Borioli J., Kitsopoulos A., Porret S., and Brandner C. (2006). Sex difference in the computation of traveling distance. In: Thomas Barkowsky, Christian Freksa, Markus Knauff, Report Series of the Transregional Collaborative Research Center SFB/TR 8 Spatial Cognition Universität Bremen / Universität Freiburg, pp. 15-16.

Sex Differences in the Computation of Traveling Distance

Alexios Kitsopoulos*, Jason Borioli, Stéphanie Porret, Catherine Brandner
Institute of Psychology, University of Lausanne, 1015 Lausanne, Switzerland, alexkits@unil.ch

Introduction

Sex-related differences in spatial cognition have been explored extensively in the literature, which shows that men and women have different spatial abilities. Men usually perform better in many of the spatial tasks carried out during experiments. Surprisingly, however, few investigations concerning sex differences in the computation of traveling distance have been done. In this context, this study explored sex differences in: 1/ Nonvisual reproduction of linear passive traveling; 2/ Nonvisual reproduction of linear active traveling; 3/ Nonvisual and visual distance estimation; 4/ Nonvisual direction estimation.

Materials and method

Participants

Thirty-seven adult men (mean age = 28.1 yrs, sd = 5.1 yrs) and thirty-seven adult women (mean age = 23.1 yrs, sd = 5.1 yrs) participated in the experiment.

Apparatus

On the floor, in the middle of the section in a large corridor, a 25-m white line ran parallel to the walls. The starting point was marked by a 50-cm white line perpendicular to the 25-m line. To the left of the main line, 7 vertical white marks, numbered from 1 to 7, placed from 8-m to 14-m, served as visual cues. All seven marks and numbers were visible from the starting point. Actual traveling distances were limited to 9, 11 and 13 m (i.e., marks 2, 4 and 6). Angles of direction estimation were measured using a plumb line and a graduated metal circle. A wheelchair was used for the passive transfer.

Testing procedure

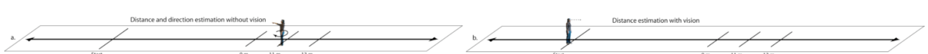
All participants underwent a 3-phases testing. At the beginning of each phase, a traveling distance was randomly chosen. Both the guide and the blindfolded subject ignored the chosen traveling distance.

Phase 1: Reproduction of linear wheelchair distance

Blindfolded subjects were transported 3 times in a wheelchair to one of the marks (9, 11 or 13 m), which remained the same throughout testing. Then, subjects were turned around and led back towards the starting point. They were asked to say “stop” when they thought they had reached the starting point.

Phase 2: Distance and direction estimations

Blindfolded subjects were led on foot from the starting point to one of the marks and asked to estimate the traveling distance. Then, they turned around and pointed in the direction of the starting point (a).
Next, subjects were guided to the starting point, the blindfold was removed, and they had to show which mark they have been led to and to re-estimate the distance that separated it from the starting point (b).



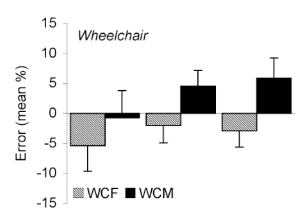
Phase 3: Reproduction of linear walking distance

Blindfolded subjects were guided on foot 3 times to one of the marks (9, 11 or 13 m) which remained the same throughout testing. Then, subjects were turned around and led back towards the starting point. They were asked to say “stop” when they thought they had reached the starting point.

Résults

Reproduction of linear wheelchair distance

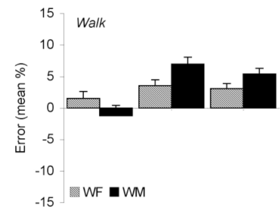
The performance did not vary throughout trial repetition (F[2,148]=1.25, ns), but comparatively to male, mean female’s error was larger (F[1,74]=4.32, p=0.43). Moreover, the pattern’s estimation showed that men overestimated traveling distance while female underestimated it.



Borioli J., Kitsopoulos A., Porret S., and Brandner C. (2006). Sex difference in the computation of traveling distance. In: Thomas Barkowsky, Christian Freksa, Markus Knauff, Report Series of the Transregional Collaborative Research Center SFB/TR 8 Spatial Cognition Universität Bremen / Universität Freiburg, pp. 15-16.

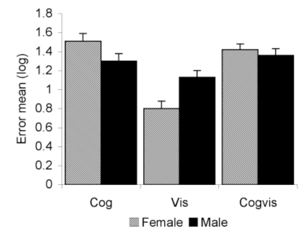
Reproduction of linear walking distance

No significant sex difference was observed in terms of active distance reproduction (F[1,75]=1.02, ns), as well as in the pattern's estimation of traveling distance.



Distance estimation: Men were significantly more accurate without visual input (F[1,74]=4.06, p=0.048) while women were significantly more accurate in terms of visual-based distance estimation (F[1,74]=9.5, p=0.003).
No sex difference was observed when nonvisual- and visual-based distance estimation data were combined (F[1,74]=0.47, ns).

Direction estimation: Although angular dispersion was weak, Watson-Williams tests on direction estimation showed a significant left deviation in men and a slight right deviation in women. Moreover women were more accurate than men.
Mean arm angle was 355° for men and 2° for women (F[1,74]=7.01, p. < .05).
Body deviation as measured at the feet showed a mean angle of 354° for men and 0° for women (F[1,74]=4.98, p. < .05).



Comments: The results of this experiment showed that men and women differed in the reproduction of passive linear displacements while no sex difference was observed in active linear displacements. Indeed, in the absence of visual input, men were more accurate than women in reproducing linear passive wheelchair traveling distance. However, performance of both men and women did not differ during linear active walking traveling distance. This difference might rely on a variation in decision-making processes allowing selecting a response since consistent underestimation was observed in women when men overestimated the distance traveling.
When blindfolded participants had to mentally estimate the traveling distance, the female error was larger than the male one. But, when subjects were asked to indicate the visual cue corresponding to the traveling distance, the male error was larger than the female one. Finally, pointing to the starting point (0°) after a whole-body rotation showed a larger deviation from 0° in men than in women. Moreover, men showed a consistent left deviation and women showed a slight right deviation.
These results seem to indicate that sex differences in spatial abilities could be rooted in basic mechanisms involved in spatial navigation like path integration. Moreover, they support the hypothesis that men and women differ in information selection used for strategy choice. Our results also suggest that sex influences brain computation of linear distance and this may open some new avenues of research.