HANDEDNESS AND PERFOMANCE

K. Sreedhar

Associate Professor, Department of Physical Education and Sports Sciences , Annamalai University

ABSTRACT

We live in a right-handed world. Left-handedness has been, and in some cases still is, considered an inconvenience, a bad habit, or a symbol of Human handedness - the consistent preference for one hand in skilled manipulative tasks - is often said to be a defining trait. the "sinister". A popular myth is that which states that "handedness may be more a matter of sidedness - of hand, foot, eye, and body, both inside and out". Left-handers appear to be mostly right-hemisphere dominant for fine motor tasks, and the right-hemisphere appears to be the more emotional and holistic hemisphere. Ambidexterity is the rhythmic coordination between the two sides of the body and the two sides of the brain. Being ambidextrous enables you to perform tasks equally well with the right or lefts side of the body. Many musical instruments are played ambidextrously, and many athletes are adept at using both of their hands. In fact, it is quite advantageous in certain sports , to be able to use both your feet with equal facility. Increasing the efficiency of the non dominant limp to perform complex tasks especially motor skills is effectively done through cross education. Motor learning associated with cross-education of strength appears to involve multiple brain regions, suggesting the process of motor learning and transfer is more complex than just passing information from one motor cortex to the other. Cross-education of strength is influenced by strength asymmetries related to handedness, and the preferential direction of transfer is from dominant to non-dominant limb. By convention, it appears that strength asymmetry between the dominant and non-dominant limb increases with increasing task complexity. Exhaustive left hand practice has been shown to dissipate asymmetry between hands for an aiming task in right-handed subjects. Increased motor unit excitability is a neural adaptation associated with resistance training and studies have shown that afferent activity from activated muscles during unilateral movement could increase excitability of the contra lateral musculature.

***Key Words**: Handedness,Ambidextrity*

INTRODUCTION

There exists in the world a very special group of individuals who are left handed. This group has had to spend their life conforming to a world that was not designed for its benefit. In addition, this group has had to put up with insults and derogatory comments aimed in its direction. We live in a right-handed world. Left-handedness has been, and in some cases still is, considered an inconvenience, a bad habit, or a symbol of the "sinister". Studies still attempt to link left-handers with socially undesirable behaviors, such as psychosis or criminal activity. The social implications of these stigmas are immense. "Left-handers may be one of the last unorganized minorities in our society, with no collective power and no real sense of common identity," says Stanley Coren (1992).

Handedness» is a vague term, and can mean many things to many people. Most people in our society define handedness as the hand one use for writing. Within the scientific community, the vagueness of this term has led to much debate. Researchers define handedness based on different theoretical assumptions. For instance, some define handedness as (a) the hand that performs faster or more precisely on manual tests, while others define it as (b) the hand that one prefers to use, regardless of performance. Some think that there are two types of handedness: (a) either left or right, or (b) either right or non-right, while others think there should be three categories (to include ambidexterity). Some think there are two different kinds of ambidexterity.

Being left-handed means having a preference for using your left hand for a variety of tasks, including reaching, throwing, pointing, catching. It also implies a preference for using your left foot for tasks such as kicking, as well as the preferred foot with which to begin walking, running and bicycling. However, there are no hard and fast rules for determining which hand or foot the Lefthander prefers to use for a particular task. Most will prefer to use the left hand or foot for delicate work. One may also have a dominant left eye, preferring to use the left eye for telescopes, camera sights, and microscopes. In general, being left-handed means having a dominant right side of the brain. Human handedness - the consistent preference for one hand in skilled manipulative tasks - is often said to be a defining trait. While other primates may demonstrate individual preferences for the right or left forelimb in reaching and in manipulating objects, only in human populations is there a consistent tendency for the right hand to be the preferred hand. In many societies, the left side is symbolically associated with ill-fortune: and in some societies, cultural pressures for the forced use of the right hand even by ‘natural left-handers’ drastically reduce the visibility of left-handedness in census databases. In the last two centuries modern industrial societies have been among those exerting strong cultural pressures for right hand use, a trend strongly associated with the emergence of mass literacy. Middle class western (white) society is more tolerant of left handers than some cultures. In many cultures eating with the left hand is an insult to the host. This is so strong that even those educated and living in the west does not adjust this view point. [Possibly related to hygiene - which hand is used for toiletry etc].

