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Indexing and influence of Biomedical Human Kinetics

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Abstract

Study aim: Despite 15 years of continuous publication of *Biomedical Human Kinetics* (*BHK*), little is known about the journal's contribution to knowledge in the field of kinesiology/exercise and sport science.
This study documented the indexing and influence of articles published in the first 15 years of publication of *BHK*.
Material and methods: Coverage of *BHK* articles in five database services was documented. Citations and citation rates were compared for the top 20 cited articles indexed in the databases to document journal influence.
Results: BHK was thoroughly indexed by four of the five databases and the journal has a relatively low percentage of uncited articles in *Google Scholar* compared to many journals. The top 20 cited *BHK* articles had between 293 and 1,238 citations and had strong usage with mean citation rates between 2.2 and 5.5 citations/article/year across the databases. Differences in indexing of journals and citations across databases, however, resulted in substantial disagreement on the top 20 cited *BHK* articles.
Conclusions: For a relatively new journal in kinesiology/exercise and sport science, *BHK* had strong indexing, with citations and citation rates similar to some multidisciplinary journals and larger than many specialized journals in the field. *BHK* authors and editors, however, should carefully use multiple citation metrics from several database services to estimate the likely scholarly impact or prestige of individual articles published in the journal.

Keywords: Bibliometrics – Database – Impact – Knowledge – Research – Scientometrics

Introduction

Biomedical Human Kinetics (*BHK*) is an open access peer reviewed health, exercise and sports science journal published since 2009. *BHK* has an international panel of regional editors and editorial board members. The 2023 volume of *BHK* marked 15 years of publication of international, multidisciplinary scholarship. This longevity indicates a contribution to knowledge development in the field of kinesiology, health, exercise and sports science. The extent of the indexing/visibility and usage/impact of *BHK* in contributing to knowledge in the field and beyond is less clear.

According to the *BHK* website and Ulrich's the journals' articles are indexed in over three dozen bibliometric database services from about a dozen agencies and companies. *BHK*, for example, is indexed in prestigious, curated databases like *Scopus*® (2016 -), *Web of Science*™ (2009-), and free/open database services like *Dimensions*, *Google Scholar*, and *OpenAlex*. Electronic indexing of articles published by a journal in specialized (e.g., *CINAHL*, *PsycINFO*, *Medline*, & *SPORTDiscus*) and multidisciplinary databases (*Scopus*® & *Web of Science*™) is important for scholars to find these reports (Knudson, 2022). This visibility is essential to planning subsequent research and the advancement of knowledge.

Journal usage, impact, or popularity is the archival role serials have in documenting observations at scholarly frontiers. Usage is usually estimated using subsequent citations to articles published in the journal by the scientific community (Bollen et al., 2009; Franceschet, 2010; Leydesdorff, 2009; Leydesdorff et al., 2016; Zhou et al., 2012). Journal usage has been most closely associated with average citations or citation rates to articles published using metrics like the Impact Factor, CiteScore, and Source-Normalized Impact per paper (Bollen et al., 2009; Franceschet, 2010; Knudson et al., 2024; Zhou et al., 2012). Journal usage is less well correlated with other journal quality constructs like rigor and prestige (Bollen et al., 2009; Franceschet, 2010; Knudson et al., 2024; Waltman & van Eck, 2013; Waris et al., 2017). Rigor is the typical perception of the selectivity of the peer review process (low acceptance rate), indicating scholar perception of the difficulty in article acceptance during

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peer review (i.e., strict reviews). Journal prestige is the perception of respect aligned with the advancement and codification of knowledge in a field (Bollen et al., 2009; Franceschet, 2010; Leydesdorff, 2009; Leydesdorff et al., 2016; Zhou et al., 2012).

Journal usage/impact is the most logical quality criteria to examine in a relatively new journal like *BHK*. There may not be much data on journal rigor (Knudson 2014) and any initial scholar perceptions of prestige are likely negatively biased by a lack of awareness. Several previous studies have documented the initial and change of usage in new journals in the field of kinesiology, exercise and sports science. Knudson (2020a) reported the top 20% cited articles in three scholarly databases for the first 15 years of publication of the journal *Sports Biomechanics*. Similar 10-to-15-year data for multidisciplinary journals in kinesiology (Knudson, 2023a) and exercise science (Knudson & Burson, 2024) using *Google Scholar* data have also been reported. Generally lower usage based on *Google Scholar* citations has been reported for specialized journals in coaching (Knudson, 2023b) and tennis medicine and science (Knudson, 2020b, 2024a, Knudson et al., 2024) than in larger, multidisciplinary kinesiology, exercise, health, and sport journals.

