

THE GENDER GAP: 100 M TO 42 KM

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Gender differences in running performance have attracted considerable interest in the last thirty years. Projections that, over time, women would run as fast or faster than men has fueled a controversy about the abilities of the sexes. The purpose of this study was to examine data from the 2000 Olympic Games to determine if there is evidence of convergence of men's and women's times over standard race distances from 100 m to 42 km. Gender differences were found to fall in a relatively small band over these distances. The mean difference over all events was 10.59% when only first place finishers were considered and 11.06% when the first seven finishers were used. Results of this study supports previous work that suggests gender differences have plateaued.

KEY WORDS: gender differences, running performance

INTRODUCTION: Participation of women in sport has increased rapidly since the advent of Title IX in 1972. Further, their rate of improvement surprised many observers. Nonetheless, Whipp and Ward (1992) astonished the running world when they projected the rate of improvement for world record times for both men and women in all running events between 200 m and 42 km and found that women's performances were improving at a rate much faster than men's, suggesting eventual convergence. They predicted that marathon times would be equal in 1998.

Earlier Drabik (1988) asserted that average women's results were improving twice as fast as men's in both swimming and running events and that the improvement was particularly noticeable in the endurance events he analyzed - the 1500 m run and the 800 m. Godik (1998) observed that mean world record performances over all running events decreased markedly over the last 70 years. He acknowledged that top women athletes might have movement characteristics similar to the top men; however, he suggested that existing differences are probably due to male/female differences in maximum oxygen consumption and anaerobic (speed-strength) capability.

A number of studies have explored gender differences in physiological variables of runners (Bam, Noakes, Juritz, & Dennis, 1997; Drabik, 1988; Godik, 1998; Joyner, 1993; Pate, Barnes, & Miller, 1985; Speechly, Taylor, & Rogers, 1996) Pate et al. (1985) equated male and female athletes on time to run 24.2 km and then compared them on a number of physiological variables. The authors concluded that performances were similar in their matched groups because the physiological variables were similar. They went on to suggest that comparable performances could be expected from athletes who possess the similar relevant physiological characteristics.

In an investigation of physiological limits for distance runners, Joyner (1993) evaluated men's performances and concluded, "There is little evidence to suggest that current record holders have physiologically improved over the last 25-30 years." Improved competitive opportunities and more difficult training programs appear to be the reasons for the high rate of improvement in women runners. At 90 km, females were found to be faster than males when they were matched on running speed at 42.2 km and a number of physiological and psychological variables (Speechly et al., 1996). Using world record times for men and women, Sparling et al., (1998) concluded that indeed gender differences had plateaued for 1500 m and the marathon.

This study examines the question of convergence of men's and women's running times as race distance increases. Recent studies are equivocal on the issue. It would appear that running performances can not continue to improve in a linear manner as was concluded by Whipp and Ward (1992). Further, it would appear that sexual dimorphism is a factor in performance differences between males and females. Females appear to excel at ultra marathon distances

under some conditions (Bam et al., 1997; Speechly et al., 1996). However, Speechly et al., (1996) emphasized that, "...there is no evidence to suggest that the elite female athlete can match or outperform the elite male athlete in the foreseeable future."

METHODS: The data set for this study was retrieved from Sydney Olympic 2000 track results posted on the World Wide Web (Results, n.d.). Times for men and women for running events from 100 m to 42 km were obtained. Percentage differences between men and women's performances were calculated for each event. The data were analyzed using three different methods. Comparisons were made between the first place finishers for men and women in each event, the top seven finishers running in the finals, and the first three finishers (medal winners). The first place finishers provided a direct comparison with other studies. The first three finishers and the first seven finishers provided more reliable assessments of the performance of the two groups. There were at least seven finals finishers in every event allowing for equitable evaluation between events.

RESULTS AND DISCUSSION: The results for each of the methods employed are displayed in Table 1. The mean percentage gender difference between first place finishers, over all

Table 1 Race Time and Velocity Differences Between Males and Females

Race Distance	Percent Time Difference: $((w - m) / m) * 100\%$			Percent Velocity Difference: $((mv - ww) / mv) * 100\%$		
	First	Top3	Top7	First	Top3	Top7
100 m	8.92	10.54	10.66	8.19	9.51	9.62
200 m	8.71	9.86	10.30	8.01	8.97	9.33
400 m	12.02	11.64	11.01	10.73	10.43	9.93
800 m	10.58	10.85	11.65	9.57	10.42	10.42
1500 m	15.56	15.52	14.75	13.46	13.43	12.86
5000 m	8.01	8.00	8.18	7.41	7.41	7.56
10000 m	10.94	11.12	11.53	9.87	10.01	10.33
42000 m	10.02	10.08	10.39	9.11	9.15	9.41
Mean	10.59	10.95	11.06	9.54	9.92	9.93
SD	2.40	2.15	1.84	1.92	1.72	1.48

events was $10.59 \pm 2.40\%$ and ranged between 8.01% and 15.56%. With the exception of the two extreme scores (1500 m and 5000 m), the differences varied little over all the events and are very close to values reported earlier. Recalculating data from Godik (1998) reveals that the mean difference was $10.36 \pm 1.75\%$ in comparisons of world best times for 1996.

Sparling et al. (1998) examined results from the 1500 m and 42 km events over a sixteen year period ending in 1996 and found that men ran an average of $11.1 \pm 1.1\%$ faster than women in the 1500 m. and $11.2 \pm 0.9\%$ faster than women at 42 km. The comparable ranges were 9.2-13.2% and 9.7-12.6%.

