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Women in the Experimental Analysis of Behavior

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We examined the status of women in the experimental analysis of behavior by comparing authorship by women in the *Journal of the Experimental Analysis of Behavior* (*JEAB*) to authorship by women in three similar journals. For all journals, the percentage of articles with at least one female author, the percentage of authors who are female, and the percentage of articles with a female first author increased from 1978 to 1997. However, the participation by women in *JEAB* lagged behind participation in the other journals on each measure. Female membership on the editorial board of *JEAB* also failed to increase from 1978 to 1997. Suggestions are made that may increase the participation of women in the experimental analysis of behavior.

Key words: participation of women, gender equity, experimental analysis of behavior, *Journal of the Experimental Analysis of Behavior*

The first author was waiting to register for a convention when a friend mentioned an Internet discussion that asked whether men and women are treated equally (gender equity) in the experimental analysis of behavior. Opinions were divided. When the first author was asked, she cited several reasons for believing that some inequities continue. However, because intuition and anecdotes provide poor evidence, we gathered data about the status of women in the experimental analysis of behavior.

We gathered somewhat different data than those presented in the past (e.g., Laties, 1987; Myers, 1993; Neef, 1993; Poling et al., 1983). We compared the participation by women as authors in the *Journal of the Experimental Analysis of Behavior* (*JEAB*) to their participation in three other journals that are comparable to *JEAB* in selectivity and subject matter. Many other statistics have been used to assess gender equity. For example, Myers (1993) reported that the percentage of female first authors in *JEAB* (15%) was smaller than the percentage of women in the general population (51%), the percentage of doctorates in psychology (55%) or experimental psychology (48%) that were awarded to women, or the percentage of female full members of the Association for Behavior Analysis (ABA, 31%). However, Neef (1993) argued that these data do not establish that women are treated inequitably. There are many alternative explanations for the differences in percentages. For example, the percentage of female members of the general population would exceed the percentage of female authors in *JEAB* if publishing requires some special abilities or background that are not widely distributed. The percentage of women who hold doctorates in psychology or who are full members of ABA would exceed the percentage of female authors in *JEAB* if the subject matter of the experimental analysis of behavior appeals less to women than other subjects, such as applied behavior analysis or developmental psychology.

By comparing participation rates of women as authors in comparable journals, we hoped to rule out differences in ability and interest as explanations for differing results. We reasoned that authors in similarly selective journals should be similar in intelligence, background preparation, motivation to pub-

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lish, and so on. Therefore, none of these factors could easily account for different participation rates. Journals dedicated to a similar subject matter should also attract people with similar interests. Therefore, differences in interests probably could not explain different participation rates.

We do not argue that differences in participation rates by women across these journals must be attributed to gender inequity. The journals differ in other ways that could contribute. For example, as will be apparent from the descriptions of their editorial policies, *JEAB* is the only one of our journals that publishes information about the behavior of individual organisms. For as yet unknown reasons, this difference might limit its appeal to women. Nevertheless, we believe that these new statistics provide information that will contribute to a broader understanding of the status of women in the experimental analysis of behavior. At the very least, they raise questions that must be answered.

We did not include information on the applied analysis of behavior. Such information would be valuable, but we were less confident of our ability to pick appropriate comparison journals and to be certain of the gender of authors in the applied field.

METHOD

We examined each issue of *JEAB*, the *Journal of Experimental Psychology: Animal Behavior Processes* (*JEP: ABP*), *Animal Learning & Behavior* (*AL & B*), and *Learning and Motivation* (*L & M*) from 1978 to 1997 to determine the number of authors, the number of articles, the number of female authors, the number of female first authors, and the number of articles that included a female author. We analyzed the data over a 20-year period to cover a substantial amount of time and to include years over which, in the authors' opinions, attitudes towards women changed substantially. As a graduate student in the 1970s, the first author often heard discriminatory comments, such as "the best predictor of success in psychology is gender." We believe that these comments have largely disappeared from ordinary conversation. Therefore, at least the incidence of overt statements of bias decreased over these years.

We assumed that women's participation as authors in *JEAB* reflects their participation in the experimental analysis of behavior because *JEAB* is the flagship journal of the field. We chose the three comparison journals for two reasons. First, all of these journals are selective. Although these data are somewhat old, acceptance rates are approximately 50%, 20%, 30%, and 30% for *JEAB*, *JEP: ABP*, *AL & B*, and *L & M*, respectively (Buffardi & Nichols, 1981). Because it is somewhat easier to publish in *JEAB* than in its comparison journals, it cannot be argued that women fail to publish in *JEAB* because it is too difficult.

