

# IMPACT OF HEMISPHERIC DOMINANCE ON BEHAVIOURAL LATERALITY STYLE

**Reena Menezes, Dr. Priyanka Kacker, Prof. C.R. Mukundan**

M.Sc. Neuropsychology,  
Institute of Behavioural Science,  
Gujarat Forensic Sciences University, Gandhinagar

Assistant Professor,  
Institute of Behavioural Science,  
Gujarat Forensic Sciences University, Gandhinagar

Axxonet Brain Research Laboratory,  
Axxonet System Technologies,  
Bangalore

---

---

## Abstract

*The cerebral hemispheres play crucial role in forming the mental state of human being. "Hemistry", is an aspect of the brain that considers two distinguished modes of information flow into the brain their differential processing modes within the two hemispheres. These two modes of information processing become the foundation for the development of differences in the functions of the two cerebral hemispheres. Each hemisphere has certain areas assigned with certain functions. The dominance of a particular processing mode in the brain of an individual gives rise to specific behavioural and personality characteristics. An individual may be excellent in performing certain tasks and may exhibit characteristics which would define his individuality, his identity and the dominant talent. These characteristics may be strongly correlated with the hemispheric dominance. Thus, it is considered that there may be a close link between hemistry and behavioural characteristics of an individual. This research aims at understanding the correlation between Hemistry and behavioural characteristics of a group of volunteers. The samples selected for this research were 150 males and 150 females of age group, 18-25 years. To measure characteristics exhibited by an individual Binary Preference Questionnaire (Morton, 2003) will be used and a questionnaire is developed and validated by an expert neuropsychologist to measure the brain dominance and characteristics exhibited by the right or left-brain oriented individuals. The results showed that less than half of the total number of samples reflected hemispheric dominance and exhibited respective hemisphere characteristics. However, more than half of the samples reflected hemispheric dominance but exhibited characteristics of non-dominant hemisphere. The hypothesis that there exists a relation between Hemistry and behavioural characteristics exhibited by the right and left-brain oriented individuals is not completely supported by the data obtained. Thus, the result stands inconsistent with the data obtained and the earlier researches.*

---

**Key Words:** Hemispheric Dominance, Brain Lateralization

---

## INTRODUCTION

### HEMISTRY

The brain which seems to be an aggregate or a unified entity has been found to be bilateral. Basically the brain is divided into two hemispheres: the left hemisphere and the right hemisphere. These two hemispheres are connected to each other through tracts containing a massive bundle of fibres which are called Cerebral Commissures. The largest cerebral commissure connecting the two hemispheres is known as the Corpus Callosum. Its main function is transfer of learned information between the two hemispheres. The two hemispheres are not entirely symmetric. The most acquainted and familiar asymmetry in humans has been found to be language (Springer & Deutsch, 1993). It was discovered long ago that damage to any one of the hemispheres of the brain would have a diminishing effect on the movement of the opposite side of the body. Researchers have always been posed with the question related to the existence of two hemispheres. Many of them have researched about the differentiating factor between the two hemispheres and process of interaction between them. Various structural and functional asymmetries were identified and studied and various Hemispheric interaction models were put forth. Recently, Positron Emission Tomography (PET) and Functional MRI (fMRI) were used and new hemispheric asymmetries were discovered. These studies have associated changes in the brain lateralization as a function of variables of population such as aging.

Certain functions are localized in specific brain areas. Thus, different areas of the brain have specialized functions. The localization of different functions to one side of the brain is termed as

“Lateralization”. If one hemisphere is more prevailing or controlling in a specific function, it is often termed as being dominant (Bear et al., 2007). Hemisphericity positively directs that a person will innately be either left or right-brain oriented with respect to thinking and behavioural characteristics. Hemispheric laterality and cerebral asymmetry are terms used to replace the term “dominance”. An executive element, embedded in the local environment of the left hemisphere, will predictably have a different vista than the one embedded within the right hemisphere, which results in Hemisphericity. With detailed exploration about the structure and functions of the brain taking place, “hemispheric dominance” related to the language lateralization of the brain was substituted by “Cerebral Asymmetry” which referred to non-language dominance differences and task dependent differences (Morton, 2003b). Thus many studies and researches on the brain indicate that each hemisphere is specialized for particular cognitive functions. The right hemisphere believes in the theory “the whole is greater than the sum of its parts” and hence processes information in a holistic manner. On the other hand, the left hemisphere tends to segregate or divide the information into individual components. It has also been stated earlier that “The left cerebral hemisphere is specialized to process only one stimulus at a time, in a sequential, logical, and linear manner, whereas the right hemisphere can process a whole bunch of stimuli at the same time (Ornstein, 2004). In general, the left hemisphere appears to be a language and future-oriented with theoretical cognitive approach, whereas the right hemisphere is feeling, experience and present oriented with concrete practical approach (Kolb, 1984).

