

What Do Our Words Say? An Analysis of *IJSP* Titles

Why analyze the words we “place above all others”?

The words or terms in a journal article’s title most literally are placed *above* all words. I have become acutely aware of titles or headlines in the era of “clickbait.” The title of an article can draw a reader in and set the expectation for the research before they read the full article (*if* the entire article is read). Therefore, the nature of our attention in a largely digital world heightens the importance of words used in titles. Words are data. They inform and draw our attention just as a graph or table does. We may describe the progression of topics, emerging trends, and potential areas left unexplored by assessing the history of titles. What can we learn from the past 17 years of titles in the *International Journal of Sports Physiology and Performance (IJSP)*?

“Sankofa—a word from the Akan people in Ghana about learning from the past to make progress in the future.”

Our interest in the words we use is evident by publications exclusively concerned with term use or proposed misuse.^{1–4} The recent discussions on the term “load”^{1,3} are of interest to the readership of *IJSP*, considering that “load” is the eighth most frequent word in *IJSP* titles over the past 17 years (Figure 1). In a seemingly subtle way, the most frequent words in titles will saturate our table of contents, direct our attention, and, intentionally or not, potentially skew our perception of importance based on prevalence. Therefore, the simplest version of topic modeling, a text-mining term-frequency analysis, provides initial insight and reflection on what our words say about the research we’ve done and the research still left to do.

How were the titles analyzed?

A field devoted to topic modeling seeks to cluster words to characterize the contents. As stated, the most basic form of this analysis is to assess term frequency. Term frequency is particularly suitable for a simple analysis of *IJSP* article titles. The specified maximum length inherently forces authors to choose only words or terms that are highly relevant to the information produced. To be clear, the analysis I performed was not comprehensive and sought to systematically identify a few areas for discussion in this editorial. I have provided an extended version of the results in the supplemental file. Readers with specific interests can extend the analysis to derive greater insight through their directed inspection. (A particular benefit of open science [and providing code and data used] is that additional analyses can be performed to extend the research or allow exploratory analysis for different research questions.)

In brief, I searched PubMed for all full-text *IJSP* articles up to March 11, 2022: (“International Journal of Sports Physiology and Performance” [Journal]) AND (fft[Filter]) and exported the

results for subsequent analysis. I then determined the number of titles present over the history of *IJSP* (2006 to current) and for 5-year periods to observe trends (inclusive years of 2006–2010, 2011–2015, 2016–2020, and most recent incomplete period of 2021–2022). Next, I created a corpus of the titles and term document matrix for each period. The creation of the term document matrix included several data cleaning steps (removal of punctuation, removal of stop words, lowercasing all words, reducing words to a stem, and removal of numbers). Subsequently, I calculated the frequency of words and standardized the values as a percentage of the number of titles present in each period. The 20 most frequent terms (%) from 2006 to March 2022 are shown in Figure 1. In addition, I created a table ordered by the top 40 terms historically to allow for analysis of any trend shifts over time. To allow for a more straightforward visual detection of these changes, I applied a conditional color format to the data for each period (Figure 2; see also [Supplementary Material S1](#), the R markdown knit as an html file [available online], and [Supplementary Material S2](#), the data used for the analysis in csv format [available online]).

What can be said about the trends in the frequency of words in titles?

As stated in the mission of *IJSP*, “The journal promotes the publication of research in **sport** physiology and related disciplines that has direct practical application to enhancing **sport performance**, preventing decrements in **performance**, or enhancing **recovery of athletes**.” The bold words (or their stem) were present in the top 20 most frequent terms (Figure 1). These terms in titles provide evidence that the journal remains true to its mission.

However, I also identified other trends:

- There was a consistent increase in the frequency of the term “load” in titles (from 3.0% to 10.4%). This likely reflects the rise in research associated with load monitoring. However, it may also indicate that the term “load” is a broad construct³ and captures many relevant subdimensions.
- Large and consistent increases in the terms “elite” (from 10.9% to 19.8%) and “professional” (from 2.2% to 8.0%) may indicate the increased number of embedded sport scientists or industry-based research students leading to greater access to these cohorts. However, I cannot discount the possibility that the increase is due to more liberal use of the term “elite” to describe populations.⁵
- The term “match” was scarcely present in titles from 2006 to 2010 but is now consistently present (Figure 2). The change may reflect technological advances allowing tactical analyses to quantify and assess sport performance.
- The call for more research on female participants⁶ has been heeded in *IJSP*, with the word (or stem) “female” ranging from 2.6% to 4.3% in the first 15 years of the journal to a noticeable increase to 7.4% over 2021 and 2022. Interestingly,

