THINKING STYLE PREFERENCES IN COMMUNICATION PATHOLOGY

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ABSTRACT:

TITLE: Thinking style preferences in Communication Pathology.

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In the present study, the thinking style preferences in Communication Pathology were describe since literature suggests that personality, mental preferences and the choice of profession should be congruent. A descriptive, exploratory study was done. A convenience, non-probability sample was used to identify 120 subjects to participate in the study. The subjects that participated in the study included first year students in Communication Pathology, final year students in Communication Pathology and professional, graduate Communication Pathologists. A cover letter, biographical questionnaire and the Herrmann Brain Dominance instrument were handed to the 120 identified subjects of the study. 91 of the 120 questionnaires were returned. The results indicate that the thinking style preference of the Communication Pathologist is quadrant C of the Four Quadrant Whole Brain Model. Quadrant C is followed by preferences for using quadrants B, D and A. When looking at the thinking style preferences of Speech-Language Pathologists, Audiologists and Speech-Language Pathologists *and* Audiologists, the preferred quadrant of all three groups still is quadrant C. It is interesting to note however that Audiologists and Speech-Language Pathologists *and* Audiologists' quadrant D obtained higher scores than individuals that considered themselves exclusively as Speech-Language Pathologists. Quadrant A is the least preferred quadrant for all the subjects that participated in the study. Learning- and teaching strategies relevant to the thinking style preferences of the student in Communication Pathology were developed. The results have important implications for the selection of future students to the course B. Communication Pathology, the development of new curricula and the training and education of students.

Key words: Thinking style preference, Herrmann Brain Dominance Instrument, learning- and teaching strategies and communication pathology.

OPSOMMING:

TITEL: Denkstylvoorkeure in Kommunikasiepatologie.

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In hierdie studie is daar ondersoek ingestel na die denkstylvoorkeure in Kommunikasiepatologie aan gesien literatuuraandui dat persoonlikheid, verstandprosesse en die keuse van beroep kongruent moet wees. 'n Beskrywende, ondersoekende studie is gedoen. 120 proefpersone (eerste jaar studente in Kommunikasiepatologie, finale jaar studente in Kommunikasie= patologie en gekwalifiseerde Kommunikasiepatoloë) is deur middel van 'n toevallige gerieflikheidssteekproef geselekteer. Hierdie proefpersone het 'n dekbrief, 'n biografiese vraelys en die "Herrmann Brain Dominance Instrument" ontvang. 91 van die 120 vraelyste is terug ontvang. Die resultate dui aan dat die Kommuniksiepatoloog se denkstylvoorkeur in kwadrant C van die "Four Quadrant Whole Brain Model" lê. Kwadrant C word gevolg deur kwadrant B, D en A. Wanneer daar gekyk word na die denkstylvoorkeure van die Spraak-Taalterapeut, die Oudioloog en die Spraak-Taalterapeut *en* Oudioloog, is kwadrant C steeds die voorkeur van al drie die groepe respondente. Oudioloë en Spraak-Taalterapeute *en* Oudioloë vertoon egter hoër waardes in kwadrant D as respondente wat hulself as sleg Spraak-Taalterapeute beskou het. Die minste denkstylvoorkeur bestaan deurgaans in kwadrant A. Leer- en onderrig strategieë wat relevant is vir die denkstylvoorkeur van die student in Kommunikasiepatologie is ontwikkel. Hierdie strategieë is daarop gemik om ook aspekte wat nie in die gemiddelde student as voorkeur ervaar word nie, te ontwikkel. Die resultate van hierdie studie het belangrike implikasies vir die keuring van toekomstige students tot die kursus, die ontwikkeling van nuwe kurrikuluminhoude en die opleiding van studente.

Sleutelwoorde: Denkstylvoorkeur, "Herrmann Brain Dominance Instrument", leer- en onderrigstrategieë en kommunikasiepatologie

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1. INTRODUCTION

Many young people who have completed their schooling and who are supposed to be ready to enter the workplace on a full-time and "permanent" basis are not prepared for this enduring commitment (Edison 1994). Sarason (1977) notes that questions regarding the enjoyment of work frequently trigger different and sometimes ambivalent feelings. Society places expectations on us to enjoy the chosen profession and to experience satisfaction and fulfilment in the workplace (Edison 1994). The question can therefore be asked, "how can these positive expectations be achieved?" Ideally, personality and the choice of occupation should be congruent (Edison 1994) and therefore a profession should be chosen in the area of strongest preference (Herrmann 1995). Herrmann (1995) suggests that the nature of any type of work is largely dependent on mental processes and this implies that highest productivity will be achieved when there is a positive correlation between the chosen profession and the preferred mental modes. Self-knowledge about one's mental processes is therefore essential not only to choose the right career, but the right job within that career (Herrmann 1995).

In order to obtain knowledge about the individual's mental processes and mental selves, many theories have been developed in personality psychology to provide insight into the total human being with consideration of individual differences (Möller 1987). The practical application of personality theories lies in the development of methods and processes for the evaluation of human functioning (Van Der Westhuÿsen 1987). Depending on the theory being followed, different instruments have been developed to determine a person's preferred thinking and learning styles, for example: the Myers-Briggs Type Indicator, Kolb's Learning Style Model, the Felder-Silverman Learning Style Model and the Whole Brain Thinking Style Preference Model of Herrmann (Felder 1996).

The ***Myers-Briggs Type Indicator (MBTI)*** is a forced-choice, self-report inventory that attempts to classify persons according to an adaptation of Carl Jung's theory of personality and the instrument is available in a 166-item (Form F) and a 126-item

version (Gregory 1996). Jung (1875 – 1961) observed that human behaviour is not random, but instead, follows identifiable patterns that develop from the structure of the human mind (http://www.gsu.edu/~dsch¡b/wwwmbti.html).

MBTI results indicate the respondent's likely preferences on four dimensions: extraversion (E) / introversion (I), sensing (S) / intuition (N), thinking (T) / feeling (F) and judging (J) / perceiving (P) (Felder 1996). There are 16 possible ways to combine the preferences, resulting in 16 psychological archetypes, e.g. ISTJ, ESTP, ESJF and INTJ. Although many factors combine to influence an individual's behaviour, values and attitudes, the four-letter type descriptions summarise underlying patterns and behaviours common to most people of that type (http://www.gsu.edu/~dsch¡b/wwwmbti.html).

The MBTI has several disadvantages and according to Möller (1987), one of the main disadvantages lies in Jung's controversial theory, which forms the basis of the MBTI. Interpretations of the above archetypes are too slick and simple, possessing an almost horoscope-like quality (Gregory 1996), while other researchers feel that the resulting four-letter description of the MBTI is too complex and the use of exclusive language inhibits the accessibility of this powerful tool (http://www.aptcentral.org/apttype.html). The reliability and validity of the MBTI are also dubious since the establishment of reliability and validity is difficult for this test (Kline 1993).

In the early 1980s Mezirow, Freire, Kolb and Gregorc stressed that the heart of all learning lies in the way experiences are processed, and in particular, the critical reflection of experience (http://www.aitech.ac.¡p/~itesl¡/Articles/Kelly-Experiental/). Learning was considered to be a cycle that begins with experience, continues with reflection and later leads to action, which in itself becomes a concrete experience for reflection. Kolb further refined the concept of reflection by dividing it into separate learning activities, perceiving and processing (http://www.aitech.ac.¡p/~itesl¡/Articles/Kelly-Experiental/).

Kolb went on to develop the ***Kolb's Learning Style Model*** to help individuals understand their strengths and weaknesses. This inventory measures the learner's mental preferences in the four stages of learning and can be seen on a continuum, running from:

- Concrete experience: being involved in a new experience;
- Abstract conceptualisation: creating theories to explain observations;
- Active experimentation: using theories to solve problems and make decisions and
- Reflective observation: watching others or developing observations about own experiences (http://www.cyg.net/~¡blackmo/diglib/styl-d.html#Kolb's Theory of Learning Styles).

According to Felder (1996), using this instrument can identify four types of people:

Type 1: concrete and reflective;
Type 2: abstract and reflective;
Type 3: abstract and active and
Type 4: concrete and active.

Kolb's Theory and Inventory do have certain limitations. The results obtained are based solely on the way learners rate themselves, learning style preferences are not rated through standards or behaviours, and relative strengths are only given for the individual learner, not in relation to others (http://www.cyg.net/~¡blackmo/diglib/styl-d.html#Kolb's Theory of Learning Styles).

The ***Felder-Silverman Learning Style Model*** was formulated by Richard M. Felder and Linda K. Silverman and classifies people according to preferences on four dimensions of a learning style model (Felder 1996). The Index of Learning Styles (developed by Barbara A. Solomon and Richard M. Felder) is an instrument based on the above model and is used to assess preferences on the following dimensions:

- *Sensing learners and intuitive learners:*
  Sensing learners are concrete, practical and orientated towards facts and procedures.
  Intuitive learners are conceptual, innovative and orientated towards theories and meanings.
- *Visual learners and verbal learners:*
  Visual learners prefer visual representations of presented material – pictures, diagrams and flow charts.
  Verbal learners prefer written and spoken explanations.
- *Inductive learners and deductive learners:*
  Inductive learners prefer presentations that proceed from the specific to the general.
  Deductive learners prefer presentations that go from the general to the specific.
- *Active learners and reflective learners:*
  Active learners learn by trying things out and working with others.
  Reflective learners learn by thinking things through and working alone.
- *Sequential learners and global learners:*
  Sequential learners prefer learning in linear, orderly and small increments.
  Global learners are holistic and learn in large leaps (http://www2.ncsu.edu/unity/lockers/users/f/felder/public/ILSpage.html).

The following limitations of the Index of Learning Style (ILS) should be noted. The ILS has not been validated and the results only provide an indication of the individual's learning preferences. This learning style provides an indication of probable strengths and possible tendencies or habits that might lead to difficulty in the academic setting, but it does not reflect the student's suitability or unsuitability for a particular subject, discipline or profession (http://www2.ncsu.edu/unity/lockers/users/f/felder/public/ILSpage.html).

Although the above models are very valuable, the Herrmann Brain Dominance Instrument based on the ***Whole Brain Model***, developed by Herrmann (1995) is acknowledged in literature to be of the most valuable when discussing the

correlation between brain dominance, learning styles and adjustment in the profession, since results are quantifiable (Herrmann 1995).

The Four Quadrant Whole Brain Model developed by Ned Herrmann based on the research of Nobel Prize-winning Roger Sperry's Left Brain/Right Brain theory and the work done by Paul McLean on the Truine Brain theory (Lumsdaine & Lumsdaine 1995; Herrmann 1996).