Personality traits and cognitive styles, both have been associated with the terms “left-brained” and “right-brained” for quite some time, each having a predetermined approach of its own. Distinctions regarding specializations attributed to the left vs. right hemispheres include verbal vs. spatial (Gazzaniga, 1970), local vs. global (Navon, 1983), categorical vs. coordinate (Kosslyn et al., 1989), positive vs. negative emotions (Hellige, 1993), and production vs. monitoring (Cabeza et al., 2003b). It is a widely stated general rule that the left hemisphere is involved in verbal processing to a great extent in comparison to the right hemisphere. On the contrary, the right hemisphere is found to be more associated with spatial processing (Hellige, 1993). Over a century ago, the left hemisphere’s specialization for language has been proved and accepted. It was found that the functions of speech and language remained less affected which led to the conclusion that the left hemisphere is extremely important to language functions at least in right-handed people. Studies of split-brain patients helped to get a different perspective of the specialized functions of the two hemispheres. A consistent finding in these studies is that right-handed patients are capable of solving visuospatial tasks with their left hand (right hemisphere) but not with their right hand (left hemisphere), and the opposite occurs with verbal tasks (Gazzaniga, 1970). Thus, the studies of split-brain patients gave a strong evidence for a strong right-hemisphere spatial specialization, which is complementary to the left hemisphere dominance for verbal processes. On the basis of studies that used functional neuroimaging, hemispheric specialization was proved with the help of lateralized activation patterns. It has also been confirmed that both hemispheres are employed in most cognitive tasks (Cabeza and Nyberg, 2000). This does not imply that each hemisphere is equally competent, or that either could do the task alone. However, the processing commands have to be distributed between the two interacting hemispheres. However, certain condition demand processing by a single hemisphere for better efficiency along with suppression of the activity in one of the hemispheres.

Studies of lesions indicated that the motor function was foremost controlled by the hemisphere ipsilateral to the side of the body through lesion studies. A French physician Jean Baptiste Bouillaud (1796-1881) was one of the first advocates of lateralization of language in hemispheres. In 1825, Bouillaud presented a paper to the Royal Academy of Medicine in France suggesting the most of the motor tasks are performed using the right hand then it may be a probability that the left hemisphere might be the structure in control of that hand. An inference could be drawn from this observation that language would be localized in the left hemisphere. He also proposed that speech is localized in the frontal lobes. This theory was further studied by Bouillaud’s son-in-law Simon Alexandre Ernest Aubertin (1825-1893), who further collaborated with French physician, Paul Broca in 1861.

A French physician Pierre Paul Broca, in 1861 presented his research on the lateralization of brain function. In his research, he dealt with a male patient, Monsieur Leborgne who suffered from loss of speech. He was nicknamed “Tan” as he could only say “tan”. In a few days, Tan died and Broca in his autopsy focussed on the presence of a lesion in the left cerebral hemisphere. He located speech in the third convolution of the frontal lobe on the left side of the brain. Then onwards, left hemisphere was marked as a dominant hemisphere in language. The speech region of the brain was termed as “Broca’s area” as an acknowledgement to his contribution. Damage to this area will result in speech production deficits, a syndrome known as “Broca’s Aphasia”. German anatomist Carl Wernicke supposed that there existed a relation between hearing and speech. He found that the temporal lobe was also involved in language. In honour of Wernicke’s contribution, the temporal lobe aphasia or fluent aphasia was termed as “Wernicke’s aphasia” and the region of the temporal involved in this aphasia came to be known as “Wernicke’s area”. He stated a new language disorder, conduction aphasia which resulted from the cutting of the arcuate fibres that connected the two speech areas without damaging the areas. A person suffering from this disorder would be able to secure his speech sounds, movements and language comprehension but impairment of speech will take place where it would be difficult to judge the meaning the words said. One of the crucial findings of Gazzaniga and Sperry included the

perspective that the right hemisphere had the potential of basic language processing but usually has grammatical abilities.

The Wada test, created by Juhn Wada at the Montreal Neurological Institute in 1949, was designed specifically to study lateralization. It is commonly used to determine the importance of the left or the right hemisphere in language. In this test, a barbiturate is injected in the carotid artery on one side and gradually transported to the opposite hemisphere. Either one of the hemispheres to suppress it for some time so that the functioning of individual hemisphere can be observed. Here, during this period of suppression of hemisphere, the capability to use language is tested. If the left hemisphere is anaesthetized and is the dominant hemisphere, the patient loses all ability to speak, whereas if the left hemisphere is anaesthetized but the right hemisphere is dominant, the patient will continue to speak throughout the procedure (Bear et al., 2007). A study published in 1977, Brenda Milner used the Wada test to demonstrate that 98% of right-handed people and 70% of left-handed people have a dominant left hemisphere with regards to language and speech function. The results depicted that 2% of right-handed people have a dominant right hemisphere, which is the same percentage of patients that exhibit aphasia following a lesion to the right hemisphere (Branch et al., 1964). This test is usually employed in medical situations like a neurosurgery, where the surgeons determine the dominant hemisphere in order to confirm that the removal of certain brain tissues will not interfere with the crucial functions of language and speech comprehension as well as processing.

