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Bibliometrics, impact factors and manual therapy: Balancing the science and the art

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Bibliometrics can be defined as a field of research that examines bodies of knowledge both within and across disciplines (Holden et al., 2005). Although many methods are commonly used, perhaps the most widely known is citation analysis; that is, tracking published articles to see whether they are subsequently cited by others (Smith, 2008a). Much of contemporary bibliometrics can be traced back to a seminal publication known as *Shepard's Citations*, a tool first used by American lawyers in 1873 to establish whether a previous legal judgment had been referred to, overruled, or made invalid in some other way (Adair, 1955). By the early 20th century, citation analysis had attracted the attention of various scientific scholars, although most of their early work simply involved the counting and sorting of reference lists. Nevertheless, some trends were noticed early on in the journals of chemistry (Gross and Gross, 1927), engineering (Bradford, 1934) and physiology (Brodman, 1944). Perhaps the most striking observation was that not all journals were being equally cited; rather, only a few core periodicals appeared to be attracting the majority of all citations. On the other hand, while larger journals tended to gather more citations than smaller ones, some of the smaller periodicals still appeared to be performing well, relative to their actual size and circulation.

With this phenomenon in mind, an information scientist named Eugene Garfield proposed calculating a journal's relative 'impact' in 1955 (Garfield, 1955), whereby the number of citations received by a particular journal in a particular time period could be divided by the number of articles it had actually published during that time. The concept was refined with experience to include only 'citable items' in the calculation, that is, substantial types of articles that were most likely to be cited by others (Garfield, 1986). Garfield then founded a company known as the *Institute for Scientific Information* (ISI), and began publishing impact factors in the yearly *Journal Citation Reports*® (JCR®) during the early 1970s (Smith, 2008c). Data from ISI-listed journals was initially collated in the *Science Citation Index*® (SCI®), although by 1972 the scope of material had expanded to also encompass the social sciences, which led to formation of the *Social Sciences Citation Index*® (SSCI®) (Garfield, 1972). Garfield's idea caught on over time, the ISI was acquired by *Thomson Scientific* (later Thomson Reuters), and impact factors now represent a powerful influence in the world of modern publishing (Smith, 2006). Given that the impact factor calculation is fundamentally based on citation counts, citations themselves have now risen to become the 'currency' of modern scientific research (Joseph, 2003).

Impact factors tend to change over time and are generally believed to be increasing in recent years. Such trends have been quantitatively demonstrated in both the larger medical journals (Chew et al., 2007) and also in some of the smaller health (Smith, 2008b) and medical (Boldt et al., 2000) sub-disciplines. There are a few potential reasons for this phenomenon. Firstly and fundamentally, although the basic calculation itself has not changed for

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over 50 years (i.e. citations received divided by articles published), the actual number of citations being made each year is steadily increasing. This is probably due to various factors, such as an increased use of automatic referencing software, thereby making it easier to include a larger number of references in a journal article than before (Smith and Hazelton, 2008). This may reflect an increasing tendency for authors to cite their peers whenever possible, and thus increase the chances of their article being accepted. There is also increasing pressure on authors to include more references per article to help demonstrate a more comprehensive understanding of the topic. Secondly, journal impact factors are now being increasingly influenced by deliberate editorial practices in recent years, as more and more journals learn to play the 'impact factor game' (Tse, 2008).

Citation analysis represents a subset of bibliometric research with which most researchers and academics are becoming increasingly familiar. Although relevancy of a published article is highly desirable, exactly how well it will achieve this goal is not predictable at the time of publication (Balon, 2005). Given time, however, citation trends will emerge and many scholars now consult the various electronic databases to see where and when their articles have been cited, and by whom. There are three main types of scientific article; those that present data, those that teach, and those which analyze, speculate or comment (D'Auria, 1999). Literature reviews tend to attract more citations than original articles, which themselves tend to attract more citations than editorials or letters. Even so, all forms of academic scholarship are important for clinicians in manual therapy, as evidenced in this journal. Although clinical experience may suggest that various kinds of physical therapies are worthwhile, evaluations still need to be based on research findings, especially empirical clinical research (Michels, 1982). Academic publishing is not just for scientists. Indeed, ten years ago D'Auria suggested that scholarship itself is the 'intellectual counterpart of manual dexterity in clinical work' (D'Auria, 1999, p. 277).