On the outside, our bodies appear to conform to a bilaterally symmetrical "blue-print". This may have misled some to assume that our internal organs are also symmetrical on both sides of the midline. It is common knowledge that the heart and liver are placed asymmetrically, but one often finds references in the literature to the "symmetry" found in other internal organs, such as the lungs, kidneys, and ovaries. However, our internal organs are largely asymmetrical. The right lung has 2 lobes whereas the left has 3, the right kidney is usually lower and wider than the left, and the two ovaries also have significant structural asymmetries (Davies & Coupland, 1967). Therefore, it appears as though symmetry in the human body disappears when there is no adaptive pressure to retain it.

Though most people believe that handedness is a simple proposition, which is incorrect. Handedness is a spectrum. Chances are that you are more nearly ambidextrous than you realizes. You can for example probably write quite well with your left hand even if you have always been right handed. Many of the circuits in the human nervous system operate through crossed latterly- that is the right hand is wired to the left side of the brain and vice versa. In at least 95% of right handers the speech – language center is in the brain’s left hemisphere. Yet only about 15% of left-handers are simply hooked up, with speech controlled by the opposite right hemisphere. If right side of the body is controlled by the left side of the brain and vice versa then left handed peoples are the only one in their right mind. Why we are left or right handed remains one of the great unsolved mysteries of science. The bones of the arm tend to grow to be slightly longer on the side of the dominant hand. The mechanisms of this are increasingly well understood: bone growth responds to loading. If a limb is disused, for example due to paralysis, the bones begin to atrophy. If a limb sustains repeated high levels of mechanical loading, its bones will respond by growing more vigorously and by increasing in density. Human hand preferences develop in early childhood, and so the bones of the arm on the preferred side (which will be subject to consistently greater loading) will tend to grow to be slightly greater in length during childhood and adolescence. The term *brain lateralization* refers to the fact that the two halves of the human brain are *not* exactly alike. Each hemisphere has *functional specializations*: some function whose neural mechanisms are localized primarily in one half of the brain.

Broadly speaking the left side of the brain is thought by some scientists to process linear, logical information, while the right side trends more towards processing emotions and mood. Some studies even suggest that lefties are more prone to stress and sensitive to certain drugs. The ability to integrate what some researchers call the more ‘ logical’ left side of the brain and the more ’intuitive’ or ‘artistic’ right side of may helped lefties excel in many fields. The left-hander is right-brain dominant. Thus, his or her strongest talents should be consistent with the functions of the right brain. The right brain is superior in visual- spatial; such abilities are useful in mathematics and architecture. Therefore, left-handers should be drawn to these fields. In addition, these left-handers would be more likely to have immune vulnerability. Researchers have established, a link between strong right-handedness and the lack of mathematical ability (Annet and Manning ,1990) and there is a relationship between left handedness with musical talent and diseases resistance (Hassler and Gupta, 1993).

A popular myth is that which states that "handedness may be more a matter of sidedness - of hand, foot, eye, and body, both inside and out" (Fincher, 1980). Further, it is commonly believed that being left-handed for writing "also implies a preference for using your left foot for tasks such as kicking" (Benowitz, 1996). The actual concordance between handedness and other lateral preferences is surprisingly low, at least in left-handers. Right-handers are 95% right-footed and 66% right-eyed, but only 45% of left-handers are left-footed and 57% of left-handers are left-eyed (Coren, 1993; Bourassa, McManus, & Bryden, 1996). Footedness and eyedness are probably much less culturally or environmentally influenced than handedness. If people exhibited a general "sidedness", cultural influence may help explain why a fraction of the right-handed population is left-footed.

