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## How Industrial-Organizational Psychology Can Benefit From Scientometrics (and Vice Versa)

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Scientific fields benefit when their researchers engage in self-reflection. Accordingly, we welcome the evidence gathered by Gardner, Ryan, and Snoeyink (2018) on gender differences in our field, the field of industrial and organizational (I-O) psychology. In this commentary, we argue that such self-reflection processes can be further enhanced by taking advantage of the wealth and breadth of scientometrics, the quantitative study of science.

### How I-O Psychology Can Benefit From the Science of Scientometrics

Scientometricians (i.e., researchers in the field of scientometrics) mainly study production and reception of scientific output (i.e., possible measures of scientific performance) and other forms of scientific communication. For instance, they investigate performance indicators (e.g., the h-index) and

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web-based supplements (“altmetrics”; for an introductory book see Thelwall, 2016) and analyze different publication data sources (e.g., how dominated the database PsycINFO is by English-language publications; see Krampen, 2016). Moreover, they study similarities between papers (e.g., by using new techniques such as co-citation proximity analysis; Gipp & Beel, 2009) as well as try to visualize knowledge domains (“science mapping”; see Chen, 2017). For a better understanding of the field of scientometrics, readers are encouraged to consult relevant journals such as *Scientometrics*, *Journal of the American Society for Information Science and Technology*, and *Journal of Informetrics* or introductory books such as the one by Qiu, Zhao, Yang, and Dong (2017).

The findings of scientometrics are relevant for I-O researchers interested in gender differences, as research citation metrics might reflect women’s and men’s scientific performance from a different perspective and they therefore complement results derived from other methods (e.g., Poon & Leeves, 2017). For example, our own analyses of gender differences among all members of the Society for Industrial and Organizational Psychology (SIOP) in the year 2013 showed gender differences in number of publications (favoring men) but not in the average journal impact factor (König, Fell, Kellnhöfer, & Schui, 2015), indicating the importance of different performance indicators, whereas Gardner et al. (2018) looked at the number of publications in two journals, *Journal of Applied Psychology* and *Personnel Psychology*, as the only performance indicator in the area of publications.

To explore their research questions, scientometricians typically use large data sets. For example, our SIOP member analysis (König et al., 2015) had an *N* of authors of 4,234 and an *N* of publications of 46,656, and a second publication based on this data set also included around 100,000 collaborators (Fell & König, 2016). Another study on gender differences in all sciences was even based on an *N* of 5,483,841 papers (Larivière, Ni, Gingras, Cronin, & Sugimoto, 2013). Such large *N*s reduce the likelihood that results are biased by factors such as the peculiarities of chosen journals. In this realm, König and Bajwa (2018) showed that the journal *Personnel Psychology* (one of the two journals Gardner et al. analyzed) is more dominated by US authors than other top I-O psychology journals. This US dominance might have biased Gardner et al.’s results because international authors are (slightly) more likely to be female than US authors (König & Bajwa, 2018). Gardner et al.’s choice of journals might also help explain why we found only minor gender differences in percentages of first authorships in our much larger data set on SIOP members (König et al., 2015), unlike Gardner et al. who found 65% of first authors to be male. Furthermore, large *N*s allow for insightful subgroup analyses. For example, although König et al. (2015) found clear gender differences in a number of publications in the

total sample, nearly no gender differences were found among SIOP student members.

To run comprehensive scientometric analyses, researchers have developed special automation tools that are often freely available, like Publish or Perish (<http://www.harzing.com/pop.htm>) or SocSciBot (a web crawler and hyperlink analyzer, see <http://socscibot.wlv.ac.uk/>). Particularly helpful for the study of gender differences is <https://genderize.io/>, a webpage that enables individuals to determine people's gender by their first names, using a list of more than 200,000 distinct first names from nearly 80 countries (for an example see Fell & König, 2016), and that frees researchers' resources because they do not have to code gender by hand (as Gardner et al. did). Such tools will therefore make it easier for interested readers to run their own scientometric analyses.

Using scientometric approaches, I-O psychologists will be able to answer many questions to understand gender differences in our field. Some of these questions have already been asked by Gardner et al. (2018). For example, they asked how (dis)similar women's and men's publication records are at different care stages, and they also asked about gender differences in research topics within I-O psychology (a first scientometric answer has already been found in König et al., 2015). A myriad of additional questions could be explored. For example, scientometric studies could explore whether male (or female) researchers from our field remain focused on a low number of topics over the course of their careers versus diversifying their research interests (cf. Abramo, D'Angelo, & Di Costa, 2018), whether papers in I-O psychology that receive nearly no immediate but much delayed recognition are more likely to be written by female versus male researchers (cf. Bornmann, Ye, & Ye, 2018), whether female and male I-O psychologists differ whom they choose as international collaborators (cf. Ni & An, 2018), whether gender explains a significant amount of variance in reviewing activities and reviewing leniency or severity (cf. Ortega, 2017), and whether the relationship between number of publications and salary is moderated by gender (cf. Sandnes, 2018). Surely, interested readers who make themselves a bit more familiar with the world of scientometrics will come up with many more topics worth being studied.

### **How Scientometrics Can Benefit From I-O Psychology**

Fostering the link between I-O psychology and scientometrics will likely also benefit the field of scientometrics. In I-O psychology, team and collaboration processes, which are relevant for teams of authors as well, have been studied for a long time, with special interest toward gender diversity (e.g., Roberson, Ryan, & Ragins, 2017). For example, female authors in I-O psychology collaborate more intensively than male I-O psychologists (Fell & König, 2016). Why is this the case? Answering such a question will be difficult or even

impossible by conducting only scientometric analyses of collaboration patterns. Instead, it will likely require models and data with which I-O psychologists are familiar (e.g., data on agreeableness of male and female authors; see Feingold, 1994). In addition, the wealth of knowledge on career trajectories that our field has produced over the years (e.g., Sullivan & Baruch, 2009) could be helpful for guiding scientometric studies on the careers of female and male scientists.

## Conclusion

We hope that our commentary stimulates more exchange between I-O psychology and scientometrics, and we particularly hope that this exchange leads to more research that helps us assess the nature and progress of I-O psychology, in particular regarding gender issues.

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## What We Do Not Know: Answers From the SIOP Income and for Peer Review Employment Survey

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Gardner, Ryan, and Snoeyink (2018) emphasize the need to assess human capital and market factors that may contribute to gender differences in income and suggest that such data are not readily available. As members of the Institutional Research Committee, we thought it important to provide some evidence addressing the focal article's main points using what data are available. Specifically, we conducted ad hoc analyses using data from

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