

Trends in Women's Participation at the Meetings of the Association for Behavior Analysis: 1975–2005

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We examined women's participation, relative to men's, at the annual meetings of the Association for Behavior Analysis (ABA) between 1975 and 2005. Among our findings are upward trends in female presenters across formats (e.g., posters), types of authorship (e.g., first authors), and specialty areas (e.g., autism). Where women have attained parity, however, they are still often underrepresented, given their percentage of membership. Women also participate less than men as sole and invited authors and discussants and in the domains of basic research and conceptual analysis, but participate more than men in the applied domain. Data from the *Journal of the Experimental Analysis of Behavior* and the *Journal of Applied Behavior Analysis* show parallel but delayed trends toward parity in basic and applied research, whereas data from *The Behavior Analyst* show only modest gains in the conceptual domain. We discuss the gender disparities in ABA's more prestigious categories of participation (e.g., invited addresses) and across its content domains, as well as in science in general, and the role of social and cultural factors in producing the disparities and how behavior analysts might aid in correcting them.

Key words: Association for Behavior Analysis, conference participation, journal authorship, gender

When the American Psychological Association (APA) was founded in 1892, women's participation was limited. They faced restricted access to graduate education and training and had few opportunities for academic placement and advancement (Hogan & Sexton, 1991; Russo & Denmark, 1987; Scarborough & Furumoto, 1987). In 1942, the National Council of Women Psychologists was formed to redress these and related problems (Mitchell, 1951; see Bryan & Boring, 1944), but few gains were made until the 1970s. The Association for Women in Psychology was founded in 1969; the Committee on Women in Psychology was estab-

lished in 1970; APA Division 35 for the Psychology of Women was formed in 1973; and APA's Women's Program Office was started in 1977 (see De Meuse, 1987; Pfafflin, 1984; Scarborough, 1994). In 1970, just over 20% of the PhD recipients in psychology were women; in 2005, the percentage was nearly 72% (Cynkar, 2007).

Founded in 1974, the Association for Behavior Analysis (ABA) was, from the start, proactive on the behalf of women. In particular, ABA's early governance sought to assure women's participation in the association (Vargas, 1989). Its Executive Council established a committee for the Professional Development of Women (Peterson, 1978). A special interest group (SIG) by that name was formed in 1979. And, between 1979 and 1984, the association's annual conference included a specialty area for Women's Issues in Behavior Analysis. These activities notwithstanding, women's participation has been less than men's in two of the field's most vital areas: journal publications and participation at ABA's annual meetings.

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With respect to publications, between 1978 and 1992, women were first authors on only 16% of the articles published in *The Behavior Analyst (TBA)*, ABA's house journal (Myers, 1993). This was about the same percentage for women authors in the field's leading journal for basic research—the *Journal of the Experimental Analysis of Behavior (JEAB)* (Myers; see also Laties, 1987; McSweeney & Swindell, 1998). In the field's leading applied journal—the *Journal of Applied Behavior Analysis (JABA)*—the percentage was twice as high at 31% but was not at parity (Myers; see also Laties; McSweeney, Donahoe, & Swindell, 2000); the *Journal of Organizational Behavior Management* had the same percentage (Culig, Dickinson, McGee, & Austin, 2005; see also Jarema, Snyderski, Bagge, Austin, & Poling, 1999; McGee, Bucklin, Dickinson, & McSweeney, 2003). These findings are consistent with other assessments of women's underrepresentation in the field. In 1992, for instance, only 4% of the 50 most published authors in applied behavior analysis were women (Hayes & Grundt, 1996). A decade later, women comprised less than 20% of the most published authors throughout behavior analysis in general (Shabani, Carr, Petursdotir, Esch, & Gillett, 2004).

As for women's participation at ABA's annual meetings, less is known. Only two pertinent studies have been published. Not unexpectedly, based on their percentage of ABA membership, women were underrepresented as authors of invited addresses, in symposia, and at poster sessions at the 1982 meeting (Poling et al., 1983). A decade later, the situation had changed little (Myers, 1993). The present paper expands on and updates these findings. First, we assess women's participation since ABA's first meeting in 1975 through 2005. Second, we address a broader array of formats, roles, levels, specialty areas, and content domains.

And third, we compare women's participation in ABA's content domains of basic and applied research and conceptual analysis with their authorship levels in three corresponding journals—*JEAB*, *JABA*, and *TBA*.

METHOD

To analyze women's participation at the meetings, we coded conference participation by gender in ABA's first conference program in 1975, in every fifth program through 2005, and in every program between 2001 and 2004 (ABA membership data were available for 2000 to 2005). The membership data allowed us to differentiate between women's parity with men (i.e., under, at, or over 50%) and their under- or overrepresentation, given their percentage of membership. Women's percentage of ABA membership was 48% (1,405 of 2,928) in 2000, 56% (1,966 of 3,501) in 2001, 58% (2,269 of 3,876) in 2002, 61% (2,600 of 4,265) in 2003, 62% (2,813 of 4,543) in 2004, and 64% (2,981 of 4,692) in 2005. Men's percentages were the reciprocal: 52%, 44%, 42%, 39%, 38%, and 36%, respectively.

