



# Participants in Behavior-Analytic Sports Studies: Can Anybody Play?

Katarina Rotta<sup>1</sup> · Anita Li<sup>1</sup> · Alan Poling<sup>2</sup>

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## Abstract

Participating in athletics confers a wide range of benefits, regardless of participants' gender or disability status. Our review of 95 behavior-analytic sports-performance articles revealed that over half of them included at least 1 female participant, but only 5 included at least 1 participant with a reported developmental disability. Given that females are often underrepresented as research participants, and that female athletes face unique barriers, it is heartening that so many articles involved female participants. Moreover, there were more female than male participants overall. However, it is surprising and distressing that so few articles involved participants with a developmental disability. Participating in sports can be a lifelong source of fitness, friends, and fun. Practitioners should encourage people of all ages, races, and genders, and from all disability categories, to find a sport they like, to learn to do it well enough to enjoy it, and to do it regularly. Researchers should give them the tools necessary to make those efforts as easy, and as fruitful, as possible. Nothing but good can come from these efforts.

**Keywords** Bibliometric analysis · Developmental disabilities · Gender issues · Inclusivity · Sports performance · Women

Behavior analysts have developed effective interventions for improving performance in several different sports. Research in this area is summarized in a book edited by Luiselli and Reed (2011) and in recent reviews by Luiselli and Reed (2015) and Schenk and Miltenberger (2019). Sports are big business, as evidenced by the \$1.06 billion in revenue generated by U.S. college sports during 2016–2017 (Rovell, 2018) and the substantially larger sums generated by professional sports, such as the National Football League, which generated over \$15 billion in revenue during the 2017 season (Howmuch.net, 2018). Exemplary performance in several sports can lead to college scholarships and, in some sports, to lucrative professional contracts.

But the benefits of developing sports skills are by no means limited to elite athletes. Participating in sports at all levels has health, psychological, and social benefits (Allender, Cowburn, & Foster, 2006; Eime, Young, Harvey, Charity, & Payne, 2013). Health improvements include preventing disease and ameliorating deleterious effects of aging via

enhanced skeletal muscle, tendon, and joint function due to repeated practice and training. Sports participation also reduces the risk of osteoporosis, depression, and anxiety, which are more common among women than among men, but problems for both (Fentem, 1994). Beyond that, participating in sports increases social interaction and social support and is associated with greater life satisfaction (Eime et al., 2013). Some degree of competency is required to participate in any sport. Competent, and in some cases exemplary, sports performance is of social significance for participants and hence a worthy target for applied behavior analysts.

Many people can remember a time when very few girls and women participated in sports, largely because they were denied the opportunity. Early feminists and their allies demanded change, and it came, in part because of the passage of Title IX of the Federal Education Amendments of 1972 (Bell, 2008). Title IX, enforced by the Office of Civil Rights of the Department of Education, states that “no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance” (U.S. Department of Education, 2015, para. 2). Today, girls and women have the opportunity to participate in organized sports at the high school and college levels, and many do so. For example, in 2017–2018, 3,415,306 girls participated in high school sports

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✉ Alan Poling  
alan.poling@wmich.edu

<sup>1</sup> Western Michigan University, Kalamazoo, MI, USA

<sup>2</sup> Department of Psychology, Western Michigan University, Wood Hall, 1903 West Michigan Avenue, Kalamazoo, MI 49008, USA

(National Federation of State High School Associations, 2018) and 216,378 women participated in National Collegiate Athletic Association (NCAA) championship sports (NCAA, 2018). For boys and men, the respective values were 4,565,580 and 278,614.

Behavior analysts have long been interested in gender issues and reported data relevant to them (e.g., Poling et al., 1983). For example, they have found that male participants are overrepresented in many, but not all, of the research areas of interest to behavior analysts, which may be a reason for concern (see Li, Wallace, Ehrhardt, & Poling, 2017; Poling et al., 2009). To our knowledge, there is no published report of the gender of participants in behavior-analytic sports-performance research.

