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Using hemispheric preference as a predictor of success in a limited-residency information systems doctoral program

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Abstract

Due to the specific functionality of each of the brain's hemispheres, historically many educators and researchers have been quick to identify students or employees as having a right or left brain hemispheric preference. This is important, they believed, in order to create learning and work environments that utilize the strengths of each preference. More recently, researchers have argued that this dichotomy does not exist; the actions of humans rely on the coordinated functionality of both hemispheres. In an effort to support their contention, this study investigated the attrition rate of 152 students in a limited-residency information systems doctoral program. Students were administered a measure of brain hemishperic preference within the first two years of the program; they were then tracked for up to eight additional years until they left the program via attrition or graduation. The results of a logistic regression support the theory that a given hemispheric preference does not predict a student's choice of graduate degree program or success therein.

Keywords: information systems, graduate studies, hemispheric preference, attrition

Introduction

Throughout the history of formal education, researchers have attempted to identify student characteristics or learning constructs that, when considered while designing a teaching strategy or environment, might contribute to higher levels of student achievement and retention. The rapid growth of technology-based distance education programs, with attrition rates significantly higher than traditional programs, has led to increased interest in studies of this type; these include, among others, investigations of learning style (Richmond & Cummings; Terrell, 2014, 2005a), connectivity between students and faculty (Angelino et al., 2007; Carr, 2000; Ivankova & Stick, 2005; Moore, 2014), demographic characteristics (Aragon & Johnson, 2008; East & East, 2009; Rovai, 2003) and information perception (Terrell, 2005b). This paper will continue the investigation of constructs of this type and discuss the relationship between students' cerebral hemispheric preference and retention in an online information systems doctoral program.

Human Brain Anatomy and Function

The human brain is divided into distinct lobes and structures, with each controlling specific functions or activities (Carter, 2009; Nolte, 2008) (Figure 1). Humans exist through the coordinated effort of sections controlling specific physiological functions (e.g., the brain stem) and higher order functions (e.g., the development of intelligence and reasoning within the parietal lobe). Damage to any of these structures may lead to physical (e.g., damage to the temporal lobe may result in seizure disorders) or developmental issues (e.g., pituitary gland tumors may contribute to vision problems).

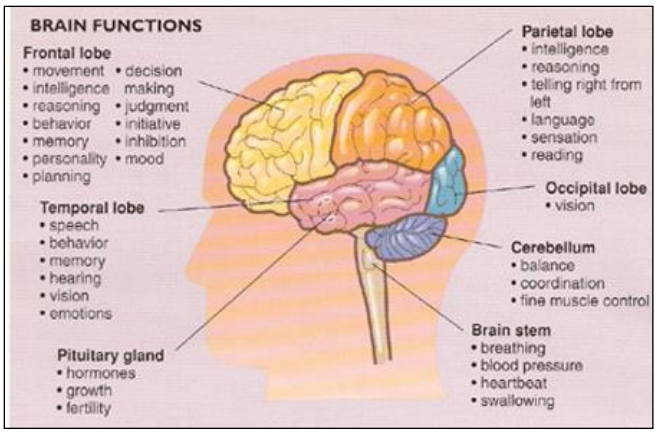

Figure 1- Neural Anatomy (www.brainsurgery.com)

When viewed from a superior perspective, it can be seen that the brain is further divided into two hemispheres (Figure 2).

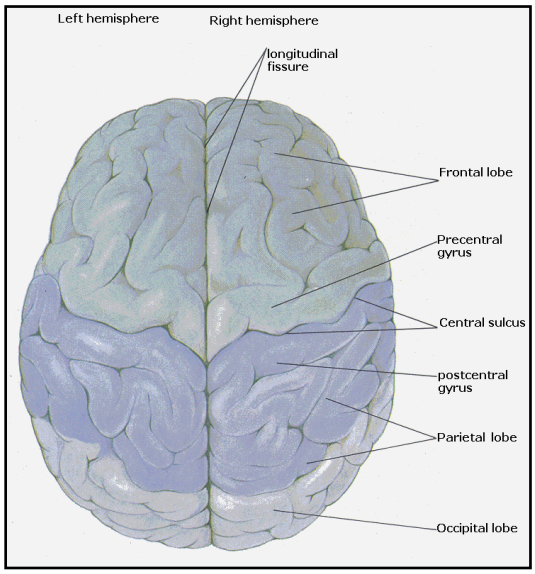

Figure 2- Left and Right Hemispheres (www.users.ecs.soton.ac.uk)

As shown in Table 1 (Taggart and Robey, 1981) the left hemisphere is most associated with analytic tasks (e.g., sequence, structure, logic, etc.) while the right hemisphere controls spatial representation and perspective (e.g., visual imagery, ideas, relationships, etc.).

