various cries of unfair, foul are heard. These no doubt occur for quite different reasons: ratings are below expectations, and the fear that these ratings may actually be used to disproportionally hand out financial support or honours to various departments. These results were presented, to various academics from a number of departments. Their various reactions may reflect the typical responses of academics to this exercise. They were both positive and negative.

Negative

One counselled not to publish the papers as it would make too many important people angry, and that being the messenger of bad news for their department, one would inevitably suffer the plight of such bearers of bad tidings. Another argued that as the BPS journals are all second rate,

it would reveal a ranking of second rate products, and the reverse order might be more useful that the actual order. An anonymous reviewer wrote: "BPS journals do not represent the major publishing venue for most British authors and, consequently, are not accurate output by British psychologists". A third complained that the BPS journals do not cover physiological and clinical psychology sufficiently and hence that if a department has major strength in this regard it would not be reflected in this analysis. A fourth wanted some more analysis between publication count and the affiliation of the editor and the editorial board believing that an element of favouritism was noticeable with some of the authors. Others objected to the whole exercise for reasons previously discussed, though none seemed to note that the ranking concurred with various other methods.

Positive

One person said that it has confirmed his and his department's belief about where they should be placed which had not occurred in previous exercises of this kind. In fact one pointed out that he had performed such an exercise but was afraid to publish given the wrath that may accrue from colleagues, and as all academic criteria were peer reviewed he felt his career might be in jeopardy. Another said that it was interesting because another method had yielded such consistent results and that it became difficult to ignore such evidence. A third believed it highlighted the best departments empirically and disinterestedly, unlike *rank* orders produced by clearly non-disinterested committees.

No one would argue that such exercises are without limitations. Every attempt to rank order academic excellence must go into a myriad of practical (and political) problems. But when different (if somewhat related) measures correlate highly, and each has different strengths and limitations, it does seem as if a working grouping system could be produced.

The above exercise was not an exercise in determining academic *performance* because it did not relate output to input (Gillett, 1989). To do so would have meant "correcting" the productivity factor given in Table 2 by such things as the number of full and part time academic staff, post-graduates, grants held etc. This was impossible since this study examined productivity over a 10 year period during which some departments saw a major decline in staff numbers, others held constant though there was an exchange of individuals, while some actually increased. In this sense big departments, particularly those with a majority of the staff in their most productive years (i.e. 35–45 years), many post-graduates, and those that were (for one reason or another) recipients of large grants, are likely to be more productive. But it is equally possible that the cost per publication is higher in big departments than small ones. However one reacts to this big vs small issue, Table 1 does show up some simple anomalies with some of the biggest departments scoring comparatively low and vice versa. Oxford (scoring third) and Exeter (scoring fourth) are relatively small departments.

Another artifact is worthy of note. This study did not note the precise position of the author, simply his or her chosen affiliation. Some authors were no doubt post-graduates and research associates/assistants and fellows. Further some scholars hold more than one appointment and are able to attribute the institutional affiliation at choice. Authors, some highly productive and others not, may have moved in this decade so helping or hindering the department they went to or came from. Conscious of the problems of publication and citation counts Endler (1987, pp. 180–181) had developed a weighted publication and publication index (see Appendix).

Gillett (1989) has argued that journal peer review criteria are superior to grant-giver peer review or impressionistic peer review data. This study has shown that productivity measures are reliable, but it could not demonstrate the validity of such a measure. The problem for the psychometrician of scientometric measures is to know what criterion to use to validate the measures. More importantly perhaps such an exercise can only provide hypotheses but not answers to more important but elusive questions such as what is the optimal environment for research?

However the results do provide some evidence for the Lotka–Price law which suggests some highly rated departments may be leaning heavily on the fecundity of a few!

REFERENCES

Chapman, A. (1989). Assessing Research: Citation—count shortcomings. *The Psychologist*, *8*, 336–344.

Cox, W. & Carr, V. (1977). Productivity ratings of graduate programs in psychology based upon publication in the journals of the American Psychological Association. *American Psychology*, *32*, 793–813.