Gender Coding

We coded conference participants as women if their first names were conventionally female (e.g., Mary, Erin) and as men if their first names were conventionally male (e.g., Jim, Aaron). Unless we knew their gender, participants were otherwise coded as undetermined. The mean percentage of undetermined participants across all years was 5.2%, ranging from 1.3% in 1985 to 8.9% in 2005, the latter due largely to an increase in participants from countries outside English-speaking North America. We break down these percentages further in our coding categories below and discuss their effects on our findings in our discussion.

Coding Categories

Presentations and formats. A presentation was defined as an entry in an ABA program that included a title and an author in one of four formats: poster presentations (which began in 1977 and we started coding in 1980), symposia presentations, paper presentations, and invited presentations. The mean percentage of undetermined authors across these formats was 4.3%, ranging from 1.0% for invited presentations to 6.1% for poster presentations. We did not code participants in panel discussions, invited tutorials, workshops, ABA Expos, business meetings, special events, or reunions.

Participation role. Symposia, paper sessions, and invited sessions typically have chairs, and symposia typically have discussants. We coded both for gender. The mean percentage of undetermined chairpersons was 2.8%, ranging from 0.5% for invited sessions to 5.6% for paper sessions. The percentage of undetermined symposia discussants was 1.3%.

Authorship level. Participation as an author was coded as (a) sole author, (b) first author of a coauthored presentation, and (c) other than first author of a coauthored presentation. The mean percentage of undetermined authors was 5%, ranging from 3.7% for sole authors to 5.8% for authors other than first authors.

Specialty areas. ABA began organizing its presentations into specialty areas in 1979, which we started coding for gender in 1980. For the 1975 program, we categorized and coded the presentations according to the 1979 specialty areas. For the areas established after 1979—Human Development and Gerontology (1986), Teaching Behavior Analysis (1997), and Autism (1998)—we started coding the first one in 1990 and the second two in 2000. Although the names of some specialty areas changed over time, we retained

the original names because their content remained largely the same (e.g., between 1992 and 1996, Organizational Behavior Management became Performance Management and Training). Except for the specialty area in Women's Issues in Behavior Analysis (1979–1984), we did not code areas that existed for only a few years or that appeared sporadically because they had few presentations (e.g., Computer Applications, 1985–1991; Other, 1988, 1993, 1998–2001). The mean percentage of undetermined authors across the specialty areas was 5.3%, ranging from 2.8% for Theoretical, Philosophical, and Conceptual Issues to 7.8% for Teaching Behavior Analysis.

Domains. We grouped 9 of the 12 specialty areas listed in 2005 into three content domains—basic and applied research and conceptual analysis—and coded women's participation in them as authors at any level. The specialty areas for basic research were the Experimental Analysis of Behavior and Behavioral Pharmacology. The areas for applied research were Autism; Clinical, Family, and Behavioral Medicine; Community Interventions and Social and Ethical Issues; Developmental Disabilities; Education; and Organizational Behavior Management. The area for conceptual analysis was Theoretical, Philosophical, and Conceptual Issues. We did not group the remaining areas—Human Development and Gerontology, Verbal Behavior, and Teaching Behavior Analysis—into any one domain because they included presentations in all three.

Journal comparisons. Finally, we compared the foregoing findings with those for female authors in *JEAB*, *JABA*, and *TBA* for basic and applied research and conceptual analysis, respectively. We did not include *Behavior and Philosophy* because it has had so few female authors that no reliable publication patterns could be discerned, except for the obvious. Frances McSweeney kindly provided

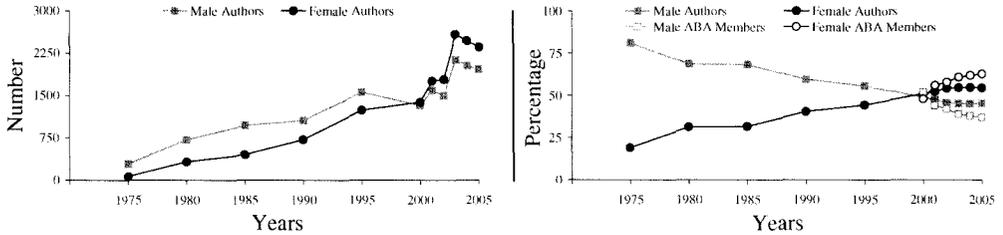


Figure 1. The left panel depicts the total number of female and male ABA authors on posters, symposium papers, papers, and invited events at the ABA meetings between 1975 and 2005. The right panel depicts the same data set on a percentage basis. The right panel also includes data on the percentage of female and male ABA members.

the gender data in *JEAB* and *JABA* from 1980 to 1995 (see McSweeney et al., 2000; McSweeney & Swindell, 1998). We ourselves coded *JEAB* and *JABA* for 1975, 2000, and 2005, and *TBA* for every 5th year between 1980 and 2005.

RESULTS

Author Gender

Figure 1 presents the number of ABA authors by gender on posters, symposium papers, papers, and invited events between 1975 and 2005. It depicts increasing numbers of women and men between 1975 and 1995, yet fewer women overall; more women than men by 2000; and then variable increases and decreases in both women and men, but with more women overall through 2005. To show these trends more clearly, the right panel displays these data as percentages. Comparing these percentages to what might be expected given women's percentage of ABA's membership between 2000 and 2005, we see that although women were above parity, they remained underrepresented.