According to Sperry and his team of neurosurgeons, many specific mental abilities are laterised, that is, carried out, supported and co-ordinated predominantly in one hemisphere or the other of our dual brain. In order to understand this theory, knowledge about the right and left halves of the neocortex, right and left halves of the limbic system and the structures that provide the pathway along which different parts of the brain send signals to one another, is essential. These structures, as well as situational and interactive functioning, comprise key aspects of the Left Brain/Right Brain theory (Herrmann 1996).

Dr Paul McLean, Head of the Laboratory of Brain Evolution and Behaviour at the National Institute for Mental Health in the United States of America, proposed the Triune Brain Theory, according to which the human brain is in reality three brains, each superimposed over the earlier pattern of "brains-within-brains". The first proposed brain is an ancient, primitive, reptilian brain, which comprises the brain stem, the mid-brain, the basal ganglia and the reticular activating system. The second brain, the limbic, or mammalian brain registers reward and punishment, is the seat of the emotions and controls the body's autonomic nervous system. Finally, over the limbic brain lies the neocortex, the convoluted mass of gray matter that has evolved over the last million years. It is the neocortex that enables us to think, perceive, speak and act as civilised human beings (Herrmann 1996). By incorporating these theories, a model of the human brain can be built with two paired structures, the two halves of the cerebral system and the two halves of the limbic system (Figure 1).

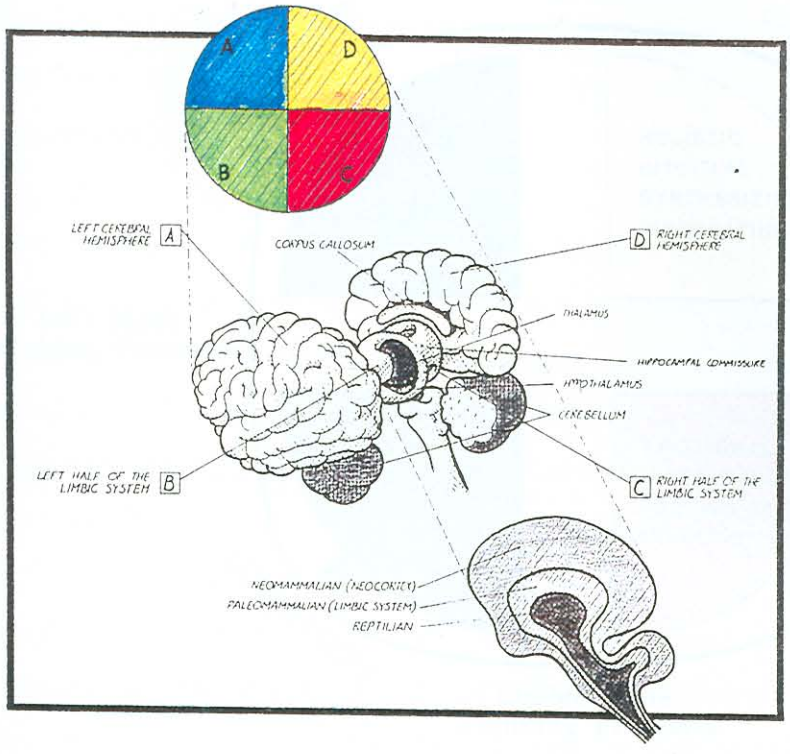

Figure 1: The relationship of the Four Quadrant Whole Brain Model with the theories of Sperry and McLean (Herrmann 1996:64).

This model allows one to differentiate between the notion of a left brain/right brain, and also between the more sophisticated notions of cognition or intellect, which describe the cerebral preference, and the visceral, structured and emotional preference, which describes the limbic preference.

The Four Quadrant Whole Brain Model (Figure 2), although originally thought of as a physiological map, is today an entirely metaphorical model and serves as an organising principle of how the brain works. The circular display represents the whole thinking brain, which then divides into four metaphorical conscious modes of knowing, the two halves of the cerebral cortex (Sperry) and the two halves of the limbic system (McLean), each with its own behaviours demonstrably associated with it (Herrmann 1996).

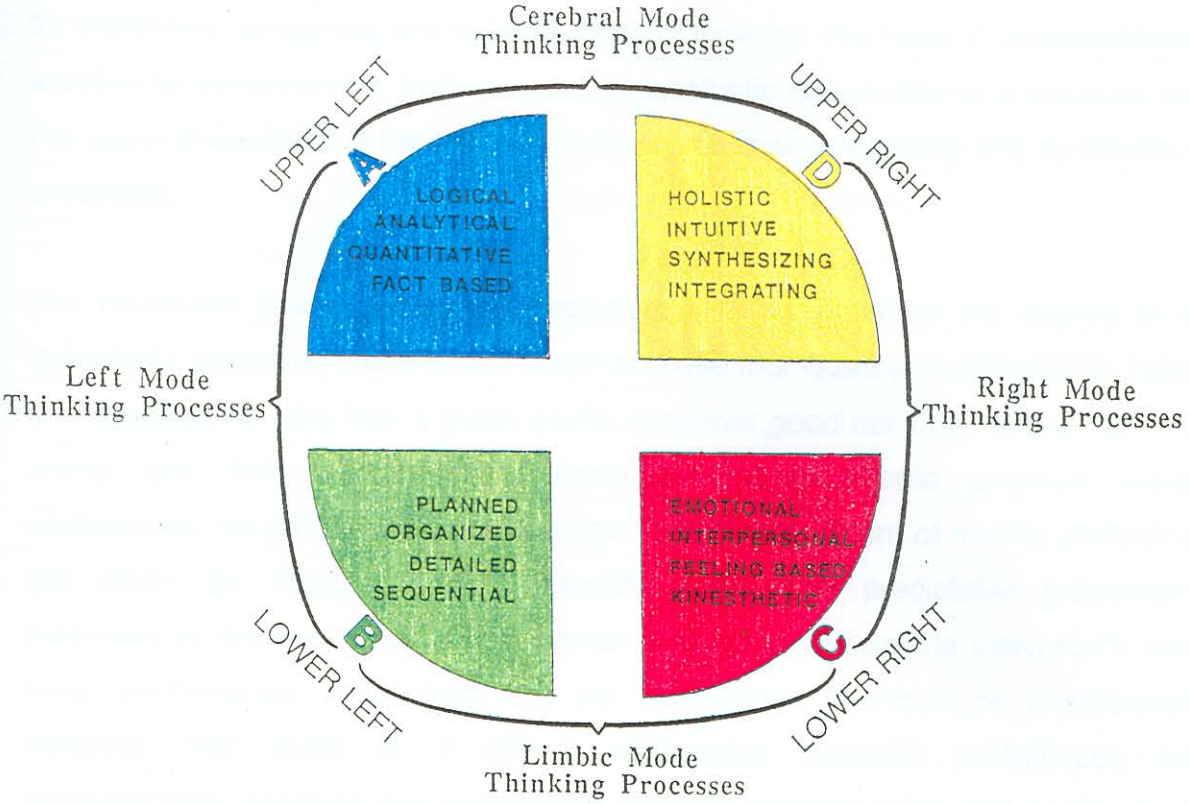

Figure 2: The Whole Brain Model (Herrmann 1995: 411).

According to Herrmann (1996) the term *dominance* provides the basis for the measurement of individual differences. It is a biological fact that dominance exists between all paired structures throughout the body system; hands, feet and eyes are seemingly the same, but actually different. Nature has provided a physical characteristic, called dominance, as a selection process for these different body parts, and the same concept can be applied to the structures of the brain that are measured by the Herrmann Brain Dominance Instrument.

According to Figure 2, the four quadrants of the ***Four Quadrant Whole Brain Model*** represent the four thinking structures of the brain. The upper left and right hemispheres represent the cerebral processes (cognitive and intellectual ways of thinking) and the lower left and right halves, the limbic system, which represents the more visceral processes (structural and instinctive ways of thinking) (Herrmann 1995). Herrmann (1995) explains that the upper A quadrant is the focus of logical, analytical, fact-based and quantitative thinking. The lower B quadrant is the location

for organised, sequential and detailed kinds of thinking. The lower C quadrant is the location for interpersonal, feeling-based, kinaesthetic and emotional processes, and the upper D quadrant is the focus for holistic, intuitive, integrating and synthesising processes.

The Herrmann Brain Dominance Instrument (HBDI) quantifies the degree of an individual's dominant preference in each of these four quadrants (Herrmann 1996). It is important to note that a given profile is neither *good nor bad*, neither *right nor wrong* and that the Herrmann Brain Dominance Profile displays *mental preferences*, not *abilities or competencies*. This measurement of mental preference can easily be interpreted and translated into quite predictable behavioural outcomes in the workplace, since mental preference affects the individual's work style, performance, productivity and job satisfaction. It should be emphasised, however, that there is a strong relationship between preferences and competencies, because the motivational aspects involved imply that one typically leads to another. Research indicates that, while various types of individuals may be drawn to a profession, not all types tend to succeed in all areas of that profession (Myers & Myers 1980). The question is, "how does the Four Quadrant Whole Brain Model relate to the professional competencies and work satisfaction factors of the professional person?"

According to Sarason (1977) the professional person is faced with specific problems in the workplace. For most professionals, their occupations provide intrinsic rewards but this frequently leads to lack of control over their work schedules. As the person becomes more proficient and more recognised as an expert, more opportunities beckon and the workload increases. Although the professional person longs for a more manageable schedule, his/her nature makes this unattainable. A second source of dissatisfaction for professional persons is the discrepancy between the level of esteem accorded to them by their clients or society, and their own self-concepts. The last problem according to Sarason (1977) lies in the lack of challenge in activities that were previously challenging but because of experience are no longer so.

The present-day communication pathologist[1] is not only faced with these problems but also with greater demands and changes in the profession of communication pathology (Ashby 1995). According to Campbell and Taylor (1992) the demands of an expanding and increasingly technical and specialised profession require advanced knowledge in a number of areas. It is clear that the practising communication pathologist of today is required to acquire more information and apply more skills than at any other point in the history of the profession. The career success and effectiveness of the communication pathologist is attributable to a combination of technical expertise and desirable personal attributes (Oratio 1977). According to Ashby (1995) communication pathologists of today need to be renaissance people, masters of all knowledge and manipulators of all the tricks of the trade.