Table 1 - Hemispheric Tactics

Left Dominant Tactics	Right Dominant Tactics
Structured	Open-ended
Verbal	Spatial
Facts	Ideas
Sequence	Relationship
Outline	Summary
Logical	Intuitive

From this, and based also on the earlier work of Sperry (1962), a popular view of hemisphericity has emerged that describes persons as either left or right brain dominant. In both of these, it is commonly accepted that a learner relies on a hemispheric-specific set of tactics, attitudes or approaches in a learning environment. For example, "left-brainers" have been described as logical with a preference to learn in a linear manner, being detail oriented with strong emphasis on order and pattern perception, having a preference for the written word and often choosing careers in the sciences. Persons with a right-brain preference are more likely to interject personal feelings into their decision making, favor spatial perception rather than exact details, and are attracted to professions in the liberal arts or social sciences.

Recent research (e.g., Harvard University, 2010; Kosslyn and Miller, 2013) has disputed this by stating that learning cannot be described as relying on one hemisphere over the other; while a given hemisphere may control specific functionality, very rarely is a specific task exclusive to a particular hemisphere. For example, if language skills are examined, speech and grammar are controlled by the left hemisphere, while the right hemisphere controls comprehension and understanding. Despite this, throughout the years, the commonly accepted and propagated theory of brain hemisphericity has led to the extensive development of lesson plans, teaching approaches and learning tools designed to support both types of learners.

Purpose of the Study

Due to the nature of the discipline, students pursuing a degree in information systems should, based on the earlier literature, prefer a left-brained approach to learning (Benson & Standing, 2002; Saleh, 2001; White & Sivitanides, 2002. 2005). This study attempted to support or discredit that theory by collecting demographic and hemispheric preference data from students enrolled in an information systems doctoral program. Using that data, the study was driven by three research questions:

1. Will students in a doctoral level information systems program demonstrate a preference for a left-brained approach to learning?

2. Will a student's hemispheric preference be predictive of attrition from a limited-residency doctoral program?

3. Is there an interaction between hemispheric preference and demographic characteristics (e.g., gender, age and ethnicity) as they relate to success in a limited-residency doctoral program?

Instrumentation

Data for the study were collected using the *Human Information Processing Survey* (HIPS), (Scholastic Testing Service, 1984). The HIPS includes 40 scale items, each with three forced choices focused on identifying the respondent as preferring a right, left, mixed or integrated approach to processing information. In order to ascertain a given person's processing style, the numeric Right and Left values are compared, with the smaller value being subtracted from the larger. The resultant value is labeled with the prefix of the larger value, with the result of the subtraction suffixed to that label. For example, a person with an R score of 120 and an L score of 100, would be labeled as R20 (i.e., R120 – L100 = R20), a person with an L score of 100 and an R score of 50, would be labeled as L50. The HIPS has been shown to have acceptable construct and content validity, and high levels of reliability (Reynolds, Riegel & Torrance, 1977). For the purposes of this study, only the hemispheric prefix (i.e., R or L) was used in data analysis.

Procedures

The population for this study consisted of 152 students enrolled in a limited-residency information systems doctoral program in a graduate school of computer and information sciences. The average age of the population was 44, with slightly more females (n = 82) than males (n=70). Thirty (i.e., 19.7%) self-identified as belonging to a minority group (e.g., African-American, Hispanic, Asian-Pacific Islander, etc.).

At the time the data were collected, students were required to take a course in learning theory during which they completed the *Human Information Processing Survey*. Coursework completion generally takes two years; students are then allowed up to eight additional years to complete their dissertation. The students were tracked over 10 years until they either graduated or left the program due to academic or personal reasons.

Results

In order to answer the first research question, as shown in Table 2, a majority of students indicated a left-brain preference (n = 86, 56.6%) however the difference between that and the count of students identified as having a right-brain preference (n = 66, 43.4%) was not significant , $\chi^2(1) = 2.632$, $p = .105$.

Table 2 – Frequency of Hemispheric Preference

	Observed N	Expected N	Residual
Left	86 (56.6%)	76.0 (50%)	10.0
Right	66 (43.4%)	76.0 (50%)	-10.0
Total	152 (100%)		

To answer research questions two and three, a logistic regression (Hosmer et al, 2013) was performed to ascertain the effects of brain hemispheric preference, age, gender and ethnicity on the likelihood that students would graduate from a limited residency doctoral program. The logistic regression model was not statistically significant, $\chi 2(8) = 8.512$, $p = .385$. The model explained 3.7% (Nagelkerke R2) of the variance in and correctly classified 67.1% of cases. None of the predictor variables in the equation were shown to have a significant effect on attrition from the program.