Given a decade and half of publication of *BHK*, it is timely to evaluate the indexing and usage of the journal in the scientific community. This study documented the articles published in *BHK* in the first 15 volumes, their indexing in five major database services, and selected usage metrics to top cited articles. These data are important to understanding the usage and influence of this relatively new journal in the field of kinesiology, exercise, health, and sports science.

Material and methods

Bibliometric data on the population of articles published by *BHK* were collected from the journal website (https://sciendo.com/journal/BHK). The number of all *BHK* research articles, excluding editorials, introductions, and special communications, published in the first 15 volumes (2009–2023) from 2014 until 2024 were identified and totaled (N = 395). The bibliometric indexing of these articles was examined by systematic searches of five database services: Two subscription services (*Scopus* & *Web of Science*) and three free services *Dimensions* (Herzob et al, 2020), *Google Scholar*, and *OpenAlex* (Priem et al., 2022). These five databases were necessary to document the breadth of indexing and journal influence of *BHK* using both prestigious subscription and open bibliometric database services. The use of *Google Scholar* with its greater indexing established a baseline of citations to the journal important in documenting the impact of a relatively new journal like *BHK*.

The usage of articles published by *BHK* reported by these database services was documented two ways. First, the most comprehensive database service (*Google Scholar*) was searched to measure several usage variables for all articles indexed over the 15 years of publication. Second, the difference in usage documented by the five databases was examined by comparing several citation metrics for the top 20 cited (≈ 5% published by *BHK*) articles indexed in each database service. Bibliometric studies typically focus analysis on top percentiles (1 to 25%) of cited articles because of the consistency of large positive skew of citations and uncited articles (Bornmann, 2014; Leydesdorff & Bornmann, 2011).

To document overall usage, the "Advanced search" option of the *Google Scholar* database service (https://scholar.google.com/) was searched. The "Return articles published in" and "Return articles dated between" functions were used to search for "Biomedical Human Kinetics" articles between 2009–2023 and in 2024. Multiple searches were conducted for individual annual volumes of the journal and several variables manually extracted and input into a Microsoft Excel file. There were several indexing and influence variables examined (Table 1). The number of published articles (N Ar) and number of indexed articles (N Ind Ar) were used to examine indexing of the number of *BHK* articles. Journal usage variables included the number of cited articles (N Cited Ar), total citations (Total C), mean citation rate to indexed articles (CR), number of uncited articles (N Uncited), and percentage of uncited articles (% Uncited Ar).

Multiple searches were performed beginning in December 2024 with data finalized on January 3, 2025. This closing date is important because *Google Scholar* updates several times a week and does not report time/year-specific citations, so citation data can only be captured at the date of searches. Manual data extraction was checked multiple times for accuracy and previous studies report the reliability of manual extraction of *Google Scholar* bibliometric data and curation for article and journal data as good with likely error less than 1% (Knudson, 2023c, 2024b).

To document differences in *BHK* usage metrics across the five database services, the citations (C) and citation rate (CR) for the top 20 cited articles were compared. In addition, the percentage agreement of the top 20 cited articles were compared with the top 20 identified according to *Google Scholar*. C and CR are the most relevant journal usage metrics for this study given they are used to calculate the wide variety of usage metrics. In addition, no universal usage metric is used by all database services for a controlled comparison.

Data were entered into JMP Pro 17.2.0 for statistical analysis. Descriptive data were calculated and mean C and CR compared across database services with two ANOVAs. Statistical significance was accepted at $p < .05$ and significant effects for database service were followed up by Tukey-Kramer HSD *post hoc* tests.