This rather dramatic statement contains much truth and according to ASHA (http://www.asha.org/students/changing.htm), prosperity for the communication pathologist depends on the provision of measurable and cost-effective services. The communication pathologist needs to be able to navigate reimbursement systems, understand the complexities of the healthcare system, understand recent legislation and advocate for services using efficacy and outcomes data. In addition, the increasingly technical, yet people-oriented practise (Craig & Sleight 1989) demands that communication pathologists need to be independent life-long learners with an entrepreneurial attitude and managerial skills (http://www.asha.org/students/changing.htm). Ashby (1995) also indicates that the communication pathologist needs to develop greater skills in team work, marketing and cost containment.

This is also true in the South African context where challenges and the changing needs that face the communication pathologist are on the increase (Tuomi 1994). According to Hugo (1998) the real challenge for the communication pathologist in

[1] From this point onword the term communication pathologist will be used for the professions speech-language pathologist & audiologist, since this term encompasses both the mentioned professions (Hugo, 1998).

the South African context is "africanisation". It is important to realise that not all of the existing Western influences should be ignored, but that the African and Western influences should be integrated to accommodate the diverse population of South Africa. Changes to the existing traditional tertiary education programmes are therefore indicated (Hugo 1998).

To accommodate the changes and demands in the profession of communication pathology, tertiary training of the student should acknowledge the fact that diverse thinking styles exist, therefore different people will have different preferred learning styles (Herrmann 1996). In this context, the term "learning style" refers to an individual's characteristic and consistent approach to organising and processing information (Tennant 1988). Herrmann (1995) identified Whole Brain Learning and Design Considerations for each of the four quadrants (Figure 3).

A-UPPER LEFT		D-UPPER RIGHT	
Learns by:	**Learners respond to:**	**Learns by:**	**Learners respond to:**
- Acquiring and quantifying - Applying analysis and logic - Thinking through ideas - Building cases - Forming theories	- Formalised lectures - Data based content - Financial/technical case discussions - Text books and bibliographies - Program learning - Behaviour modification	- Taking initiative - Exploring hidden possibilities - Relying on intuition - Self discovery - Constructing concepts - Synthesising content	- Spontaneity - Free flow - Experiential opportunities - Playfulness - Future orientated case discussions - Visual displays - Individuality - Aesthetics - Being involved
B-LOWER LEFT		**C-LOWER RIGHT**	
Learns by:	**Learners respond to:**	**Learns by:**	**Learners respond to:**
- Organising and structuring content - Sequencing content - Evaluating and testing theories - Acquiring skills through practise - Implementing course content	- Thorough planning - Sequential order - Organisational and administrative case discussions - Text books - Behaviour modification - Program learning - Structure - Lectures	- Listening and sharing ideas - Integrating experiences with self - Moving and feeling - Harmonising with content - Emotional involvement	- Experiential opportunities - Sensory movement - Music - People oriented cases - Discussions - Group interaction

Figure 3: Whole Brain Learning and Design Considerations (Herrmann 1995: 419).

Looking at the characteristics of the different quadrants of the Four Quadrant Whole Brain Model (Figure 2), Herrmann (1995) developed Whole Brain Learning and Design Considerations (Figure 3). By taking into account the diverse methods by which the student learns, certain teaching strategies can be identified, and when using a combination of these teaching strategies, the student's learning can be optimised. It is essential that students develop skills in their least preferred quadrant in order to develop their full potential. Emphasis should be placed on the fact that an individual is the product of both nature (30%) and nurture (70%) (Herrmann 1996). The nurture aspect determines who and what the individual becomes – nurturing provides the opportunity to develop into a unique person. These aspects of nature versus nurture have specific implications for tertiary education.

According to Collins (1990) in Collins and Green (1992), the educator and student have to assume four roles in the classroom setting: the generator of knowledge (educator and student), the monitor of knowledge (educator), the aligner of knowledge (educator) and the facilitator of knowledge (educator). This pattern of interaction between the educator and the student will enhance learning, since the student will also be actively involved in the teaching and learning process.

The lecturer also plays an important role in the enhancement of the student's motivation since motivation forms an integral part of successful study (Blumenfield, Puro & Mergendoller 1992). The students' interest in the material being presented and their motivation are enhanced when: emphasis is placed on intrinsic reasons for learning, material is related to the students' lives and experiences, choices are given regarding what, where, with whom or how work is done, varied tasks are assigned, realistic and challenging problems are given, and work is assigned that involves creating a product or providing some sort of closure (Lepper 1988 in Collins & Greene 1992). Felder and Silverman (1988) confirm the above, with the statement that when a mismatch exists between the prevailing teaching style and the learning style of the student it could have serious consequences, such as lower

grades and a loss of interest in the course material and ultimately the chosen profession.

The dimension of a person's learning style may be defined by considering the following:

- What type of information does the person preferentially perceive?
- Through which modality is sensory information most effectively perceived?
- With which organisation of information is the person comfortable?
- How does the person prefer to process information?
- How does the person progress towards understanding?

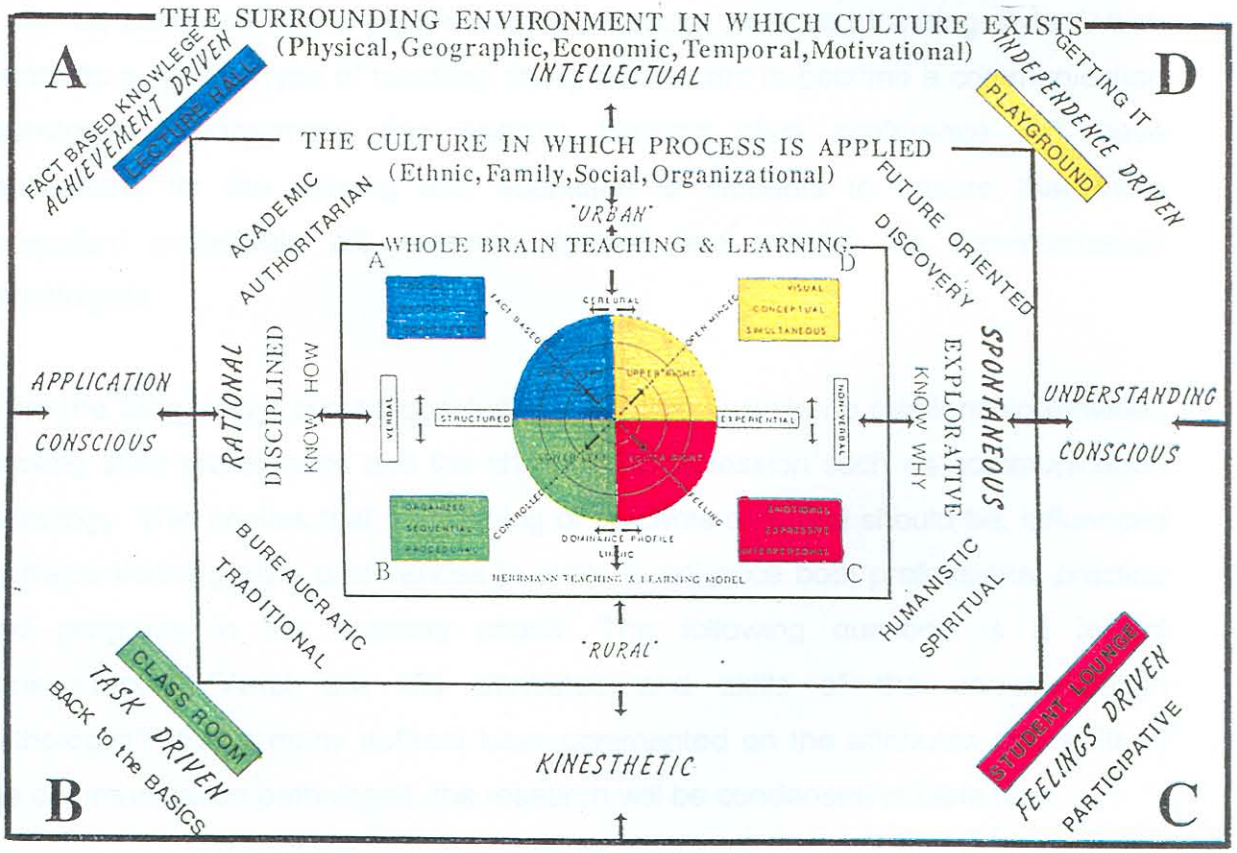

Figure 4: The Whole Brain Teaching and Learning Model (Herrmann, 1995: 417).

The Whole Brain Teaching and Learning Model of Herrmann (1995) is an attempt to summarise the different learning styles by quadrant and suggests forms of delivery for successful learning communication. The Learning-Style Model (Figure 4) promotes the deliverance of the key elements or learning points in three or four different ways, representing the four different learning styles. This might include an item of pre-work, a handout, an experimental exercise, a short video, a team activity, a metaphorical approach, a lecture and a case study. Learning material that is being presented should comply with all four, or most of the student's preferred methods of learning in order to accommodate learning preferences but should also develop skills in the student's least preferred mode of learning (Herrmann 1995).

It can be assumed that a person with a particular preferred thinking style (which demands a specific type of teaching style) would want to become a communication pathologist. Furthermore this specific thinking style preference will have implications for the training and education of students to ensure that more competent individuals are selected, trained and practise as communication pathologists.

From the foregoing it can be concluded that there is a strong relationship between thinking style preferences and the choice of a profession such as communication pathology. This implies that the training of students can, and should be, influenced by these thinking style preferences in order to enhance both professional practice and progress in the learning phase. The following question is a logical consequence: "What are the attributes and skills of the communication pathologist?" Since many authors have commented on the attributes and skills of the communication pathologist, the research will be condensed in table form.

Table 1: Attributes and skills of the communication pathologist.

Researcher:	Skills:	Attributes:
ASHA (2000):	❑ Planning and priority setting ❑ Organising and time management	❑ Perspective

	❑ Managing diversity ❑ Team building ❑ Interpersonal and peer relationship ❑ Organisational agility ❑ Conflict management ❑ Problem solving ❑ Dealing with paradox ❑ Creativity	
Scheurle (1992):	❑ Clinical training	❑ Personal philosophy ❑ Education ❑ Family support ❑ Self-confidence ❑ Professional association
Craig and Sleight (1989):	❑ Sensitivity ❑ Creativity	❑ Passiveness ❑ Unpretentiousness ❑ Emotional stability
Sutherland, Cornett and Chabon (1988):	❑ A scientific attitude ❑ A therapeutic attitude ❑ Business acumen	❑ Friendliness ❑ Expertise ❑ Professional norms ❑ Professional and legal identity ❑ Honesty, patience and tolerance ❑ Objectivity and modesty ❑ Tactful and well groomed
McLauchlin (1986):	❑ Objectivity ❑ Curious ❑ Innovative ❑ Risktaker	❑ Self-respect and self-worth ❑ Self-disciplined and a hard worker ❑ Positive and optimistic ❑ Emphatic, patient, enthusiastic and proud ❑ Determined ❑ Balanced ❑ Confident, respectful and flexible
Van Riper (1979):		❑ Hopeful ❑ Understanding ❑ Emphatic ❑ Persistent ❑ Accept failure

Although many researchers have reviewed the preferred and ideal attributes and skills of the communication pathologist, there is a definite deficiency in the method of data collection in these studies. These attributes and skills were primarily deduced from assumptions, and information was therefore not obtained by using a

scientifically valid method. Craig and Sleight (1989) used a structured personality assessment, the MBTI (Gregory 1996), to determine attributes and skills, but as mentioned above, problems exist in the reliability and validity of this instrument. The above-mentioned personality attributes and skills are convincing, but in the light of the growing emphasis on validity and reliability, the determination of these attributes and skills using scientifically valid methods is essential. By using the Herrmann Brain Dominance Instrument, the demerit in the data collection method regarding the attributes and skills of the communication pathologist can be remedied because the instrument was internally and externally validated in 1980, 1981 and 1982 and since 1983 the validation process has continued (Herrmann 1995).