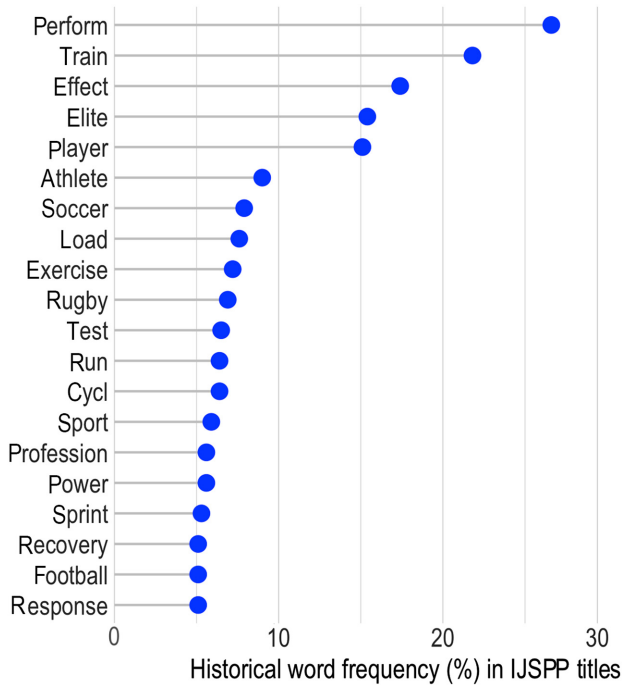


Figure 1 — A lollipop plot of the 20 most frequent words used in titles in *IJSP* over the entire history of the journal (2006 to current [March 2022]). The most frequent word was “perform,” the stem from the term “performance,” as expected based on the journal’s mission.

the term “male” does not show even in the top 40 (Figure 2). However, this is likely the result of authors more frequently making male participants the assumed sex, whereas titles are explicit if all female participants were present. Authors of research in *IJSP* would benefit from better title specificity when naming their cohort.⁷

In just 17 years, *IJSP* has already shown shifting trends in words used in titles and, therefore, topics researched. Some trends may be due to directed special topics or can be used to inform special topics in the future. Nonetheless, we must be vigilant in maintaining the quality of research when “hot topics” emerge. I look forward to the future titles and advances in our field!

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WORD	2006–2010 %	2011–2015 %	2016–2020 %	2021–2022 %
Perform	23.9	25.9	27.3	27.2
Train	21.7	18.4	22.7	24.6
Effect	20.4	17.1	18.1	13.3
Elit	10.9	16.6	14.5	19.8
Player	10.0	14.3	16.3	15.7
Athlet	6.5	9.7	8.5	11.5
Soccer	3.0	10.1	7.7	8.0
Load	3.0	3.9	9.5	10.4
Exercis	8.3	6.9	6.9	7.7
Rugbi	2.6	7.6	7.5	6.5
Test	10.0	7.1	5.7	6.2
Cycl	5.7	6.3	6.6	6.8
Run	4.8	7.6	5.8	7.1
Sport	10.0	5.0	6.2	3.6
Power	6.5	3.7	5.4	8.9
Profession	2.2	3.4	6.7	8.0
Sprint	3.5	5.4	6.0	4.1
Respons	7.8	4.8	4.3	6.5
Footbal	4.3	5.8	5.4	3.6
Recoveri	3.0	6.1	5.2	4.4
Physiolog	8.3	6.0	3.6	5.6
Competit	6.1	5.2	4.1	5.9
Physic	1.7	5.2	5.2	3.8
Studi	3.9	4.5	4.2	6.8
Differ	3.0	3.9	4.5	6.5
Strength	2.6	2.6	4.5	7.7
Relationship	3.0	2.6	4.6	5.6
Influenc	2.6	4.3	3.8	5.3
Match	0.4	6.1	4.0	3.3
Muscl	5.2	2.6	4.1	5.3
Use	7.0	2.8	3.8	4.7
Chang	2.6	3.0	5.0	3.0
Femal	2.6	4.3	2.8	7.4
Improv	0.9	2.8	4.9	3.8
Intern	2.2	3.7	3.6	5.6
Measur	4.8	3.2	4.4	2.4
Leagu	1.3	5.0	3.6	2.7
Time	4.8	3.0	3.7	3.0
Valid	3.9	3.5	3.7	2.7
Profil	2.6	3.5	3.3	4.1

Figure 2 — The 40 most frequent words in *IJSP* titles over different periods as a percentage of the number of titles present. The frequency by period is also conditionally formatted using green to purple for easier visual identification of changes in trends over time. (If you are viewing the figure in black and white, see the online article for the color version of the figure.) NB: Words are in the stemming format and not renamed as in Figure 1 for comparison.

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