Results

All *BHK* articles published in the first 15 years were indexed by the *Dimensions*, *Goole Scholar*, *OpenAlex*, and *Web of Science*™ databases. Like *Dimensions*, *OpenAlex*, and *Web of Science*™, Google Scholar indexed more publications than the 394 in the journal website. *Scopus*® began indexing *BHK* articles in 2016 so only 243 articles (62%) were indexed by that database service. Indexing and usage of articles in each volume of *BHK* by the *Google Scholar* database are reported in Table 1.

Table 1. Google Scholar indexing and citations of *Biomedical Human Kinetics* articles by volume

Year	N Ar	N Ind Ar	N Cited Ar	Total C	CR C/Ar/Yr	N Uncited Ar	% Uncited Ar
2009	23	23	23	426	1.8	1	4.2
2010	25	25	25	392	1.8	0	0
2011	25	29	27	442	2.1	2	6.9
2012	24	28	27	424	2.2	1	3.6
2013	18	18	16	300	1.7	2	11.1
2014	24	25	25	347	2.2	0	0
2015	25	26	25	220	1.5	1	3.9
2016	24	23	23	314	2.5	0	0
2017	24	25	23	322	2.9	2	8.0
2018	25	25	22	181	1.9	3	12.0
2019	27	28	27	391	4.9	1	3.6
2020	30	31	27	245	3.8	4	12.9
2021	30	31	28	200	4.2	3	9.7
2022	35	34	28	124	3.9	6	17.7
2023	35	36	27	93	5.8	9	25.0
Total	394	407*	373	4,421	–	35	–
Mean	26	27	25	295	2.9	2.3	8.9

Note: Number of published articles (N Ar), number of indexed articles (N Ind Ar), number of cited articles (N Cited Ar), total citations (Total C), mean citation rate to indexed articles (CR), number of uncited articles (N Uncited), and percentage of uncited articles (% Uncited Ar). * Indicates that Google Scholar captures more publication/documents than the articles listed on the *Biomedical Human Kinetics* website.

Usage of all 394 *BHK* articles was strong with 94% cited and 4,421 total citations according to *Google Scholar* (Table 1). Issues had CR between 1.5 and 5.8 C/Ar/Yr, with an overall mean of 2.9 C/Ar/Yr. Overall, almost all indexed *BHK* articles were cited with only 8.9% of articles going uncited by 2025.

Total citations to the top 20 cited articles were 1,233, 674, 499, 498, and 292 for *Google Scholar*, *OpenAlex*, *Web of Science*™, *Dimensions*, and *Scopus*®, respectively. Usage of the top 20 cited articles was significantly different for C ($F_{4,95} = 23.09$, $p = 0.001$) and CR ($F_{4,95} = 9.91$, $p = 0.001$) across the five database services. *Post hoc* tests indicated that *Google Scholar* had larger ($p < .05$) mean citations (61 C/Ar/Yr) than other all other databases. The mean citations to the top 20 articles was the smallest ($M = 5$) for the *Scopus*® database. The other significant *post hoc* differences, high variability and positive skew of the citations of these top 5% articles are illustrated in the box plots of Figure 1. Similarly, *post hoc* tests indicated mean CR to top 5% *BHK* articles were significantly larger in *Google Scholar* (5.4 C/Ar/Yr) than the other databases that were not significantly different (2.4 to 3.2 C/Ar/Yr) from each other (Figure 2).

The top 20 cited *BHK* articles according to each database service are listed in Table 2. Disagreement from the top 20 articles ranked by citations compared to *Google Scholar* was 65, 60, 50, and 15 percent for *Dimensions*, *OpenAlex*, *Web of Science*™, and *Scopus*®, respectively.