Second, all journals are devoted to a similar subject matter and appeal to similar audiences. The following quotations are the first sentences from the editorial policies that appeared in the first issue of each journal in 1997.

The *Journal of the Experimental Analysis of Behavior* is primarily for the original publication of experiments relevant to the behavior of individual organisms.

The *Journal of Experimental Psychology: Animal Behavior Processes* publishes experimental and theoretical studies concerning all aspects of animal behavior processes.

Animal Learning & Behavior publishes experimental and theoretical contributions and critical reviews in the areas of investigation encompassed by the title of the journal.

Learning and Motivation publishes original experimental papers addressed to the analysis of basic phenomena and mechanisms of learning and motivation, including papers on biological and evolutionary influences upon the learning and motivation processes.

As a result of these similarities, many authors publish in more than one of these journals. The audiences are also

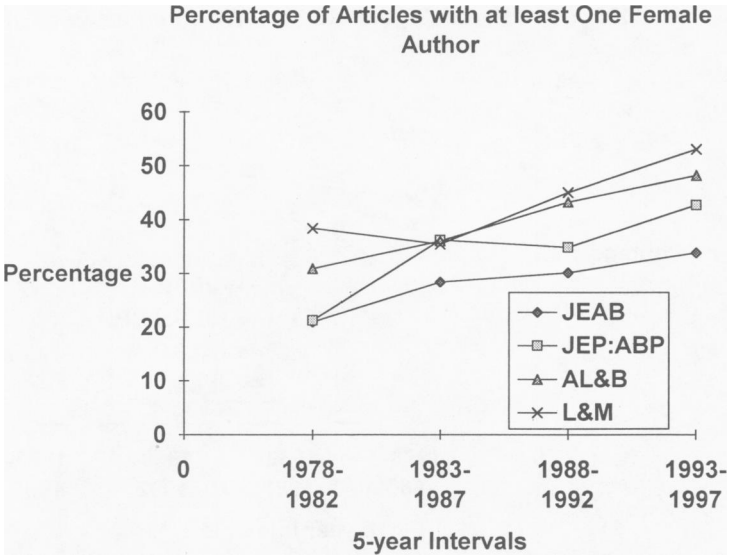

Figure 1. Percentage of articles with at least one female author over 5-year intervals from 1978 to 1997 for the *Journal of the Experimental Analysis of Behavior* (*JEAB*), the *Journal of Experimental Psychology: Animal Behavior Processes* (*JEP: ABP*), *Animal Learning & Behavior* (*AL & B*), and *Learning and Motivation* (*L & M*). All results are means. Each function presents the results for a different journal.

similar enough so that the journals advertise in each other's pages.

Some assumptions were required to collect the data. Gender was easy to identify in the many cases in which we knew the authors. In other cases, authors were considered to be female if they had a stereotypically female first name (e.g., Mary) or if they used the stereotypically female spelling of an ambiguous name (e.g., Marian is usually female, Marion is male; Frances is usually female, Francis is male).

Our task was made more difficult by two problems. First, in some cases, authors used only initials without giving a first name. We considered omitting all authors who used initials from our data. That resolution was dismissed because several prominent women often use their initials (e.g., P. A. Couvillon, T. M. Foster, A. W. Logue). Therefore, eliminating all authors who used initials might underestimate the appearance of women. Instead, we counted authors who used initials and considered them to be women only when we knew that to be the case. As a result, some women who used initials were undoubtedly counted as men. Second, some authors have unisex first names (e.g., Chris, Robin). To cope with this problem, and to try to offset the overcounting of men among initialed authors, we counted all authors with a unisex name as female unless we specifically knew otherwise.

As a result of these compromises, our calculations are undoubtedly somewhat inaccurate. However, the level of accuracy probably did not change systematically over time or differ across the journals.