If knowledge regarding the Four Quadrant Whole Brain Model and the personality attributes and skills of the communication pathologist is integrated, the following thinking style preferences for the communication pathologist can be proposed:

Table 2: Proposed thinking style preference for the communication pathologist.

Skills:				Attributes:
Quadrant A:	**Quadrant B:**	**Quadrant C:**	**Quadrant D:**	
❑ Problem solving ❑ Business acumen ❑ Scientific attitude ❑ Professional norms ❑ Education ❑ Objectivity ❑ Clinical training	❑ Planning ❑ Professional identity ❑ Priority setting ❑ Organising ❑ Time management ❑ Legal identity	❑ Team building ❑ Empathy ❑ Family support ❑ Personal philosophy ❑ Acceptance ❑ Conflict management ❑ Perspective ❑ Tactful ❑ Understanding ❑ Sensitivity ❑ Peer relationships ❑ Patience ❑ Tolerance	❑ Creativity ❑ Innovative ❑ Curiosity ❑ Flexibility ❑ Risk-taker ❑ Managing diversity	❑ Modesty ❑ Optimistic ❑ Self-discipline ❑ Enthusiasm ❑ Hopeful ❑ Hard worker ❑ Balanced ❑ Passiveness ❑ Expertise ❑ Pride & respect ❑ Honesty ❑ Friendliness ❑ Persistence ❑ Confidence ❑ Well groomed ❑ Determination ❑ Unpretentious

The proposed thinking style preferences for the communication pathologist was constructed using the personality attributes and skills presented in Table 1 and integrating this information with the Whole Brain Model (Herrmann 1995) (Figure 2). The different personality skills were categorised according to quadrant characteristics presented in the model by Herrmann (1995). The attributes that were not categorised into quadrants were considered personal characteristics that cannot necessarily be developed. The proposed profile indicates that the communication pathologist should ideally be "whole brained", but there is definitely a stronger dominance in quadrant C where a cluster of skills are present.

Against the literature review it is obvious that research has already been done on the brain dominance of the communication pathologist, the preferred skills and attributes of people in these professions (ASHA 2000; Craig & Sleight 1989 and Scheurle 1992) and the influence of teaching styles on the individual (Herrmann 1996; Herrmann 1995 and Blumenfield *et al.* 1992). However none of these results were validated by the direct use of the HBDI. The necessity for further research on the thinking style preferences of the communication pathologist using the Herrmann Brain Dominance Instrument, specifically, is therefore apparent. The rationale of this study is therefore to describe the thinking style preferences of the communication pathologist. The participants in the study include a group of first-year communication pathology students who passed the selection criteria of the course ($N = 42$), a group of final-year communication pathology students ($N = 23$) and a group of communication pathology graduates who are considered competent professionals ($N = 26$). The results of this study will provide information regarding the pro-forma profile of the communication pathologist, as well as information regarding the development of the content of new curricula and valuable insights for lecturers regarding the important role of whole brain learning and teaching strategies.

2. METHOD

A review of the literature on the topic of preferred personality attributes and skills indicates that a certain type of person, with a certain thinking style preference or a specific type of mental preference, will consider communication pathology as a profession. The research question that will be answered is therefore: "What is the thinking style preference of the communication pathologist?"

2.1 Research aims

The main aim of this study is to describe the thinking style preference of a group of communication pathologists (undergraduate students and practising graduates) using the Herrmann Brain Dominance Instrument. In order to realise this primary aim, the following ***sub-aims*** were formulated:

- To determine the thinking style preference of the subjects in the study using the Herrmann Brain Dominance Instrument and to establish possible patterns of thinking style preferences pertaining to the three groups that participated in the study.

- To determine if there were any differences in the patterns of brain dominance of the speech-language pathologist versus the audiologist, versus both professions.

- To determine learning and teaching strategies relevant to the thinking style preferences of the subjects.

These sub-aims were included in order to ascertain applicable deductions relevant to the study. The necessity for a descriptive, exploratory study into the thinking style preferences of the communication pathologist was therefore indicated.

2.2 Research design

Erwee (1996) differentiates between three types of research designs. These include exploratory, descriptive and causal studies. Exploratory studies are designed to obtain sufficient information about a specified problem in order to facilitate the generation of hypotheses. Erwee (1996) claims that this type of study has utility by virtue of its ability to prevent preconceived notions from excluding potentially useful results. Descriptive studies, in contrast, are described as those with research designs involving knowledge of relevant variables in the research question. Causal studies are those designed either to confirm or disprove hypothesised relationships or to estimate the parameters and strengths of known relationships between variables (Erwee 1996).

The present study may be classified as a descriptive, exploratory study. Certain desired attributes and skills of the communication pathologist, identified by previous research, have been used to compile the hypothetical profile of the communication pathologist. There is also a need for an exploratory study, since the primary aim of this study is to determine the thinking style preference of the communication pathologist using the Herrmann Brain Dominance Instrument.

The independent variable in this study is the different groups that participated in the study, namely: a group of first-year undergraduate communication pathology students, a group of final-year undergraduate communication pathology students and a group of qualified professionals. These groups are considered the independent variable since the researcher was able to control and manipulate them at will (Leedy 1997). The dependent variable (Leedy 1997) is the results of the Herrmann Brain Dominance Instrument which will be measured as a result of the influence of the independent variable. Control variables in the research were the three different groups that participated in the study, the distinction made between speech-language pathologists and audiologists and the geographical area from which the subjects were chosen. By including these control variables, the results of

the Herrmann Brain Dominance Instrument could be cross-referenced to measure reliability and accountability.

All the subjects in these three groups that participate in the study will therefore receive a covering letter explaining the aim of the research project, a biographical questionnaire and the survey (the Herrmann Brain Dominance Instrument). The subjects will be asked to complete the questionnaires in their own time.

2.3 Subjects

Three groups of subjects were used in this study, first-year undergraduate students in communication pathology, final-year undergraduate students in communication pathology and a group of practising communication pathologists. These three groups were included since the researcher wanted to describe a possible programme of change from the novice first-year communication pathology student, to nearly competent professionals, to practising professionals.

In the section that follows, the subject selection criteria and procedures will be discussed separately in order to facilitate clarity of presentation of the data. A description of the subjects selected to participate in the study will thereafter be presented, in order to provide a complete overview of the population sample utilised in the study.

2.3.1 Subject selection criteria

Potential candidates were selected on the basis of adherence to specified criteria. These criteria include:

- *Selection to the course: B. Communication Pathology:*

This criterion was relevant to groups 1 and 2.

This criterion was included to ensure that the participants in the study fulfilled the requirements proposed for admittance to the course, B. Communication Pathology.

- *Registration at the Health Professions Council of South Africa:*

This criterion was relevant to group 3 of the subjects.

Registration at the Health Professions Council of South Africa implies that the subject graduated as a communication pathologist and can be considered a competent professional.

2.3.2 Subject selection procedure

A convenience, non-probability sample was used during the selection procedure of subjects (Czaja & Blair 1996). According to Bailey (1987) this kind of sampling is less complicated, more cost effective and advantageous since anybody who conforms to the criteria can be used. A weakness of this type of sampling is that the survey results may be biased (Graziano & Raulin 1993). In the case of this study, only subjects from one geographical area, one tertiary academic institution and one cultural context were used. The subject selection procedure will be discussed separately for the three groups used in the study.

- Group 1 (first-year undergraduate students in communication pathology):

The first-year class at the Department of Communication Pathology at the University of Pretoria completed the Herrmann Brain Dominance Instrument as a part of the Academic Development Program. This information was gathered at the beginning of the year 2000.

- Group 2 (final-year undergraduate students in communication pathology):

The class of final-year students in communication pathology at the Department of Communication Pathology at the University of Pretoria were selected to participate in the study since information was needed regarding the development of brain dominance during the completion of the course, B. Communication Pathology. The researcher asked permission from the Head of the Department of Communication Pathology at the University of Pretoria to use the fourth-year students in the study.

- Group 3 (graduate communication pathologists):

Two groups of graduate communication pathologists were identified, namely private practitioners and personnel at a tertiary academic institution. These two groups were selected since most communication pathologists in private practice and in the academic environment would have had the opportunity to specialise in one of the two available professions (speech-language pathology and audiology), as opposed to those employed in the public sector who would probably have to be active in both. Private practices were identified and the researcher then contacted the different owners and made an appointment to explain the study and its purpose to the participants. The Head of the Department of Communication Pathology at the University of Pretoria was contacted and permission was asked for personnel of the Department of Communication Pathology to participate in the study.

2.3.3 Description of the subjects who participated in the study

The Herrmann Brain Dominance Instrument, with the accompanying covering letter and biographical questionnaire, were given to 120 participants. This method of drop-off administration was chosen since there are no monetary costs other than the duplication of the material, participants can complete the questionnaire at their leisure, there is greater anonymity in the responses and interviewer bias is reduced (McBurney 1994). Of the 120 questionnaires, 91 were returned and all of these were accepted. This return rate of 76% is considered very high (McBurney 1994) and may indicate that the subjects who participated in the study were interested in the study and its results. The final group of subjects and their relevant characteristics are presented in Table 3.

Table 3: Description of subjects and relevant characteristics.