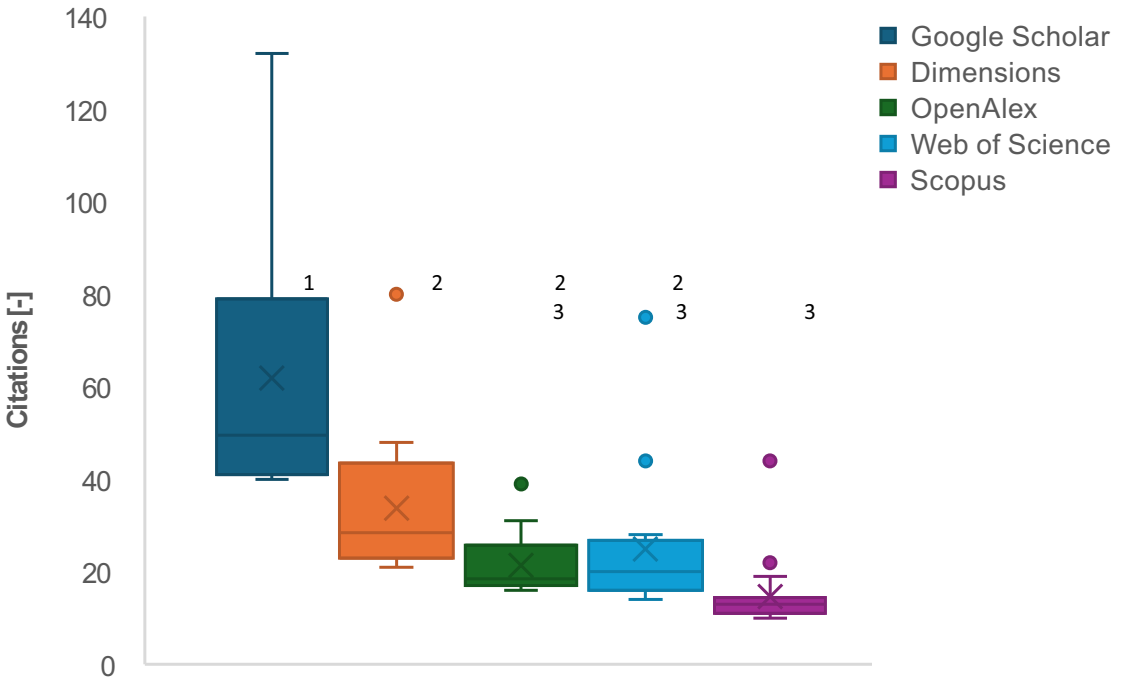

Figure 1. Box plots of citations to the top 20 cited *Biomedical Human Kinetics* articles indexed in five database services. Means with different numbers are significantly different according to Tukey HSD *post hoc* tests

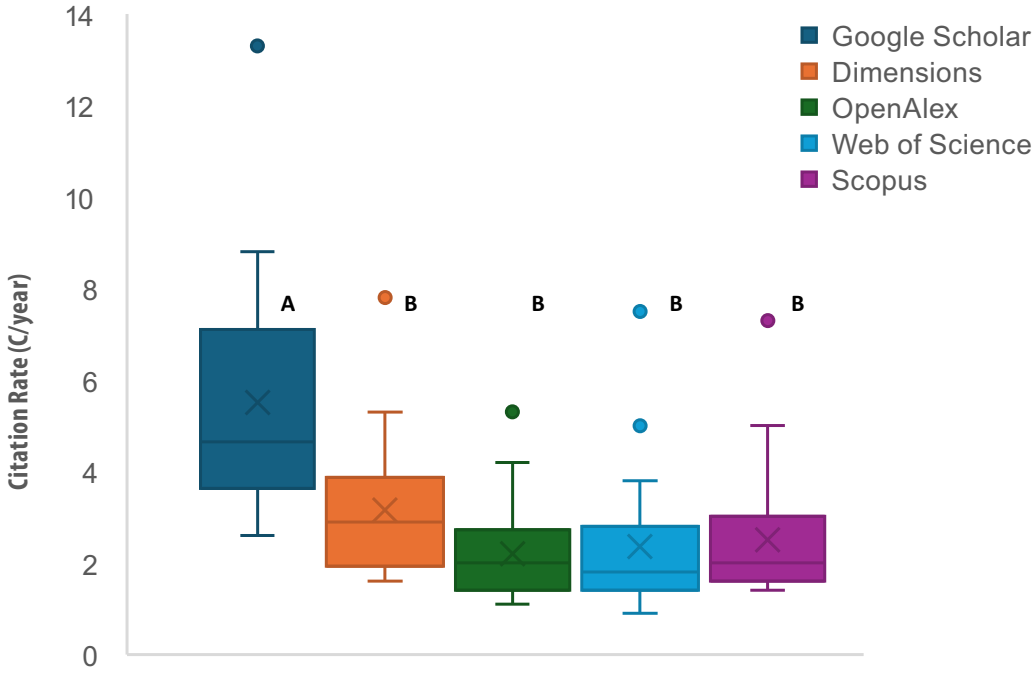

Figure 2. Box plots of citation rate to the top 20 cited *Biomedical Human Kinetics* articles indexed in five database services. Means with different letters are significantly different according to Tukey HSD *post hoc* tests

