4-12-2013

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Sex Differences in the Relationship Between Motion Sickness and Handedness
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Abstract

We examined the possibility that gender differences in brain laterization might play a role in gender differences in motion sickness. Participants completed a simulator sickness questionnaire before and after immersion in the virtual environment. Overall, the findings for men showed no significant relationship between handedness and motion sickness, but the findings for women were significant. Strongly left handed women were more affected by visually induced motion sickness than ambidextrous and strongly right handed women. Strongly right handed women were slightly more affected than ambidextrous women.

Introduction

Previous research indicates that virtual environments may elicit visually induced motion sickness (Stanney, Hale, Nahems, & Kennedy, 2003). Motion sickness is thought to result when conflict arises between one’s perception of themselves as moving and whether they are actually moving in the environment (e.g. motion sickness in a car). Women typically experience more motion sickness symptoms than men. (Flanagan, May, & Dobie, 2005). There is no known explanation for this gender difference. The current study explores handedness to see if brain organization might be involved. Handedness has been used as an indirect measure of brain laterization in different neurological tasks involving linguistic and phonological processing that has shown gender differences. These data confirm a gender difference in the left hemisphere’s and right hemisphere’s phonological processing skills between people who are left and people who are right handed (Tremblay, Ansado, Walter, & Joanette, 2007). The current study examined possible gender differences in brain laterization that might play a role in the gender differences surrounding motion sickness. We hypothesized that the more “balance” between the hemispheres (indicated by ambidexterity), the less conflict between self-movement perception and actual movement in the environment, therefore the fewer motion sickness symptoms experienced. The motion sickness symptoms were measured by having the participant take a simulator sickness questionnaire before and after the immersion in the virtual environment.

Method

Participants. Participants were 79 male and 103 female undergraduates (age: M= 20.29, SD= 4.68) who had normal color vision, and ranged from strongly left handed to strongly right handed.

Materials and Procedure. Before entering the virtual environment participants completed the handedness questionnaire. After that, participants took a simulator sickness questionnaire before and after immersion in the virtual environment. The scores from the first questionnaire were subtracted from the second questionnaire to show the visually induced motion sickness symptom rating from the effects of the virtual environment. The virtual environment contained 10 objects (e.g. TV, lamp, etc.) at scattered locations throughout the building. In order to keep participants focused in the virtual environment researchers instructed them to try to learn the locations of all the objects and that they would later need to mark them on a map. This was called the Cognitive Map Task. The participants were immersed in the building for 10 minutes, and at the end of each minute the researcher would ask the participant to rate themselves on a 1-20 scale of those motion sickness symptoms. If a participant reached a rating of 7 the researcher would immediately stop the immersion to prevent further sickness.

Results

The findings for women did show a significant linear relationship between handedness and motion sickness, F(1, 102) = 13.10, p = .001. The women also showed a significant quadratic relationship between handedness and motion sickness, F (2, 100), p = .001. Strongly left handed women were more affected by visually induced motion sickness than ambidextrous and strongly right handed women, and strongly right handed women were more affected than the ambidextrous women. The findings for men did not produce a significant linear, F (1, 77) = 1.15, p = .29, nor quadratic, F (2, 76) = 1.63, p = .20, relationship between handedness and motion sickness. The gender difference between motion sickness symptoms was also significant (women: M= 5.25, SD= 6.75) and men, M=.58, SD= 3.78), t(180) = 5.52, p<.001.

Conclusions

Gender did play a role in the relationship between handedness and motion sickness. Strongly left handed women were the most affected by visually induced motion sickness. Strongly right handed women were more affected than ambidextrous women. Men did not show a significant relationship between handedness and motion sickness. Women experienced more motion sickness symptoms than men. This study supports previous research that claims women are more susceptible to motion sickness than men. These findings suggest a complex role for brain laterization in women’s susceptibility to motion sickness. Based on this finding it may be possible that men and women process self-movement and actual movement in different brain hemispheres and that for women, being left or right handed plays a significant role on their perception of movement causing them to feel more motion sickness symptoms, especially if they are strongly left handed.