In consideration of behavior analysts' well-founded interest in both sports and gender issues, we examined the gender of participants in articles covered in Schenk and Miltenberger's (2019) recent and extensive review of behavioral interventions to enhance sports performance. They searched four databases (PsycINFO, ERIC, PsycArticles, and Education: A SAGE full-text collection) using the search terms "sports" and "behavior analysis" together. Articles were included in their review if they involved a behavioral intervention, which they defined as "any form of an intervention that might alter an observable behavior," and the target behavior was sports performance, "consisting of measurement of an of an athlete's observable behavior" (p. 249). Articles were excluded "if the focus was solely on physical activity (i.e., exercise promotion) rather than sports performance" or "if the focus was therapeutic instead of performance based" (p. 249). Reference lists of the articles selected for inclusion were perused in an attempt to find other relevant articles that were not detected by searching the databases. A total of 101 articles were included in their review. Although their search procedures may have missed a few relevant articles, they appear to be sound and to have yielded a broad and nearly comprehensive set of articles. For these reasons, we chose to examine the gender of participants in the articles reviewed by Schenk and Miltenberger, rather than to conduct an independent search for relevant articles.

The benefits of participating in sports are not confined to neurotypical populations. This is evident when the effects of sports participation by people with an intellectual disability are considered (see, e.g., Grandisson, Tétréault, & Freeman, 2012). There is good evidence that participating in sports can, for example, increase self-esteem (e.g., Castagno, 2001; Siperstein & Hardman, 2006), enhance social competency (e.g., Dykens & Cohen, 1996; Siperstein & Hardman, 2006), and foster healthy living habits (e.g., Hawkins & Look, 2006) in members of this population. Developing competent performance might well magnify the benefits of sports participation by such individuals, and by other people with developmental disabilities. Therefore, and in view of the fact that research in other areas of applied behavior analysis often

involves participants with developmental disabilities, we determined how many of the studies reviewed by Schenk and Miltenberger (2019) included participants with developmental disabilities. Finally, we determined whether the gender of the first, second, and last author was related to the gender of the participants whom they studied. The first author has a primary role in the research project (American Psychological Association, 2020), and the senior, and supervisory, member of the research team often appears as the second, or as the last, author. Individuals in any of these positions seemingly could influence the participants studied.

## Method

The first author perused each of the intervention articles identified by Schenk and Miltenberger (2019) in their Table 1 and recorded whether the study involved only male participants, only female participants, or both male and female participants, as well as the number of male and female participants (one article did not provide this information). She also recorded whether any participant was described as having a developmental disability and, if so, the nature of the disability. Six articles did not report the gender of participants, and they are not considered in our analysis. For the articles that are considered, the rater recorded the gender of the first, second, and last author of each article. Authors were designated as male or female according to their first names as outlined by McSweeney and Swindell (1998). If gender could not be determined on this basis, a Google search was conducted using the person's full name to determine gender from sources such as a university web page, as described by Li, Curiel, Pritchard, and Poling (2018). When an article had only two authors, the person listed second was considered as the last, not the second, author.

**Table 1** The Gender of Participants as a Function of the Gender of Authors

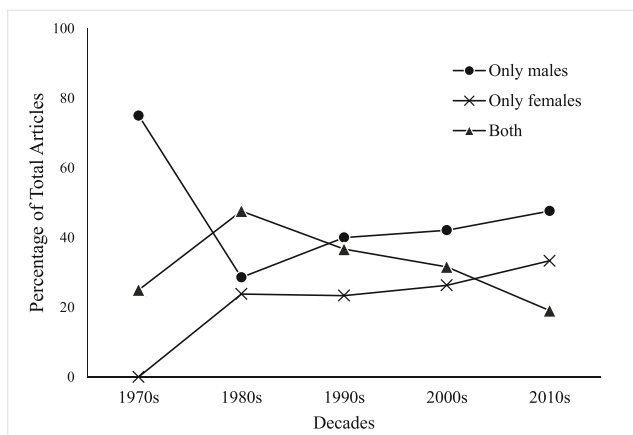
Percentage of Articles With These Participants					
Female first author ( <i>N</i> = 40)			Male first author ( <i>N</i> = 56)		
Female only	Male only	Both	Female only	Male only	Both
40	15	40	13	55	27
Female second author ( <i>N</i> = 8)			Male second author ( <i>N</i> = 34)		
Female only	Male only	Both	Female only	Male only	Both
13	50	38	35	32	29
Female last author ( <i>N</i> = 15)			Male last author ( <i>N</i> = 68)		
Female only	Male only	Both	Female only	Male only	Both
53	20	27	19	44	34

*Note.* Not all percentages sum to 100 because not all articles reported on participant gender.