Ambidexterity is the ability to use both your hands with equal ease or facility, but if you're armless, it could be your feet. The Greeks encouraged and tried to promote ambidexterity because it was simply logical in sports and battle to be adept with both hands instead of one. By combining the Phoenician style of writing right to left with their own left to right system, the

Greeks created a reading and writing system called boustrophedon, where the lines ran alternately right-to-left and left-to-right. With alternating sweeps of the eyes back and forth, reading was more swift and efficient. To be able to use both hands equally well, practice is the key. Many musical instruments are played ambidextrously, and many athletes are adept at using both of their hands. In fact, it is quite advantageous in certain sports , to be able to use both your feet with equal facility. Since swimming is an ambidextrous activity, teaching dyslectic children to swim often helps them to read and write normally because it balances the brain hemispheres. Become ambidextrous and along with an added physiological brain growth, a more balanced integration of your 2 hemispheres will be achieved. Studies have shown that ambidextrous people are more emotionally independent, more determined, more adaptable to new situations and more apt to handle problems without giving up

Ambidexterity is the rhythmic coordination between the two sides of the body and the two sides of the brain. Being ambidextrous enables one to perform tasks equally well with the right or lefts side of the body. Becoming Ambidextrous will greatly stimulate right brain cell development which will lead to Whole Brain Thinking which is critical for all individuals. Right brain functions that are crucial for athletes include: subconscious function, creativity, focus, awareness, rhythm, imagination, flowing, circular, and emotion. Improvements in Ambidexterity will increase an individual’s mindfulness and create a more relaxed environment when performing any activity. Equal performance on both sides of the body — to be able to use both hands equally well. It requires practice. Become ambidextrous and along with physiological brain growth, a more balanced integration of your 2 hemispheres of your brain will be achieved. Studies have shown that ambidextrous people are more emotionally independent, more determined, more adaptable to new situations and more apt to handle problems without giving up. Although ambidexterity is rare at birth, it can be learned. The key in learning is to start paying attention to minor tasks and performing them with one's opposite hand daily. While difficult at first, minor tasks like brushing teeth, opening doors, and eating will become steadily easier if a person keeps at it. Learning to write or throw with both hands is far harder, but with patience and practice, it is feasible for anybody to become proficient with both hands. It is also very advantageous in football/soccer as a player can shoot from almost any position no matter on which side the ball is. It is therefore impossible for a defender to try to block the side from which the attacker can shoot better. It is also advantageous for the goalkeeper to be equally able to dive towards his left and his right.

Left-handed and ambidextrous people have 11% larger corpus callosa (the bundle of nerve fibers joining the right and left sides of the brain) than right handed people. Obviously the more we use and exercise our brain, the more it physically grows. Increasing the efficiency of the non dominant limp to perform complex tasks especially motor skills is effectively done through cross education. Motor learning associated with cross-education of strength appears to involve multiple brain regions, suggesting the process of motor learning and transfer is more complex than just passing information from one motor cortex to the other. Cross-education of strength is influenced by strength asymmetries related to handedness, and the preferential direction of transfer is from dominant to non-dominant limb. Further, cross education of strength is accompanied by changes in activation in both hemispheres of the brain that resemble what has been previously reported with motor learning (Pascual-Leone et al., 1994; Karni et al., 1995; Pearce et al., 2000), which might indicate the occurrence of neural plasticity with training. These results also indicate a relationship between transfer of strength and transfer of skill. Cross-education of strength is a motor learning adaptation also reliant on peripheral feedback from muscles during training. Peripheral feedback appears necessary to elicit appropriate changes in neural coordination necessary for cross-education of strength to occur. Cross-education of strength is also influenced by strength asymmetries related to handedness, and the preferential direction of transfer is from dominant to non-dominant limb. The behavioral similarity between cross-education of strength and interlateral transfer of skill in regards to the preferential direction of transfer leads to the conclusion that they are essentially the same neural adaptation in response to learning or perfecting a motor paradigm (strength or skill).

