BJR

EDITORIAL

Orthopaedic journals, impact factors, research impact and research quality

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I am delighted to announce that *Bone & Joint Research* (BJR), which was only established in 2012, has now received its first impact factor, which is 1.640. This is the first opportunity that the BJR has had to get an impact factor, as a journal must be registered in PubMed for at least three years. The journal impact factor is an independent measure calculated by Thomson Reuters in Philadelphia, United States and only a subset of journals are considered to be of sufficient quality to be listed by Thomson Reuters for an impact factor. The impact factors range from under 1 to over 50 (e.g. *New England Journal of Medicine* 55.87). Unfortunately, orthopaedic journals have relatively low impact factors, which tend to be less than 5.

In comparison, several other body systems have journals with far higher impact factors, for example, the neurological system (e.g. *Nat Rev Neurosci* 31.4, *Annu Rev Neurosci* 22.7, *Trends Cogn Sci* 21.1, *Neuron* 16) and the cardiovascular system (e.g. *J Am Coll Cardiol* 15.3, *Circulation* 14.9, *Eur Heart J* 14.7, *Circ Res* 11.1) have multiple journals with high impact factors. It is, therefore, worth reflecting as to why orthopaedic journals do not have higher impact factors.

The impact factor for a journal in a given year is calculated by dividing the number of citations, in that year, to the source items published in that journal during the previous two years, by the number of citable articles in the preceding two years. For example, the journal impact factor for Year X = (Year X citations to Year (X-1) + Year (X-2) articles)/(no. of "citable" articles published in Year (X-1) + Year (X-2)). Thus, for a citation to count towards a journal's impact factor, it needs to be cited within two years of publication.

There are a number of factors that affect the total number of citations. The citations can be distributed evenly between the articles published, or, they can be heavily weighted to a small number of articles, which have a very high number of citations. For instance, in 2005 a study in *Nature* reported that 89% of the citations in its journal came from only 25% of the articles published.[1] Haddad[2] has listed a number of other factors that affect the number of citations, which include the number of publications in a research field; the average number of references in a paper and the type of article – reviews tend to get more citations, and scientific articles tend only to cite scientific articles, whereas clinical papers cite both clinical and preclinical articles. In addition to these factors, the citation rate is also dependent upon the number of researchers in a given field; the country of origin; the country where it is published and the language in which it is written.

Furthermore, as the impact factor does not count all citations a paper has received, but only those in the preceding two years, the vast majority of research that will quote a paper in that time period will already have been started before the cited paper is published. This makes the impact factor even more dependent on the number of researchers in a given field. Kodumuri et al[3] have also pointed out the critical nature of the time period over which the citations are considered, as there is a greater lag time for surgical papers to be cited.

Demonstration of the impact of research is gaining increasing importance worldwide, as national funding bodies are using this to determine the allocation of central funding. Publications in journals with high impact factors are often used as a mark of this. However, different types of papers have different target audiences. For some, the paper is aimed at researchers, for others it is clinicians and for others still, policy makers. These different 'audiences' have different rates of citation, thus, a paper that has a message which is most relevant to practicing clinicians who do not write papers, may have a lower citation rate than a paper whose target readership is academics who, themselves, write regularly.

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Table I. Most highly cited *Bone & Joint Research* papers published in 2013

Papers	Citations (2014)	Downloads (2014)
Sidaginamale et al[4] (P1)	8	730
Rodrigues-Pinto et al[5] (P2)	7	1042
Kon et al[6] (P3)	7	962
Goffin et al[7] (P4)	4	812
Patel et a[8] (P5)	4	1139