All of the articles considered by Schenk and Miltenberger (2019), and by us, described an original study that examined sports performance. Therefore, we excluded studies that focused on general physical activity and physical education. Literature reviews, conceptual articles, and unpublished dissertations or theses also were excluded. A second rater independently scored 20 of the total 101 articles (19.8%), selected at random. Interobserver agreement across all categories was 94.4%. When the raters disagreed, they examined the article together and reached a consensus as to the correct rating, which is reported.

## Results

We analyzed a total of 95 articles, 4 of which appeared in the 1970s, 21 in the 1980s, 30 in the 1990s, 19 in the 2000s, and 21 in the 2010s. Two articles appeared in the 1960s, but neither reported the gender of participants, hence we did not analyze them. No article provided information about nonbinary or transgender athletes. Across all years, 41% of the analyzed studies included only male participants, 25% included only female participants, and 34% included both. Figure 1 shows the percentage of articles involving only male participants, only female participants, and both male and female participants across decades. In the 1970s, three of the four studies (75% of the total) included only male participants and one study (25%) included both male and female participants. In the 1980s, 28% of the studies included only males, 24% included only females, and 48% included both. The percentage of articles including only male participants increased across decades from the 1980s through the 2010s, with values across decades of 28%, 40%, 42%, and 48%. The percentage of articles including only female participants also increased across this period, with values across decades of 24%, 23%, 26%, and 33%. The percentage of articles with both male and



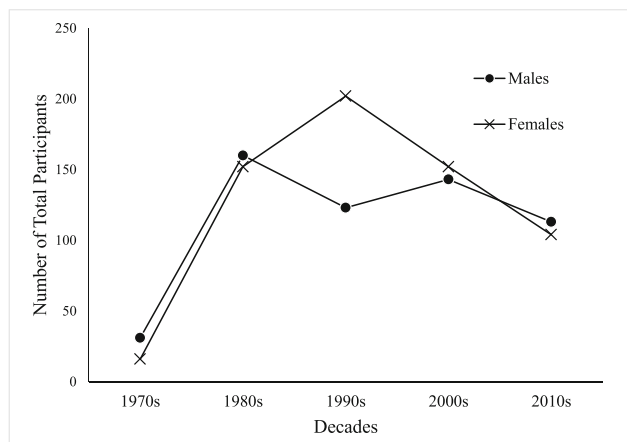
**Fig. 1.** Percentage of articles that involved only male, only female, or both male and female gender participation across decades from the 1970s to the 2010s

female participants generally decreased from the 1980s through the 2010s, with values of 48%, 37%, 32%, and 19%.

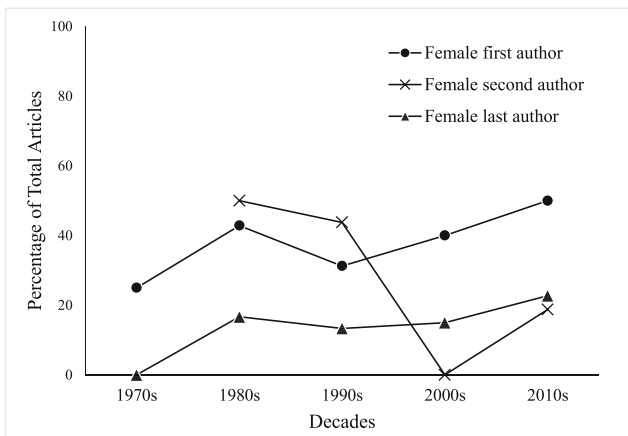
Overall, there were 626 female participants and 570 male participants in the studies we examined. Figure 2 shows the total number of male and female participants in each decade. There were more male participants than female participants in the 1970s, 1980s, and 2010s and more females than males in the 1990s and 2000s. We were able to determine the gender of the first author for 96% of the articles, the second author for 89% of the 47 articles where this measure was appropriate, and the last author for 93% of the 91 articles where this measure applied. For the articles where the gender of authors could be determined, 39% of first authors, 17% of second authors, and 16% of last authors were female. Figure 3 depicts by decade the percentage of total articles with females in each of these authorship positions. Both the percentage of articles with a female first author and the percentage of articles with a female last author generally increased across time. The percentage of articles with a female second author decreased over the decades, but there were relatively few articles in this category, which makes it difficult to interpret these findings.