RESULTS AND DISCUSSION

Changes in Participation Rates over Time

Figures 1, 2, and 3 contain the percentage of articles with at least one female author, the percentage of authors who are female, and the percentage of articles with a female first author, respectively, over the four 5-year intervals from 1978 to 1997. Each function presents the mean of the results for one of the four journals. The figures show that participation by women rose over

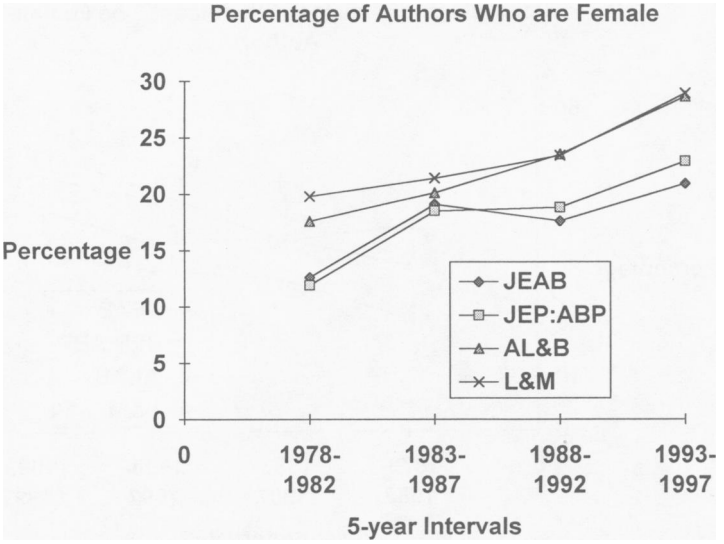

Figure 2. Percentage of all authors who were female over 5-year intervals from 1978 to 1997 for the *Journal of the Experimental Analysis of Behavior* (*JEAB*), the *Journal of Experimental Psychology: Animal Behavior Processes* (*JEP: ABP*), *Animal Learning & Behavior* (*AL & B*), and *Learning and Motivation* (*L & M*). All results are means. Each function presents the results for a different journal.

the last 20 years. The increase appears for all journals and for all three of the measures of participation. The size of the increase is substantial. It varies from 38% to 100% depending on the journal and measure. Similar temporal increases in the percentage of female first authors (Myers, 1993; Poling et

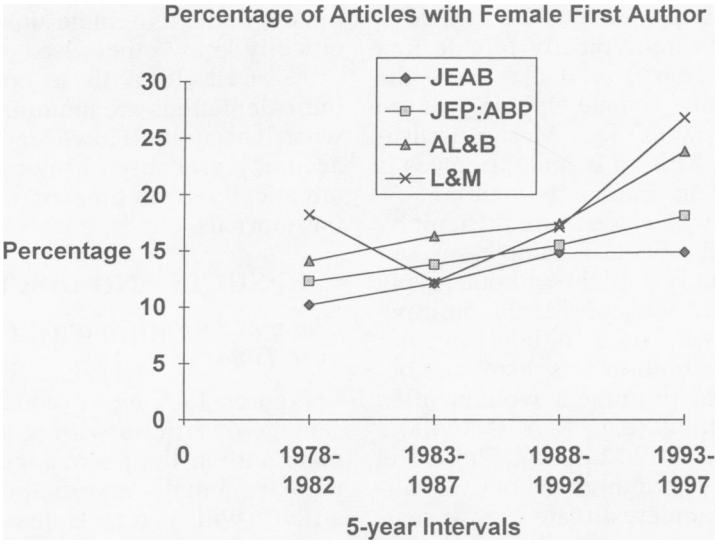

Figure 3. Percentage of articles with a female first author over 5-year intervals from 1978 to 1997 for the *Journal of the Experimental Analysis of Behavior* (*JEAB*), the *Journal of Experimental Psychology: Animal Behavior Processes* (*JEP: ABP*), *Animal Learning & Behavior* (*AL & B*), and *Learning and Motivation* (*L & M*). All results are means. Each function presents the results for a different journal.

al., 1983) and the percentage of female authors (Poling et al., 1983) have been reported for *JEAB* in the past.

