Gender of *Personality and Individual Differences* (PAID) contributors: An analysis of recent years (2008-2016).

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Abstract

This study aims to identify the gender of researchers who published in Personality and Individual Differences (PAID) during the 2008-2016 period. Of a total of 12,137 authorships, gender could be identified in 11,023 (90.8%). Results show a slight gender imbalance in favor of men that tends to diminish throughout the years, almost reaching parity in the last three years. Data show that: a) gender asymmetry is greater in the number of authorships than in the number of authors (individuals), partly because men tend to publish in a wider range of years during the period studied; b) men are relatively overrepresented in the last (senior) position of the author by-line; and c) in relative terms, women tend to be concentrated in the last years of the period studied. Taken together, these three points suggest that age probably plays a role in the (slight) gender imbalance, as observed in other scientific fields. Regarding the scientific impact of contributors, no gender differences were found in the number of citations received.

Keywords: Personality, Individual Differences, PAID, Gender, Women, Scientific production, Collaboration patterns, Scientific impact.

1. Introduction

Despite significant progress in recent years, bibliometric analyses of the worldwide research production show that gender imbalances persist, and women are still underrepresented in most scientific fields (less than 30% of authorships worldwide; see Larivière, Ni, Gingras, Cronin, & Sugimoto 2013; West, Jacquet, King, Correll, & Bergstrom, 2013). Bibliometric studies in psychology are abundant, but gender analyses are scarce and not recent enough (Boice, Shaughnessy, & Pecker, 1985; Guyer & Fidell 1973), or limited to a specific geographical area, such as Australia (Malouff, Schutte, & Priest, 2010), Italy (D'Amico, Vermigli, & Canetto, 2011), or Spain (Barrios, Villarroya, & Borrego, 2013). Recently, González-Alvarez & Cervera-Crespo (2017b) carried out a gender analysis of all the psychology articles published in 2009 included in the Web of Science database (Thomson Reuters). From a total of 90,067 authorships, gender could be identified in 74,413 (82.6%) of them, and the analysis revealed 40,782 (54.8%) male authorships and 33,631 (45.2%) female authorships. These data corresponded to 24,477 (49.9%) individual men and 24,553 (50.1%) women, respectively. Therefore, contemporary psychology presents gender parity in the number of authors, and a certain gender asymmetry in the number of authorships that is much lower than in science in general.

We were interested in examining the gender composition of contributors in an influential psychology journal such as *Personality and Individual Differences* (PAID) and, at the same time, observing its temporal evolution in recent years. PAID publishes articles that aim to integrate the major factors of human personality with the scientific study of individual differences and their main determinants. A few bibliometric studies

have focused on PAID (Bedford, 2003, 2007), but to our knowledge no gender analysis of this journal has been published until now. In Bedford (2003), the author compared the frequency and geographical origins of published contributions to PAID in the 1993-1995 and 1999-2001 periods. Four years later, Alan Bedford (2007) extended the comparison to the 2003–2005 period. However, neither of these two bibliometric analyses performed a gender study of PAID contributors. The aim of the present study was to identify the gender of researchers who currently publish in *Personality and Individual Differences* and examine the evolution of the gender composition since 2008 (the first year full names were available) to 2016. To this end, the gender of PAID authorships (and individual authors) was identified and the pattern of research collaboration, scientific content, and scientific impact were analyzed from a gender perspective.

2. Method

2.1. *Database*.

This study was based on Thomson Reuters' Web of Science (WoS) database. Other scientific databases, such as Scopus, are unable to automatically provide the authors' full names from a set of records. All the regular articles published in PAID during the 2008-2016 period were selected and subsequently analyzed. We chose 2008 as the first year of the analysis because WoS began to include the authors' full names (field tag AF: Author Full Name) in that year, although a small percentage of records still display only the authors' initials.

The records were extracted in text format and preprocessed through the BibExcel software (Persson, Danell, & Wiborg-Schneider, 2009), in order to perform the subsequent bibliometric analyses with the BIbExcel and Microsoft Excel 2010 programs.

2.2. *Gender identification*.

After a normalization process that eliminated initials accompanying given names and replaced hyphens with spaces, all the authors' first names were matched through GenderChecker, a database that includes 102,142 worldwide names classified as male, female, or unisex (acquired from http://genderchecker.com/). This database has been used in recent research (e.g., Carnahan, Kryscynski, & Olson, 2016; Mansour et al., 2012; Yun et al., 2015). For more details see the Supplemental Material.

2.3. *Procedure*.

BibExcel (Persson et al., 2009) makes it possible to extract information from any field (surname, full name, affiliation, keywords, number of citations, etc.) of any paper. This software is a toolbox for bibliometricians that creates a file in which the values of an extracted variable are associated with each individual paper (identified with a number)[1]. Finally, the values of all the variables studied were combined and entered in a master Excel database to perform the subsequent bibliometric and statistical analyses (details in the Supplemental Material).

3. Results and Discussion

3.1. *Authorships and authors*.