Table 1 shows the percentage of total articles with only female participants, only male participants, and both male and female participants as a function of the gender and position of authors. With the exception of second authors, which were relatively few, male authors were more likely to study male participants than female participants, and female authors were more likely to study female participants than male participants.

Of the five articles targeting individuals with a reported developmental disability, two included individuals with autism spectrum disorder, two included individuals with attention-deficit/hyperactivity disorder, and one included individuals with “mental retardation,” now referred to as an intellectual disability. All but one of these articles targeted only males. The exception included both male and female participants.



**Fig. 2.** Total number of male participants and female participants across decades from the 1970s to the 2010s



**Fig. 3.** Percentage of articles with a female first author, female second author, and female last author across decades from the 1970s to the 2010s

## Discussion

Most of the articles we examined reported the gender of participants, which is unsurprising in view of prior findings (Li et al., 2017; Poling et al., 2009) and the recommendations of the *Publication Manual of the American Psychological Association* (American Psychological Association, 2020). For us, given that females are often underrepresented as research participants (see Poling et al., 2009) and that, despite tremendous advances, female athletes continue to face challenges largely unknown to males (see, e.g., Cooky, Messner, & Nextrum, 2013; Feminist Majority Foundation, 2014; Martin et al., 2016; Milner & Braddock, 2017), what is surprising is that females were well represented as participants in the studies that we reviewed.

Overall, there were more female than male participants in the articles we examined, and this pattern was evident in two of the five decades of interest. When articles involving only female participants and both females and males were combined, there were female participants in 56 of the 95 articles we examined (59%). Across decades from the 1980s to the 2010s, there were female participants in 70%, 56%, 60%, and 50% of the articles, respectively. For males, the corresponding values were 75%, 72%, 75%, and 63%. Only four articles were published in the 1970s. Three of them included only male participants and one included both males and females.

Although more than half of the articles we examined included female participants, the percentage of articles that included males was higher overall and for each of the decades we examined individually. One variable that may have contributed to this outcome is the relative number of females and males involved in sports, which is greater for males. For example, the ratio of females to males participating in both high school and collegiate sports is about 7:9 (National Federation of State High School Associations, 2018; NCAA, 2018).

A second variable is the sports examined. Some sports, such as baseball, are primarily played by males, whereas

others, such as volleyball, have more female players. Determining whether there is gender bias in the selection of participants requires a sport-specific comparison of the gender distribution of research participants relative to participants in that sport at large, which we did not attempt. We did not do so because the articles examined by Schenk and Miltenberger (2019), and by us, covered 21 sports, but for most of them there were too few studies to support meaningful conclusions.

A third variable that may have contributed to the gender of participants is the gender of the first and last authors, most of whom were male in the articles we examined. Our data show that the gender of first and last authors is related to the gender of participants, with males more likely to study males than to study females and females more likely to study females than to study males.

Studies examining other kinds of behavior-analytic research have shown that the percentage of articles with female first (and last) authors has increased substantially over time (see Li et al., 2018; McSweeney, Donahoe, & Swindell, 2000), and such a trend was evident in our data. Nonetheless, even in the 2010s a substantial majority of articles had male first and last authors. We sincerely hope that more women develop an interest in behavior-analytic sports research, and our findings suggest that this is likely to happen.

We also hope that the substantial effort that behavior analysts have expended to improve sports performance both continues and broadens in scope. One obvious extension is to people with developmental disabilities, who very rarely appeared in the studies we examined. Of the 95 articles reviewed, only 5 targeted this population. Behavior analysts have a long and rich tradition of working to teach people with autism spectrum disorder and other developmental disabilities socially significant skills—one of the first things that a practitioner learns is that “ABA is an evidence-based treatment for autism”—and it is interesting that they have largely ignored sports performance. There is compelling evidence that participating in sports has health, psychological, and social benefits (Allender et al., 2006; Eime et al., 2013), and many people with developmental disabilities want to play sports (e.g., English Federation of Disability Sport, 2013). Behavior analysts should help them fulfill that desire.