The preferential direction of transfer was from dominant to non-dominant limb (Parlow and Kinsbourne, 1989; Gordon et al., 1994; Imamizu and Shimojo, 1995; Stoddard and Vaid, 1996; Latash, 1999; Teixeira, 2000-experiment 1; Criscimagna-Hemminger et al., 2003; Teixeira and Caminha, 2003). As outlined in Chapter 1, transfer of skill between limbs has been the focus of motor control researchers, whereas exercise physiologists have focused on transfer of strength between limbs with training (cross-education of strength). The skill transfer literature is extensive but is limited mainly to motor tasks involving the hand and arm. Consequently, skill transfer studies always consider the degree of handedness in designing protocol. The tendency for the use of hand and arm movements has made it is difficult to apply findings from skill transfer studies to cross-education of strength studies where mostly lower body tasks are used. Regardless of protocol, cross-education of strength studies rarely report limb dominance (Carolan and Cafarelli, 1992; Housh et al., 1992; Weir et al., 1995; Shields et al., 1999; Ebersole et al., 2002) or have rarely attempted to control for it methodologically (Kannus et al., 1992; Shima et al., 2002; Farthing and Chilibeck, 2003a). As demonstrated by the findings of Experiment 1, the influence of the dominant limb and the direction of transfer are important for cross-education of strength. However, cross-education of strength studies have included a vast range of protocols with varying task complexity, targeting both upper (Moritani and deVries, 1979; Cannon and Cafarelli, 1987; Shields et al., 1999; Ebersole et al., 2002; Farthing and Chilibeck, 2003a) and lower body musculature (Carolan and Cafarelli, 1992; Kannus et al., 1992; Garfinkel and Cafarelli, 1992; Housh et al., 1992; Weir et al., 1995; Hortobágyi et al., 1997; Seger et al., 1998; Hortobágyi et al., 1999; Tracy et al., 1999; Shima et al., 2002). Less is known about transfer asymmetry and the influence of limb dominance on transfer direction for the lower body, so their importance may be underemphasized or assumed to have little impact. Presumably less is known about transfer asymmetry with lower limbs because leggedness may be more difficult to define than handedness and may even differ from footedness (Vanden-Abeele, 1980). However, more recently, the Waterloo Footedness Questionnaire (WFQ) has been used to reliably determine the degree of footedness (Elias and Bryden, 1998) using a similar scoring system to the Waterloo Handedness Questionnaire (WHQ) used in the present experiment. Elias and Bryden (1998) found that footedness was actually a more reliable predictor of language laterality than handedness. This might indicate that transfer asymmetry with cross-education of strength is more pronounced in the lower limbs than the upper limbs. Cross-education of strength studies that have reported limb dominance with leg training have used kicking preference or take-off in jumping to determine the dominant leg (Housh et al., 1992; Kannus et al., 1992; Weir et al.,1995). However, the dominant limb for kicking and take-off could be opposite for some subjects (Vanden-Abeele, 1980).

By convention, it appears that strength asymmetry between the dominant and non-dominant limb increases with increasing task complexity. Exhaustive left hand practice has been shown to dissipate asymmetry between hands for an aiming task in a right-handed subject (Heath and Roy, 2000) suggesting that becoming more familiar with a task with the left hand reduces asymmetry. Perhaps related to task familiarity, is that adults show reduced asymmetry between hands as compared to youth (Bryden and Roy, 2005), indicating that experience also reduces asymmetry. Whether or not similar responses are shown for complex or unfamiliar strength tasks is yet to be determined. This knowledge would be beneficial for predicting the influence of handedness or the preferential direction of transfer for future studies of cross-education of strength, or it may enable researchers to predict when cross-education of strength will occur. Increased motor unit excitability is a neural adaptation associated with resistance training (Aagaard et al., 2002). Hortobágyi et al. (1999) argue that afferent activity from activated muscles during unilateral movement could increase excitability of the contra lateral musculature.

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