Groups:	Group 1 (First-year students in communication pathology):	Group 2 (Final-year students in communication pathology):	Group 3 (Graduate professionals):
Number of subjects:	42	23	26

Criteria for selection:	Enrolled students for the course, B. Communication Pathology.	Enrolled students for the course, B. Communication Pathology.	Registered at the Health Professions Council of South Africa.
Time as graduate professional:	N = 42	N = 23	N = 26
❑ 0 – 5 years	-	-	7
❑ 5 – 10 years	-	-	5
❑ 10 years and more	-	-	14
Preferred profession:	N = 37*	N = 23	N = 26
❑ Speech-language pathologist	9	-	8
❑ Audiologist	3	4	12
❑ Both	25	19	6

*Frequency missing = 5 (no response)

2.4 Apparatus and material

2.4.1 Apparatus and material used to identify possible candidates for the study

This section is only relevant to the subjects in group three, since groups one and two were readily available to the researcher. The Private Practitioners' List 2000–2001 of the South African Speech-Language-Hearing Association was consulted to identify possible candidates for the study. These candidates were then randomly selected and contacted.

2.4.2 Apparatus and material used to collect data

2.4.2.1 The covering letter

Since human subjects were used in the research, ethical standards were of critical importance (Leedy 1997). A covering letter (Appendix A) was therefore included to ensure that subjects experienced feelings of fairness, honesty, openness of intent, respect for their integrity and privacy as well as an informed willingness to voluntary participate in the research activity (Leedy 1997).

2.4.2.2 The biographical questionnaire

A brief biographical questionnaire (Appendix B) was included since information was needed to determine if there were any differences in the patterns of brain dominance of the speech-language pathologist and audiologist, to describe any changes in the mental preferences from the novice first-year communication pathology student to final-year students to practising professionals, and to determine learning and teaching strategies relevant to the thinking style preferences of the subjects participating in the study.

Questions that formed part of this questionnaire were:

- How long have you been a practising speech-language pathologist and/or audiologist?

  Options given:

  0 – 5 years, 5 – 10 years and 10 years or more.
- As what do you consider yourself?

  Options given:

  Speech-language pathologist, audiologist or both.

2.4.2.3 The Herrmann Brain Dominance Instrument

General information regarding the Herrmann Brain Dominance Instrument:

The Herrmann Brain Dominance Instrument (Appendix C) is one of the most powerful and flexible diagnostic tools available (http://www.thinkingnetwork .com.au.hbdi/). It is a diagnostic survey made up of 120 questions and the answers to these questions indicate a person's "brain dominance", i.e. the degree to which he/she prefers a particular way of thinking and therefore behaving.

The HBDI is the result of extensive development and modification taking into account the results of continuing brain research, and the instrument is now in its 18th version. The instrument was internally and externally validated in 1980, 1981, and 1982 and since 1983 the validation process has continued (Herrmann, 1995). The results of the scoring are free of value judgement and cultural bias, an essential feature in the South African context, and are adaptable to growth and

change since they are not restricted to one application (http://www.thinkingnetwork.com.au.hbdi/). According to Herrmann International, the HBDI can also be used to depict the composition of groups and thus show what is special about a certain group.

Presenting the results of the HBDI:

The scoring protocol results in a quantified measure of an individual's preference for each mental quadrant, which is then charted on a circular grid to make a personalised visual metaphor (Herrmann 1995). The graphic representation is supplemented in a four-digit numerical code that assigns a number to each quadrant (from quadrant A to D), indicating the strength of preference for that quadrant, for example 2-1-1-3.

- The number 1 stands for a score of 67 or more points on any one preference and is considered a primary preference. A score of over one hundred represents a very strong preference for the specific quadrant's modes of thinking.
- The number 2 represent a score of 34 to 66, and is considered a secondary preference and indicates neither preference nor avoidance.
- The number 3 designates a score of 0 to 33. A tertiary preference or a possible avoidance of an area is thus indicated. This means that although an individual has developed good skills for operating in this quadrant, the use of this quadrant could be demanding or even enervating (Herrmann 1995).

The results of the HBDI are presented in a full-colour, personal profile, with an accompanying interpretation booklet that explains the profile (http://www.thinkingnetwork.com.au.hbdi/) and can be used as a developemental tool.

2.4.3 Apparatus and material for the analysis and processing of data

The biographical information obtained in the questionnaire was analysed and processed using a Pentium computer with the Microsoft Excel Program.

The completed HBDI survey forms were sent to the database at the Herrmann International headquarters in Lake Lure, Northern Carolina in the United States of America where the information was processed. A scored profile package for each of the three groups that participated in the study was compiled.

2.5 Data collection procedure

The data collection procedure will be discussed separately for the three groups that participated.

- Group 1:

The first-year students of the Department of Communication Pathology were asked to complete the Herrmann Brain Dominance Instrument as a compulsory part of the selection procedures at the beginning of the year 2000. No time constraint was set and the students could complete it in their own time.

- Group 2:

The final-year students were given information pertaining to the Herrmann Brain Dominance Instrument and emphasis was placed on the fact that the instrument is not a test and does not measure cognitive abilities. The subjects received the biographical questionnaire and the Herrmann Brain Dominance Instrument and were asked to complete it in their own time. When they had finished, they were asked to give it to the class representative with whom the researcher had consulted beforehand.

- Group 3:

Graduate professional communication pathologists were contacted at their workplaces where they received the Herrmann Brain Dominance Instrument along with the covering letter and the biographical questionnaire. No time constrains were given for the completion of the questionnaires.

2.6 Data analysis and processing

The results obtained from the biographical questionnaire and the HBDI were integrated for each individual subject. Raw data were keyed into the computer and the SAS program (Statistical Analysis System) was used to analyse this data into frequency tables. The frequency, percentage and the cumulative percentage were calculated for each of the variables. The Friedman two-way analysis of variance test was also done in order to determine if there was a significant difference between the results obtained for each quadrant ($p \leq 0.05$). The processed data was interpreted according to the sub-aims of the study:

- *To determine the thinking style preference of the subjects in the study and establish possible patterns of brain dominance pertaining to the three groups that participated in the study.*

The data of the different group profiles of group 1 (first-year students), group 2 (fourth-year students) and group 3 (graduate professionals) were obtained and specific tendencies were identified.

- *To determine if there were any differences in the patterns of brain dominance of the speech-language pathologist and audiologist.*

The group profiles of groups 1, 2 and 3 were divided into subjects who indicated that they considered themselves to be speech-language pathologists only, audiologists only, or both.

- *To determine learning and teaching strategies relevant to the thinking style preferences of the subjects.*

The group profiles for groups 1 and 2 were analysed and processed to determine if certain learning and teaching styles would be more relevant and successful during the education and training of communication pathology students.

3. RESULTS, INTERPRETATION AND DISCUSSION

The main aim of this study was to describe the thinking style preferences of a group of communication pathologists. The results are presented, discussed and interpreted according to the formulated sub-aims. Visual graphics are used in order to simplify the discussion of the results and, where appropriate, the statistical methods employed are referred to.

3.1 Thinking style preferences of the communication pathologist using the Herrmann Brain Dominance Instrument

3.1.1 Thinking style preferences of first-year communication pathology students using the Herrmann Brain Dominance Instrument

The thinking style preferences of the group of first-year students ($N = 42$) in communication pathology were determined by the completion of the HBDI. Figure 5 depicts the *average* thinking style profile of first-year students in communication pathology.

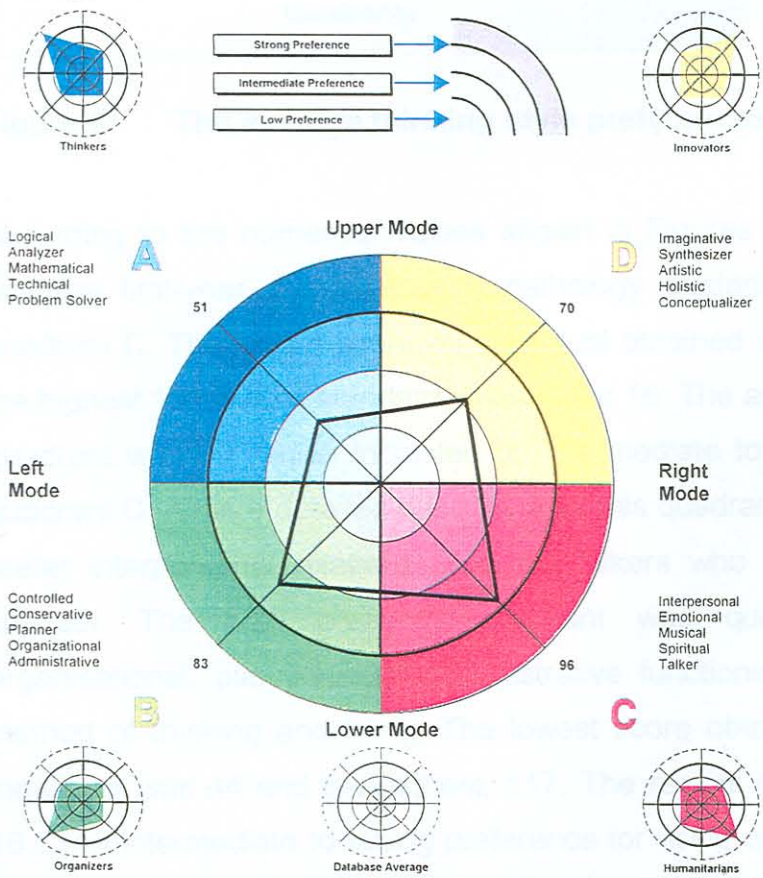

Figure 5: The *average* thinking style profile (first-year students).

Figure 6 provides a graphic presentation of the *average* thinking style preferences of first-year students according to the Herrmann Brain Dominance Instrument. The Friedman test of *statistical significance* shows that the results obtained were not indicative of a statistically significant value ($p = 0{,}0000$); statistically speaking no quadrant is more dominant than another. This study will however concentrate on the *numerical values* of the different quadrants.

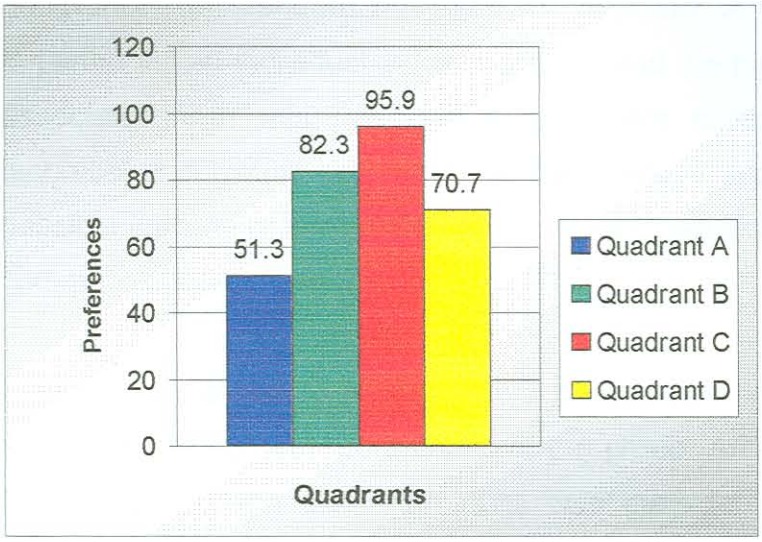

Figure 6: The *average* thinking style preferences (first-year students).