Changes in percentage participation do not necessarily indicate that absolute participation by women has increased. For example, the percentage of participating women would increase if the number of participating men decreased even if the number of participating women was unchanged. This is not the case, however. The number of participating women increased over the period of investigation for all journals except *AL & B*. From the first to the last 5-year interval, the number of female authors rose from 17.6 to 30.4, from 6.4 to 18.8, and from 12.2 to 19.0 for *JEAB*, *JEP: ABP*, and *L & M*, respectively. The number fell from 35.0 to 30.0 for *AL & B*. From the first to the last 5-year interval, the number of female first authors rose from 7.6 to 10.4, from 3.2 to 6.0, and from 5.0 to 7.0 for *JEAB*, *JEP: ABP* and *L & M*, respectively. The numbers fell from 12.4 to 10.8 for *AL & B* over the same years.[1]

Participation in JEAB *Relative to Similar Journals*

Figures 1, 2, and 3 show that participation by women as authors in *JEAB* lags behind their participation in the comparison journals. Participation by women in *JEAB* lags behind *AL & B* for all 12 points plotted in Figures 1 to 3; it lags behind *L & M* for 11 of 12 points. The difference between *JEAB* and the other journals may be substantial. Although participation by women in *JEAB* lags behind their participation in *JEP: ABP* by only up to 20%, participation in *JEAB* lags behind *AL & B* and *L & M* by 30% to 50%, depending on the journal and the measure.

The percentage of articles with at least one female author (Figure 1) might be biased if the average number of authors per article differed across the journals. The percentage of articles with at least one female author would rise by chance alone as the number of authors per article rises. Consistent with this argument, the average number of authors per article is somewhat smaller for *JEAB* than for the other journals. The avearge number of authors per article was 2.07, 2.24, 2.26, and 2.34 for *JEAB*, *JEP: ABP*, *AL & B*, and *L & M*, respectively, averaged over the 20 years under consideration. However, this cannot account for all of the evidence of lower participation by women in *JEAB*. The results in Figures 2 and 3 are not subject to this limitation, but they show that women participate at lower rates as authors in *JEAB* than in journals such as *AL & B* and *L & M*.

The differences in participation rates among the journals are probably not artifacts of the manner in which the data were collected. Authors with unisex names were counted as females in this analysis. Therefore, a difference would appear if more people with unisex names published in *AL & B* and *L & M* than in *JEAB*. However, the number of people with unisex names who were not known to the authors was small. Likewise, all of those who used initials and who were not specifically known to the authors were counted as males. This would contribute to the present results if more people used their initials when publishing in *JEAB* than in the other journals. More people might use their initials when publishing in *JEAB* if they modeled the behavior of prominent behavior analysts, such as B. F. Skinner, R. J. Herrnstein, or J. E. R. Staddon. However, the percentage of authors who used their initials was not larger for *JEAB* (9.0%) than for the other journals (10.7% for *JEP: ABP*; 11.5% for *AL & B*; 9.4% for *L & M*). Finally, Myers (1993) re-

[1] The number of articles published per year by *AL & B* decreased over the years under study. This reduced the number of first authorships. The number of authors per article remained relatively constant over these years. Therefore, the reduction in articles published also reduced the total number of authors per year. As a result, the number of participating women could fall, even though their percentage participation as authors and first authors increased.

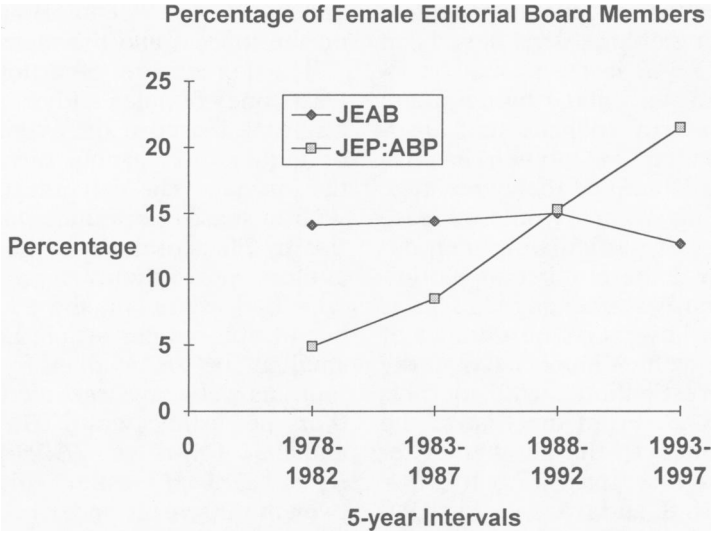

Figure 4. Percentage of female Editorial Board members over 5-year intervals from 1978 to 1997 for the *Journal of the Experimental Analysis of Behavior* (*JEAB*) and the *Journal of Experimental Psychology: Animal Behavior Processes* (*JEP: ABP*). All results are means. Each function presents the results for a different journal.

ported similar absolute rates of participation, and similar temporal changes in participation rates, by women in *JEAB* even though he used a different method of data analysis. He excluded all unknown cases from consideration.