Researches done earlier solely rested on the recording obtained from lateral eye movements. In Lateral eye movement studies, it was primarily assumed that the lateral eye movement in the right direction during cognitive tasks reflected dominant left hemisphere processing (Kinsbourne, 1972) as opposed to lateral eye movement in the left direction that indicated right hemisphere processing. It was consistently found that lateral eye movement in the right direction occurred in verbal tasks whereas lateral eye movement in the left direction were present in spatial tasks.

Despite the use of LEMs to evidence hemisphericity by a number of theorists, (Beaumont, Young & McManus; Christie & Raine, 1988; Springer 1985) the resulting studies into the validity of the technique have revealed inconsistent results. Lateral eye movements could not be proved as a valid indicator of hemispheric dominance due to lack of evidences due to which, the use of this technique has been criticized by Beaumont, Young and McManus (1984), a view supported by Raine (1991). New methods that facilitated the study of hemisphericity are electroencephalogram (EEG) and event-related potentials (ERP). However, various differences in cortical anatomy and lack of uniformity issues relating to electrode placement and data analysis have been put forth by theorists (Halasek & Highberg, 2001). In addition to this, an argument stating the dependence of ERP studies on the number of times a trial should be repeated to create artificial linguistic processing conditions (Halasek & Highberg, 2001) and the hindrance it caused to the potential of the experimenter to differentiate between perceptual, linguistic and cognitive factors. Use EEG and ERP studies of hemisphericity have been tagged as problematic due to the question on the ability of the experimenter to interpret such studies with key precision (Halasek & Highberg).

Hemisphericity is a phenomenon in relation to the distinguishing factors between the left and the right hemispheres in thinking and behaviour. The concept of hemisphericity was surrounded by the belief that it was based on the rate of inclination or declination between the left and right hemisphere in terms of functional asymmetry. After several contradicting and striking reports, the field of hemisphericity finally collapsed in the 1980s (Beaumont, Young, and McManus, 1984). After about twenty five years of the suppression of the concept of hemisphericity, a new term called "hemisity" was introduced. This binary concept explained that an individual is innately either left or right brain oriented in thinking and behavioural styles. This fact is irreversible. Based on this binary concept, three independent, but highly intercorrelated biophysical methods (dichotic deafness, two-hand line bisection, two-hand mirror tracing) have shown persistent significant differences between individuals (Morton, 2001, 2002, 2003a,b,c). The measurement of the cross sectional area of the MRI midline corpus callosum contributed to the discovery of the first neuroanatomical difference in hemisity subtypes (Morton and Rafto, 2006). A concrete fact that threefold differences were present in corpus callosal information transfer capacity between right and left brain-oriented hemisity subtypes was found. Morton, in his study assessed 133 hemisity subtype subjects on the basis of the answers given by them to five behavioural questionnaires (Zenhausern, 1978; Morton, 2002, 2003c). He observed that the answers given by the hemisity subtype subjects to the "either-or" choices were opposite. In order to make interpretation easier, the items were grouped into five categories based on the grounds of priority which are as follows:

- (1) Logical orientation
- (2) Type of consciousness
- (3) Fear level and Sensitivity
- (4) Social-Professional Orientation
- (5) Pair bonding-Spousal dominance style

Hemisity has helped to categorize people into a duality of anatomy and behaviour. This was made possible by use of three biophysical methods (Morton, 2001, 2002, 2003a,b). As the result of further extension of this research, hemisity can now be determined, based upon which side of an individual's vgACC is thickest, as revealed by a 3min MRI scan (Morton and Rafto, 2010). What thinking and behavioural style differences exist

between right and left brain-oriented hemispheric subtypes? Initially, these four methods helped to divide the subjects into two groups: LPs and RPs. Thus emerged a different aspect of hemisphericity which questioned the differences between the right and left brain oriented hemispheric subtypes. Morton intended to check whether any common behavioural preferences existed between the left brain oriented and right brain oriented individuals. In this research, five behavioural preference type questionnaires were administered, three of which contained non-overlapping “either-or” forced choice type of binary statements (Morton, 2002, 2003c) along with two new questionnaires, on the MRI calibrated subjects of the two hemispheric subgroups. It was observed that the right and left brain oriented individuals chose opposite responses which were noticeable.

#### **LOGICAL ORIENTATION:**

**Local—global** – The left brain oriented individuals depicted local processing bias in comparison to the global bias depicted by the ones that are right brain oriented.

**Logical—intuitive** – In agreement to the earlier researches and studies, the hemispheric subtypes display analytic/logical versus gestalt/holistic preferences. This led to the hypothesis that a right brain oriented individual may be associated with high scores on intuition, feeling, perception and/or extraversion. On the other hand, a left brain oriented individual may be associated with high scores on judgement, sensing and/or introversion. Feeling is a roughly estimated subjective opinion whereas “sensing” is quantitative analysis of measurement. Thus, a right brain oriented individual has the ability to evaluate objectively using qualitative data in comparison to the left brain oriented individual who have lower levels of accuracy in similar kind of estimation.