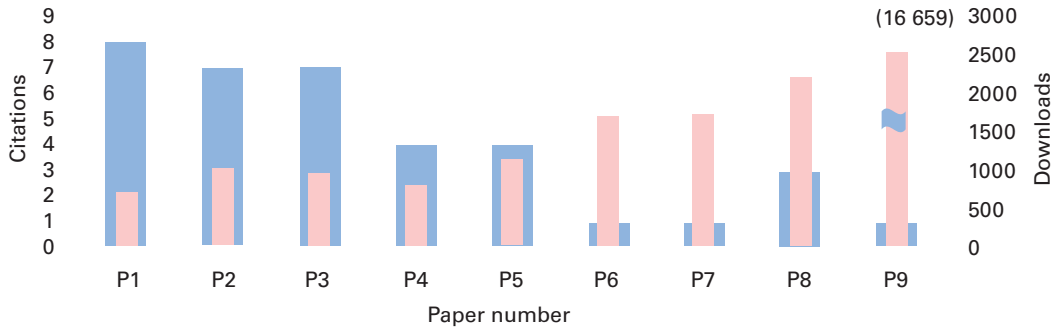

Fig. 1

Graph showing interrelation of citations compared with downloads. (Number in brackets indicates actual number of downloads).

Table II. Most highly downloaded *Bone & Joint Research* papers published in 2013

Papers	Citations (2014)	Downloads (2014)
Zhang et al[9] (P9)	1	16 659
Karlakki et al[10] (P8)	3	2200
Ketola et al[11] (P7)	1	1720
Johnson et al[12] (P6)	1	1681
Patel et al[8] (P5)	4	1139

Table III. Most highly cited papers in *The Bone & Joint Journal* published in 2013

Papers	Citations (2014)	Downloads (2014)
Jenkins et al[13]	19	1010
Chareancholvanich et al[14]	18	776
Parvizi et al[15]	16	1072
Zywiel et al[16]	13	478
Gøthesen et al[17]	13	418

Table IV. Most highly downloaded papers in *The Bone & Joint Journal* published in 2013

Papers	Citations (2014)	Downloads (2014)
Ahmad et al[18]	3	2860
Roche and Calder[19]	1	2802
Ibrahim et al[20]	1	1411
Modi et al[21]	1	1084
Parvizi et al[15]	16	1072

There will be exceptions to this, such as the pivotal randomised controlled trials (RCTs), which will be read by clinicians and quoted by academics. As a consequence of this, the relationship between downloads (marker of use by clinicians, researchers and policy makers) and citations (marker of use by researchers) will not necessarily be linear. In 2014, the five most cited BJR papers[4-8] from 2013 are listed in Table I and the five most downloaded BJR papers[8-12] are listed in Table II. Only one paper is in both Tables (Fig. 1). As might be expected, the highly cited papers in Table I are more relevant to researchers. The highly downloaded papers were on clinical update topics that would be expected to appeal more to practicing clinicians. Although not cited greatly, the high downloads indicate that these papers appear to have had a significant impact on clinical practice.

A similar picture is seen with the orthopaedic clinical journal, *The Bone & Joint Journal* (BJJ; formerly JBJS-Br). Only one of the five most highly cited papers[13-17] in the BJJ (Table III) and the five most highly downloaded papers[15,18-21] (Table IV) overlap.

Sarli et al[22] have also recognised that the value of publications falls into different domains; research impact, knowledge transfer, clinical implementation and community benefit. They indicate that citation analysis alone, therefore, does not assess the impact of a paper fully. For this reason, several authors have examined alternative metrics of research impact. For example, Brueton et al[23] examined other ways of assessing the value of methodological research, such as the applications of a piece of work, further developments of the research, release of software and provision of guidance materials to facilitate uptake, formation of new collaborations, and broad dissemination.

Despite these concerns, the impact factor is a yardstick of a journal and an indication of quality of the review process; this is vitally important given the burgeoning number of open access journals, which do not always have the same pedigree of peer review.