Alternative explanations for differences in participation by women must be considered. The journals were selected to appeal to similar audiences. Therefore, the field represented by *AL & B* and *L & M* probably did not appeal more strongly to women than the field represented by *JEAB*. It also seems unlikely that differences in the selectivity of the journals could account for differing participation. Participation by women was lower in the journals with the highest (*JEAB*, acceptance = 50%) and lowest (*JEP: ABP*, acceptance = 20%) acceptance rates than in the journals with intermediate rates (*AL & B*, acceptance = 30%; *L & M*, acceptance = 30%; Buffardi & Nichols, 1981). Obviously, many subtle differences among the journals could have created the different levels of participation, but one of the remaining hypotheses is that work by women is treated differently at the different journals.

Participation at More Selective Levels

Figure 4 presents the percentage of female members of the Board of Editors of *JEAB* and the percentage of female Consulting Editors for the *Journal of Experimental Psychology: Animal Behavior Processes* during the four 5-year intervals from 1978 to 1997. Membership on these boards was determined by consulting the January issue of each year. The numbers do not include information about the Editor or Associate Editors. Including this information would bias against finding changes over time because these editors change infrequently. Information about only two journals appears in Figure 4 because they are the only journals under consideration that consistently had a formal editorial board from 1978 to 1997. A few data are also available for *AL & B*. From 1985 to 1988, 16.7% of the Consulting Editors of *AL & B* were women. Women make up only 10.9% of the Board

of Consulting Editors that was appointed in 1998.

Figure 4 shows that participation by women on the editorial board of *JEP: ABP* rose substantially from 1978 to 1997 in part because participation was low at the beginning of the period. The form of the increase suggests that, formally or informally, *JEP: ABP* has a quota for the participation of women that has increased over time. From 1978 to 1985, only one woman appeared on the editorial board; two women appeared from 1986 to 1987; three appeared from 1988 to 1993; four appeared from 1994 to 1995; and five appeared from 1996 to 1997. There were no exceptions to this pattern.

In contrast, the representation of women on the editorial board of *JEAB* remained constant or decreased slightly over the 20 years under consideration. Although Laties (1987) reported increases in the number of women on the Editorial Board of *JEAB* from 1958 to 1987, most of the increase occurred before 1980 and would not appear in Figure 4. Part of the lack of progress evident in Figure 4 was caused by the journal's fine treatment of women in the early years that we examined. From 1978 to 1982, women were marginally overrepresented on the Editorial Board (14.1%) relative to their appearance as either authors (12.6%) or first authors (10.2%). More recently, the representation of women on the editorial board has failed to keep up with their participation in the journal as a whole. From 1993 to 1997, women appeared somewhat less frequently on the editorial board (12.7%) than they appeared as authors (20.9%) or first authors (14.9%).

One potential explanation for the pattern of results reported in Figure 4 is that the increasing participation by women in *JEAB*, apparent in Figures 1, 2, and 3, has not had time to reach the Editorial Board. If this were the case, however, Figure 4 should mirror the increasing participation apparent in Figures 1, 2, and 3, but after a delay. The failure to find any increase in participation on the Editorial Board could be explained only if it takes many (15 to 20) years for authors to reach the board. This is an intuitively unappealing assumption. Although one case may not be representative, the first author served her 1st year on the Editorial Board 8 years after she published her first article in *JEAB*.

Neef (1993) pointed out that many factors could account for lower participation of women on editorial boards than as authors. Women might decline invitations to join the board more often than men decline similar invitations. In addition, candidates for editorial positions are mainly experienced authors. Therefore, fewer women might be selected for the board than appear as first authors if female first authors tended to publish few articles but male first authors tended to publish many. She showed that the editorial board of the *Journal of Applied Behavior Analysis* was drawn mainly from among its experienced authors regardless of their gender.

Neef's (1993) arguments might help to explain differences in the absolute rates of participation by women as first authors and editors, but they cannot easily explain why the temporal trends differ for first authors (Figure 3) and editorial board members (Figure 4). To explain these results, it would be necessary to assume that even though the percentage of female first authors rose over time, the number of rejected invitations to the editorial board increased or the number of papers published by individual women fell relative to publications by men at least enough to offset this rise.