Endler, N. (1987). The scholarly impact of psychologists. In Jackson, D. & Rushton, J. (Eds), *Scientific excellence, origins and assessment*. Newbury Park, CA: Sage.
Endler, N., Rushton, J. & Roediger, H. (1978). Productivity and scholarly impact (citations) of British, Canadian and US departments of psychology (1975). *American Psychologist, 33*, 1064–1083.
Furnham, A. (1990). Quantifying quality: An argument in favour of citation counts. *Journal of Further and Higher Education, 14*, 105–110.
Garfield, E. (1983). How to use citation analysis for faculty evaluations and when is it relevant. *Current Contents, 44*, 354–361.
Garfield, E. (1988). Can researchers bank on citation analysis? *Current Comments, 44*, 3–12.
Gillett, R. (1989). Research performance indicators based on peer review: A critical analysis. *Higher Education Quarterly, 43*, 20–38.
Gillett, R. & Aitkenhead, M. (1987). Rank injustices in academic research. *Nature, 327*, 381–382.
Helmreich, R., Beane, W., Lucker, G. & Spence, J. (1978). Achievement motivation and scientific attainment. *Personality and Social Psychology Bulletin, 4*, 222–226.
Helmreich, R., Spence, J., Beane, W., Lucker, G. & Matthews, K. (1980). Making it in academic psychology: demographic and personality correlates of attainment. *Journal of Personality and Social Psychology, 39*, 896–908.
Howard, G., Cole, D. & Maxwell, S. (1987). Research productivity in psychology based on publication in the journals of the American Psychological Association. *American Psychologist, 42*, 975–986.
Johnes, G. (1988). Research performance indicates in the university sector. *Higher Education Quarterly, 42*, 54–71.
Jones, L., Lindzey, G. & Coggeshall, P. (1982). *An assessment of research doctorate programs in the United States*. Washington: NAP.
Lotka, A. (1926). The frequency distribution of scientific productivity. *Journal of the Washington Academy of Sciences, 16*, 317–323.
Price, D. (1976). A general theory of bibliometric and other cumulative advantages processes. *Journal of the American Society for Information Science, 27*, 292–300.
Root, L. (1987). Faculty evaluation: Rehability of peer assessments of research, teaching and service. *Research in Higher Education, 26*, 71–84.
Roose, K. & Anderson, C. (1970). *A rating of graduate programs*. Washington: ACE.
Rushton, J. (1977). The impact of British psychology journals on science. *Bulletin of the British Psychological Society, 30*, 212–213.
Rushton, J. (1989). A ten-year scientometric revisit of British Psychology Departments. *The Psychologist, 2*, 64–68.
Rushton, J. & Endler, N. (1977). The scholarly impact *and* research productivity of departments of psychology in the United Kingdom. *Bulletin of the British Psychological Society, 32*, 107–109.
Rushton, J., Murray, H. & Paunonen, S. (1983). Personality, research creativity and reaching effectiveness in university professors. *Scientometrics, 5*, 93–116.
Rushton, J., Littlefield, C., Russell, R. & Meltzer S. (1983). Research production and scholarly impact in British universities and departments of psychology: An update. *Bulletin of the British Psychological Society, 36*, 41–44.
Simonton, D. (1984). *Genius, creativity and leadership*. Cambridge, MA: Harvard University Press.

APPENDIX

Weighted Publication Index

Weight	Category
20	Texts and other Scholarly Books
10	Edited Books
6	Chapters in Books
4	Journal Articles
2	Magazine Articles
2	Reprints of Articles
2	Book Reviews
1	Unpublished Reports

Weighted Productivity Index

Weight	Category
2	Invited Address
1	Paper presented at a conference
2	Grants: Major grants, funded outside the university

Weight	Category
0.5 × No. of citations	SCI weighted average by rank. For assistant professors citations are averaged over the last three years, for associate professors over the last two years, and for full professors the current year citation count is used SSCI weighted average by rank, as above.
0.5 × No. of citations	