Testing the *Matilda Effect* in Communication Research: Comparing Citation Patterns to Female and Male Authors

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Abstract

The *Matilda effect* is bias against female accomplishments in science and one manifestation is fewer citations when compared to male authors. An analysis covering 15 years and over 1,000 journal articles failed to find support for the Matilda effect in three central journals in communication. Female first-authored articles published in *Journal of Broadcast and Electronic Media* were more often cited compared to male-authored articles. Highly productive female authors were more likely to be cited compared to males, and the proportion of articles authored by females increased over time. Male authors were significantly more likely to cite their own work across all three journals.

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Rossiter (1993) dubbed the Matilda effect to label, "the have-nots of scientific history, including especially women in science" (p. 326). One specific form is the disproportionate number of citations to scholarship as a function of author sex. The current paper will examine the effect in three highly influential communication journals—*Communication Monographs (CM), Journal of Broadcasting and Electronic Media (JOBEM) and Human Communication Research (HCR).*

The Matilda effect was recently tested in an original experiment by Knobloch-Westerwick, Glynn, and Huge (2013) who had students rate the scientific quality of International Communication Association abstracts attributed to male and female authors. The results showed a significant interaction effect—student raters attributed greater scientific quality to abstracts authored by males, and this effect was especially pronounced in male-typed topics. In a subsequent analysis, Knobloch-Westerwick and Glynn (2013) examined over 1,000 studies published from 1991 to 2005 in *Journal of Communication* (*JOC*) and *Communication Research (CR)* and found female authors were cited, on average, 12.77 times and male authors were cited 17.73 times. The current study sought to replicate this analysis using the same years of analysis for three additional journals in the field of communication.

The journals under investigation represent three central journals in communication in terms of their influential position in the citation network (Park & Leydesdorff, 2009). Historical and recent journal impact factors position *HCR*, *CM,* and *JOBEM* in the top echelon in the field (Feeley, 2008). It is expected that the number of citations to lead female authors will be less than the number of citations to male lead authors (*H1*). It is also predicted that there will be an

interaction effect such that female authors who are studying female-typed topics will be cited less frequently than male authors examining male-typed topics (*H2*). The current investigation also considers the phenomenon of self-citation in relation to the sex of the first author and compares male authors versus female authors' rate of self-citation (*RQ1*). Also of interest is the proportion of female-lead authors over time (*RQ2*).

Method

Data Retrieval & Coding

In March 2013, entries for publications in *HCR*, *CM* and *JOBEM* were downloaded from ISI Web of Knowledge database. From this download, author names from 1991 through 2005 were extracted—this time period replicates the analysis undertaken previously by Knobloch-Westerwick and Glynn (2013). The cutoff year of 2005 also allowed 7 years for articles *to be cited* by authors.

Two coders indexed author names for biological sex based upon entries for these articles in other databases. When author sex was unknown, coders searched university websites in an attempt to gather information. Krippendorf's alpha was 0.96 for the 10% of the database coded twice. An author was considered highly productive if he or she had published five or more articles in since 1980 (see Knobloch-Westerwick & Glynn, 2013).

In addition, the network of authors within the three journals was established by examining cross-citations or relatedness (Garfield, 2006) among authors in the three journals. Using Knobloch-Westerwick and Glynn's (2013) language, these authors were considered peer with three or more articles in *CM*/*HCR*/*JOBEM*.

Topic of article (i.e., male-typed vs. female-typed) was coded using the same procedures detailed by Knobloch-Westerwick and Glynn (2013). Unless otherwise specified, analyses were

conducted using ANOVA with publication year serving as covariate and author sex, gender typing, and productivity (high vs. low) as between-subjects factors.

Results

Descriptive Statistics

For the 15 years of coverage, 1,177 articles were examined—341 in *HCR*, 326 in *CM*, and 510 in *JOBEM*. Among these articles, there were 1,481 unique authors, 2,447 total authors (counting authors with > 1 article) and 207 authors considered prolific (37% women). An average article had 2.08 authors (*SD* = 1.34) and for 39.8% of articles the lead author was female. In the overall analyses, an average article made 45.53 citations to other articles (*SD* = 24.24) and 3,530 references were made to peer journals (*HCR*/*JOBEM*/*CM*); the average article cited an average of 3.00 peer scholars (*SD* = 4.16).

Regarding gender-typed topics, 75 article titles (6.4%) fell into female-typed topics, 180 (15.3%) were coded as male-typed, and the vast majority (77.8%) were coded as gender neutral. Among gender-neutral and male-typed topics, 45% were authored by a male author (or all male authors). Approximately one half of female-typed articles were authored by female authors, and this difference was significant, χ^2 (6) = 46.35, $p < .01$. Stated differently, for female-typed articles, the first author was more than two times more likely to be female than male. The average article in this sample of articles was cited 18.56 times (*SD* = 27.74)[1].

