Limb Dominance, Laterality, and the Simon Effect

Ariane Baum, Matt Flood, Hope Hiza, Ryan McNamara, Jillian Schmidt
Sponsor: Jeff Ives, Exercise & Sport Sciences

Human laterality is generally defined as differences in left to right side preference or performance. These differences are noticeable in handedness, footedness, and eye dominance. Data also supports the existence of left and right side brain preferences, which are related to handedness and a preferred side of the brain used in processing visual information differently based on the spatial origin of the incoming visual signal.

Handedness is well known and an easily measured aspect of laterality, but its counterpart, footedness, is less definitive. Footedness preference has two components, a preference of one leg for stability (e.g., standing on one leg) and a preference of one leg for mobility (e.g., kicking a ball). Research has hinted that one's handedness (right or left) is associated with certain cognitive functions, and one's overall level of footedness is related to other types of cognitive function. Teasing out these associations, though, has been hampered by poor understanding of the stability versus mobility aspects of footedness, and if handedness even possesses a mobility and stability component. It is the aim of this study to examine if information processing speed is influenced by limb laterality, and if this influence is different between stability and mobility limb preferences.

To examine these relationships a descriptive and correlational research design will be employed using a convenience sample of 30 male and female participants. All subjects will signed informed consent approved by the Ithaca College IRB and will be tested over three days. On Day 1 each subject will be assessed for handedness and footedness, visual dominance, and bilateral and unilateral balance and leg power. On Days 2 and 3 each subject will undergo trials of the Simon Effect reaction time test on a computer. The Simon test uses stimulus-response spatial compatibility and incompatibility to tease out left to right side differences in cognitive processing. In the Simon test a word is shown on the computer screen to indicate which limb to use (Left or Right), but the location of the word is on either the left or right side of the screen. Spatially compatible trials have the word matching with the side (e.g., Right limb command, Right side presentation), whereas spatially incompatible trials have the word and location different (e.g., Left limb, Right side). Compatible responses result in faster reaction times, and the dominant limb to be faster than the non-dominant limb. Subjects will perform a total of 160 trials per day of the Simon test under four conditions: seated with a foot response (foot mobility), standing with a foot response (foot stability), seated with a hand response (hand mobility), and

leaning while supporting with the arms with a hand response (hand stability). Data will be analyzed for left to right movement speed differences in mobility and stability situations, and their associations to limb dominance, eye dominance, and physical performance tests analyzed. It is hypothesized that stability situations will result in slower reaction times, and that preferred mobility leg will result in faster reactions than the preferred stability leg.