WHAT IS LEG DOMINANCE?

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INTRODUCTION

Often in research studies, it is important to assess right and/or left dominance of the hand or foot. Contrary to hand dominance, minimal attention has been given to the concept of leg or foot dominance. In the simplest terms, leg dominance has been determined by which hand is dominant. If one is right-handed, then one must be right leg dominant. If one is left-handed, then one must be left leg dominant. In other instances, leg dominance has been determined by a one-or two-foot item skills test such as kicking a ball or stepping up on a chair. (Harris, 1958; Kovak and Horkvic, 1970; Peters and Durding, 1979; and Porac and Cohen, 1981). It was not until the Chapman et al. (1987) test was designed that a more comprehensive assessment was possible. They developed a test of 13 items which included both manipulative and weight bearing activities. Alternative tests of leg dominance have been based on the strength of the two legs and how it is related to handedness. Singh (1970) studied the strength of the legs in a pushing activity and found that the right legs of right-handed subjects were no different than their left legs, but found that left-handed subjects had stronger left legs than right legs. On the other hand, Carnahan et al. (1986) and Rosenrot (1980) reported left-foot superiority in strength of force production in right handers. It also has been implied by some that because the left leg in right-handed people is longer and heavier, it must be stronger (Chibber and Singh, 1970). This has not, however, been fully substantiated. Friberg and Kvist (1988) studied handedness and leg length inequality in athletic jumping performances. They found no relationship between takeoff leg and handedness, but a significant relationship between leg length inequality and takeoff leg. The longer leg generally was the preferred leg. Therefore this study was undertaken to: 1) compare the contralateral strength of the quadricep and hamstring muscles in right and left leg dominant subjects; and 2) compare manipulative and weight bearing activities in right and left leg dominant subjects.

METHODOLOGY

Seventy-six right- and left-handed subjects, both male (n=43) and female (n=33), who had no history of knee problems or leg abnormalities volunteered for the study. Leg dominance initially was evaluated by 11 items of the Chapman et al. (1987) test for foot preference. The items were kicking a soccer ball into a basket, stamping an inverted aluminum-foil muffin tin liner into a circle, moving a golf ball through a maze, writing one's name in the sand, smoothing the sand, arranging pebbles in a straight line, balancing a rod on the end of one foot, rolling a golf ball around a circle, kicking as high as possible on a wall, sitting and tapping out the rhythm to "Jingle Bells", and hopping on one foot. Subjects were told to use the foot that would enable them to perform the skill successfully. On each item, subjects received a "1" for using the right foot, "3" for using the left foot, and "2" for using one foot first and then the other foot. The scores ranged from 11-33. Those subjects who scored between 11 and 18 were considered to be right leg dominant (n=39), those who scored between 27 and 33 were considered to be

left leg dominant (n=30), and those who scored between 19 and 26 were considered to be neither predominantly right or left leg dominant (n=7). These seven subjects were eliminated from further testing. Coincidentally, the right leg dominant subjects were also right-handed while the left leg dominant subjects were left-handed. The skill items later were divided into manipulative skills (golf ball through maze, write name in sand, smooth sand, arrange pebbles, balance rod, and golf ball around circle) and weight-bearing skills (kick a ball, stamp tin, high kick, tap "Jingle Bells", and hop on one foot).

Strength testing was conducted on a Cybex II isokinetic dynamometer set at 60 deg/sec. The order in which the quadriceps and hamstrings of each leg were tested was randomly determined by a flip of a coin. Each subject warmed up by riding a bicycle ergometer. This was followed by the Cybex testing which consisted of three flexion and extension movements giving the best possible effort. The highest peak torque of the three flexion and extension movements was recorded. Paired t-tests ($p<0.05$) were used to determine the differences, if any, in the contralateral strength of the quadricep and hamstring muscles in the left and right dominant subjects. A second paired t-test ($p<0.05$) was used to compare the manipulative and weight-bearing activities in the right and left dominant subjects.

RESULTS AND DISCUSSION

Table 1 contains the Cybex stength testing results for males and females.

Table 1. Contralateral strength (Nm) in hamstrings and quadriceps in right and left dominant males and females.

Right Leg Dominance	Rt Hams	L Hams	Rt Quads	L Quads
Male (n=22)	112.07	114.12	217.36	214.81
	(18.55)	(23.61)	(38.32)	(37.77)
Female (n=17)	67.20	68.08	122.01	121.60
	(11.42)	(13.11)	(20.33)	(22.33)
Combined (n=39)	92.82	94.04	175.09	174.19
	(27.44)	(30.26)	(58.14)	(56.49)
Left Leg Dominance	Rt Hams	L Hams	Rt Quads	L Quads
Male (n=15)	127.94	128.66	229.92	231.20
	(28.82)	(29.24)	(32.59)	(30.49)
Female (n=15)	65.08	67.36	120.50	128.02
	(9.47)	(10.20)	(20.77)	(20.60)
Combined (n=30)	96.66	98.02	175.21	179.62
	(38.16)	(37.88)	(61.78)	(58.37)

Paired t-tests revealed no significant differences ($p>0.05$) in the contralateral strength of the quadricep and hamstring muscles in either the left or right leg dominant subjects. This suggests that strength of the leg cannot be used to determine leg dominance. This was in agreement with Picconatto et al. (1990) who found no relationship between lower extremity dominance and isokinetic measures at knee and hip. However, when Singh (1970) related handedness, footedness, and strength, he found that the right legs of right-handed subjects were no different than their left legs, but found that left handed subjects had stronger left legs than right legs. This finding was different from the Carnahan et al. (1986) and Rosenrot (1980) studies where evidence was found to

support the concept of stronger left legs for right-handed people.

This brought up the question about the nature of the activities used to assess leg dominance. In further examining the Chapman et al. (1987) test for leg dominance, there was a suggested grouping of manipulative type and weight- bearing type activities.

To explore the concept of leg dominance being linked with the type of activity selected to demonstrate dominance, a comparison was made between the manipulative and weight-bearing activities of the Chapman et al. (1987) test. Table 2 illustrates the results of this comparison.

Table 2. Manipulative versus weight bearing skills.

	Mean score	Probability
Right Leg Dominance		
Manipulative	1.14 ± 0.20	0.018*
Weight Bearing	1.26 ± 0.28	
Left Leg Dominance		
Manipulative	2.84 ± 0.20	0.026*
Weight Bearing	2.65 ± 0.37	

* $p<0.05$ level. Score of 1=right leg dominant and 3=left leg dominant

A significant difference ($p<0.05$) was observed between manipulative and weight-bearing skills for both the right and left leg dominant subjects. In manipulative skills, the right leg dominant subjects tended to use the right leg, but in weight bearing skills, these same subjects tended to use the left leg. The same sequence of events was seen in the left leg dominant subjects. It seems logical to assume that an individual will vary the choice of leg in performing a task based upon the goal of the movement, manipulative or weight-bearing. Moreover, the manipulative tasks appear to parallel manipulative tasks performed by the hand. In fact, Peters (1988) went so far as to suggest that there may be a dual dominance concept. This also could be applied to the leg or foot. The results of this study suggest that right leg dominant people tended to use the right leg for manipulative skills and the left leg for supportive or weight-bearing skills. The reverse was true for the left leg dominant people.

CONCLUSIONS

It was concluded that: 1) the dominant leg in right or left leg dominant subjects as determined by a series of manipulative and weight-bearing performance items is not the stronger of the two legs; and 2) the preference of leg by either right or left leg dominant subjects is dependent on the type of activity, manipulative or weight-bearing.

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