

Sex Differences in Simple Visual Reaction Time: A Historical Meta-Analysis

Irwin W. Silverman^{1,2}

To test the hypothesis that the magnitude of sex differences in simple visual reaction time (RT) has narrowed across time, a meta-analysis was conducted on 72 effect sizes derived from 21 studies ($n = 15,003$) published over a 73-year period. The analysis provided strong evidence for the hypothesized change. In addition, the analysis indicated that the sex difference in RT was on average smaller with non-U.S. samples than with U.S. samples. No relation was found between the magnitude of the sex difference in RT and age or presence vs. absence of a warning signal. Two factors—participation in fast-action sports and driving—are proposed as having been responsible for the decrease in the magnitude of the sex differences in simple visual RT across time.

KEY WORDS: visual reaction time; sex differences; meta-analysis; historical changes.

Perusal of the records for timed sports events reveals two progressions over the course of the past century. One is that the winning times decreased for both men and women. The other is the rate of decrease was greater for women than men. Illustrative of these trends are the winning times for the 100-m run in the Olympic Games (World Almanac and Book of Facts, 2003). For women, this event was introduced into the Olympics in 1928; therefore, I will use this year as the base year to compare the two sexes. In that year, the winning time was 10.8 s for men and 12.2 s for women, a difference of 1.4 s. In 2000, the winning time for men was 9.84 and 10.75 s for women, a difference of .91 s. Thus, over this 72-year period, the winning times decreased by 8.9% for men and 18.9% for women, and the difference between the two sexes decreased by 64.5%. Of further note is that the winning time for women in 1928 was only .2 s slower than the winning time for men in 1896 and that the winning time for women in

2000 was equal (within rounding) to that for men in 1928.³

Considering these trends for the motor performances of world-class athletes, one may wonder whether the same trends held for the motor performances of people in general. The only evidence to date that bears on this question comes from a meta-analytic study conducted by Thomas and French (1985), which examined sex differences on a large number of motor tasks in children and adolescents. The study also examined across-time differences in a number of these tasks, including three timed tasks: dash, shuttle run, and tapping. Results showed that male participants outperformed female participants on the timed tasks, but that the change in the magnitude of the sex difference across time was not significant for any of them.

¹Department of Psychology, Bowling Green State University, Bowling Green, Ohio.

²To whom correspondence should be addressed to Department of Psychology, Bowling Green State University, Bowling Green, Ohio 43403; e-mail: silpsych@adelphia.net.

³Other writers (e.g., Ransdell & Wells, 1999; Whipp & Ward, 1992) have also taken note of the diminishing differences in the performances of men and women in the field of track. Guttmann (1991) has pointed to similar developments in swimming: "For 15 swimming events, the difference between the men's and women's records was 12.41% in 1936, 11.36% in 1956, and 9.27% in 1976. By 1980, the difference in the 400-m crawl had diminished to only 5.2%" (p. 252).

The preceding across-time results by Thomas and French (1985) should be viewed with caution. For one thing, these authors treated publication year as a dichotomous rather than as a continuous variable. The problem here, as discussed by Cohen (1983), is that when a continuous variable is dichotomized, there is a decrease in statistical power and thus an increase in the probability of Type II errors. For another thing, the shuttle run and tapping studies covered only 14 years (for references, see Thomas & French, 1987). In light of the slow rate of change over time in the performances among elite athletes (see below), it seems improbable that 14 years was enough time to witness substantial changes in the size of sex differences in the motor abilities among people in general.

The present article reports the results of a meta-analysis that focused on across-time changes in the magnitude of sex differences in simple visual reaction time (RT). Thomas and French (1985) included simple RT in their meta-analysis, finding boys to be faster than girls, but for reasons not given, they did not examine the RT data for across-time changes. Perhaps they did not conduct such an analysis because there were only six studies in the simple RT corpus and because five of them were published during only a 7-year time span. Two strengths of the present meta-analysis are that it includes a large number of studies (21) and that the studies cover a 73-year period. In addition, the present meta-analysis includes studies from 11 countries, whereas Thomas and French's meta-analysis of simple RT studies included studies from only one country.

The present meta-analysis was based on three premises. The first is that the historical trends for the performances of athletes are mirrored in the performances of people in general. The second and third premises are that RT improves with practice, and that girls and women have increasingly engaged in activities that provide the opportunity to practice RT. The first premise is purely speculative, but the second and third premises are supported by a considerable amount of evidence.

Regarding RT and practice, several studies (Ando, Kida, & Oda, 2002; Blank, 1934; Cotten & Purcell, 1973; Elliott, 1972; Taniguchi, 1999) provide evidence on this relation. Of particular interest here is the study by Blank because the participants practiced on a simple visual RT task for a large number of days (10 altogether). Blank (see Woodworth & Schlosberg, 1954) found that RT decreased ap-

proximately 10%.⁴ Although this may seem like a small decrease, it does not seem small when compared with the performances of world-class athletes. Consider the winning times in the 100-m run for the Olympics. In this event, going forward from 1928, 56 years passed before the winning time for women was reduced by 10%. Furthermore, men have yet to shave off 10% from the winning time recorded for this event in the 1928 Olympics.

Regarding women's participation in activities that provide the opportunity to practice RT, two historical trends are noteworthy. One is the increase in the number of women's events in the Olympics, most of which emphasize speed. I noted above that the women's 100-m run was introduced into the Olympics in 1928. In fact, 1928 was the first year when women's track events were included in the Olympics, for a total of three events. In sharp contrast to the situation for women, the 1928 Olympic Games featured 13 men's running events. An additional event for men (but not for women) was the decathlon, which includes several running events. Since that year, the Olympics has added six women's track events, one each in 1948, 1964, 1988, and 1996, and two in 1972. Another Olympic sport in which performance is measured in terms of time is swimming. The first Olympics to include women's swimming events were the 1912 games, which had two such events. Since then, 14 women's swimming events have been introduced into the games, one each in 1948, 1956, 1960, 1988, and 1996, two in 1924, and six in 1968. (Parallel to the expansion of participation by women in the summer Olympics, the number of women's events in the winter Olympics has greatly increased.) Although I assume that the increase in the number of women's events in the Olympics reflected an increase in participation in sports by women worldwide, I acknowledge that, except for the United States, the data to back up this assumption are sketchy (see Guttman, 1991).

What makes the United States different is that the National Federation of State High School Associations, beginning in 1972, has conducted annual surveys to determine how many boys and girls had participated in high school athletic programs (*Participation in High School Sports, 1972–2001*, n.d.) (In

⁴More recently, Feinstein, Brown, and Ron (1994) found that practice did not decrease simple visual RT; in fact, under one of four conditions, RT increased with practice. However, these investigators had participants practice the RT task at 2–4-week intervals; perhaps RT improves only when practice occurs at closely spaced intervals.