

INFLUENTIAL LITERATURE IN APPLIED SPORTS BIOMECHANICS

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This study documented the perception of prestige of applied sports biomechanics journals, as well as influential articles and books. Recent ISBS members were surveyed to rate the quality/prestige of 35 journals. Descriptive statistics of ratings were calculated for respondents and correlated with the 2008 impact factor (IF) reported in the *Journal Citation Reports*. Mean ratings showed that international perception of influential journals were weakly ($r = 0.48$) correlated with the IF. These results confirm previous studies that the IF is a poor index for evaluating the influence of journals publishing applied sports biomechanics research, and there was considerable diversity among the respondent's nominations of the most influential books and articles in the field.

KEY WORDS: bibliometrics, book, citation, impact factor.

INTRODUCTION: Much of the world scientific community uses the *Journal Citation Reports* and the impact factor (IF) statistic to rate journals. There have been, however, many articles reporting several limitations of the IF (Bollen et al. 2006; Frank, 2003; Seglen, 1997). One problem of the IF that adversely affects sports biomechanics is a bias against small disciplines (Frank, 2003; Seglen, 1997; Stanzer 1995).

This problem has been explored by several studies in biomechanics. Knudson and Chow (2008) reported that ratings of journal prestige by American Society of Biomechanics (ASB) members were weakly correlated ($r = 0.35$) with the IF. This weak association was confirmed ($r = 0.34$) by a study of International Society of Biomechanics in Sports (ISBS) member ratings of journals and the IF (Knudson and Ostarello, 2008). Knudson and Chow (2008) also reported journal ratings were different relative to the ASB interest area of the respondents. For example, "ergonomics & human factors" members rated *Ergonomics* in the top three, while the other four interest areas did not have this journal in the top 13 of 62 journals. Exercise & Sport Sciences members rated *Sports Biomechanics* 11th but other interest areas did not have it in the top 20. Knudson (2007) reported that journal ratings by exercise & sport sciences members of ASB were not significantly correlated with the IF.

It is likely that scholars in an applied discipline like sports biomechanics are disadvantaged by the widespread use of the IF. Theoretical and multidisciplinary journals have nominally higher IF values than clinical or applied journals. Given that sports biomechanics serials are either weakly or not correlated with the IF, it is important for applied disciplines like sports biomechanics to document the peer ratings of important journals and literature in their fields. The purpose of this study was to document the perception of prestigious or influential applied sports biomechanics journals by ISBS members. The study also examined the articles and books that were considered influential and highly regarded in the field. It was hypothesized that ratings of journals and highly-rated articles would be poorly associated with journal 2008 IF.

METHOD: An invitation to participate in a survey listing 35 journals (Table 1) was emailed to the recent members ($n = 916$) of ISBS. Journals publishing applied sport science research that were recently rated in previous studies (Knudson 2007; Knudson & Ostarello, 2008) were included in the survey. Two more emails reminded members of the opportunity to participate in the study. Respondents were asked to rate the quality or influence of articles on applied sports biomechanics in these journals on the 5 point anchored scale: 4-Likely Superior Quality or

Impact, 3-Likely High Quality or Impact, 2-Likely Moderate Quality or Impact, 1-Likely Low Quality or Impact, or 0 Unknown Quality or Impact.

The survey also asked respondents to report what they thought were the three most influential applied sports biomechanics textbooks ever written, as well as the three most influential scientific articles in applied sports biomechanics. Demographic data collected were age, primary job responsibility, and country of residence. Journal ratings were compiled and correlated with IF for all journals with an IF in 2008 (n = 24). Statistical significance was accepted at the P < 0.05 level. Descriptive data on rankings are reported as mean ± SD.

RESULTS: Fifty-two responses were received from 28 different countries. The mean age was 41 ± 11 years with primary job descriptions of applied researcher (52%) and teacher (31%). Few respondents reported their job as primarily basic research (7%) and other (10%). Descriptive data on the influence ratings and IF for the journals are listed in Table 1. There was a weak ($r_{22} = 0.48$) correlation between mean ratings and the IF. Forty-seven different books were nominated as “most influential” textbooks in five different languages, and ninety-two different articles were nominated. Table 2 lists the top four nominated publications.

Table 1. Journal prestige ratings (Mean ± SD) in Applied Sports Biomechanics and 2008 Impact Factor (IF)

