KINETIC ASYMMETRY IN LEFT AND RIGHT DOMINANT FEMALE RUNNERS: IMPLICATIONS FOR INJURY

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INTRODUCTION

The cause of running injuries continues to elude scientists. While a number of factors have been examined, the role of gait asymmetry and limb dominance has received little attention. Gait asymmetry has been suggested to be both a cause and effect of injury [1]. In addition, previous literature reports that left dominant (LD) people tend to be more symmetrical than right dominant (RD) people [2]. However, the relationship between laterality and gait has not been explored.

Therefore, one purpose of this study was to examine the differences in kinetic asymmetry during gait between LD and RD runners. The difference in injury patterns between LD and RD runners was also examined. The study focused on the symmetry of loading parameters that have previously been linked to chronic running injuries [3]. It was hypothesized that LD runners would be more symmetrical and, as a result, have fewer injuries than RD runners.

METHODS

This is an ongoing study in which, to date, there are 16 LD subjects and 16 age- and mileage-matched RD subjects enrolled. An *a priori* power analysis, based on a 10 point difference in symmetry and variability from previous literature, indicated that 24 subjects were needed per group. All volunteers were female, rearfoot strikers who ran at least 20 miles per week and were free of any lower extremity injuries at the time of data collection. Limb dominance was determined by the foot with which a subject would kick a ball.

Subjects ran along a 25 meter runway at a speed of 3.65 m/s (± 5%), striking a force platform (Bertec Corp., Worthington, OH) at its center. Data were sampled at 960 Hz. Five trials were collected for both the left and right sides. The kinetic variables of interest were peak vertical impact ground reaction force, average and instantaneous vertical loading rates, and peak vertical shock. For each subject, these variables were extracted from the individual trials and averaged across the five trials, within each side.

The symmetry index (SI) [4] was used to evaluate the symmetry of each runner with respect to each of the kinetic parameters: $SI = (X_{dom} - X_{non\text{-}dom})/X_{dom} * 100$

Following the gait assessment, all running-related injuries were monitored for one year. Independent, two-tailed t-tests were performed to compare the kinetic variables and the number of injuries sustained by the LD and RD runners. A value of $p<0.05$ was considered significant for all comparisons.

RESULTS AND DISCUSSION

While the SI values were not significantly different between the LD and RD runners (Table 1), instantaneous loading rate and peak shock were 24.9 and 32.5%, respectively, higher in the RD runners. These individuals also had 38.2% more injuries than LD runners. Based on the *a priori* power analysis, the current number of subjects does not adequately power the study. Therefore, the results may be strengthened as the study continues, and additional subjects are added.

In light of previous literature suggesting that LD people tend to be more symmetrical [5], the kinetic preliminary findings of this study are not surprising. LD people often cite the need to adapt to a "right-handed world." However, this has much less of an influence on lower extremity tasks. Therefore, the increased symmetry may not necessarily be a learned adaptation, but may be related to neurological control. The fact that the more asymmetrical, RD runners are so much more likely to become injured may lend insight into the role of symmetry in the mechanism of injury.

Future studies will focus upon examining how other gait mechanics (ie. kinematics) differ between LD and RD runners. The link between gait mechanics and the side on which a runner sustains an injury will also be studied.

Table 1: Comparison of SI Values and Number of Injuries between the LD and RD runners

	Impact GRF	Avg. LR	Instant. LR	Peak Shock	# of Injuries
LD	9.0	15.6	9.4	16.6	13
RD	8.0	17.1	12.5	24.6	21
p-value	0.68	0.69	0.30	0.22	0.26
% Diff	12.6	9.2	24.9	32.5	38.1

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ACKNOWLEDGEMENTS

This study was supported by Department of Defense grant DAMD17-00-1-0515