Figure 5 summarizes information about the participation of women at increasingly selective levels in *JEAB* for each of the 5-year periods under investigation. We assumed that it is easier to appear as an author in *JEAB* (all) than it is to appear as a first author (first), and that it is easier to appear as a first author than to be selected for the Board of Editors (editors). For each of these three levels of selectivity, a bar repre-

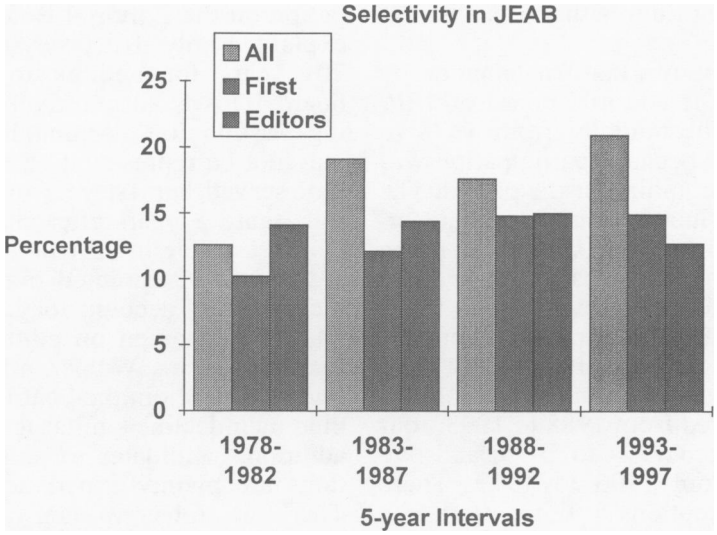

Figure 5. Percentage of women occupying each of three increasingly selective positions (author, all; first author, first; editorial board member, editors) over 5-year intervals from 1978 to 1997 for the *Journal of the Experimental Analysis of Behavior* (*JEAB*). All results are means.

sents the percentage of women who occupied that position during a 5-year interval.

Figure 5 shows that participation by women in *JEAB* did not change systematically with the selectivity of the position over the years from 1978 to 1987. For example, from 1978 to 1982, 12.6%, 10.2%, and 14.1% of authors, first authors, and editorial board members, respectively, were female. In contrast, participation by women decreases with increases in selectivity in more recent years. For example, from 1993 to 1997, 20.9%, 14.9%, and 12.7% of authors, first authors, and editorial board members, respectively, were female.

These data are consistent with the idea that a "glass ceiling" is developing for the participation of women in the experimental analysis of behavior. That is, although women are participating more in the experimental analysis of behavior, their participation is largely confined to the lower levels of the profession. A similar trend may be apparent at *AL & B*. Although conclusions based on only two points are suspect, the low participation by women on the current Editorial Board of that journal (10.9%) and the decrease in this participation rate over time (from 16.7% to 10.9%) stand in contrast to the high current participation by women as authors in *AL & B* (28.6%, authorship; 23.8%, first authorship) and the large increase in their participation as authors over time (63%, authorship; 69%, first authorship, see Figures 2 and 3).

Other less compelling data from *JEAB* are also consistent with the idea that women are increasingly excluded from more selective positions. We examined the participation of women as authors on articles that appeared to be invited rather than submitted. We did not include information from any of the recent *JEAB* special issues because manuscripts were publicly solicited for those issues. Instead, we included information from issues in which a special topic was examined (e.g., *The Behavior of Organisms* at 50) or in which commentaries appeared in the same issue as the paper on which they commented. Our data were taken from the following issues: November, 1987, September, 1988, September, 1993, January, 1996, and March, 1997. Only 9.3% of the authors of these, presumably invited, articles were female.

Although these data are suggestive, they provide less convincing evidence for the exclusion of women than the previously cited information about the Editorial Board. *JEAB* did not explicitly identify these articles as invited. In addition, women may have been invited but chose not to participate.

Summary and Suggestions for Improvement

To summarize, we found both good and bad news for women who wish to participate in the experimental analysis of behavior. On the positive side, the participation rate by women as authors in *JEAB*, the flagship journal, increased consistently and substantially (approximately 50%) from 1978 to 1997. On the negative side, two aspects of the data are consistent with, but do not compel, the conclusion that gender inequity still exists in the experimental analysis of behavior: Women are underrepresented in *JEAB* relative to their participation in similar journals, and women's participation in *JEAB* now decreases as the selectivity of the position increases. We have several suggestions for improving this situation. For other suggestions, see Poling et al. (1983).