**Verbalizer—visualizer:** A left brain oriented individual prefers to think in words as opposed to a right brain oriented individual who has preference for thinking in pictures. This indicates that hemisphericity has a relation with the distinction between verbalizer – visualizer. Consistent with many earlier studies (Richardson, 1977, 1978; Montgomery and Jones, 1984), it is hypothesized that right hemisphericity will be associated with a pre- dominantly visualizer style, while left hemisphericity will be associated with a predominantly verbalizer style.

#### **TYPE OF CONSCIOUSNESS**

**Transliminality:** A significant difference was observed in the left brain and right brain oriented subjects in aspects related to consciousness. The observation was that the left brain oriented individuals were usually unable to recall dreams which were unclear and undetailed whereas right brain oriented individuals had clear and detailed dreams which they could recall. This indicated that the individuals with right brain orientation had access and the ability to move in and out of consciousness, which means they are transliminal. On the other hand, the individuals with left brain orientation were obstructed and unable to access the unconscious. Transliminality has a close connection with experiences during sleep.

**Absorption:** The left brain oriented individuals seem to have the ability to multitask as well as concentrate easily on multiple tasks and thrive on chaos whereas the right brain oriented individuals concentrate on one thing at a time and their attention is easily diverted due to any kind of disorder.

**Mindfulness:** Mindfulness is the process of being aware. An operational definition of mindfulness as “the awareness that emerges through paying attention on purpose, in the present moment and non-judgmentally to the unfolding of experience moment by moment” was proposed by Kabat-Zinn (2003). The two important components of mindfulness are attention and cognition (Malinowski, 2008) which implies self-regulating the attention and inclinations towards one’s own experiences. The right brain oriented individuals may show high scores in the aspect of mindfulness.

**Fantasy Proneness:** In terms of the visual images, the right brain oriented individuals tend to imagine and create quite clear and intense imageries as opposed to the left brain oriented individuals who may not be able to create clear and bright images. Since fantasy proneness is strongly related to vividness of visual imagery (van de Ven and Merckelbach, 2003), individuals with right hemisphericity will score higher on the scale of fantasy proneness.

**Morningness-Eveningness:** Many researches, studies and literatures have correlated morningness with left hemisphericity and eveningness with right hemisphericity such as (Adan and Almirall, 1992 or Muro et al., 2009). Introversion on a higher scale, distress and alertness are associated with morningness. It is a strong correlation with higher baseline levels of arousal. It is a noticeable fact the eveningness is closely associated with extraversion, less self-control, inclination towards impulses, higher risk-taking tendency, more openness to experience, an exclusive sense of humour and frequent occurrence of nightmares. Eveningness is closely linked with symptoms of depression and a greater inclination towards bipolar disorder. It is predicted that right hemisphericity will be associated with eveningness, while left hemisphericity will be associated with morningness, as measured by the Morningness–Eveningness Questionnaire (Horne and Ostberg, 1976).

**Alexithymia:** Alexithymia is a syndrome that is characterized by an inability to verbally describe feelings, flattened affect, inability to recognize emotions in others, absence of fantasies and dreaming, preoccupation with minute details of external events, somatic complaints and withdrawn personality traits (Sifneos et al., 1977). Left brain oriented individuals tend to abstain from discussing or talking about their

feelings. Studies of commissurotomy patients suggest that the dissociation between affect and cognition seen in alexithymia is related to a functional disconnection of the hemispheres (Hoppe and Bogen, 1977). A clinical study of a patient with agenesis of the corpus callosum revealed severe alexithymia (Buchanan et al., 1980). Increased size of the corpus callosum may be associated with greater interhemispheric communication (Christman, 1995). Right hemisphericity is associated with a larger area of the corpus callosum (Morton and Rafto, 2006), and with lower levels of alexithymia. It is predicted that left hemisphericity will be associated with higher scores on the Toronto Alexithymia Scale (Bagby et al., 1994).

**Repressors:** A repressive defence style, i.e., preferential use of the defence mechanism of repression has been found to be associated with relatively greater left hemisphere activation (Waldinger and Van Strien, 1995). It was associated with the retardation of the perception of threat and advocate self-esteem. It also showed a preference for defence mechanisms characterized by the inhibition of interpersonal conflict and ambivalent or negative emotions, and by selective accentuation of the positive (Schwartz, 1990). Tomarken and Davidson (1994). A higher left frontal EEG activation, an elevated autonomic responsiveness and systolic blood pressure is significant in repressors. The repressive coping style may be associated with a functional hemispheric disconnection (Schwartz, 1990). Davidson (1984), discovered that there was relative deficiency in the transfer of negative affective information from one hemisphere to the other in repressors. Thus, the repressive style of coping seems to have a strong association with greater left frontal activation and reduction in the transfer of negative affective information across the corpus callosum. It is here predicted that left hemisphericity will be associated with a repressive style, as indicated by high scores on measures of social desirability, and low scores on measures of anxiety on the MCSDS (Tomarken and Davidson, 1994).