Hypotheses 1 & 2: Citations by Author Sex and Topic

Results for H1 indicated the number of citing articles was not significantly different as a function of first-author sex, *F* (1, 1,172) = .25, *ns*. Female lead authors were cited, on average, 19.34 times (*SD* = 30.22) compared to male lead authors (*M* = 18.05, *SD* = 25.98). There was a main effect of gender-typed topic on citations received, *F* (1, 1,172) = 4.05, $p < .05$, $\eta^2 = .003$.

Male-typed topics (M = 22.43, SD = 36.55) received more citations than female-typed topics (M = 17.87, SD = 25.80). There was no significant interaction effect between author sex and research topic, F (1, 1,172) = .13, p = .73. Thus, support was not found for H1 or H2. Publication year indicated older articles are more often cited, F (1, 1,172) = 5.21, $p < .05$, $\eta^2 = .004$.

Analyses by Academic Journal

***HCR*.** For *HCR*, there was not a significant effect on citations by author sex, although there was a trend toward male authors being more often cited (M = 30.19, SD = 38.92) than female authors (M = 21.96, SD = 21.36), F (1, 336) = 2.28, p = .13, $\eta^2 = .01$. There was a main effect for research topic with male-typed articles cited (M = 50.78, SD = 59.77) more often than female-typed articles (M = 24.60, SD = 28.59), F (1, 336) = 11.06, $p < .01$, $\eta^2 = .03$. There was not an interaction effect between sex and topic, and no effect for publication year.

***CM*.** For the sample of *CM* articles investigated, only publication year influenced number of citations received, F (1, 321) = 4.84, $p < .05$, $\eta^2 = .02$. Female authors in *CM* (M = 20.95, SD = 41.81) were more often cited compared to male authors (M = 16.12, SD = 18.22).

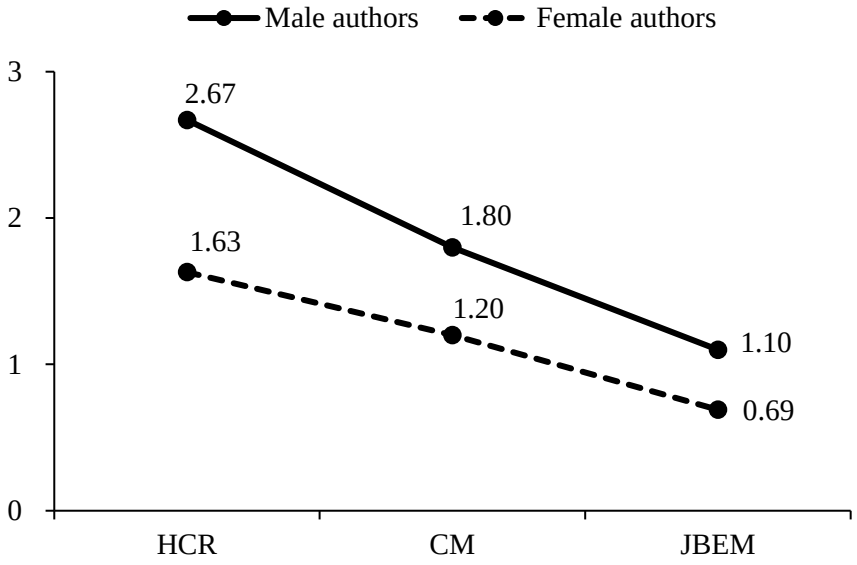
***JOBEM*.** Publication year for articles in *JOBEM* from 1991 to 2005 was not a significant predictor of citations. There was a main effect for lead author sex on citations -- female authors (M = 16.57, SD = 25.33) were more often cited compared to male authors (M = 10.92, SD = 12.72), F (1, 505) = 10.70, $p < .01$, $\eta^2 = .02$. This relationship was not qualified by topic of research.

RQs 1 & 2: Proportion of Female Authors over Time and Self-Citations

RQ 1 was concerned with the level and influence of self-citations in communication scholarship. Main effects for each factor were identified as well as an interaction effect between author sex and journal. Male authors (M = 1.77, SD = 2.53) self-cited more often than female

authors (M = 1.18, SD = 1.79), F (1, 1,704) = 41.29, $p < .01$, $\eta^2 = .02$. Also, authors in *HCR* self-cited more than authors in *CM* or *JOBEM*, F (2, 1,704) = 48.29, $p < .01$, $\eta^2 = .05$. These findings are depicted in Figure 1. The interaction effect between author sex and journals was also significant, F (2, 1,704) = 26.25, $p < .05$, $\eta^2 = .004$ (see figure 1).