Categories of Participation

Presentation formats. Figure 2 presents the number and percentage of authors by gender in the four presentation formats (posters, symposium papers, papers, and invited events). In each one, men outnumbered women for the first 20 years,

whereas in the past decade, women have drawn almost even with men on papers and now outnumber them on posters and symposia papers. In contrast, women have been consistently outnumbered on invited papers by about 3:1. Given their percentage of ABA's membership, women are now equally represented on posters but are underrepresented in the other formats.

Participation role. Figure 3 presents the number and percentage of ABA participants by gender for chairs of paper sessions and invited sessions. Chairs of paper sessions are typically those who organize the sessions, whereas chairs of invited sessions are often the specialty area coordinators or members who propose the invited authors. As chairs, women have consistently been outnumbered by men, albeit with some convergence over time until recently, when the trends have reversed. Although we coded the number and percentage of participants as discussants on paper sessions and invited sessions, we have not included these data because the cases were too few to depict meaningful relations. The data, however, are available on request.

Figure 4 presents the number and percentage of participants by gender for chairs and discussants of symposia. Chairs of symposia are typically those who organize the sessions; discussants are usually selected from among the established researchers in the specialty area. In these roles,

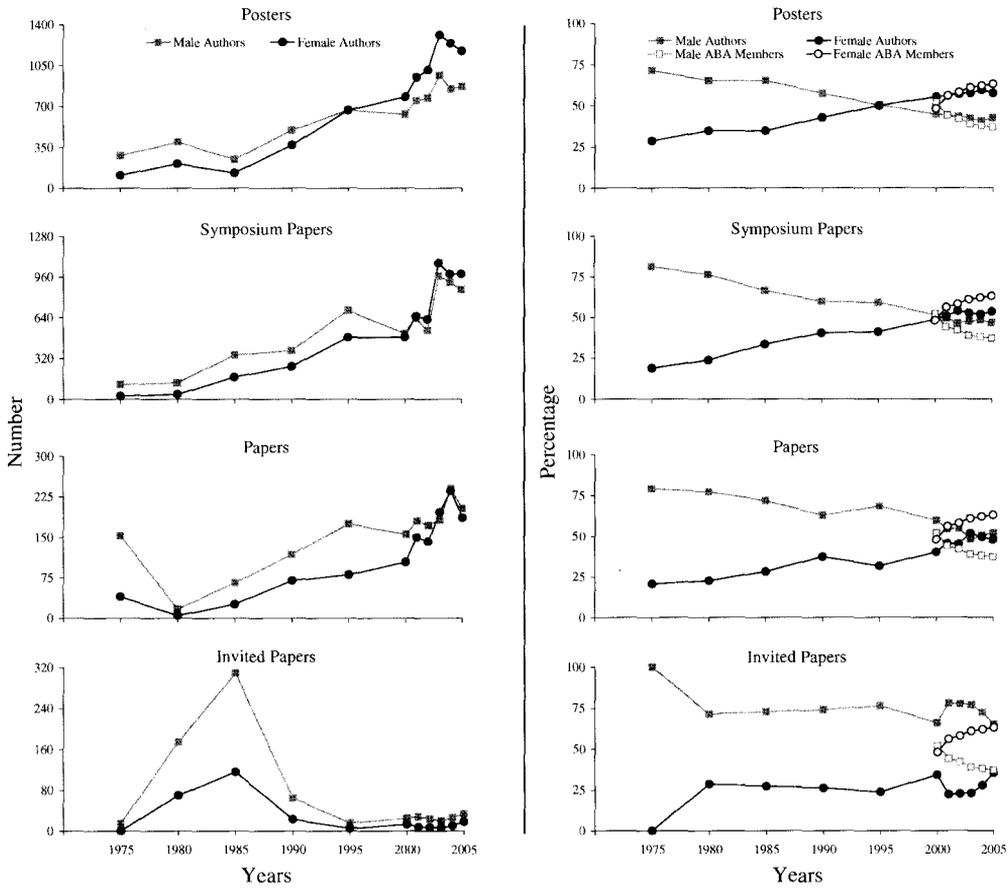


Figure 2. From top to bottom, the left and right panels depict, respectively, the total number and the percentage of female and male authors for posters, symposium papers, papers, and for posters, symposium papers, and invited papers at the ABA meetings between 1975 and 2005. The right panels also include data on the percentage of female and male ABA members.