According to the *numerical* values shown in Figures 5 and 6, it is clear that the average first-year communication pathology student's dominant quadrant was quadrant C. The lowest score an individual obtained in this quadrant was 63, and the highest 122, with a standard deviation of 16. The average score obtained in this quadrant was 96, which indicated an intermediate to strong preference for using quadrant C. A more detailed description of this quadrant implies that these students prefer interpersonal relations, and are talkers who are emotional, musical and spiritual. The next preferred quadrant was quadrant B, which includes organisational, planning and administrative functions as well as a conservative method of thinking and living. The lowest score obtained in this quadrant for an individual was 44 and the highest, 117. The results gave a standard deviation of 16,5. An intermediate to strong preference for using quadrant B was also indicated with an average score of 83. In quadrant D, a score of 70 was obtained (an

intermediate to strong preference). Students who showed a preference in this quadrant are imaginative, synthesising, artistic and holistic conceptualisers. A standard deviation of 20,6 was found. The lowest score for an individual was obtained in quadrant D (35) and the highest was 111. The lowest score (51) was obtained in quadrant A, which indicated that the average first-year student in communication pathology showed an intermediate preference for using this quadrant. The standard deviation for quadrant A was 14,1. The lowest score obtained for an individual student was 20 and the highest was 77. Work elements associated with this quadrant are problem solving, analytical, mathematical, technical and logical skills and the low average score in quadrant A indicated a possible inability or avoidance of the use of these skills by the first-year students in communication pathology.

Figure 7 depicts the key descriptors by quadrant in order to provide information regarding the general preferences of the group. An arbitrary mark was chosen as 50% and anything less than 50% was considered to be indicative of a low preference or the need for further development.

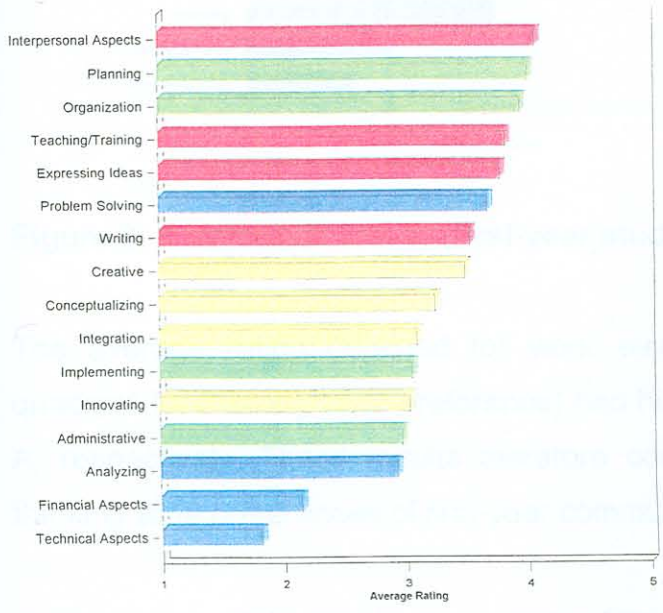

Figure 7: Key descriptors (first-year students).

The results of Figure 7 correlated with the results obtained in Figures 5 and 6. Most of the key descriptors, which indicate the group's greatest preferences, were in quadrant C. Quadrant C's key descriptors showed the highest values, followed by quadrants B, D and A.

The work elements, or aspects of a profession for which the amount of competency is shown, is depicted in Figure 8. A value of 4 or 5 is indicative of greater competency and anything less than 4 shows elements that need further development.

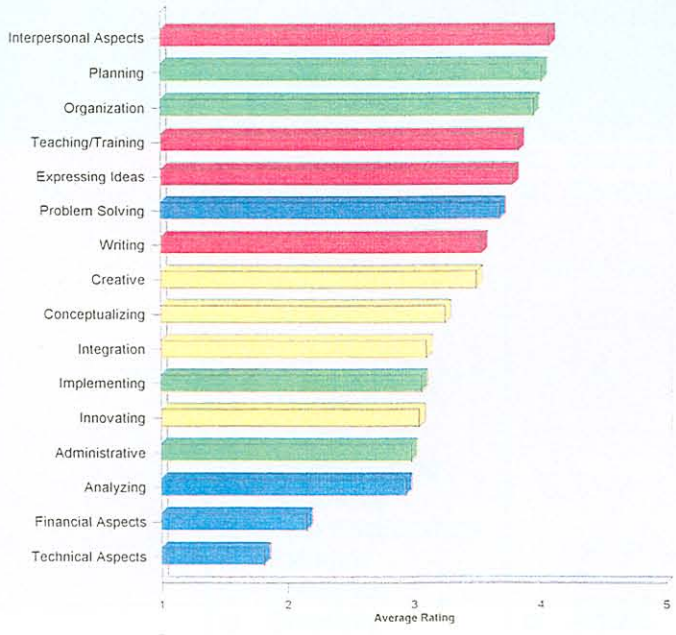

Figure 8: Work elements (first-year students).

The average rating obtained for work elements shows that quadrant C (the quadrant for thinking style preference) had higher ratings than quadrants B, D and A, respectively. These results therefore confirmed the results obtained for the thinking style preferences of first-year communication pathology students.

A comparison of the results presented in Figures 7 and 8 and the proposed thinking style preferences of the communication pathologist (Table 2) is shown in Table 4.

Table 4: A comparison of proposed skills, less preferred key descriptors and work elements of poorer competency (first-year students).

Quadrant:	Associated skills:	Key descriptors (preference of less than 50%):	Work elements (competency rating of less than 4):
A	❑ Problem solving ❑ Business acumen ❑ Scientific attitude ❑ Professional norms ❑ Education ❑ Objectivity ❑ Clinical training	❑ Factual ❑ Quantitative ❑ Critical ❑ Mathematical ❑ Analytical	❑ Problem solving ❑ Analysing ❑ Financial aspects ❑ Technical aspects
B	❑ Planning ❑ Professional identity ❑ Priority setting ❑ Organising ❑ Time management ❑ Legal identity	❑ Conservative ❑ Sequential ❑ Detailed ❑ Dominant	❑ Implementing ❑ Administrative
C	❑ Team building ❑ Empathy ❑ Family support ❑ Personal philosophy ❑ Acceptance ❑ Conflict management ❑ Perspective ❑ Tactful ❑ Understanding ❑ Sensitivity ❑ Peer relationships ❑ Patience ❑ Tolerance	❑ Musical ❑ Symbolic	❑ Teaching / training ❑ Expressing ideas ❑ Writing
D	❑ Creativity ❑ Innovation ❑ Curiosity ❑ Flexibility ❑ Risk-taker ❑ Managing diversity	❑ Artistic ❑ Holistic ❑ Synthesiser ❑ Simultaneous ❑ Spatial	❑ Creative ❑ Conceptualising ❑ Integrating ❑ Innovating

The results obtained in this comparison (Table 4) can be used to identify aspects that are in need of further development. It should be kept in mind that there is a strong relationship between preferences and competencies, since one typically leads to another (Herrmann 1996).

For quadrant A the development of a greater preference for factual, quantitative, critical, mathematical and analytical aspects is very important in order to comply with the proposed thinking style preferences of the communication pathologist. The results obtained for work elements, aspects of a profession that the individual considers himself to be less competent in, are also problematical since the four above-mentioned skills of lesser competency are essential for the development of skills associated with communication pathology. The key descriptors of quadrant B indicated that there was least competency for conservative, sequential, detailed and dominant aspects for the group of first-year students in communication pathology. The work elements identified, implementing and administrative, were indicative of problems with the proposed skills. These skills cannot be developed without successful implementation and administration. Although musicality, as a key descriptor of lesser preference, is not essential to be a successful communication pathologist, it should be noted that the development of a greater preference for and competency in this aspect could lead to creative and interesting therapy sessions. The development of a greater preference for the use of symbols is more important, since this ability to use and understand objects, marks and signs as being representative of facts and ideas, is important for the development of skills such as family support, acceptance, conflict management and sensitivity. The development of a greater competency in teaching and training, expressing ideas and writing is of the utmost importance. The profession of communication pathology cannot function without these competencies since many of the proposed skills such as conflict management, team building, family support and good peer relationships cannot be developed without these three skills. The skills of lesser competency for quadrant D, creativity, conceptualising, integrating and innovating, need to be developed in order to comply with the proposed skills of the communication pathologist. For example, without innovation, no risk-taking, flexibility, creativity or management of diversity can be achieved. The need for the development of greater preference for the use of artistic, holistic, synthesising, simultaneousness and spatial skills is apparent. The inter-relationship between preferences, competencies and skills is again obvious when looking at a skill like flexibility. One would have

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difficulty developing this skill without a preference for using the above key descriptors.

When comparing the HBDI results obtained for first-year students in communication pathology with the proposed thinking style preferences for the communication pathologist (Table 2), it is clear that most of the proposed skills (ASHA 2000; Scheurle 1992; Craig & Sleight 1989) were concentrated in quadrant C. One very important factor should be noted however. Although the highest concentration of skills was situated in quadrant C, the proposed thinking style preferences indicates that the communication pathologist should be "whole-brained" (Herrmann 1995). That means that although a certain skill might not be in the individual's preferred thinking style (the individual's dominant quadrant for which a strong preference is present), the individual *must* be able to utilise skills in intermediate and low preference quadrants. The key descriptors in Figure 7 emphasise aspects of lesser preference, especially in quadrants A, B and D. The work elements depicted in Figure 8 indicate poor competencies of the first-year students in communication pathology. Since there is a strong relationship between preferences, competencies and therefore the development of certain skills associated with a profession, the development and nurturing of preferences and competencies are essential to comply with the ever-growing demands and challenges placed on the communication pathologist (Hugo 1998; Ashby 1995 and Tuomi 1994).

3.1.2 Thinking style preferences of final-year students in communication pathology using the Herrmann Brain Dominance Instrument

The thinking style preferences of the group of final-year students ($N = 23$) in communication pathology were determined from the completion of the Herrmann Brain Dominance Instrument. Figure 9 depicts the *average* thinking style profile of final-year students in communication pathology. The Friedman test of *statistical significance* shows that the results obtained were not indicative of a statistically significant value ($p = 0{,}0000$); statistically speaking no quadrant was more dominant than the other. This study will however concentrate on the *numerical values* of the different quadrants.