Other target populations that merit special attention are nonbinary and transgender athletes, who were not reported in the articles we examined and certainly face barriers. Further, people with disabilities other than developmental disabilities, such as adapted sports athletes, Paralympians, and athletic veterans who were injured while serving our country, could also be well served by behavior analysts with expertise in sports training, although we did not collect data regarding these populations. Combining behavior analysts’ expertise with that of coaches, kinesiologists, and adapted sports specialists may be especially gainful, and we encourage behavior analysts to seek such collaboration.

Some degree of competency is needed to make participation enjoyable, and behavior analysts' success with other target behaviors suggests that they have the tools to foster competent sports performance in many people with disabilities. Moreover, and importantly, some people with developmental and other disabilities have the potential to become excellent athletes. For example, about 4.9 million athletes with developmental and physical disabilities participate in the 32 sports of the Special Olympics (2020), and their performances sometimes are truly exceptional. They might well do even better if exposed to the kinds of interventions reviewed by Schenk and Miltenberger (2019), which are typically both effective and "state of the art."

Of course, one size does not fit all when it comes to behavior-analytic interventions, and it is highly likely that many of the interventions reviewed by Schenk and Miltenberger (2019) would have to be modified to benefit people with developmental disabilities. Determining whether sports-training interventions that are shown to be effective with neurotypical participants are effective in other populations and, if not, how they can be modified to be more valuable are worthy goals for researchers. For example, several different strategies have been used to increase basketball players' foul-shooting accuracy (Hall & Erffmeyer, 1983; Hamilton & Fremouw, 1985; Kladoopoulos & McComas, 2001; Lerner, Ostrow, Yura, & Etzel, 1996). Would any of these interventions, which were evaluated in college players, benefit middle school or high school players, with or without developmental disabilities? And which is most effective? Comparative sports research has largely been neglected, but it is certainly worth doing. So, too, are studies examining whether interventions that work well in controlled research settings can be exported to the everyday world. Are, for example, any of the foul-shooting interventions simple, cheap, and easy enough to be used by coaches in recreational leagues? Such questions merit the attention of researchers, but they also have implications for practitioners.

For instance, many behavior-analytic practitioners work with Special Olympics participants in other contexts and should consider helping to develop those athletes' skills. Being aware of the procedures that have proven effective with other populations is a good first step, but practitioners should be cognizant that these interventions may require modification to be effective. They also should be guided by the performance of their clients, not by the findings reported in a publication, in determining whether an intervention is worthwhile.

The discipline of applied behavior analysis is committed to using evidence-based practices, but it is easy to forget that this is a two-step process: First, an intervention that is likely to be effective, based on scientific research, is selected. Second, the value of that intervention for every treated individual is empirically demonstrated. With some treatment goals, participant

groups, and everyday situations, there will be few, if any, studies to guide the initial selection of an intervention. In such cases, practitioners should develop an intervention strategy based on fundamental behavioral principles, implement it carefully, monitor its effects, and, if necessary, alter it until the desired effect is obtained, or it becomes clear that the intervention is ineffective. This strategy is, of course, not limited to interventions that target athletic performance and should be the foundation of everyday applied behavior analysis.

We believe that practitioners should encourage people of all ages, races, and genders, and from all disability categories, to find a sport they like and can access, to learn to do it well enough to enjoy it, and to do it regularly. Learning to do it well enough to enjoy it may require some form of intervention, and behavior analysts are well trained to find an appropriate one, modify it if necessary, and evaluate its effects. They are also well able to determine whether people directly affected by an intervention find its goals, procedures, and outcomes to be acceptable—that is, to examine social validity—and they should always do so. It is noteworthy that Glidden, Bamberger, Draheim, and Kersh (2011) found that, although both Special Olympics participants and their parents favorably rated the experience, the parents generally overstated the benefits. They warn against relying on proxy measures, and given the importance that many parents place on success in youth sports, this warning appears to be well founded. Participating in sports is not a panacea, and no one should be made to do so, but everyone who wants to should be given the opportunity and, insofar as possible, the skills that enable them to do so. We behavior analysts should do our best to ensure that gender and disability status are characteristics of, not barriers to, athletes.

## Compliance with Ethical Standards

**Conflict of Interest** The authors have no conflicts of interest to declare.

**Ethical Approval** The manuscript is based on a review of published articles and does not involve human research participants or animal subjects.

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