Figure 1. Average Number of Self-Citations by Author Sex and Journal



In regard to RQ2, the proportion of female authors increased over time in the three 5-year intervals (1991–1995, 1996–2000, 2001–2005) from 34.5% to 39.8% to 44.8% consecutively. The number of female authors increased by 7.5% for *HCR*, 9.9% for *CM*, and 12.5% for *JOBEM*.

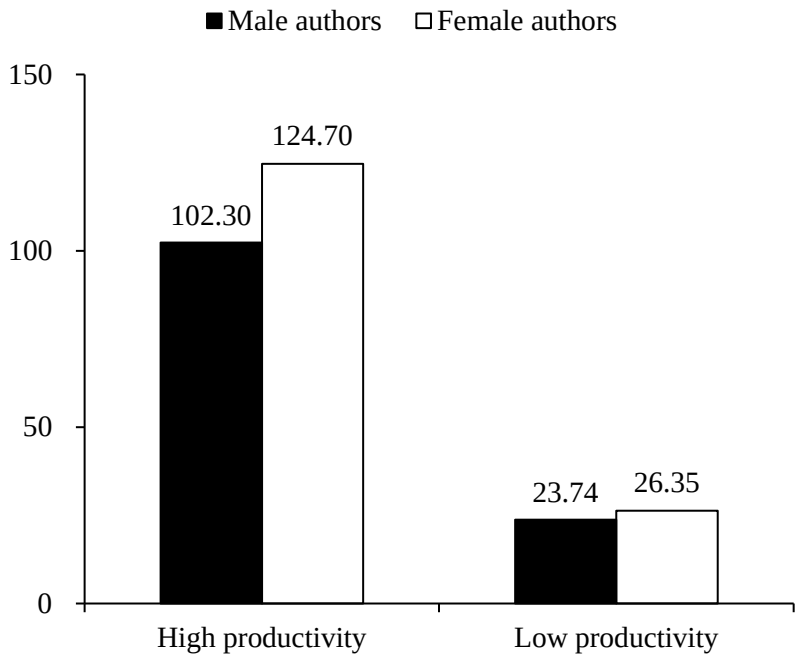
Supplemental Analyses

Productivity of authors. ANCOVA was conducted with citations received by an author as the criterion factor and sex of author and productivity as between-subjects factors and publication year as covariate. Among the sample of authors across the three periodicals, 9.5% were considered highly productive (N = 141).

Analyses using author as unit of analysis yielded significant findings. There was a small

but significant effect for authorship sex, F (1, 1,475) = 5.67, $p < .05$, $\eta^2 = .004$, and a main effect for productivity, F (1, 1,475) = 322.37, $p < .01$, $\eta^2 = .18$. Highly productive females (N = 657, M = 32.94, SD = 60.51 for citations received) were more likely than males to be cited, and the highly productive were more often cited compared to the less productive. The means are reported in Table 1. There was also an interaction effect between author sex and productivity, F (1, 1,475) = 4.89, $p < .05$, $\eta^2 = .003$. Findings indicate highly productive female first authors are more likely to be cited when compared to highly productive male first authors (see Figure 2).

Figure 2. Citations by Level of Productivity and Author Sex



Discussion

The current findings failed to support a Matilda effect in three central communication journals. A reverse effect occurred for *JOBEM* wherein female authors were more often cited than male authors. The explanation for this citation difference likely lies in the tail end of the distribution of citations to the journal as the majority of articles are seldom cited while a minority

of articles garner the lion's share of cites. The statistically significant findings in the current article and in the original analysis (Knobloch-Westerwick & Glynn, 2013) yielded small effect sizes, often explaining less than 1% of the variance. The current analysis indicates that first author sex, year of publication (given the 15-year span covered), and gender-related topic do not systematically account for the variability in number of citing articles. There is evidence self-citations explain variability as, on average, each first author cited his or own work one to two times per article (see Ferrara & Romero, 2013).

Male authors were significantly more likely to cite themselves compared to female authors (see Wilson, 2014) and prolific scholars were more often cited than the less published. It might serve an author well in the eyes of blind reviewers to reference a more influential scholar's work in developing an argument or justifying a particular research procedure (Beatty, Feeley, & Dodd, 2012). It may also be the case that a citing author is more likely to find an article when an author has more articles on a given research topic, assuming he or she publishes in a focused area of scholarship.

The Matilda effect suggests biases may exist in the reward system in academia and research should continue to investigate these possibilities. Biases may not be restricted to author characteristics but may also include research practices or topic of research articles. Our own research has begun to examine these potential biases in the publications in communication.

Note

1. The distribution of citations to articles was highly skewed and thus, analyses were conducted using a log transformation of citations and results did not differ meaningfully. All data are reported using raw data.

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