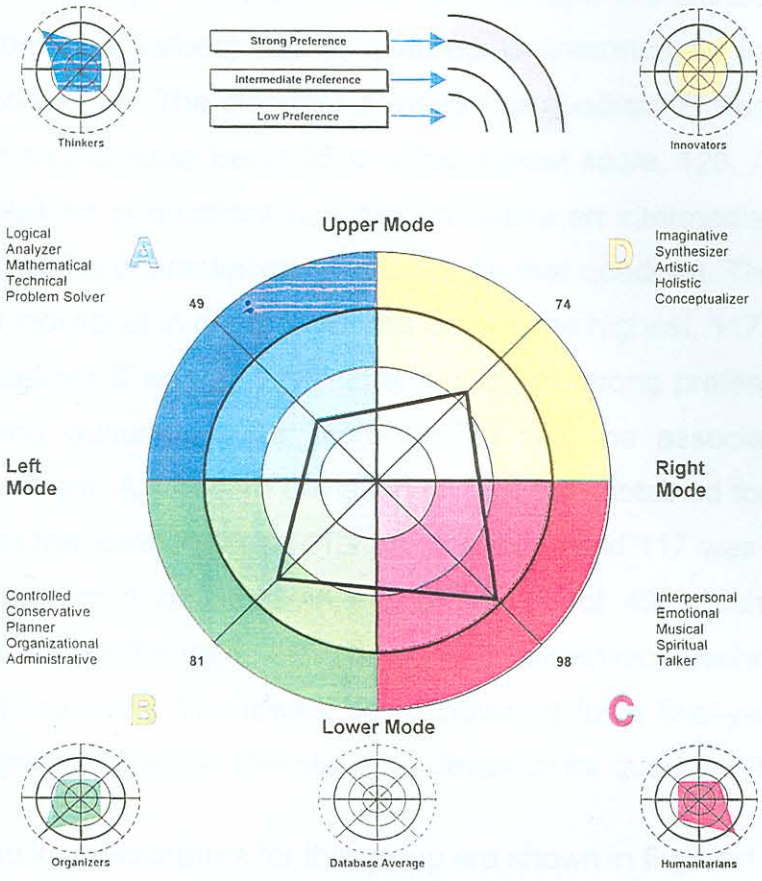

Figure 9: The *average* thinking style profile (final-year students).

Figure 10 provides a graphic presentation of the *average* thinking style preferences of final-year students in communication pathology according to the HBDI.

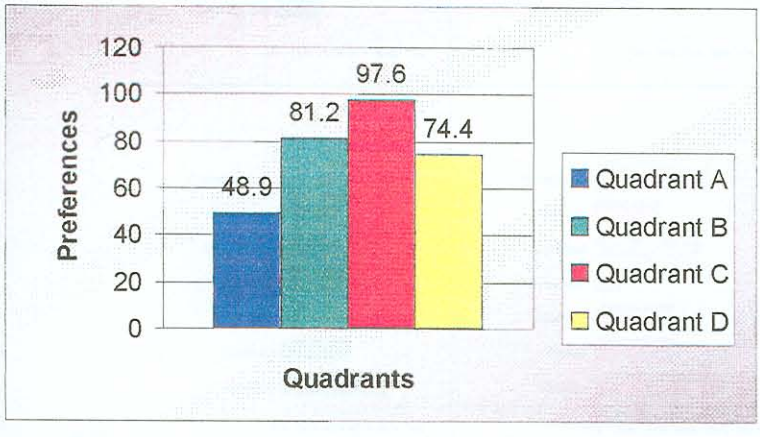

Figure 10: The *average* thinking style preferences (final-year students).

The *average* of the dominant thinking style preference for the final-year students (*numerical values*) was in quadrant C (intermediate to strong preference), with a score of 98. The standard deviation for quadrant C was 20,2 with the lowest score for an individual being 35 and the highest score, 128. An average score of 81 was obtained in quadrant B, which indicates an intermediate to strong preference for using the characteristics indicated for that quadrant. The lowest score obtained for an individual in quadrant B was 35 and the highest, 117. The standard deviation for quadrant B was 23,2. An intermediate to strong preference was also indicated for using quadrant D (a score of 74) and the associated characteristics of that quadrant. A standard deviation of 19,4 was obtained for quadrant D. A score of 47 was the lowest obtained for an individual, and 117 was the highest for quadrant D. Quadrant A obtained an average score of 49, which indicates an intermediate preference for using logic, analysis, mathematics, technical methods and problem-solving skills. The lowest score obtained for a final-year student was 21 and the highest score, 84. The standard deviation for quadrant A was 15,7.

The key descriptors for this group are shown in Figure 11.

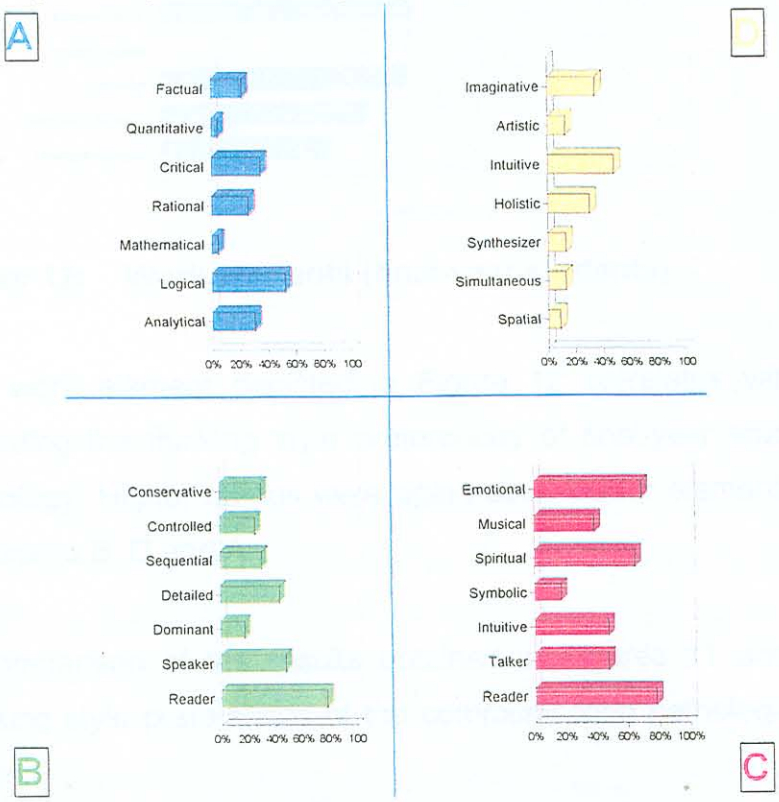

Figure 11: Key descriptors (final-year students).

The results shown in Figure 11 confirm the graphic representations in Figures 9 and 10. Higher percentages (more than the arbitrary 50%) were obtained for key descriptors in the more preferred quadrants (quadrant C) than in the intermediate preference quadrant (quadrant A).

The work elements, aspects of a profession of which the amount of competency is shown, is depicted in Figure 12. A value of 4 or 5 is indicative of greater competency and anything less than 4, elements that need further development.

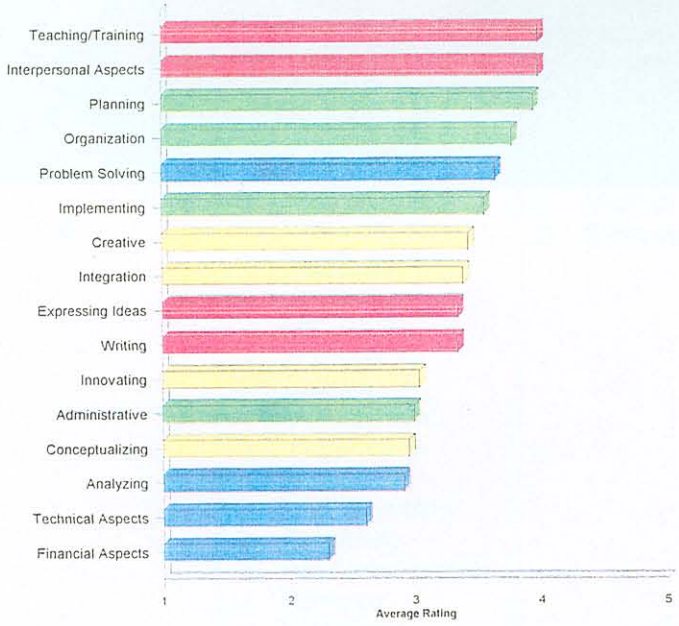

Figure 12: Work elements (final-year students).

The work element depicted in Figure 12 correlates with the results obtained regarding the thinking style preferences of final-year students in communication pathology. Higher ratings were again obtained for elements in quadrant C than in quadrants B, D and A.

A comparison of the results obtained in Figures 11 and 12 and the proposed thinking style preferences of the communication pathologist (Table 2) is shown in Table 5.

Table 5: A comparison of proposed skills, less preferred key descriptors and work elements of poorer competency (final-year students).

Quadrant:	Associated skills:	Key descriptors (preference of less than 50%):	Work elements (competency of less than 4):
A	❑ Problem solving ❑ Business acumen ❑ Scientific attitude ❑ Professional norms ❑ Education ❑ Objectivity ❑ Clinical training	❑ Factual ❑ Quantitative ❑ Critical ❑ Rational ❑ Mathematical ❑ Analytical	❑ Problem solving ❑ Analysing ❑ Financial aspects ❑ Technical aspects
B	❑ Planning ❑ Professional identity ❑ Priority setting ❑ Organising ❑ Time management ❑ Legal identity	❑ Conservative ❑ Controlled ❑ Sequential ❑ Detailed ❑ Dominant ❑ Speaking	❑ Organising ❑ Implementing ❑ Administrative
C	❑ Team building ❑ Empathy ❑ Family support ❑ Personal philosophy ❑ Acceptance ❑ Conflict management ❑ Perspective ❑ Tactful ❑ Understanding ❑ Sensitivity ❑ Peer relationships ❑ Patience ❑ Tolerance	❑ Musical ❑ Symbolic	❑ Expressing ideas ❑ Writing
D	❑ Creativity ❑ Innovation ❑ Curiosity ❑ Flexibility ❑ Risk-taker ❑ Managing diversity	❑ Artistic ❑ Imaginative ❑ Holistic ❑ Synthesiser ❑ Simultaneous ❑ Spatial	❑ Creative ❑ Integrating ❑ Innovating ❑ Conceptualising

The results obtained in this comparison (Table 5) can again be used to identify aspects that are in need of further development. It should be kept in mind that there is a strong relationship between preferences and competencies, since one typically leads to another (Herrmann 1996).