Journal	Rating	IF	Journal	Rating	IF
<i>J Appl Biomech</i>	3.3 ± 0.9	1.2	<i>Res Q Exerc Sport</i>	1.9 ± 1.3	1.2
<i>J Biomech</i>	3.3 ± 0.9	2.8	<i>Sports Eng</i>	1.9 ± 1.4	----
<i>Sports Biomech</i>	3.1 ± 1.0	0.5	<i>Clin J Sports Med</i>	1.8 ± 1.3	1.6
<i>J Sports Sciences</i>	2.8 ± 1.3	1.7	<i>J Atl Training</i>	1.7 ± 1.3	1.7
<i>Med Sci Sports Ex</i>	2.8 ± 1.4	3.4	<i>J Sports Med Ph Fit</i>	1.7 ± 1.2	0.7
<i>Br J Sports Med</i>	2.6 ± 1.0	2.1	<i>J Oth Sports Ph Ther</i>	1.6 ± 1.3	1.9
<i>Proc: ISBS Conf</i>	2.5 ± 1.2	----	<i>Perc Mot Skills</i>	1.5 ± 1.2	0.4
<i>Am J Sports Med</i>	2.5 ± 1.4	3.6	<i>J Sport Rehab</i>	1.4 ± 1.2	0.4
<i>Clin Biomech</i>	2.4 ± 1.2	2.0	<i>J Ex Sci Fit</i>	1.3 ± 1.2	----
<i>J St Cond Res</i>	2.3 ± 1.2	0.8	<i>Int J Sp Sci Coach</i>	1.3 ± 1.3	----
<i>J EMG Kine</i>	2.3 ± 1.3	1.8	<i>Int J Ap Sports Sci</i>	1.3 ± 1.4	----
<i>Eur J Ap Physio</i>	2.2 ± 1.4	1.9	<i>Jap J B Sports Ex</i>	1.0 ± 1.3	----
<i>J Sci Med Sport</i>	2.1 ± 1.3	1.9	<i>Res Sports Med</i>	1.0 ± 1.1	----
<i>Int J Sports Med</i>	2.1 ± 1.4	1.6	<i>Int J Sp Hlth Sci</i>	0.9 ± 1.1	----
<i>J Sports Sci Med</i>	2.0 ± 1.2	0.6	<i>Biology Sport</i>	0.7 ± 0.9	0.1
<i>J Hum Mov Stud</i>	2.0 ± 1.2	----	<i>Ap Res Co Athl An</i>	0.7 ± 1.1	----
<i>Eur J Sport Sci</i>	2.0 ± 1.2	0.8	<i>Kor J Sports Biomec</i>	0.6 ± 1.1	----
<i>Sc J Med Sci Sports</i>	1.9 ± 1.4	2.3			

---- Indicates no IF for 2008.

Table 2. Top Four Books and Journals Publishing Articles Nominated as Most Influential in Applied Sports Biomechanics

Books	Percentage of Nominations
Hay 1993 <i>Biomechanics of Sports Techniques</i> . Prentice Hall.	22
Winter 2009 <i>Biomechanics and Motor Control of Human Movement</i> . Wiley.	14
Kreigbaum & Bartels 1995 <i>Biomechanics: A Qualitative Approach</i> . . . Benjamin-Cummings	5
Knudson & Morrison 2002 <i>Qualitative Analysis of Human Movement</i> . Human Kinetics.	5
Articles	Percentage of Nominations
<i>Journal of Biomechanics</i>	20
<i>Medicine and Science in Sports and Exercise</i>	10
<i>Journal of Sports Sciences</i>	9
<i>Journal of Applied Biomechanics/International Journal of Sport Biomechanics</i>	9

Note: The most recent edition of nominated books is reported.

DISCUSSION: This study confirmed previous observations of a weak ($r^2 = 12\text{-}23\%$) association (Knudson & Chow, 2008; Knudson & Ostarello, 2008) between the IF and scholar ratings of influential journals in applied sports biomechanics. This was also consistent with other studies that report weak or no correlations between the IF and disciplinary ratings of journals (Bensman, 1996; Donohue & Fox, 2000; Sellers et al. 2004). Journal ratings in this study and others (Knudson, 2007; Knudson & Ostarello, 2008) are more appropriate estimators of journal prestige and influence in applied sports biomechanics than the IF. The results of the open-ended nominations of influential articles supported the journals most highly rated. Articles nominated tended to be published in the journals ranked in the top journals in Table 1.

A surprising finding was the large variability or limited consensus on what were influential books and articles. There were 47 different books published between 1969 and 2009 that were nominated as the “most influential” books ever written. Influential articles were published in 35 different journals or proceedings between 1899 and 2009. The diversity of responses was likely related to the specific sport interests of the respondents. This was similar to previous studies that reported respondents ratings were strongly influenced by their interest area within biomechanics (Knudson & Chow, 2008). Seven articles received two nominations: three experimental papers (Cavagna et al. 1968; Feltner & Dapena, 1986; Fleisig et al., 1995) and four review papers (Bartlett, 1997; Novacheck, 1998; Putnam, 1991, 1993). Eighteen respondents declined to nominate outstanding articles because they thought it was too difficult or not possible. Some respondents nominated theoretical articles related to their movement interests rather than a paper with explicit application to sports biomechanics. Given this variability, it appears that, as a group, respondents who specialize in sports biomechanics do not share a clear understanding of “applied” sports biomechanics.

The very small response rate in the present study means the sample cannot be considered as representative of the ISBS membership or typical sports biomechanics scholars. Despite these limitations scholars can use these ratings and other publishing ratings to select outlets for publication in applied sports biomechanics research. There was little agreement among the respondents on influential research in applied sports biomechanics. This may represent an opportunity for ISBS to make recommendations or standards on the factors desirable for biomechanical research to be truly applicable to sports.

CONCLUSION: The data support the conclusion that the IF is a poor index of the prestige or influence of journals in the area of applied sports biomechanics. Applied researchers affiliated with ISBS who were inclined to respond to this survey had diverse views about influential books and seminal articles in sports biomechanics. There was also variability in journal ratings and nominations of influential literature possibly because the respondents had specific sports biomechanics research interests.

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