Limitations and Suggestions for Future Research

The primary limitation of this study is temporal; students were tracked for up to 10 years to ascertain whether they graduated from the program. This includes students entering between 1990 and 2000, thereby giving a data collection window of 10 years, from 2000 to 2010. Additionally, the generalizability of these results is affected by three more manageable limitations. First, the results from students in a doctoral program may not be representative of students at other levels, thereby calling for research of this type with differing populations. Next, as shown, the demographics of the students involved in the study did not appear to significantly affect attrition rates; it is possible that the research of this type could be conducted with students representative of other demographic groups. Finally, the subjects in this study were students in a limited-residency doctoral program; it is advisable that this research of this type be replicated in traditional and completely online programs.

Conclusions

Scientists and the academic community have long accepted the idea that there are specific functionalities controlled primarily in a given hemisphere within the brain. The hemispheres do not work in isolation, rather in unison. As an example, simple verbal communication requires the left hemisphere to play a dominant role in speech, grammar and comprehension, while the right hemisphere provides the mechanism for understanding the meaning of what is being said. Unfortunately, many educators have overlooked the dualistic nature and have developed plans, approaches and tools to facilitate equal opportunities for students with a perceived hemispheric preference. Many have also used a perceived hemispheric preference as predictive of a given person's educational interests and success in their given endeavor. Contrary to that, in this paper it has been shown that hemispheric preference does not predict the choice of a given doctoral program, nor does it predict success in a given subject area.

References

Angelino, L., Willliams, F., & Natvig, D. (2007). Strategies to engage online students and reduce attrition rates. *The Journal of Educators Online, 4*(2).

Aragon, S. & Johnson, E. (2008). Factors influencing completion and noncompletion of community college online courses. *The American Journal of Distance Education, 22*(3), 146-158.

Benson, S. & Standing, C. (2002). Are information systems students in their right minds? In Dadahzadeh, M. Saber, A. & Saber, S. (Eds.), *Information technology education in the new millennium* (70-80). Hershey, PA: IRM Press.

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. *Chronicle of Higher Education, 46*(23), A39-A41.

Carter, R. (2009). *The human brain book* (9th ed.) London: DK Publishing.

East, B., & East, C. (2009). Attrition in online and campus degree programs. *Online Journal of Distance Learning Administration, 12*(2).

Harvard University (2010) *The neuroscience of teaching and learning: Unit 1: we all have different brains*. Retrieved from: https://www.cfa.harvard.edu/smg/Website/braincourse/brainlearning/unit1_sec2.html

Hosmer, D., Lemeshow, S., & Sturdivant, R. (2013). *Applied logistic regression* (3rd ed.) Hoboken, NJ: Wiley.

Ivankova, N. V., & Stick, S. L. (2005). Collegiality and community-building as a means for sustaining student persistence in the computer-mediated asynchronous learning environment. *Online Journal of Distance Learning Administration, 8*(3).

Kosslyn, S. & Miller, G. (2013). *Top brain, bottom brain: surprising insights into how you think*. New York: Simon & Schuster.

Moore, R. (2014). Importance of developing community in distance education courses. *TechTrends, 58*(2), 20-24.

Nolte, J. (2008). *Human brain: an introduction to its functional anatomy* (6th ed.). St. Louis: Mosby.

Reynolds, C., Riegel, T. & Torrance, E. (1977). Bibliography on R/L hemisphere function. *Gifted Child Quarterly, 21*, 574-585.

Richmond, A. S., & Cummings, R. (2005). Implementing Kolb's learning styles into online distance education. *International Journal of Technology in Teaching and Learning, 1*(1), 45-54.

Rovai, A. (2003). In search of higher persistence rates in distance education online programs. *Internet and Higher Education 6,* (2003), 1 – 16.

Saleh, A. (2001). Brain hemisphericity and academic majors: a correlation study. *College Student Journal, 35*(2).

Scholastic Testing Service (1984). *Human information processing survey administrator's manual*. Bensenville, IL.

Sperry, R. (1962). Some general aspects of interhemispheric integration. In Mountcastle (Ed.), *Interhemispheric relations and cerebral dominance*, 43-49.

Taggart, W. & Robey, D. (1981) Minds and managers: on the dual nature of human information processing and management. *Academy of Management Review, 6*(2), 187-195.

Terrell, S. (2014). The use of experiential learning styles to predict attrition from a limited residency information systems graduate program. *The Online Journal of Applied Knowledge Management, 2*(1), 1 – 10.

Terrell, S. (2005a). Supporting different learning styles in an online learning environment: does it really matter in the long run? *Online Journal of Distance Education Administration, 8*(2).

Terrell, S. (2005b). A longitudinal investigation of the effect of information perception and focus on attrition in online learning environments. *Internet in Higher Education, 8*(3).

White, G. & Sivitanides, M. (2002). A theory of the relationships between cognitive requirements of computer programming languages and programmers' cognitive characteristics, *Journal of Information Systems Education, 13*(1), 59–66.

White, G. & Sivitanides, M. (2005). Cognitive differences between procedural programming and object oriented programming. *Journal of Information and Management, 6*(4), 333-350.