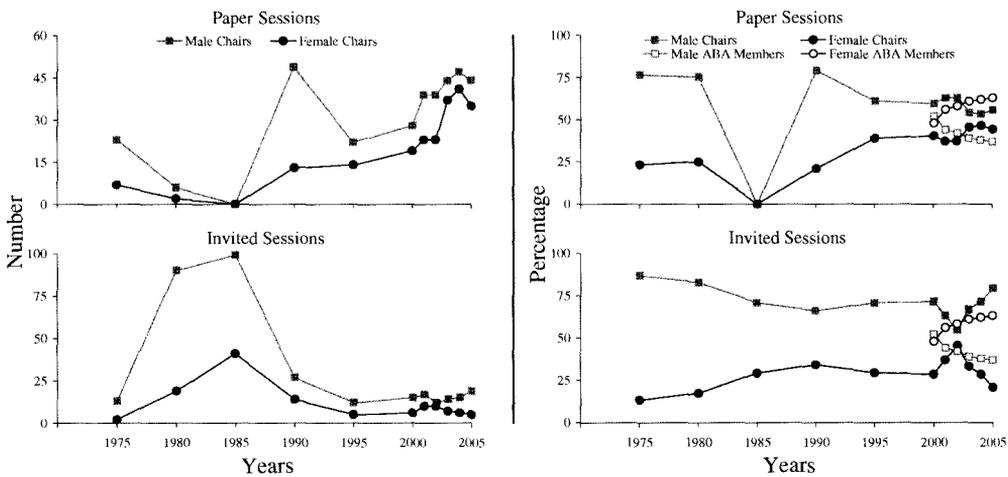


Figure 3. From top to bottom, the left and right panels depict, respectively, the total number and the percentage of female and male chairs of paper sessions and discussants of invited sessions at the ABA meetings between 1975 and 2005. The right panels also include data on the percentage of female and male ABA members.

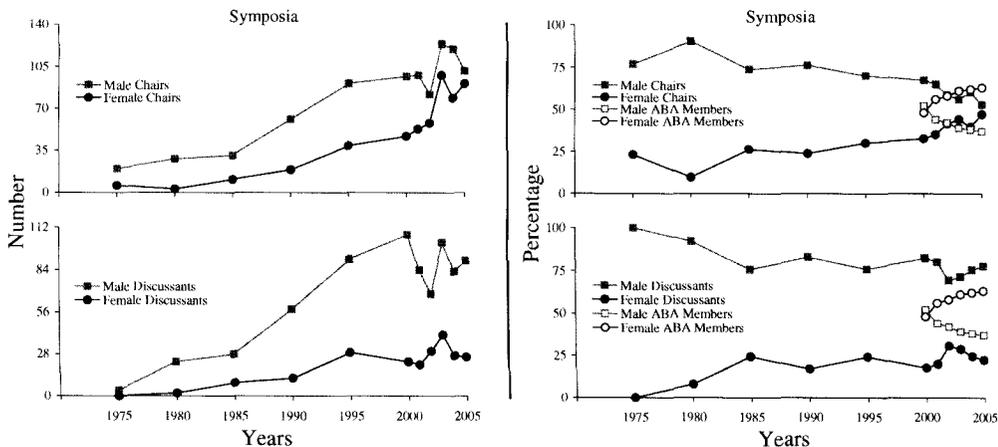


Figure 4. From top to bottom, the left and right panels depict, respectively, the total number and the percentage of female and male chairs and discussants of symposia at the ABA meetings between 1975 and 2005. The right panels also include data on the percentage of female and male ABA members.

women have been consistently outnumbered by men, especially as symposia discussants, although some convergence has occurred.

Authorship level. Figure 5 shows that female coauthors (other than first author) and female first authors among coauthors were nearly at

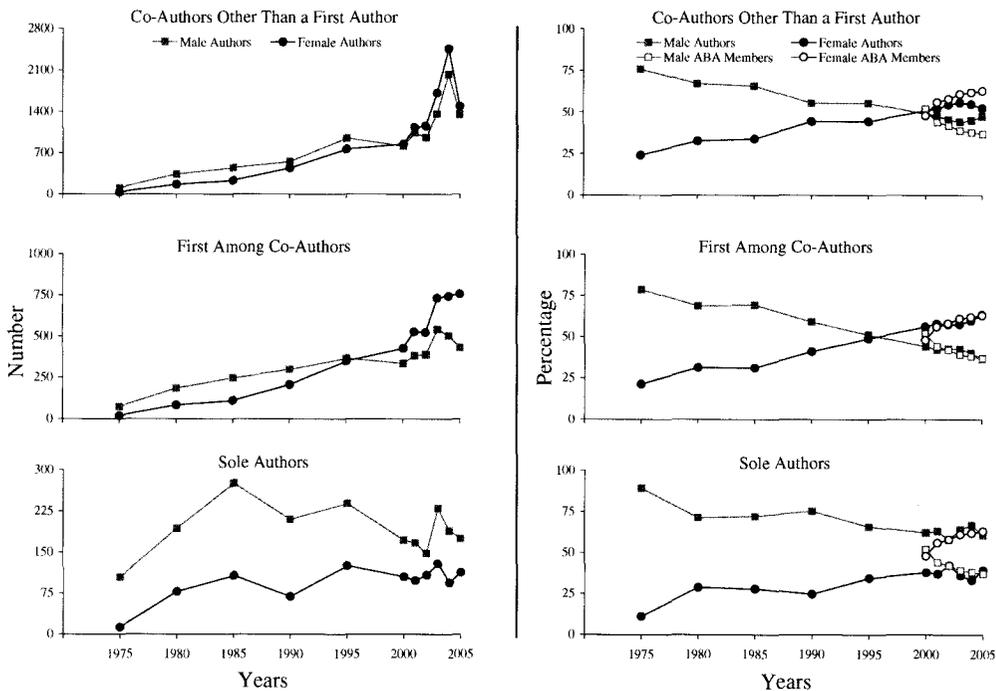


Figure 5. From top to bottom, the left and right panels depict, respectively, the total number and the percentage of female and male coauthors other than first authors, first authors among coauthors, and sole authors at the ABA meetings between 1975 and 2005. The right panels also include data on the percentage of female and male ABA members.

