Differences in Subspecialty Specific Research Productivity: H-index vs RCR

David B Ahn[1], Dhruv Mendiratta, Isabel Herzog[2], Daniel Frank Liggio, Neil Kaushal, Michael M Vosbikian, Kathleen S Beebe, Alice Chu[3]

[1]Department of Orthopaedics, Rutgers New Jersey Medical School, [2]New Jersey Medical School, [3]NYU Faculty Grp Practice

INTRODUCTION:

There is known variability of research productivity within orthopedic subspecialties. Traditionally, relative productivity is measured using metrics such as the Hirsch index (H-index), which depends on an author's lifetime number of publications and citations, and may unilaterally benefit older researchers who have been in the field for a longer period. Therefore, alternative metrics have been proposed such as the "relative citation ratio" (RCR) developed by the National Institutes of Health (NIH) which calculates an author's citation index within that year compared to others in the same field. In this study, we explored whether mean RCR (mRCR) follows the same pattern as h-index with regards to differences within subspecialties among orthopedic surgeons in the United States.

METHODS:

The data of all orthopedic surgery faculty with programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) in the United States were collected. Subspecialties were divided into 11 categories: None (generalist), Adult Reconstruction, Foot & Ankle, Sports Medicine, Spine, Trauma, Pediatrics, Hand & Upper Extremity, Musculoskeletal Oncology, Upper Extremity Reconstruction, and Other. The Other category was excluded from the sample as it was the smallest category including 2.25% (n = 63/2802) of the sample, and it included various subspecialties that did not fit into other categories. H-index was collected from Scopus, and mean RCR (mRCR) was calculated using the iCite database. Analysis was performed using SPSS software.

RESULTS:

In total, 2739 academic orthopedic surgeons were included in the analysis. The most common subspecialty was Sports Medicine: 17.20% (n = 471/2739), and the least common subspecialty was Upper Extremity Reconstruction: 4.67% (n = 128/2739) (Figure 1).

For the total number of publications, the highest subspecialty was Spine with a mean of 71.25 (SD 111.77). Hand & Upper Extremity had the lowest mean number of publications with 40.07 (SD 53.03). Spine also had the highest total number of citations with a mean of 2108.94 (SD 4126.13). Pediatrics had the lowest mean number of citations with 858.93 (SD 1692.85).

For h-index, the highest subspecialty was Spine with a mean of 18.73 (SD 32.81), followed by Adult Reconstruction: 15.59 (SD 17.95), then Sports Medicine: 14.95 (SD 14.76). Hand & Upper Extremity had the lowest mean h-index: 11.22 (SD 10.59) (Figure 2).

For mRCR, Adult Reconstruction had the highest mean with 2.15 (SD 2.29), followed by None: 2.09 (SD 3.27), then Sports Medicine: 2.05 (SD 1.81). Pediatrics had the lowest mean with 1.45 (SD .87) (Figure 3).

DISCUSSION AND CONCLUSION:

The mRCR is a modern method of comparing research productivity among authors that place greater emphasis on recent research productivity compared to past contributions. In this study, we find that the H-index closely follows patterns found in authors' total number of publications and citations. Specifically, Spine consistently ranked the most productive according to all of these 3 metrics. In 2022, however, the trends are variables and Spine subspecialty ranked 4th out of the included 10 subspecialty types.

A possible explanation for Spine subspecialty ranking much lower based on mRCR ranking as compared to h-index ranking is that a higher proportion of recent research in orthopedics is being performed in the Adult Reconstruction or Sports Medicine space compared to Spine research. If this were to be true, mRCR would prove to be a more accurate measure of recent relative research productivity. Further research into examining the proportions of recent research being performed in orthopedics may further explain the noted trends and help shed light on the nuanced differences between h-index and mRCR and their most appropriate applications.

Figure 1. Prevalence of Subspecialties

Subspecialty	Value
Sports Medicine	~470
Trauma	~360
Adult Reconstruction	~340
Hand & Upper Extremity	~320
Pediatrics	~310
Spine	~310
Foot & Ankle	~195
Musculoskeletal Oncology	~150
None	~135
Upper Extremity Reconstruction	~130

Figure 2. Ranking of Subspecialty Based on H-Index

Subspecialty	Value
Spine	~19
Adult Reconstruction	~16
Sports Medicine	~15
Musculoskeletal Oncology	~15
None	~15
Upper Extremity Reconstruction	~15
Trauma	~12
Foot & Ankle	~12
Pediatrics	~11
Hand & Upper Extremity	~11

Figure 3. Ranking of Subspecialty Based on Mean RCR

Subspecialty	Value
Adult Reconstruction	~2.15
None	~2.1
Sports Medicine	~2.05
Spine	~2.0
Upper Extremity Reconstruction	~1.85
Foot & Ankle	~1.8
Trauma	~1.6
Musculoskeletal Oncology	~1.5
Hand & Upper Extremity	~1.5
Pediatrics	~1.45