### FEAR LEVEL AND SENSITIVITY

**Anxiety-confidence:** It seems that the left brain oriented individuals were more inclined to anxiety than the right brain oriented ones. Individuals with left hemisphericity do not prefer to discuss or talk about their emotions as opposed to those with right hemisphericity who are comfortable in discussing and experiencing emotions. Post-traumatic disorder may be associated with left hemisphericity along with other illnesses that are based on anxiety and caused by stress.

### SOCIAL AND PROFESSIONAL ORIENTATION

The two important aspects of social and professional life are extroversion and introversion. Based on the research, an association was discovered between left brain oriented individuals and introversion. Similarly, right brain oriented individuals were associated with extroversion. Introversion is associated with greater cerebral blood flow while extroversion with less cerebral blood flow (Mathew et al., 1984). A non-verbal decoding deficit was observed in introverts which implied lesser functioning of right hemisphere in introverts (Lieberman and Rosenthal, 2001). Introverts exhibit hyper-anxious Type A behaviour in which they tend to suppress stimulation in order to control excessive baseline arousal (Ludvig and Happé, 1974). They usually tend to medicate themselves with depressants and as a result are more inclined to alcoholism (Morton, 2011, 2012). On the other hand, the extroverts display a low baseline arousal for which they seek stimulation so that the arousal level can be balanced to an optimum level. Individuals with right hemisphericity seem to choose stimulating substances over depressants (Morton, 2011, 2012). The researches and studies quoted earlier have shown a strong association between higher baseline arousal and morningness, alexithymia and the repressive defence style, all of which coincidentally are indicative of individuals with left brain orientation. Extraversion has been found to be significantly associated with various characteristics associated with transliminality and right hemisphericity, including creativity and mania/hypomania (Cassano et al., 2009). Extraversion is also associated with higher levels of emotional awareness (Igarashi et al., 2011).

**Theory of mind abilities:** The theory of mind is the capacity to draw a conclusion or make a deduction about the intentions, feelings and mental states of other individual and use this data to predict and control behaviour (Premack and Woodruff, 1978). Theory of mind abilities have been found to be associated with various aspects of non-literal language, including metaphor, humor, irony, and sarcasm (Langdon et al., 2002; Channon et al., 2005). Based on evidence, right hemisphericity individuals are believed to have a greater potential to understand and know what others are thinking. Damage to the right hemisphere has shown to impair the comprehension of similes, metaphors, proverbs, sarcasm, humour, and other non-literal inferences (Brownell et al., 1990). Both affective prosody and sarcasm perception are thought to depend on the right hemisphere (Shamay-Tsoory et al., 2005). The right frontal lobe is involved to a great extent in the coordination between the theory of mind abilities and self-awareness. (Stuss et al., 2001). A right hemisphere stroke may cause impairment in the tasks associated with the theory of mind (Happé et al., 1999).

## PAIR BONDING AND SPOUSAL DOMINANCE STYLE

### Attachment

The items included in the category of Pair Bonding and Spousal Dominance style consider the behaviour in terms of attachment. The research implied that in individuals with left hemisity, the behavioural attachment system is activated at a very low level whereas in individuals with right hemisity, there is a greater activation of the behavioural attachment system. Theoretical arguments and empirical studies have suggested that attachment behaviours are mediated predominantly by the right hemisphere, particularly the right orbitofrontal cortex (Mohr et al., 2008). This research has predicted an inference that left hemisity is more closely associated with an avoidant spousal attachment style as opposed to right hemisity which has a strong inclination towards the dominant spousal attachment style.

It is not yet explicitly defined the extent to which the traits of hemisity assist the different aspects of personality. A further research to explore in depth the relation between the different traits of hemisity and the overall personality is the need of the hour.

Evidence has been amassed that the left cerebral hemisphere in most right- handed individuals manifests facilities for language (Broca, 1865), has an orientation for local detail (Robertson and Lamb, 1991), has object abstraction-identification abilities (Kosslyn, 1987), and appears to possess a hypothesis-generating, event "Interpreter" (Gazzaniga, 1989, 2000; Wolford et al., 2000). In contrast, the RH has been demonstrated to excel in global analysis (Robertson and Lamb, 1991; Proverbio et al., 1994), object localization (Kosslyn et al., 1989), facial recognition (Milner, 1968), and spatial construction (Sperry, 1968). Among the about 90% of humans who are right-handed (Coren, 1992), language is located in the LH in about 96% of them (Knecht et al., 2000). Of the remaining about 10% of left handed individuals, some 73% of these also have language in their left cerebrum (Knecht et al., 2000). Thus, the conclusion drawn is that the Left hemisphere houses language ability in about 93.7% of us.

## BINARY QUESTIONNAIRE AND HEMISITY QUESTIONNAIRE:

Recently the Binary Questionnaire and the Hemisity Questionnaires have also been developed and utilized (Morton, 2012).