Some of the earliest citation analysis in physical therapy journals appears to have been conducted around 25 years ago. Although it was not citation analysis as such, in 1982 Michels explored the issue of research evaluation in physical therapy, asserting the importance of a sound research base for clinical practice (Michels, 1982). In one of the first bibliometric investigations in our field, Dean and Davies (Dean and Davies, 1986) investigated the frequency of citations combined with a 'Reputational Assessment' of contributors in physical therapy. In their article, the authors performed a citation analysis of the journals *Physical Therapy* and *Physiotherapy Canada* between 1981 and 1982, concluding that the perception of therapists regarding the impact of eminent individuals was comparable to ratings of those individuals made by objective measures, such as citation analysis. Five individuals who were nominated as being 'eminent' in the profession also appeared regularly in the citation lists of these two journals. In the same year, 1986, Bohannon and Gibson published their analysis of journals cited in *Physical Therapy*, finding that *Physical Therapy* itself was the most highly-cited periodical, followed by the *Archives of Physical Medicine and Rehabilitation* (Bohannon and Gibson, 1986). Interestingly, the second ranked journal on the list had attracted less than half the number of citations as the first.

In 1987, Bohannon proposed one of the first 'core' lists of physiotherapy journals by examining citation frequency in *Physical Therapy*, *Physiotherapy*, *Physiotherapy Canada* and *Physiotherapy Practice* (Bohannon, 1987). In 1989, Bohannon and Tiberio examined the medical index coverage of journals cited in physiotherapy periodicals, finding that it was neither complete nor consistent. The following year, 1990, an article looking at information accessing behavior of physical therapists was published by Bohannon, who established that while books and journals were certainly being read, physical therapists also utilized patient protocols, medical communications, course notes and materials from company representatives (Bohannon, 1990). In 1991, another citation analysis was conducted by Bohannon and Roberts to help establish a 'core list' of rehabilitation journals, during which the authors found that information relating to rehabilitation was actually being published across a large number of different journals (Bohannon and Roberts, 1991). In 1992, Roberts conducted a study of the journal literature and its quality in relation to physiotherapy. His results suggested that while *Medline* was an excellent source of supplementary material relevant to physiotherapy, coverage was not complete and other information sources also needed to be consulted (Roberts, 1992b). In the following year, Roberts then looked at the coverage of core journals in rehabilitation and related topics by various online databases. In his study, it was revealed that although the number of core journals was very large, their actual coverage by information services was still very selective (Roberts, 1992a). In the same year, Kuhlemeier published a bibliometric analysis of the *Archives of Physical Medicine and Rehabilitation*, reporting that although it sat near the top of impact factor rankings for rehabilitation periodicals, its score was lower than for most medical journals (Kuhlemeier, 1992).

In 1995, Tesio and colleagues investigated, from a bibliometric and citationist perspective, the drive of the neurology profession toward rehabilitation. In their study, the authors found that rehabilitation literature suffered from having a relatively small number of articles published, having a greater proportion of the literature being published in journals without impact factors, and having lower impact factors even when published in ISI-listed periodicals (Tesio et al., 1995). In a 1997 article, the literature of physical therapy was 'mapped' by examining citations in two established journals, *Physical Therapy* and the *Archives of Physical Medicine and Rehabilitation* (Wakiji, 1997). A skewed distribution of citations was clearly demonstrated, with only 14 journals being responsible for one-third of all references, whereas the next one-third came from 95 other journals. In 1999, Bohannon proposed another list of core physiotherapy journals established by means of citation analysis. In his study, the author looked at 5534 citations from 973 journals, finding that 48 journals had been cited 20 times or more in the time period 1997–1998. Over half of all citations received by this core group were from only 10 journals with the highest number of citations (Bohannon, 1999). In 2001, the issue of impact factors and their relationship with rehabilitation journals was explored by Lankhorst and Franchignoni, with the authors finding that *Clinical Rehabilitation*, was placed second in impact factor rankings among journals specifically dedicated to rehabilitation medicine (Lankhorst and Franchignoni, 2001). Although citation analysis has not yet been performed for *Manual Therapy*, a recent editorial pointed out that Masterclasses themselves now represent some of the most popular downloads (Beeton, 2008). Future bibliometric analysis of *Manual Therapy* would certainly be interesting to conduct, if only to establish whether article download trends in manual therapy mirror citation behavior.