To begin with, female undergraduates should carefully select the institutions to which they apply for graduate training. As we collected these data, we were impressed that female first authors and female members of the Editorial Board published frequently with other women. To their credit, many men also published frequently with female coauthors. However, a number of male senior authors rarely or never appeared with female coauthors. Therefore, we suggest that women who are considering graduate work in the experimental analysis of behavior determine whether they will be likely to publish with their mentors as one of the factors that they consider when selecting a graduate program.

Editors could also take special steps to ensure that manuscripts by men and women are treated similarly in the review process. Conducting blind reviews, in which the identity of the author is removed before review, should help. Blind reviews may not be successful by themselves, however. The author of a manuscript is often identifiable from many clues (e.g., subject matter, writing style) even after explicit information is removed. Therefore, we also suggest that editors send articles by female authors to at least some female reviewers. Sending an article by a female author to female reviewers does not guarantee a fairer or more favorable treatment. In fact, it could be argued that today's female Editorial Board members are more highly selected and, therefore, may have higher standards than their male counterparts. Nevertheless, our impression that female first authors and editorial board members publish frequently with other women suggests that they probably would not treat an article more harshly because of the gender of its author.

Our data suggest that editors should only rarely issue invitations to publish in the journal. Although the data are flawed because we do not know how many women turned down such invitations, women appear to be underrepresented among authors of invited publications. Failing to issue invitations to publish would eliminate this source of underrepresentation.

Editors should also rely on an objective list of authors, rather than on their memory or on calls to friends, when making selections for important positions (e.g., Editorial Board membership, any articles that they do invite). Editors may not explicitly discriminate against women when issuing invitations, but may fail to remember women's contributions as well as they remember the contributions of men. If the latter is the case, then having a reminder of women who publish in the field may help to correct the problem.

When people are considered for editorships or memberships on editorial boards, their track record of publishing with women should be considered as

one among many factors in the decision. Men may fail to publish with women for many reasons (e.g., lack of opportunity), only one of which is that they evaluate the work of women more harshly than that of men. However, when men do publish with women, it provides at least some evidence that they take women seriously enough to treat work by women fairly when serving as an editor.

Statistics on the participation of women and minorities in the experimental analysis of behavior should be formally kept. We cannot know whether the status of women is improving without knowing their current and past status. Measures such as the ones presented here are easy to collect on a yearly basis. Several other statistics could be routinely included in the annual report of journal editors. Such statistics include the number of articles submitted to the journal by men and women as both authors and first authors, the percentage of each that were accepted and rejected, the number of offers of editorial positions made to men and women, and the percentages of those positions that were accepted by men and women.

Other data might also be useful. For example, it would be useful to know the percentage of doctorates in the experimental analysis of behavior that are granted to women. The absolute participation rates by women shown in Figures 1, 2, and 3 seem low (see also Myers, 1993). For example, an average of 17.6% of all authors and an average of 13.0% of first authors in *JEAB* from 1978 to 1997 were women. However, low absolute participation rates do not show that inequitable treatment occurred without a measure of how often women would participate if gender equity prevailed. As argued earlier, several measures (percentage of women in the general population, percentage of doctorates in psychology that are held by women, percentage of female members of ABA) do not provide good estimates of expected participation. The percentage of female members of Division 25 of the American Psychological Association is also inappropriate because it confounds women in the experimental analysis of behavior with women in applied behavior analysis. The percentage of women who belong to the Experimental Analysis of Nonhuman Behavior Special Interest Group of ABA has similar flaws. The 1997–1998 *ABA Membership Directory* lists only 20 members of this group, and the list fails to include most women who publish regularly in *JEAB*. The most appropriate measure of estimated participation is probably the percentage of PhD recipients from programs in the experimental analysis of behavior who are women. However, even this number is not entirely satisfactory. It might still misestimate the expected participation of women in journal authorship because all PhD recipients do not publish. For example, some take applied jobs (e.g., for drug companies) in which publication is less likely.

Finally, we urge potential female authors not to use the possibility of unequal treatment as an excuse for failure to publish. Although this article contains information that is consistent with the idea that gender inequity still occurs, it will fail to increase women's participation in the experimental analysis of behavior if it encourages women to use unequal treatment as an explanation for their failures.

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