Several MRI studies were performed to determine the structural differences of the brain of the left brain and right brain oriented individuals. One of the important neuroanatomical differences discovered was that the cross-sectional area of the midline of the corpus callosum of right brain oriented individuals was three times larger as compared to that of left brain oriented individuals and to be unrelated to sex or handedness (Morton and Rafto, 2006). The other fact discovered was that the bilateral anterior cingulate cortex (ACC) in areas 24 and 24' was upto 50% larger on the right side for individuals with right brain orientation as compared to the individuals with left brain orientation it was up to 50% larger on the left (Morton and Rafto, 2010).

Once the hemisity of an individual could be determined, the next question that arose was whether there could be significant differences in the behavioural preferences of the right hemisity and left hemisity individuals? Morton attempted to draw a relation between the hemisity subtype of an individual and his behavioural preferences. Based on his research, he put forth the result that individuals with left brain orientation tend to be top-down, detail oriented and reason deductively whereas individuals with right brain orientation tend to be bottom up, big picture and prefer inductive reasoning. In terms of the Type of Consciousness, individuals with right brain orientation were more visual, relied on concrete reasoning and had the ability to find commonalities between objects. On the other hand, individuals with left brain orientation, were more verbal, relied on abstract reasoning and had a strong inclination to find differences between objects. In regards to Fear, Level and Sensitivity, the left brain oriented individuals were more sensitive, silent, emotion-avoiding and defensive whereas the right brain oriented individuals were bold, talkative and invasive. For Social and Professional Orientation, individuals with left hemisity were more independent, secluded and competitive in comparison to individuals with right hemisity who were more orderly, responsible and open. In relation to Pair bonding style and Spousal Dominance, individuals with left brain orientation were less dominant and demanded privacy, calmness, coolness, try to avoid emotions with logic and assist the spouse. Right brain orientated individuals were comparatively more dominant, demanded closeness from spouse and required to be restored of their confidence in the faithfulness of the spouse and support, along with being intuitive and directive.

Usually for most of the left brain oriented individuals, the executive element of the anterior cingulate lies in the hemisphere that contains language which implies transcallosal communication is not required which is opposite as compared to the scenario in which the executive element would be present in the contralateral hemisphere which does not house language. In such cases, the corpus callosum in the individuals with left brain orientation could be guessed to be smaller in comparison to those with right brain orientation. Several beliefs associating gender, laterality and brain surfaced in the past. Initially, when corpus callosum was studied, the aspect of hemisity remained aloof. This resulted in a confusion and the results were grouped based on sex or handedness with hemisity, a major factor influencing corpus callosum (Morton and Rafto, 2006).

This error focussed on the stereotypical view that the male brain is more specialized due to its higher laterality (McGlone, 1980). On the contrary, the data available from the studies involving corpus callosum suggested that the left brain oriented individuals, irrespective of the sex they belong to, are more lateralized in comparison to the whole community of males. Similarly, individuals with right brain orientation, irrespective of the sex they belong to, are less lateralized. Thus, the sexual stereotype stands opposed. These findings attempted to put an end to the controversial topic about which sex has the larger corpus callosum (Luders et al., 2003). There was no significant difference between the two sexes in either their mean corpus callosum, the range of its size, or in the IQ of the subjects (Morton and Rafto, 2006). Unawareness regarding the contribution made by hemisphericity to corpus callosum is the reason that approves both, the European studies stating mean corpus callosum for males to be larger (Clarke et al., 1989) and the American as well as Australian studies, stating mean corpus callosum for females to be larger (Holloway et al., 1993) as correct. All arguments involved in these studies will be based on the differences in their regional population with hemisphericity as an important factor. This is a critical aspect which needs further investigation.

The focus has now shifted to the fact that individuals irrespective of their sex having same hemisphericity exhibit various common behavioural traits in comparison to individuals belonging to the same sex but displaying opposite hemisphericity. This is strongly supported by data from the MRI calibrated preference questionnaires (Morton, 2002, 2003c, 2012). Today, probably the various traits of hemisphericity are being incorrectly defined and misinterpreted as the sex traits of the two classes: male or female traits. Thus, men in general do not “hide in their caves of silence” (Tannen, 1990; Gray, 1992). In fact, in contrast to their right brain counterpart, left brain-oriented females are every bit as “private” as left brain-oriented males (Morton, 2002, 2003c, 2012). Irrespective of the sex they belong to, individuals with right brain orientation tend to enjoy the commanding position in the nuclear family, (Morton, 2002, 2003c, 2012). Because of the newness of hemisphericity and its new behavioural distinctions, sex traits have never been studied together with hemisphericity traits. Recognition of the presence of hemisphericity in a measurable manner may introduce many hidden facets of human behaviour.