In the title of this paper we have called for a balance between the science and the art in manual therapy, and there are a few reasons why such an approach is necessary. Firstly, given the current obsession with journal impact factors, it is often forgotten that this measure contains various intrinsic limitations, and citation analysis itself is by no means perfect (Smith, 2008c). While the JCR® is known to be useful for those in the field of physical therapy (Bohannon, 1986), the impact factor calculation has not changed since it was first invented, and the two year 'citation window' may not be appropriate for every research

field, particularly some of the smaller sub-disciplines with longer publication lag-times (Smith, 2007). The impact factor itself may be due for an overhaul, perhaps as part of a general reflection and debate on where citation indexing is heading in future. From a social science perspective, Holden and colleagues have also suggested that 'any research area worthy of investigation needs to have its methods continuously and critically reviewed' (Holden et al., 2005, p. 4). Either way, most critics agree that impact factors tell only part of the story and the future use of alternative measures such as article download counts and internet-based journal sessions may offer more tangible alternatives (Favaloro, 2008).

Secondly, there is the issue of journal coverage. While bibliographic databases clearly provide a means of assimilating common threads of ideas and data (Ebrahim, 2006), this can only be achieved if journals relevant to our field are actually being included. Recent years have also witnessed a large expansion of the various complementary disciplines in health care, although less than half of the studies in this area tend to be published in journals with impact factors (Raschetti et al., 2005). Rehabilitation research is published in a large number of different journals (Bohannon and Roberts, 1991), and not all will be included in citation-tracking databases. Not all physiotherapy journals have impact factors either. The longstanding journal *Physiotherapy* for example, was not ISI-listed until 2005 and thus did not receive an impact factor score until 2007 (Harms, 2006). As such it can be suggested that the publication of modern physiotherapy research may be a relatively new phenomenon in the scientific literature. The broader field of rehabilitation itself has a shorter tradition than some of the other medical disciplines, and as such, fewer human and financial resources are probably being dedicated to it (Tesio et al., 1995).

Thirdly, there is the issue of 'crossover' given the fact that authors in multidisciplinary fields often have many different choices as to where their findings may be published. Manual therapy is well established as a multidisciplinary field and this is reflected in journal readership and article authorship. With regard to *Manual Therapy* journal itself, while most readers and authors are physiotherapists working in the field of manual therapy, the journal has also published work written by physicians, scientists, chiropractors and osteopaths (Beeton, 2008). Being interdisciplinary is not easy however, as individuals need to be familiar with other disciplines, and this often takes a great deal of time and effort (Lynch, 2006). Fourthly, there is the philosophical issue of why we conduct research in the first place. Achieving a professional balance between the science and the art of manual therapy is clearly important for the practitioner, and this point also needs to be remembered when publishing. Blind obsession with journal performance indicators is not always good for a journal and its readers, and it has been suggested that having a purely 'impact factor centered approach' can easily lead to a situation where everything practical, readable and entertaining is cut, in favor of material that will be cited (Smith, 2006). A periodical can easily fall into the trap of focusing more on those who might *cite* it, rather than those who will actually *read* it. On the other hand, journals still need to attract quality submissions on a regular basis, which is where having a high impact factor can be very useful. It is important for editors and readers to keep this balance in mind.

Finally, and perhaps most critically, it is important to remember that while publication usually stems from research, becoming purely focused on research can be detrimental for the individual practitioner, as clinical skills might easily be forgotten. Although he was referring to dermatology, in a 1999 editorial that is equally relevant to modern manual therapy, Marks suggested that there will always be a need to keep a balance between the art and science 'lest we rely too much on the modern reductionist approach to defining clinical skills and rely too little on the lessons learned from history on the value of the bedside' (Marks, 1999, p. 344).

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