The 2000 Olympics 1500 m data show a gender difference of 15.56% while the 5000 m difference is 8.01%. This is an unexpected result. One would expect both values to be close to 10 – 11% based on previous studies. In an effort to explain this difference, meteorological data were obtained from the Weather Observations During the Sydney 2000 Olympics (Weather, 2000). These data revealed that the women's 1500 m and the men's 5000 m were run on September 30 within 30 minutes of each other. The wind in the Olympic Stadium was blowing at 17 km/h at race time with gusts during that day of up to 61 km/h. These were not favorable conditions for running (Despite, 2000). The men's 1500 m was run on September 29 with a

wind velocity of 8 km/h and the women's 5000 m was run on September 25 with a wind velocity of 4 km/h

It appears that the large difference between the men and women at 1500 m may be attributed to wind conditions. The men had an advantage while the women were penalized by about 4%. Similarly, the smaller gender difference at 5000 m could be attributed to better wind conditions for the women's 5000 m. The men were penalized approximately 3%.

Results using the first three finishers in each event do not markedly change the previous conclusions. The percentage gender difference using the mean of the first three place finishers in each event is 10.95 ± 2.15 with a range of 8.00 – 15.52%.

The mean gender difference using the top seven finishers in each event was almost indistinguishable from the top three. The difference was $11.06 \pm 1.84\%$ and the range was 8.18 – 14.75%.

Interestingly, variability decreased while mean gender differences increased as more finishers were included in the calculations. This suggests that the top three or the top 7 finishers are more representative of the gene pool from which runners are drawn than first place finishers alone.

Table 1 also shows the data for percent velocity difference for each of the events using the first place finishers and Figure 1 is a plot of the same data for the top seven places showing the decline in running velocity over increasing race distance. The mean velocity difference for first place finishers was 9.54 ± 1.92 m/s. As with the gender difference, the mean velocity difference between the top three and the top seven was negligible. Excluding the anomalies at 1500 m and 5000 m leaves a range of velocity differences from 8.01 – 10.73 m/s.

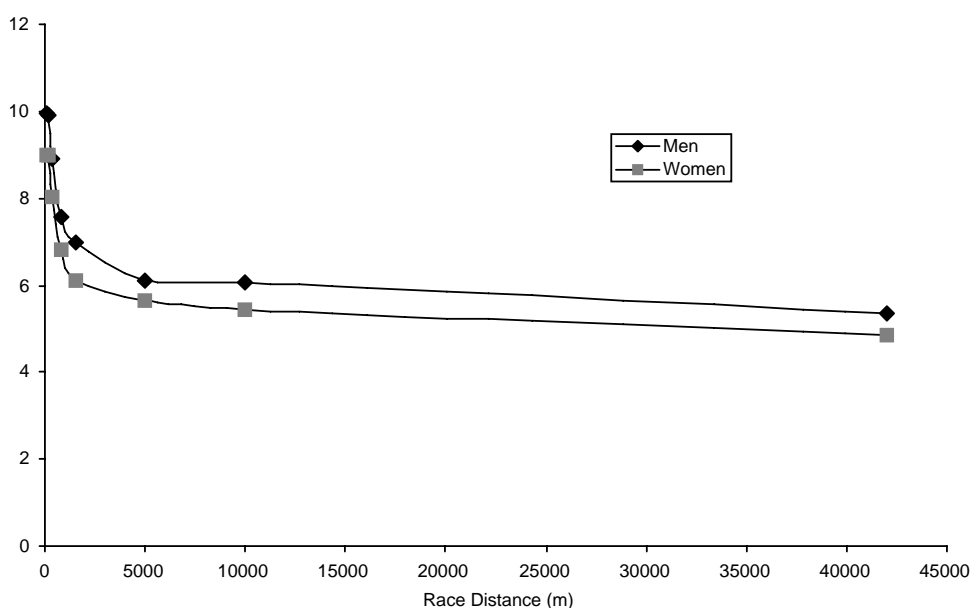


Figure 1—Women and men's velocities compared over increasing race distance.

The data from the current study appear to confirm the conclusion of Sparling (1988) that the gender gap is not narrowing. Further, the gap variability appears relatively small over all running events and remarkably small, centered around 11%, if the top seven finishers are considered.

CONCLUSIONS: It is clear that at the present time the gender gap still exists. Speculation that women are approaching men's times as the race distance becomes longer is not supported by this study. In fact, this study lends support to the conclusions of a previous study (Sparling, et al, 1998) that the gender difference has plateaued. Whether women can run faster than men at distances beyond 42 km is unclear (Speechly, et al, 1996; Bam, et al, 1997). Projections of

times based on the data from this study would not indicate a narrowing of the gap as was suggested earlier (Speechly et al, 1996). It is remarkable that the gender differences are so consistent over distance. Sparling et al (1998) examined two distance running events over a sixteen-year period and concluded that the times for both men and women are reaching a plateau. Our distance running data from the 2000 Olympics support this conclusion. Correspondingly, we do not support the conclusions of Whipp and Ward (1992) that times for men and women are converging linearly from 200 m to 42 km and their prognostication that the marathon times for men and women would converge by 1998 is clearly unfulfilled. The target time was 2:01:59. The last world marathon records were set in 1999 (men - 2:05:42, women - 2:20:43).

Implications: This work indicates that men are consistently running faster than women over a wide range of events. While training regimens may be similar between the sexes, it is unwarranted to expect similar outcomes. The differences appear to be primarily physiological, particularly at longer distances, thus emphasis should be placed on the development of technique. Unisex running events do not appear to be looming on the horizon. Perhaps we should take note of the words of Simone de Beauvoir (1971) who wrote in her book *The Second Sex*, "...in sport the end in view is not success independent of physical equipment; it is rather the attainment of perfection within the limitations of each physical type."

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