# Research Productivity and Gender Disparities: A Look at Academic Plastic Surgery

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**OBJECTIVES:** The *h-index* has utility in examining the contributions of faculty members by quantifying both the amount and the quality of research output and as such is a metric in approximating academic productivity. The objectives of this study were (1) to evaluate the relationship between *h-index* and academic rank in plastic surgery and (2) to describe the current gender representation in academic plastic surgery to assess whether there are any gender disparities in academic productivity.

**DESIGN:** The *h-index* was used to evaluate the research contributions of plastic surgeons from academic departments in the United States.

**RESULTS:** There were 426 (84%) men and 79 (16%) women in our sample. Those in higher academic ranks had higher *h-index* scores (p < 0.0005). There was a significant difference in overall mean *h-index* by gender, where the mean scores were 9.0 and 6.0 for men and women, respectively (p = 0.0005). When analyzed by academic rank, there was a significant difference in academic productivity between men and women in assistant and associate professor positions (6.4 vs 5.1, respectively; p = 0.04).

**CONCLUSIONS:** The *h-index* is able to objectively and reliably quantify academic productivity in plastic surgery. We found that *h-indices* increased with higher academic rank, and men had overall higher scores than their female colleagues. Adoption of this metric as an adjunct to other objective and subjective measures by promotions committees may provide a more reliable measure of research relevance and academic productivity in academic plastic surgery. ( J Surg 71:593-600. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

**KEY WORDS:** academic productivity, academic promotion, research productivity, gender disparity, *h*-index, plastic surgery

**COMPETENCIES:** Professionalism, Practice-Based Learning and Improvement, Systems-Based Practice

## INTRODUCTION

Advancement within academic plastic surgery is determined by several factors. Although participation in administrative capacities, contribution to medical education, and clinical performance are taken into account, research output is one of the most heavily examined aspects when determining recommendations for advancement.[1,2] As a result, the importance of using objective and quantitative statistics regarding research productivity is paramount. Several metrics frequently used to assess research productivity are total number of publications, total "significant" number of articles, and number of citations by other authors in the peer-reviewed literature.[3,4] Although these are all easily quantifiable criteria, they do little to measure the overall influence and impact. The *h-index* is one benchmark that

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evaluates both the impact and quantity of an individual's research contributions.[4]

First proposed within the past decade by physicist Hirsch[4] at the University of California, San Diego, an author's *h-index* is defined as the number *h* articles that have been cited *h* times. For example, if an academic plastic surgeon has an *h-index* of 20, it means that he or she has had 20 publications with at least 20 citations each. If they had 100 total published articles, an *h-index* of 20 indicates that only 20 of these articles were cited at least 20 times each, whereas the remaining 80 articles were cited less than *h* (20) times each. The *h-index* is a potentially more accurate measure of research productivity than previously used metrics because it incorporates both the quantity and impact of an individual's scholarship into a single statistic.

The *h-index* can be calculated using several online biomedical literature databases, including those available from Scopus and Google Scholar.[5,6] Although results between these 2 resources may vary, a previous analysis evaluating *h-indices* among academic neurologic surgeons found a high degree of correlation in calculated *h-indices* between Scopus and Google Scholar.[7]

There has been no previous analysis in plastic surgery evaluating whether this objective quantification of research contribution is valuable in determining opportunities for academic promotion. Furthermore, the effect of gender in academic productivity and academic promotion has not been described in academic plastic surgery. Although women have been increasingly entering medicine and now make up approximately half of medical school graduates, they have been historically underrepresented in surgical specialties.[8,9] The American Medical Association (AMA) estimates that women currently comprise approximately 12.3% of physicians within academic plastic surgery, a figure that is expected to rise over time, as between 20% and 30% of current plastic surgery residents are women.[10,11] The objectives of this study were (1) to evaluate the relationship between *h-index* and academic rank in plastic surgery and (2) to describe the current gender representation in academic plastic surgery to assess whether there are any gender disparities in academic productivity.

## MATERIALS AND METHODS

A list of plastic surgery residency programs was accessed from the AMA's Fellowship and Residency Interactive Database. Departments offering either or both integrated and traditional track residencies were included on this list. A total of 506 faculty members from 83 departments were included in this analysis after exclusion criteria (stated later), and their ranks were obtained using online listings from the departmental websites. Faculty members were organized into the categories of assistant professor, associate professor, professor, and chairperson. For programs where plastic surgery was a division of a surgery department, division chiefs were included in this analysis under the chairperson category. Nonacademic clinical faculty members, instructors, nonphysician research faculty, adjunct, and part-time faculty were all excluded from this analysis. Departmental websites that did not list faculty academic rank information were excluded from this analysis; from the initial 94 programs listed on Fellowship and Residency Interactive Database, 11 were excluded for this reason. Individual physicians whose academic ranks were not found on their departmental websites were also excluded from this analysis.

An *h-index* calculator using citations from the Scopus Database (http://www.scopus.com) reported calculated *h-indices* for all of the included faculty members. All data was collected in June 2012.

Statistical analyses were conducted using Student *t* tests and one-way analysis of variances where appropriate, using Microsoft Excel. Thresholds for significance were set at $p < 0.05$.

## RESULTS

After excluding departments that did not list information about faculty and academic rank online, there were 506 academic plastic surgeons from 83 departments included in this analysis. Of 83 departments included in the analysis, 77 openly disclosed chair or chief details on program websites from which the analysis was performed. There were 426 (84%) men and 79 (16%) women in this sample, with individual gender distribution by academic rank shown in Figure 1.

The mean *h-index* of all academic plastic surgeons was 8.5 (Fig. 2). There was a significant difference between genders, where male plastic surgeons in this analysis had a higher *h-index* than their female peers (9.0 vs 6.0, respectively; *t* test, $p = 0.0005$). Research productivity, as measured by *h-index*, had a significant relationship with academic rank where higher academic ranks had higher *h-index* scores (one-way analysis of variance, $p < 0.0005$) (Fig. 3). There was no significant difference in mean *h-index* between professors and chair/chief of the department (*t* test, $p > 0.05$).

The mean *h-index* by academic rank was broken down by gender. There was a significant difference between males and female faculty members of the 2 more junior academic ranks combined, assistant and associate professor (6.4 vs 5.1, respectively; *t* test, $p < 0.04$) (Fig. 4). There was no significant difference seen in the rank of professor or departmental leaders (Figs. 5 and 6).

## DISCUSSION

This study showed that as of 2012, 84% of academic plastic surgeons were men and 16% were women (consistent with