References

1. **No authors listed.** Not-so-deep impact. *Nature* 2005;435:1003–1004.
2. **Haddad FS.** The impact factor: yesterday's metric? *Bone Joint J* 2014;96-B:289–290.
3. **Kodumuri P, Ollivere B, Holley J, Moran CG.** The impact factor of a journal is a poor measure of the clinical relevance of its papers. *Bone Joint J* 2014;96-B:414–419.
4. **Sidaginamale RP, Joyce TJ, Lord JK, et al.** Blood metal ion testing is an effectivescreening tool to identify poorly performing metal-on-metal bearingsurfaces. *Bone Joint Res* 2013;2:84–95.
5. **Rodrigues-Pinto R, Richardson SM, Hoyland JA.** Identification of novel nucleus pulposus markers: interspecies variations and implications for cell-based therapiesfor intervertebral disc degeneration. *Bone Joint Res* 2013;2:169–178.
6. **Kon E, Filardo G, Di Matteo B, Perdisa F, Marcacci M.** Matrix assisted autologous chondrocyte transplantation for cartilage treatment: A systematic review. *Bone Joint Res* 2013;2:18–25.
7. **Goffin JM, Pankaj P, Simpson AHRW, Seil R, Gerich TG.** Does bone compaction around the helical blade of a proximal femoral nail anti-rotation (PFNA) decrease the risk of cut-out?: A subject-specific computational study. *Bone Joint Res* 2013;2:79–83.
8. **Patel RA, Wilson RF, Patel PA, Palmer RM.** The effect of smoking on bone healing: A systematic review. *Bone Joint Res* 2013;2:102–111.
9. **Zhang Y, Xu J, Wang X, et al.** An in vivo study of hindfoot 3D kinetics in stage II posterior tibial tendon dysfunction (PTTD) flatfoot based on weight-bearing CT scan. *Bone Joint Res* 2013;2:255–263.
10. **Karlakki S, Brem M, Giannini S, et al.** Negative pressure wound therapy for managementof the surgical incision in orthopaedic surgery: A review of evidence and mechanisms for an emerging indication. *Bone Joint Res* 2013;2:276–284.
11. **Ketola S, Lehtinen J, Rousi T, et al.** No evidence of long-term benefits of arthroscopicacromioplasty in the treatment of shoulder impingement syndrome: five-year results of a randomised controlled trial. *Bone Joint Res* 2013;2:132–139.
12. **Johnson R, Jameson SS, Sanders RD, et al.** Reducing surgical site infection in arthroplasty of the lower limb: A multi-disciplinary approach. *Bone Joint Res* 2013;2:58–65.
13. **Jenkins PJ, Clement ND, Hamilton DF, et al.** Predicting the cost-effectiveness of total hip and knee replacement: a health economic analysis. *Bone Joint J* 2013;95-B:115–121.
14. **Chareancholvanich K, Narkbunnam R, Pornrattanamaneewong C.** A prospective randomised controlled study of patient-specific cutting guides compared with conventional instrumentation in total knee replacement. *Bone Joint J* 2013;95-B:354–359.
15. **Parvizi J, Gehrke T, Chen AF.** Proceedings of the International Consensus on Periprosthetic Joint Infection. *Bone Joint J* 2013;95-B:1450–1452.
16. **Zywiel MG, Brandt J- M, Overgaard CB, et al.** Fatal cardiomyopathy after revision total hip replacement for fracture of a ceramic liner. *Bone Joint J* 2013;95-B:31–37.
17. **Gøthesen O, Espehaug B, Havelin L, et al.** Survival rates and causes of revision in cemented primary total knee replacement: a report from the Norwegian Arthroplasty Register 1994-2009. *Bone Joint J* 2013;95-B:636–642.
18. **Ahmad Z, Siddiqui N, Malik SS, et al.** Lateral epicondylitis: A review of pathology and management. *Bone Joint J* 2013;95-B:1158–1164.
19. **Roche AJ, Calder JDF.** Achilles tendinopathy: A review of the current concepts of treatment. *Bone Joint J* 2013;95-B:1299–1307.
20. **Ibrahim MS, Twaij H, Giebaly DE, Nizam I, Haddad FS.** Enhanced recovery in total hip replacement: a clinical review. *Bone Joint J* 2013;95-B:1587–1594.
21. **Modi CS, Beazley J, Zywiel MG, Lawrence TM, Veillette CJH.** Controversies relating to the management of acromioclavicular joint dislocations. *Bone Joint J* 2013;95-B:1595–1602.
22. **Sarli CC, Dubinsky EK, Holmes KL.** Beyond citation analysis: a model for assessment of research impact. *J Med Libr Assoc* 2010;98:17–23.
23. **Brueton VC, Vale CL, Choodari-Oskooei B, Jinks R, Tierney JF.** Measuring the impact of methodological research: a framework and methods to identify evidence of impact. *Trials* 2014;15:464.