Using a Modern Linked Research Database to Examine Gender Disparities in Orthopaedic Grant Funding from 2020-2022

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INTRODUCTION:

Gender disparities in research grant funding persist in many disciplines. The Dimensions database is a modern linked data infrastructure which uses machine learning and cloud computing to aggregate data including grants, publications, clinical trials, and policy documents in one place. Using Dimensions data, this study sought to examine the extent of gender disparities in US orthopaedic grant funding over the past decade. Our aim was to provide insights into the extent of gender disparities in the field of orthopaedic research and highlight the potential need for future action to address these disparities.

METHODS:

The Dimensions database was queried for all US grants awarded for orthopaedic research from 2010-2022. Keywords for orthopaedic subspecialties and all orthopaedic-related words suggested within the database were used to create the search. A total of 22,326 results were then manually screened to exclude those without direct orthopaedic focus. Dollar amounts were reported in US Dollars (USD) and adjusted for inflation using the 2023 consumer price index (CPI). Author gender was assigned using the validated Genderize algorithm application programming interface (API), which has been widely utilized in previous research on gender disparities. The Relative Citation Ratio (RCR) was used to assess the impact of publications linked to each grant. Significance was considered at $p<0.05$.

RESULTS:

A total of 1,723 grants were included. Men principal investigators received significantly higher median funding per grant (USD) in 2011, 2012, and 2013; however, this trend reversed with women receiving non-significantly higher funding in 2015, 2017, 2018, 2021, and 2022. In 2020, women received significantly higher funding per grant ($166,234 vs. $121,384, p=0.04). Throughout the 12-year period, grants authored by men accounted for approximately 71% of grants with a very weak increasing trend in percent of woman authorship (R^2 = 0.16, $p<0.001$). The majority (9/10) of the top funding organizations had non-significant differences in funding per grant awarded to men and women, although the OREF had overall higher amounts awarded to men ($20,000 vs. $5,000, $p<0.001$). Grants with men primary authors had more publications compared to women (11.1 vs. 6.6 publications, p=.001). Publications resulting from grants awarded to men had a significantly higher RCR compared to grants awarded to women (2.42 vs. 2.09, p=.04).

DISCUSSION AND CONCLUSION:

Similar amounts of funding per grant were awarded to men vs. women in orthopaedics in 7 of the past 8 years, despite significantly greater funding per grant to men from 2011-2013. Men investigators accounted for the majority of grants received during the study period compared to women, although this was lower than the current percentage of men orthopaedic surgeons. The results from this study provide important insights into the extent of gender disparities in orthopaedic grant funding and can be used to inform future initiatives aimed at reducing these disparities and promoting equity in grant funding for orthopaedic research.

Figure 1. Trends in **Woman** Authorship Among US Orthopaedic Grants, 2010 to 2022

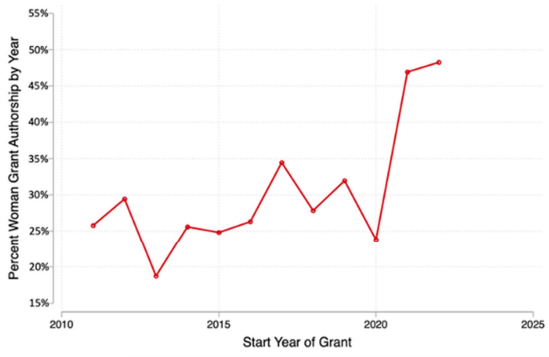

TABLE 1. US Median Funding **for Orthopaedic Research per Grant** by **Gender**

Year	Man Senior Author⁺ (USD)	Woman Senior Author⁺ (USD)	P value
2010	$167,527 (75,490-290,327)	$103,529 (50,326.7-194,389)	0.06
2011	$75,348.6 (32,838.3-191,737)	$48,805 (23,831.4-129,200)	**0.003***
2012	$57,342.7 (25,781.3-127,609)	$39,217.8 (23,991.2-113,697)	**0.02***
2013	$53,144 (25,124.5-123,094)	$40,101.5 (23,424.7-109,366)	**0.04***
2014	$52,608.1 (24,731.7-138,648)	$40,065.4 (22,643.4-116,148)	0.06
2015	$49,400.8 (23,679.1-123,502)	$68,215.6 (24,700.3-160,160)	0.13
2016	$98,325 (30,489.6-228,385)	$76,772.6 (34,893.1-215,926)	0.79
2017	$134,609 (68,741.5-298,054)	$159,257 (55,298.3-347,183)	0.49
2018	$137,559 (82,525.1-319,289)	$185,934 (67,274.4-358,203)	0.21
2019	$190,782 (65,592.5-370,475)	$137,443 (68,682-319,824)	0.10
2020	$121,384 (39,227.8-307,377)	$166,234 (74,968.5-341,961)	**0.04***
2021	$115,006 (35,282.4-298,199)	$151,890 (48,883.1-321,305)	**0.16**
2022	$111,547 (33,944.8-276,529)	$126,224 (49,997.5-297,312)	**0.47**

**Indicates statistical significance, p<0.05*
⁺Data presented as median (IQR).