TABLE 1

Percentage of Female Authors within each Specialty Area at ABA Conventions

Specialty Area	Percentage of Female Convention Authors										
	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
Autism						64.9	67.1	70.0	68.8	68.4	70.7
Teaching Behavior Analysis						52.7*	52.6*	67.0	58.2*	49.4	59.8*
Education	26.9	34.5	32.9	49.0	55.4	57.4	61.4	58.5*	56.6*	60.6*	58.6*
Developmental Disabilities	30.0	35.7	35.7	51.1	54.0	53.5	54.2*	52.8	56.4*	57.2*	55.4
Clinical; Family; Behavioral Medicine	23.9	32.0	37.8	42.0	44.4	50.7*	56.8*	55.0*	55.3	51.6	52.4
Community Interventions; Social and Ethical Issues	14.3	27.3	29.3	23.6	51.8	40.5	50.0	42.5	49.1	48.2	51.0
Human Development; Gerontology				46.2	44.8	42.4*	50.0*	38.0	44.3	55.8	48.9
Verbal Behavior	0.0	26.2	40.7	35.4	35.4	58.0	41.0	59.3*	65.0*	50.7	48.6
Organizational Behavior Management	10.0	12.9	36.4	32.9	32.0	40.9	43.5	45.8	48.7	48.1	48.5
Behavioral Pharmacology	0.0	40.0	21.6	16.0	39.4	42.7	31.0	40.0	46.2	48.8	47.8
Experimental Analysis of Behavior	7.6	13.6	22.7	27.8	36.3	40.3	41.1	42.0	42.0	41.9	42.0
Theoretical, Philosophical, & Conceptual Issues	0.0	26.9	18.9	28.6	20.7	31.2	38.9	49.0	39.2	31.8	41.2

Female ABA membership data were available for 2000 through 2005: 48% in 2000, 56% in 2001, 58% in 2002, 61% in 2003, 62% in 2004, and 63% in 2005. Numbers in bold exceed the female ABA membership percentage by at least 5%. Numbers with an asterisk are within 5% of the female ABA membership rate.

parity with male authors by 1995, after which they overtook them. The trend for the former, though, has reversed. As first authors among coauthors, women are now almost equally represented, but as sole authors they are not, although the trend has been upward.

Specialty areas. Table 1 lists the percentage of female authors in ABA's 12 specialty areas, ranked by their percentages of authorship at the 2005 meeting. In 1975, the percentages were under 33% in every area, with three areas at zero. By 2005, all of the areas were over 33%, with half of them over 50%, some having increased by a factor of four or more (e.g., Experimental Analysis of Behavior). Women are today well represented in the applied specialty areas (e.g., Autism) but are poorly represented in the basic and conceptual areas. As for Women's Issues in Behavior Analysis (1979–1984), the mean percentage of female authors

was 91.3% (range, 75% to 100%), with a bimodal distribution over time and a slightly decreasing trend.

Comparisons: ABA and Journal Authors

Figure 6 presents comparisons of ABA authors and journal authors by content domain. The left panel depicts the percentage of authors by gender in ABA's basic, applied, and conceptual domains; the right panel depicts their percentages in the three related journals. The percentage of female authors in ABA's content domains was at first low, but has increased over time. In the applied domain, women surpassed men by 1995. In 2005, their percentage was 59.6%. In the basic domain, the increase has tapered off. In 2005, women's percentage was 41.8%. In the conceptual domain, the percentage of female authors has increased over the past decade, but still lags