Within the professional category, differentiation related to the area of specialization was required. Morton (2003d) suggested that individuals in primarily “top-down” professions working at structural levels that are sub divisible, such as micro- biologists, biochemists, and particle physicists, were more left brained. In contrast, those in more “bottom-up” macroscopic or gestalt-oriented professions such as architecture, civil engineering design, and astronomy, tended to be more right brained. This, it could be implied that hemisphericity plays a crucial and intense role in career development.

An explanation has been proposed to account for the sorting of hemisphericity in higher education and career selection (Morton, 2003d). This was based on the preference of the left brain and right brain oriented individuals in terms of their choice. The performance of one subclass of hemisphericity would be excellent if they surpassed the other subclass. The consequences may be success, hardship or failure moulds the belief of an individual regarding the like or dislike of those particular topics. Topics that implied success would be selected and those that were associated with failure would be annulled. Thus, it can be said that one may choose his or her profession based on what he or she enjoys doing the most.

Existence of hemisphericity is a fact that is unavoidable and is based on the unilateral nature of a structural component of the executive system. An individual can be assessed to determine the left or right brain orientation using the earlier and newly developed quantitative methods i.e. questionnaires and tasks. The scientific reason behind the neuroanatomical differences between the individuals with left and right orientation is yet to be explored. One facet can be the contribution of the hemisphericity of the parents and correlating it with their offspring. An intense research in genetics will be able to unfold the implications of hemisphericity.

Earlier, handedness was considered to be an indicator of brain lateralization usually for complex tasks. In case of simpler tasks, brain lateralization is the index of hand preference and the hemisphere which is most likely to be used to do the task determines which hand to be used by the animal (Rogers, 2007).

Brain dominance strongly influences the personality of an individual. It has a significant effect on an individual's skills in the fields of education, profession, habits and so on. Hemisphericity will prove useful in terms of recognizing one's own ability, ideas and interests. It would prove an asset on the professional front as well intellectually for a person to perform self-analysis. Hemisphericity identifies the specific brain orientation and thus, the specific behavioural characteristics which helps one to identify the strengths and weakness in oneself.

Here an attempt is made to cross examine the impact of hemispheric dominance on the behavioural laterality style on the Indian population.

## METHODOLOGY

**OBJECTIVE OF STUDY:** To study the relation between Hemisphericity and behavioural characteristics exhibited by the right or left-brain oriented individuals.

**HYPOTHESIS:** There exists a relation between Hemisphericity and characteristics exhibited by the right or left-brain oriented individuals.

**SAMPLE:**

Total 250 students within the age group of 18-25 years were selected randomly from various colleges of Gandhinagar.

**VARIABLES:**

Independent Variables:

Hemistry (Left and right brain orientation) and behavioural characteristics

Dependent Variables:

The scores obtained on the Right-Left Questionnaire and the Binary Preference Questionnaire (Morton, 2003).

**DIAGNOSTIC TOOLS:**

Right-Left Questions Questionnaire (V. Ramachandran, 1988)

The Right-Left Questions is a 17-item self-report measure of the hemispheric dominance. It is mainly useful for screening the hemispheric dominance of individuals. It appears to be a valid and reasonable measure of hemistry.

Binary Preference Questionnaire (Morton, 2003).

It is a 40-item, report in which the items are grouped into four categories based on the grounds of priority which are as follows:

- (1) Logical orientation
- (2) Type of consciousness
- (3) Fear level, Arousal and Sensitivity
- (4) General Behavioural Style

It helps in identifying the characteristics exhibited by an individual under the influence of the dominant hemisphere. The internal validity and reliability of the questionnaire was assessed by Cronbach's alpha.

**PROCEDURE:**

The sample was randomly collected from various colleges in Gandhinagar. Students in the age group of 18-25 years were selected and given the questionnaires to be filled. The subjects were made comfortable and explained the purpose of research.

First they were asked to fill the Right-Left Questionnaire. Appropriate instructions were given. They were informed that the Questionnaire had 17 items, each having an option a and b. They had to choose either of the options and rate them on a scale of 1 to 10. 1 being the lowest and 10 being the highest.