A total of 3,795 articles published in PAID during the 2008-2016 period were obtained. They were signed by 12,137 authorships (see Table 1), with an average of

3.20 authorships/article. After excluding authorships containing only initials (92), unisex names (637), or first names that did not match the GenderChecker database (385), we obtained 11,023 (90.8%) items with gender identified (men, women) (henceforth, the percentages of men and women will always refer to the gender-identified values). Finally, the total number of authorships with gender identified included 6,385 (57.9%) male and 4,638 (42.1%) female authorships. Applying the Chi square test, the difference between male and female authorships was statistically significant, although the effect size was small, X^2(df=1) = 139.32; p< 0.0001; Cramer's V = .079.

Table 1 about here

Obviously, authorships are not the same as individual authors because one individual can publish several papers. Our database included authors' full names, as well as surnames and affiliations. We assumed that two or more records (authorships) with the same first name and surname belonged to the same individual (author). If necessary, the affiliation was verified. It is important to note that, unlike authorships, the number of authors is very close to gender balance (Table 1): 3,512 (51.0%) men vs. 3,372 (49.0%) women. Despite the high number of observations, this slight difference was not significant, X^2(df=1) = 1.42; p= 0.223; Cramer's V = .010.

We studied the gender distribution of authorships and authors (individuals) in the years from 2008 to 2016 (see Figure 1; numerical values in Table S1 in the Supplemental Material). It is evident that the relative gender disparity in both parameters

decreases over the years, almost achieving equality (50%) in the number of authors who publish in PAID.

Figure 1 about here

Comparing the overall number of authorships and authors (Table 1), men present higher productivity than women (1.82 vs. 1.38 articles/author in the entire 2008-2016 period). Nevertheless, a finer analysis is required that takes time into account. It should be kept in mind that our study covers a range of years. What is the gender difference in productivity per year? For each author, we obtained the number of years in which s/he published an article. Dividing the number of articles published by each author by the number of years in which those articles are published, we observed that the gender difference in productivity is much smaller than the overall difference: men publish an average of 1.10 articles/year (*SD* = 0.32), 95% CI [1.09, 1.11], and women publish 1.06 articles/year (*SD* = 0.24), 95% CI [1.05, 1.07]. This difference is significant (as expected, given the high number of observations), but the effect size is very small: $F(1, 6{,}882) = 41.93$, $p < .0001$, $\eta^2_p = .006$. It is remarkable this discrepancy between overall vs. annual gender differences in productivity. Examining the years in which each author publishes a paper, we find that the range of years is greater in men than in women. In other words, an important part of the gender difference in PAID publications is due to the time factor because men's publications tend to encompass a wider range of years within the 2008-2016 period.

On the other hand, if we examine the authors who published in PAID in only one single year (some of them may be new to research activity), women tend to be concentrated in the second half of the period studied: 2008-2011 (882 men, 879 women); 2012-2016 (1689 men, 1909 women). As noted below, these and other data suggest that age may play a role in this slight gender difference in PAID publications.

3.2. *Pattern of collaboration*

Collaboration (co-authorship) among researchers has increased considerably in recent decades, both in overall science and in psychology (Kliegl & Bates, 2011). PAID also reflects this trend, and the average number of authorships/article increased from 3.06 in 2008 to 3.30 in 2016. (R^2= 0.67 across the nine years; that is, the scatterplot between the authorships/article averages and the years of publication yields a regression line with correlation r = 0.82, p < .0001).

We examined the author order and gender composition in the by-line of each paper, particularly in the key positions (first and last). Following the procedure reported by Kretschmer, Kundra, Beaver, and Kretschmer (2012), we calculated the concentrations of males (COM) and females (COF) in each position. After excluding single-author papers, the COM in each by-line position was defined as the ratio between the percentage of males in that specific position and the overall percentage of male authorships. Similarly, the COF in each position is the ratio between the percentage of females in that specific position and the overall percentage of female authorships. Figure 1 shows that, in relative terms, women are underrepresented in the last position of the by-line (COF = 0.86), whereas men are relatively overrepresented in that position (COM

= 1.10). In many fields, including health and behavioral sciences, the last author position is a key position frequently reserved for the senior or leading member of the research team (West et al., 2013). In other fields, such as mathematics or economics, the author order is usually alphabetical (Waltman, 2012; West et al., 2103). In PAID, only 2.9% of the articles with four or more authors present the authorships in alphabetical order. The relative underrepresentation of women in the senior (last) position is also found in psychology (González-Alvarez & Cervera-Crespo, 2017b), neuroscience (González-Alvarez & Cervera-Crespo, 2017a), and other scientific fields (Larivière et al., 2013), suggesting that age probably also plays a role in the PAID journal.