Table 2. Agreement of top 20 cited *Biomedical Human Kinetics* articles with *Google Scholar*

Google Scholar	Dimensions	OpenAlex	Scopus	Web of Science
Konukman et al. 2010	**Konukman et al.**	**Konukman et al.**	**Hackney et al.**	**Konukman et al.**
Shahr-Jerdy et al. 2012	**Hackney et al.**	**Shahr-Jerdy et al.**		**Hackney et al.**
Grabara & Hadzik 2009	**Kovach et al.**	**Kovach et al.**	**Debskki et al.**	**Kovach et al.**
Kovach et al. 2013	**Jansen et al.**	**Hackney et al.**		**Inkinen et al.**
Hackney et al. 2019	**Shahr-Jerdy et al.**	**Grabara & Hadzik**	**Can & Karaca**	**Drid et al.**
Inkinen et al. 2013	**Grabara & Hadzik**	**Jansen et al.**		**Grabara & Hadzik**
Jansen et al. 2011	**Nikolaidis et al.**	**Inkinen et al.**		**Nikolaidis et al.**
				Jansen et al.
Bollok et al. 2011				
Gh et al. 2012	**Can & Karaca**			
Drid et al. 2009				
Nikolaidis et al. 2016				
Okecka-Szymanska et al . 2011	**Debskki et al.**			**Debskki et al.**
Can & Karaca 2019	**Drid et al.**	**Drid et al.**		
Mon-Lopez et al. 2014	**Bollok et al.**	**Can & Karaca**		**Shahr-Jerdy et al.**
Maciejewski & Callanta 2016	**Inkinen et al.**			
Garaba 2010	**Gh et al.**	**Gh et al.**		
Podstawski & Boraczynski 2014		**Debskki et al.**		
Torres et al. 2009		**Torres et al.**		
Pastuszak et al 2014				
Debskki et al 2019				

Note: Authors/year articles in agreement with *Google Scholar* in **bold**.

Discussion

This first study of the bibliometrics of articles published by *BHK* indicates thorough indexing in four of the five database services examined. The complete indexing of published *BHK* articles in *Dimensions*, *Google Scholar*, *OpenAlex*, and *Web of Science*™ was consistent with 95% coverage of the *International Journal of Exercise Science* by *Google Scholar* (Knudson & Burson, 2024). This nearly complete indexing is higher than for smaller, specialized journals in the field of kinesiology/exercise and sport (Knudson, 2023b, Knudson &Myers, 2021). Only indexing by *Scopus*® was limited to articles published in 2016 and later, which was consistent with 5-to-11-year delay in coverage of new kinesiology, exercise and sport journals by many subscription databases (Knudson, 2022). The visibility of *BHK* articles, therefore, is strong for a recently established journal.

Scholarly usage of top 20 cited indexed *BHK* articles was strong with total citations in the five databases ranging from 1,233 in *Google Scholar* to 292 in Scopus®. The low overall rate (9%) of uncited *BHK* articles in *Google Scholar* was impressive given previous studies report higher values (15–23%) for exercise science journals (Knudson, 2023b; Knudson & Burson, 2024) and overall higher values (41–44%) for kinesiology/exercise science journals in curated databases (Knudson, 2015a, 2015b). Substantial percentages of uncited articles, even after many years, are a ubiquitous phenomenon in scholarly journals (Ghosh, 1975; Nicolaisen & Frandsen, 2019; Stern 1990).

Overall, articles published by the journal also had a mean CR of 2.8 citations/article/year. This overall rate was equal to the 90th percentile cited articles (2.4 C/Ar/Yr) of a similar, recently founded international exercise science journal (Knudson & Burson, 2024). Table 1 indicates that the most recent five volumes of *BHK* have a higher mean CR (4.3 C/Ar/Yr) than the first decade of volumes published. This citation rate to recent volumes is moving closer to the median CR of 8 to 10 C/Ar/Y for top articles in a large sample of kinesiology/exercise and sport science journal with similar (Knudson, 2020a, 2023a) and longer publication histories (Knudson 2015b). This result parallels the lower than median level prestige of *BHK* compared to kinesiology-related journals according to three journal prestige-related metrics (Knudson, 2024b).