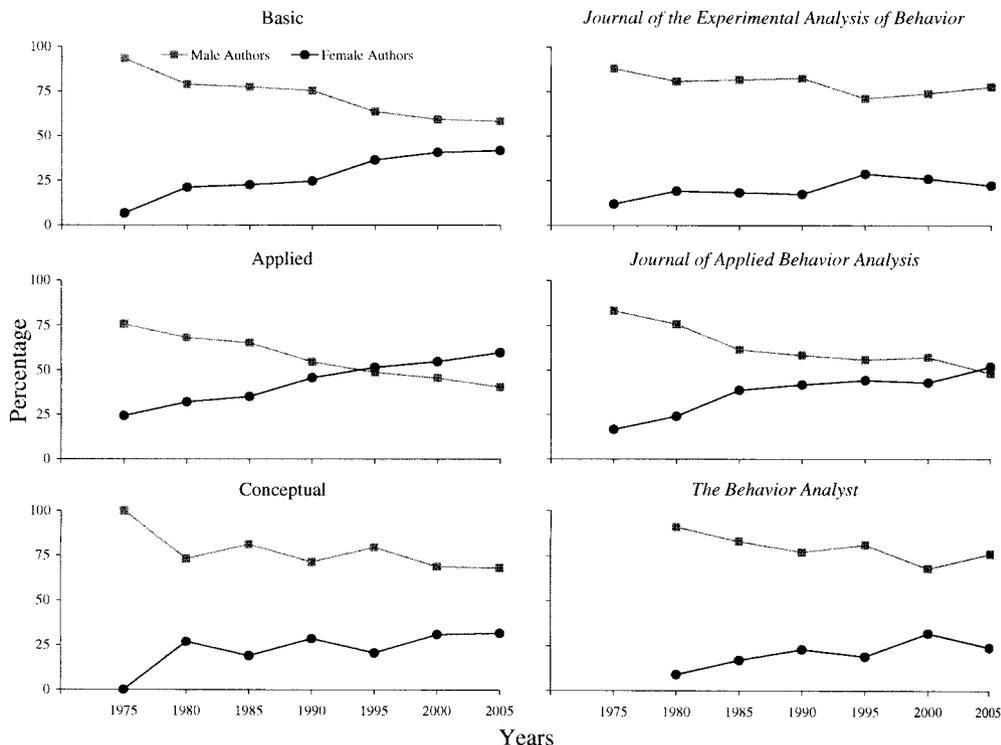


Figure 6. From top to bottom, the left panel depicts the percentage of female and male authors in the domains of basic research, applied research, and conceptual analysis at the ABA meetings between 1975 and 2005. The right panel depicts the data for female and male authors in three comparable journals: the *Journal of the Experimental Analysis of Behavior* (JEAB), the *Journal of Applied Behavior Analysis* (JABA), and *The Behavior Analyst* (TBA) for the available years.

significantly behind that of men. In 2005, it was 31.8%.

In the basic, applied, and conceptual journals, the increases in female authors have lagged behind those in their respective domains at ABA; indeed, in the basic and conceptual domains, the increases have recently ceased or reversed. By 2004, the percentage of female JABA authors passed that of males. In 2005, it was 51.9%. In JEAB, the percentage of female authors increased between 1975 and 1995 but has remained unchanged since then. In 2005, it was 22.3%. In TBA, the percentage of female authors increased steadily between 1980 and 1990 but has since been variable. In 2005, it was 24%.

DISCUSSION

As ABA's overall membership has grown in the past 30 years, so too has its female membership, eventually at a higher rate than male membership, such that, by 2001, women outnumbered men. The number of female authors at the ABA meetings also eventually grew at a higher rate than male authors, becoming a majority by 2000. In 2005, though, women were still below parity in 7 of the 11 presentation formats, in participation roles, and in authorship levels, especially in the relatively more prestigious formats (invited authors, sole authors, and symposia discussants). Moreover, given their percentage of the ABA membership, women were

underrepresented in all but two categories (posters and first author among coauthors). In ABA's 12 specialty areas, women were below parity in 6 of them and underrepresented in 11, most notably in basic research and conceptual analysis.

Disparities in Prestigious Activities

Although women have made significant gains in their absolute levels of participation at the ABA meetings, they continue to be underrepresented in activities to which some prestige accrues. For instance, although the number of female authors on posters approximates their percentage of membership, their percentage of participation on invited papers is at least three times lower than that of men. Posters are open for anyone to submit; invited papers are not. This disparity may have several sources. First, it may be due to the gender of the area coordinators who select the invited papers. However, when we coded coordinator gender, we found no systematic variations related to the percentage of invited female authors. For instance, in 1985, 1990, and 1995, the percentage of female coordinators was 39%, 53%, and 15%, respectively; however, the percentage of female invited authors hardly varied: 27%, 26%, and 24%.

A second source of disparity in the invited papers and discussants may lie in ABA's age cohorts (see, e.g., Laties, 1987). First, as seen in Figure 1, female authors were outnumbered by male authors by almost 3:1 in the first decade of the organization's existence. Given this cohort's now senior status, its members are more likely to be invited as authors than members from younger cohorts. However, if the ratio of male to female women participants in that cohort is still 3:1, then women would likely be outnumbered by that ratio as invited authors, which they were (see Figure 2). Second, since 1985, women have joined ABA at higher

rates than men. As a result, their overall membership percentage has increased in contrast to that of the women in the cohort from whom invited authors are likely drawn. The increase in women's membership thus both increases their expected participation as invited authors and decreases the percentage of women from which they would be drawn. Perhaps as the older cohort retires, women's participation as invited authors will move closer to their representation in ABA.

These two analyses assume, of course, that women and men make comparable contributions to behavior analysis over time and drop out or retire at comparable rates. The former assumption, though, may not be valid. Women publish fewer multiple articles in *JEAB* and *JABA* than men (Iwata & Lent, 1984; Laties, 1987; Neef, 1993). Thus, although the number of female ABA authors and *JEAB* and *JABA* authors has increased, women's contributions may take longer to emerge because, overall, they publish at lower rates. This is true in science in general (Cole, 1987) and in psychology (Rodgers & Maranto, 1989). In psychology, for example, in the late 1970s, men out-published women by a ratio of almost 3:1 (Helmreich, Spence, Beane, Lucker, & Mathews, 1980); even today, the ratio is close to 1.5:1 among academic clinical psychologists (Posen, Templer, Forward, Stokes, & Stephens, 2005). This difference, of course, may be mediated by correlates such as the content domain (i.e., basic, applied, conceptual), academic position (e.g., instructor, professor), and the prestige of an academic institution (see Simonton, 2002, pp. 306-307).

A third source of disparity in the invited addresses may be the number of women who hold academic and research positions in comparison to clinical and private sector positions. The former likely make more presentations and publish more often,

thereby making them more likely to be invited as speakers and discussants. If relatively fewer female members of ABA are in these positions compared to male members, then the pool of women from which invited authors and discussants are selected would be relatively smaller. Thus, women's lower participation at ABA in areas of higher prestige may reflect the actual numbers of members from whom invited authors and discussants are drawn.