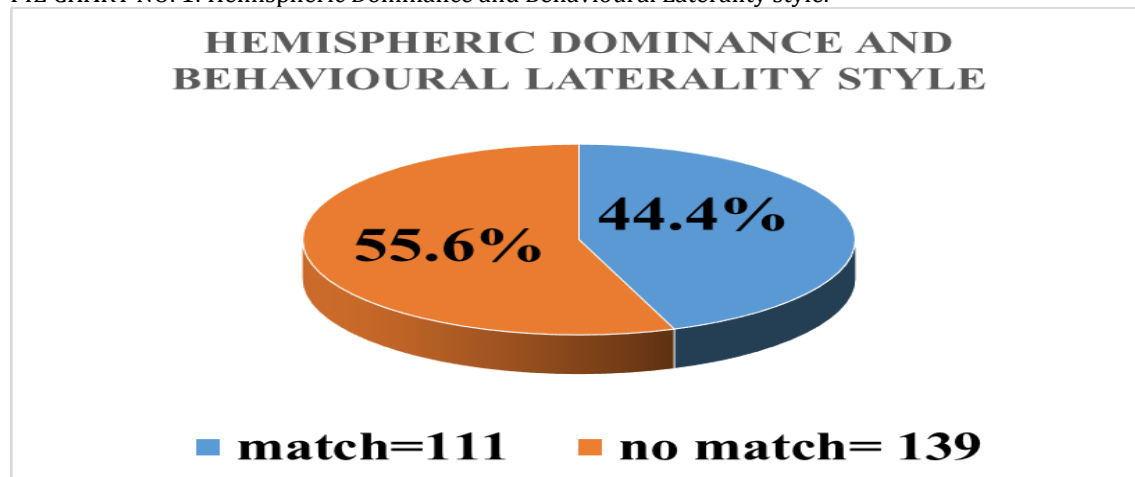
Next, they were asked to fill the Binary Preference Questionnaire. They were informed that the Questionnaire had 40 items, each having an option a and b. They had to choose either of the options that suited them the best. The Subjects were informed that there was no time limit. However, they were asked to fill the Questionnaires as soon as possible and avoid leaving any response blank.

Once the questionnaires were completed, they were collected back.

**RESULTS & DISCUSSION**

The score of each sample on the Right-Left questions questionnaire and the Binary Preference questionnaire was calculated. The total number of samples that reflected hemispheric dominance along with specific behavioural characteristics confined to the respective hemispheres was calculated. The percentage of samples exhibiting such relation was calculated and represented using a Pie chart. Refer to Pie chart no. 1.

PIE CHART NO. 1: Hemispheric Dominance and Behavioural Laterality style.



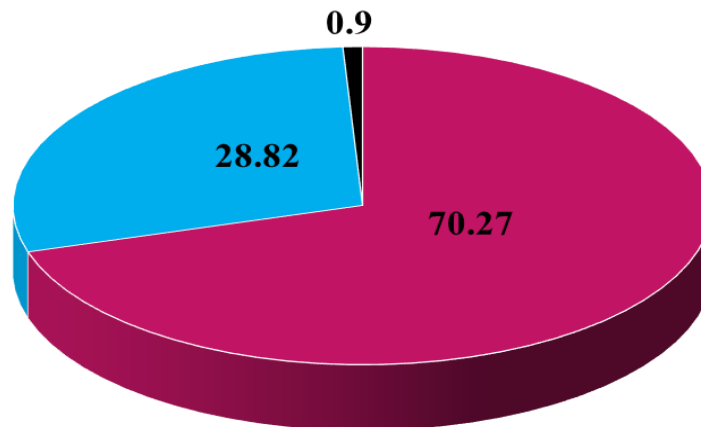
<https://www.gapifbs.org/>



Out of 250 samples , 111 samples i.e. 44.4% reflected hemispheric dominance and exhibited respective hemisphere characteristics. Also, 139 samples i.e. 56.6% reflected hemispheric dominance but exhibited characteristics of non-dominant hemisphere.

Next the total number of samples exhibiting Right hemispheric dominance and its characteristics was calculated. The percentage of samples exhibiting this dominance was computed. Similar calculation was performed for the samples exhibiting Left hemispheric dominance and its characteristics. The result was represented using a Pie chart. Refer to Pie chart no. 2.

■ **Right hemisphere**                      ■ **Left hemisphere**  
■ **Right-Left hemisphere**



PIE CHART NO. 2: Hemispheric Dominance and Behavioural Characteristics.

Out of the 111 samples that exhibited hemispheric dominance and showed respective characteristics, 78 samples i.e. 70.27 % were Right Hemisphere dominant and exhibited characteristics pertaining to the right hemisphere. On the other hand, 32 samples i.e. 28.82 % were Left Hemisphere dominant and exhibited characteristics pertaining to the left hemisphere. However, 1 sample i.e. 0.9% was Right-Left hemisphere dominant and exhibited characteristics pertaining to both the right as well as the left hemisphere.

## CONCLUSION

The hypothesis that there exists a relation between Hemisity and behavioural characteristics exhibited by the right and left-brain oriented individuals is not completely supported by the data obtained. Thus, the result stands inconsistent with the data obtained and the earlier researches.

## REFERENCES

- [1] Bruce E. Morton, S. E. (2010). Behavioural Laterality Advance: Neuroanatomical Evidence for the Existence of Hemisity. *Personality and Individual Difference*, 49. 34-42.
- [2] Gulpinar, M. A. (2005). *The Principles of Brain-Based Learning and Constructivist Models in Education*. Education Sciences: Theory and Practice.
- [3] Maartensson, F. (2007). Lateralization of Language Functions in the Human Brain. *Neurolinguistics*.
- [4] Pinel, J. P. (2003). *BioPsychology*. Boston: Pearson Education, Inc.
- [5] Sander Daselaar, R. C. (n.d.). Age-Related changes in Hemispheric Organization. *Cognitive Neuroscience of Aging: Linking Cognitive and Cerebral Aging*, 325-353.