Some scholars believe gold open access journals like *BHK* have visibility and citations advantages over traditional, subscription journals. This belief in FUTON (full text on the net) bias (Murlani et al., 2004) in favor of open access articles, however, is not supported by mixed findings of a large body of research across many disciplines (Langham-Putrow et al., 2021) and few randomized controlled studies (Saraudecha et al., 2023) of citation benefits of articles in open access journals. Most all journals now have online services and options for various open access publication. Article, and subsequently journal C and CR, may also be partially biased by vague relevance ranking algorithms (Jordan & Tsai, 2024) and errors in implementation of search engine function (Halevi et al., 2017) of most all database services. Good total citations and citation rates to articles in early *BHK* volumes, however, is evidence of genuine, growing scientific usage/impact of the journal in kinesiology, exercise, sport, and other scientific fields.

The variation in indexing of journals and their published articles across databases results in substantial disagreement of top 20 cited *BHK* articles (Table 2) between these services. Open database services like *Dimensions* and *OpenAlex* had better agreement of placement in the top 20 with *Google Scholar* given their superior indexing/coverage of the scientific literature (Delgado-Lopez-Cozar & Cabezas-Clavjo, 2013; Delgado-Quiros & Ortega, 2025; Gusenbauer, 2024; Halevi et al., 2017; Harzing & Alkangas, 2016; Martin-Martin et al., 2021). The lower agreement of the subscription databases is expected because of their limited coverage of journals, publications, and when in time they are included/indexed. The poor agreement in top cited articles from *Scopus* was related to indexing *BHK* articles beginning in 2016. These results of inconsistent indexing/visibility of *BHK* across databases confirm previous research in another kinesiology/exercise and sport science journal (Knudson, 2022).

Scholars must carefully search multiple databases to plan for original research and review articles to reduce bias introduced by inconsistent indexing, citations influencing relevance ranking algorithms (Jordan & Tsai, 2024), and errors in implementation of search engine logic of about half of these services (Gusenbauer & Haddaway, 2020). *BHK* authors and editors should, therefore, carefully use multiple citation metrics from several database services to estimate the likely scholarly impact or prestige of an article published in the journal. Neither usage nor prestige metrics of journals, however, should be interpreted as proxy measures of research quality of articles or journals published (Knudson, 2024b; Knudson et al., 2024).

Limitations of this study include the use of five bibliometric database services and a focus on the input (citations and citation rates) to journal usage variables. The five databases focused on were necessary to describe the range of indexing and journal influence of *BHK* using both subscription and open bibliometric database services. The use of *Google Scholar* as a baseline for comparison of citations was important to document the full impact of a relatively new journal like *BHK*. For example, the limited indexing of *BHK* by *Scopus*® would not accurately document the full influence of the first 15 years of the journal. Like all databases, *Google Scholar* has errors in the automatic internet crawling of journals, repositories, academic social media sites, and the references of the indexed publications. These limitations, however, do not likely affect the evidence of overall strong indexing and usage of *BHK* documented in this study.

Conclusions

Articles published in the first fifteen years of *BHK* were completely indexed by four database services, with more limited indexing of recent (2016 –) articles in *Scopus*®. *BHK* has a relatively low percentage of uncited articles in *Google Scholar* compared to many journals. The top 20 cited *BHK* articles had between 292 and 1,238 citations and had strong usage with mean citation rates between 2.2 and 5.5 C/Ar/Yr across the databases. Differences in indexing of journals and citations across databases, however, resulted in substantial disagreement on the top 20 cited *BHK* articles. For a relatively new journal in kinesiology/exercise and sport science, *BHK* citations and citation rates were similar to some multidisciplinary journals and larger than many specialized journals in the field. *BHK* authors and editors, however, should carefully use multiple citation metrics from several database services to estimate the likely scholarly impact or prestige of individual articles published in the journal. Neither usage nor prestige metrics of journals should be interpreted as good proxy measures of research quality of articles or journals.

Conflict of interest: Author state no conflict of interest

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