A fourth source of disparity may be related to women's responsibilities outside the discipline, for instance, as primary caregivers of their children and other family members (for historical accounts, see Scarborough & Furumoto, 1987). Women may have fewer presentations when they (a) are pregnant, (b) have young children, and (c) care for ill or elderly family members. However, although these competing contingencies are time consuming, longitudinal data on the productivity of female scientists in mathematics, the physical and biological sciences, and psychology suggest that neither marriage nor motherhood reduces the number of papers women publish in professional journals (Cole & Zuckerman, 1987). Moreover, female scientists with and without children seemingly publish at similar rates regardless of their scientific stature (i.e., assistant professors, full professors, members of the National Academy of Arts and Sciences). Whether this is true of behavior analysts is unknown. Even if it is true, women may still present papers at lower rates because of the time and expense of conference travel, given family obligations, and the relatively greater prestige of publishing compared to presenting, without the former's related costs. This, though, remains unknown.

The effects of the forgoing sources of disparity are, of course, empirical matters for which evidence, especially more recent evidence, is needed, as are additional measures. Measures of

women's participation in ABA other than ABA membership might include membership by gender and (a) age cohort or level (i.e., student, full), (b) terminal degree (e.g., doctorate, masters), (c) specialty area, and (d) basic or applied research or practice. ABA membership may still be a better measure of an individual's commitment to the field than conference registration alone. Conference registrants may be less committed, such that their numbers and participation vary more as a function of cycles of special interests and conference sites. The percentage of women's ABA conference registration, for instance, has been higher than that for their ABA membership every year since 2000: 57% (1,303 of 2,293), 59% (1,616 of 2,724), 64% (1,817 of 2,860), 63% (2,027 of 3,197), 66% (2,480 of 3,777), and 67% (2,552 of 3,800). This may correlate with the increased numbers and percentages of presentations in developmental disabilities among junior members of the field, creating an apparent underrepresentation of women giving invited addresses and serving as discussants.

Disparities Overall

Future research could extend our findings in still other ways. First, it could include formats we did not code. For instance, coding for panel discussions, invited tutorials, workshops, ABA Expos, business meetings, special events, or reunions might reveal similarities or dissimilarities with our categories of participation. Second, our count of authors and participants was a count of the number of times a name was listed in a program, not the number of individuals who participated in it. Any differential interaction of these numbers by gender may thus make our analyses not completely reflective of women's participation at ABA. Third, our analyses were based on the number of authors, not the quality of

their presentations or their impact on the field. Women, for instance, may give fewer invited presentations than men, but their impact may be greater, as measured, for instance, by citation analyses of publications based on the presentations.

Finally, women's participation at ABA may have been underrepresented in our study because they, more than men, might have gender-neutral names and use initials, thus making them overrepresented in our undetermined category of coding. To assess whether a comprehensive coding of participant gender would have altered our findings, we examined the categories that had the highest percentage of undetermined authors: conference year (8.9% in 2005), presentation format (6.1% of the posters), participation role (5.6% of the paper session chairs, and authorship level (5.8% of authors other than first authors). Except for participation role, more women than men have participated in these categories since 2000. Thus, if women were overrepresented among undetermined participants, our conclusions would not have been qualitatively different, only different by degree. The categories in which women were more likely underrepresented since 2000 had among the lowest percentage of undetermined authors, meaning our conclusions about them would be little affected. One final note: In 2005, the year with the highest percentage of undetermined gender (8.9%), no authors were undetermined because of their initials and only 2.7% were undetermined because of gender-neutral names. The percentage was mainly due to the number of names that were in languages unfamiliar to us. Whether these differentially interact with gender across countries is an empirical question.

Domain-Specific Disparities

Our comparison of ABA authors to journal authors in the basic,

applied, and conceptual domains yielded two main findings. First, women are better represented as authors in the three domains of ABA presentations than in the comparable domain-specific journals. This might be expected because of the time lag between presenting papers and posters and their publication. If no interactions exist between gender and the probability of presentations becoming publications, then changes in women's publications should track the patterns of change in their ABA presentations, barring any meaningfulness to some recent reversals at ABA.

The second main finding is that more women participate in the applied domain than in basic research and conceptual analysis. This presumably reflects differences in women's interests, not any systematic bias within ABA. However, we had no domain-specific membership percentages by gender that would allow us to assess variations across them. One approximation to these percentages might be women's membership in ABA's SIGs (e.g., in autism), but these are unknown. Another approximation might be domain-specific differences in journal authors (see also McSweeney et al., 2000; McSweeney & Parks, 2002). Here, we know that the gender differences in authors are a function of the number of submissions rather than editorial processing (Iwata & Lent, 1984; Odum, 2000). Beyond that, no baseline levels of participation have been established by domain or journal that would allow us to determine relative differences in the rates at which women and men submit manuscripts for publication. These levels might reflect the degree to which women participate in a journal's domain of inquiry, which might be approximated by the gender of a journal's subscribers. Overall, however, the differences we found are comparable to those in APA: Except for developmental psychology, fewer

women participate in its experimental and cognitive divisions than in its clinical and counseling divisions (American Psychological Association, 2002; Cynkar, 2007).