Figure 2 about here

In addition, we observed the collaborative pattern among authors, in part, was gender guided, depending on which gender occupied the first and last positions in the by-line (see Figure 3). This is a pattern also observed in overall psychology (González-Alvarez & Cervera-Crespo, 2017b). Thus, within the set of multi-authored PAID articles signed by a man in the first position, the number of male and female authorships was 4,059 (71.4%) and 1,626 (28.6%), respectively. This percentage difference is significantly more asymmetrical than the overall proportion (57.9%, 42.1%), X^2 (1) = 226.41; $p< 0.0001$. However, if the papers are signed by a woman in the first position, male authorships (1,751; 39.4%) are outweighed by female authorships (2,692; 60.6%),

X^2 (1) = 303.64; p< 0.0001. In a similar way, within the set of multi-authored articles signed by a man in the last position, the number of male and female authorships was 3,517 (66.8%) and 1,745 (33.2%), respectively, which is significantly different from the overall percentages, X^2 (1) = 89.44; p< 0.0001. Again, if the articles are signed by a woman in the last position, male authorships (1,100; 38.0%) are outweighed by female authorships (1,795; 62.0%), X^2 (1) = 229.59; p< 0.0001. As found in overall psychology, it seems that senior female researchers publishing in PAID tend to establish scientific partnerships with women more than male senior researchers do; or perhaps they work on subtopics that are relatively more appealing to women. Conversely, an analogous pattern emerges for senior male researchers.

Figure 3 about here

3.3. *Content*

We carried out an analysis of the scientific content of the authors using the keywords from each paper, specifically, the Keywords Plus contained in the ID field tag of Web of Science (WoS). According to WoS, KeyWords Plus are index terms created by Thomson Reuters, derived from the titles of articles to augment traditional keyword or title retrieval. Table S2 (Supplemental Material) shows the top 50% of the keywords from the papers, separated by the gender of the authors occupying a key (first or last) position in the authorship by-line. In general, a close correspondence between the terms in the two columns (“male” and “female” columns) is evident. In both genders, the top 10% correspond to the keywords *personality*, *scale, mode, behavior, validation*, and

performance. However, within the female column, a new term is included in the top 10%: *depression.* Conversely, *validity* is a new term included in the top 10% of the male column. Overall, the keywords occupying a higher position in the female column (than in the male column) include: *impulsivity*, *women*, *negative affect*, *attractiveness*, *empathy*, *reward*, *school*, *close relationships*, *emotion regulation*, and *life satisfaction*, among others. The terms occupying a higher position in the male column include: *intelligence*, *BIG 5*, *gender-differences*, *fit indexes*, *perception*, *evolution*, *schizophrenia*, *testosterone*, *sensation seeking*, *tests*, *memory*, *sexual-dimorphism*, and *social-dominance*, among others.

3.4. *Citations*

In overall science, Larivière et al. (2013) found that articles with women in dominant author positions (first or last) received fewer citations than those with men in the same positions. We tested this issue in our sample of articles published in PAID from 2008 to 2016. The number of citations was extracted for each article (TC, Times Cited), and they were separated by the gender of the authors occupying a key (first or last) position in the authorship by-line (see Figure S1 in the Supplemental Material). Overall, "male" articles received an average of 10.06 citation, 95% CI [9.78, 10.74], and "female" articles received 9.67 citations, 95% CI [9.21, 10.12]; this slight difference was not significant. A between-subjects two-way ANOVA was carried out with year and gender as fixed factors and number of citations as dependent variable. As expected, the main effect of year was significant because, logically, the articles published earlier (2008, 2009, 2010,..) received more citations than those published more recently (…,2014, 2015, 2016), $F(8, 5021) = 269.42$, $p < .0001$, $\eta^2_p = .300$. However, the main effect of

gender did not reach significance, $F(1, 5021) = 2.64$, $p = .104$, $\eta^2_p < .001$, nor did the year x gender interaction, $F(8, 5021) = 0.28$, $p = .977$, $\eta^2_p < .001$.

4. Conclusions.

In summary, our results show a slight gender imbalance in favor of men that tends to diminish over the years, almost reaching parity in the last three years. Our study also showed three additional facts. First, gender asymmetry is greater in the number of authorships than in the number of individual authors, partly because men's publications tend to encompass a wider range of years in the period studied. Second, men are relatively overrepresented in the last position of the paper by-line. In social, health, and behavioral sciences, the last author position is usually a key position reserved for the senior or leading member of the research team, and s/he tends to be a researcher with a consolidated (and presumably long) career (Waltman, 2012). Third, within the set of authors who have published in only one year (probably some of them are new researchers), women tend to be concentrated in the last years of the period studied. Taking these three facts into account, our data suggest that age probably plays a certain role in the (slight) gender imbalance of PAID contributors, as observed in other scientific fields (González-Alvarez & Cervera-Crespo, 2017b; González-Alvarez & Cervera-Crespo, 2017a; Larivière et al., 2013). In other words, it is possible that male PAID contributors on average are little older than females. A limitation of the present study is that we have not direct evidence to test the age hypothesis since the WoS database (and any other bibliographic database, such as Scopus, Psycarticles, PsycNet, PubMed,

etc.) does not provide data about the authors' age. Further research could test this hypothesis obtaining information from other possible sources.

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