Our having found no obvious source for women's differential participation in the ABA-based domains does not mean that nonobvious sources do not exist (e.g., aggregate between and within personal or unknown biases; Handelsman et al., 2005; Ruiz, 2003). Uncovering these sources, though, was beyond the purpose and purview of our research and requires methods other than our own (e.g., interviews, surveys; Liff & Ward, 2001; Probert, 2005). In the end, we expect that the major source of the gender differences and the nonobvious sources are cultural, as we describe below (for a review of the evidence on nature and nurture as determinants of the number of women in science, see Ceci & Williams, 2006).

Culturally Based Disparities

The domain-specific differences in women's conference presentations are, presumably, embedded in social contingencies and cultural metacontingencies across the life span. Gender differences in occupations, for instance, are correlated with gender-based socialization practices (Daly, 1996; Hoffman, 1972; Vetter, 1992). Research in early childhood shows that parents and caregivers typically socialize children in accord with the child's gender. Boys are more often taught to focus on achievement and independence, whereas girls are taught to foster relationships and to nurture and care for others (Barry, Bacon, & Child, 1957; Broadhurst, 1988), typically through the parents' and caregivers' selection of toys, activities, and chores (Daly; Fagot & Leinbach, 1993). Even if parents and caregivers do not encourage the use of gender-typed toys, they still respond to children more positively

when they are engaged in gender-appropriate behavior than when they are not (e.g., Caldera, Huston, & O'Brien, 1989; Fagot & Hagan, 1991; Leaper, Leve, Strasser, & Schwartz, 1995).

Cultural practices outside the home also establish and maintain gender-related differences. Descriptive research has shown that gender-typed play may be differentially reinforced and punished in early child-care settings (see Fagot & Patterson, 1969; Serbin, O'Leary, Kent, & Tonick, 1973), and experimental research has shown that social contingencies and context (e.g., presence of a teacher, peer, or model) can affect the rates of gender-typed play (e.g., Green, Bigler, & Catherwood, 2004; Langlois & Downs, 1980). Related research in education has found differential (a) gender-role depictions of female and male characters in children's stories (e.g., Hitchcock & Tompkins, 1987; Nibbelink, Stockdale, & Mangru, 1986) and educational computer software (e.g., see McNair, Kirova-Petrova, & Bhargava, 2001), (b) portrayals of female and male roles in elementary, secondary, and college textbooks (e.g., the exclusion of biographies of female scientists, gender bias; see Hulme, 1988; Kleinman, 1998; Sadker & Sadker, 1980), and (c) treatment of girls and boys in classrooms (e.g., girls are praised more for the appearance of their work, boys are praised more for its quality; see Irvine, 1986; Lubbers & Menting, 1987; Sadker & Sadker, 1994). A consistent and troubling finding of these studies is that most teachers do not see that they are acting differentially toward girls and boys until they are shown this directly (e.g., videotapes of their teaching performances; see Sadker & Sadker, 1994).

These differential practices may account for girls' and boys' academic interests and performance by subject matter. Descriptive research, for ex-

ample, indicates that girls and boys have similar interests and performance in mathematics and science when they enter elementary school, but that, by the end, girls show less interest in science than boys (Jones, Howe, & Rua, 2000; Sadker & Sadker, 1985). In middle school, this gap appears to widen, as girls report fewer science experiences than boys (Blosser, 1990; Catsambis, 1995). In high school, when mathematics and science courses become optional, girls enroll in them at lower rates than boys (Blosser; Broadhurst, 1988; Oakes, 1990). By the time students enter college, these choices may affect their selection of science over non-science majors or, within a major such as psychology, their choice of basic over applied research.

Addressing the Disparities

Behavior analysts could contribute to changing the social contingencies and cultural metacontingencies that lead to gender-based disparities within their field and its domains. Institutionally, for instance, ABA could proactively assess and evaluate women's and men's participation at its annual meetings and distribute resources to counter the contingencies that work against equal representation for either gender. This might include monitoring and encouraging women's and men's participation in all of ABA's conference activities and recruiting their differential participation in activities in which they are underrepresented, for instance, with research internships, fellowships, and awards. These activities might also be directed toward protected minority members of ABA (e.g., African-Americans, Hispanics).

Behavior-analytic efforts might be also extended to developing, implementing, and evaluating interventions for redressing these problems outside the association, for instance, in early child care (e.g., workshops for child-care providers and parents;

National Science Foundation, 2003; U.S. Department of Education, 2001), secondary education and community settings (e.g., afterschool programs, summer camps; American Association of University Women, 2004; National Science Foundation, 2003), higher education (e.g., faculty recruitment and mentoring programs, internships; Urban Institute Education Policy Center, 2000; U.S. Department of Education, 2001), higher education training (e.g., teacher training, educational resources; American Association of University Women, 1992), academic positions (e.g., equity in responsibilities and compensation; APA, 2000; Kite et al., 2001), and the workforce (e.g., pay equity; Women Employed Institute, 2000). These are problems of social importance to which behavior analysts could and should bring the force of their science, research methods, and empirically based interventions (Biglan, 1995; Guerin, 1994; Vogeltanz, Sigmon, & Vickers, 1998).

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