For quadrant A the development of a greater preference for factual, quantitative, critical, mathematical, analytical and rational aspects is very important in order to

comply with the proposed profile for the communication pathologist. These aspects of lesser preference correlated with the proposed characteristics associated with quadrant C. A person who prefers interpersonal, emotional aspects will logically have problems with or a lesser preference for the key descriptors mentioned for quadrant A. The results obtained for work elements, aspects of a profession that the individual considers himself to be less competent in, are again problematical since the four above-mentioned skills of lesser competency are essential for the development of skills associated with communication pathology. The key descriptors of quadrant B indicated that there was a lesser preference for conservative, controlled, sequential, detailed, planning and speaking aspects in the group of final-year students in communication pathology. The work elements identified: organised, implementing and administrative, were indicative of problems with the proposed skills. These skills cannot be developed without successful organisation, implementation and administration. As mentioned above, musicality as a key descriptor of lesser preference is not essential to be a successful communication pathologist. It should be noted, however, that the development of a greater preference and competency in this aspect could lead to creative and interesting therapy sessions. The development of a greater preference for the use of symbolism is of more importance since this ability to use and understand objects, marks and signs as being representative of facts and ideas, is important for the development of skills such as family support, acceptance, conflict management and sensitivity. The development of a greater competency in expressing ideas and writing (quadrant C) is of the utmost importance. Success in the profession of communication pathology is not possible without these competencies since many of the proposed skills such as conflict management, team building, family support and good peer relationships cannot be developed without these skills. The work elements of lesser competency for quadrant D, creativity, conceptualising, integration and innovation, need to be developed in order to comply with the proposed skills of the communication pathologist. For example, without innovation, no risk-taking, flexibility, creativity or management of diversity can be achieved. The need for the development of greater preference for the use of imaginative, artistic, holistic, synthesising, simultaneousness and spatial skills is apparent. The inter-

relationship between preferences, competencies and skills is again obvious when looking at a skill like flexibility. One would have trouble developing this skill without a preference for using the above key descriptors.

When a comparison is made of the HBDI results obtained for final-year students in communication pathology and the proposed thinking style preferences for the communication pathologist (Table 2), it is again apparent that most of the proposed skills (ASHA 2000; Scheurle 1992; Craig & Sleight 1989) were concentrated in quadrant C. The key descriptors of greatest preferences shown in Figure 10 emphasise the need for development of certain skills, especially in quadrants A, B and D (as identified). The work elements in Figure 12 identified competencies that need to be developed in order to comply with the proposed thinking style preferences of the communication pathologist (Table 2). Only with the development of greater competency and skills will the communication pathologist be able to comply with the ever-growing demands and challenges (Hugo 1998; Ashby 1995; Tuomi 1994).

3.1.3 Thinking style preferences of professional communication pathologists using the Herrmann Brain Dominance Instrument

The thinking style preferences of a group of professional communication pathologists ($N = 26$) were determined by the completion of the Herrmann Brain Dominance Instrument. Figure 13 depicts the *average* thinking style profiles by quadrant of professional communication pathologists. The Friedman test of *statistical significance* shows that the results obtained were not indicative of a statistically significant value ($p = 0{,}0000$). Statistically speaking no quadrant was more dominant than the other. This study will however concentrate on the *numerical values* of the different quadrants.

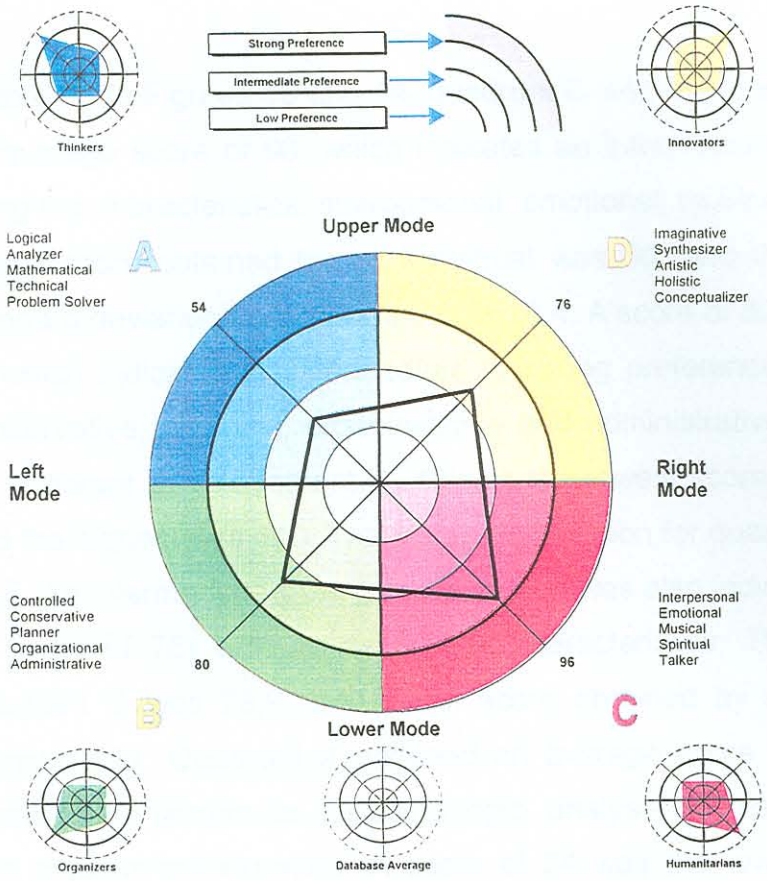

Figure 13: The *average* thinking style profile (professional communication pathologists).

Figure 14 provides a graphic presentation of the *average* thinking style preferences of professional communication pathologists according to the HBDI.

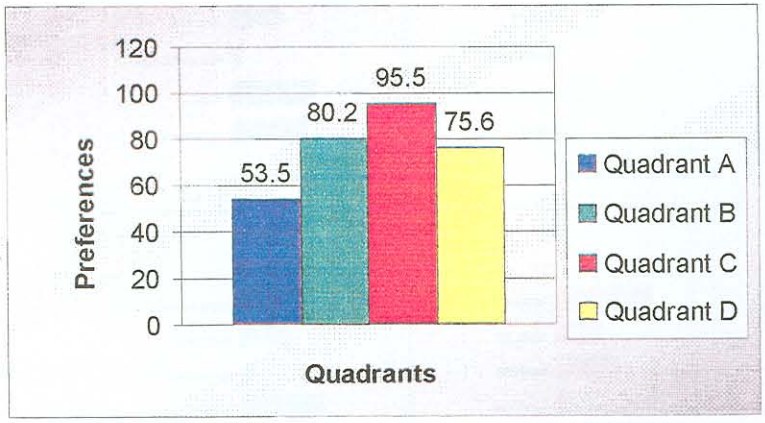

Figure 14: The *average* thinking style preferences (professional communication pathologists).

According to Figures 13 and 14, quadrant C was the most dominant quadrant with an average score of 96, which indicates an intermediate to strong preference for using the characteristics: interpersonal, emotional, musical, spiritual and talker. The lowest score obtained for an individual was 50, and the highest was 131. The standard deviation for quadrant C was 18,4. A score of 80 was obtained in quadrant B, which indicates an intermediate to strong preference for using the controlled, conservative, planning, organisational and administrative characteristics indicated for quadrant B. In quadrant B, 45 was the lowest score obtained by an individual and the highest was 110. The standard deviation for quadrant B was determined as 15,5. An intermediate to strong preference was also indicated for using quadrant D (a score of 76) with its associated characteristics. The standard deviation for quadrant D was 23,9; the lowest score obtained by an individual, 26 and the highest, 131. Quadrant A obtained an average score of 54, which indicates an intermediate preference for using logic, analysis, mathematics, technical methods and problem-solving skills. A score of 24 was the lowest score obtained by an individual and 75 was the highest. The standard deviation for quadrant A was 13,9.

More detailed information regarding the key descriptors are provided in Figure 15.

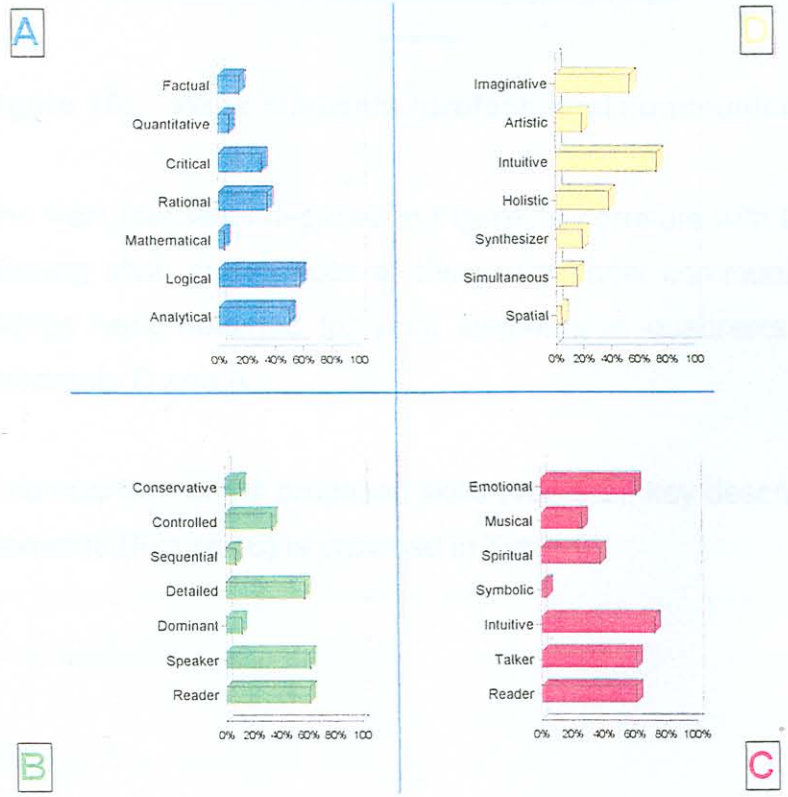

Figure 15: Key descriptors (professional communication pathologists).

The results obtained in Figure 15 confirm the graphic representations in Figures 13 and 14. Higher percentages for key descriptors were obtained in the quadrant of greater preference, namely quadrant C. Quadrant B followed, with lower percentages and quadrants D and A had even lower percentages. Figure 15 depicts the work elements of professional communication pathologists. A rating of less than 4 is indicative of less competence.

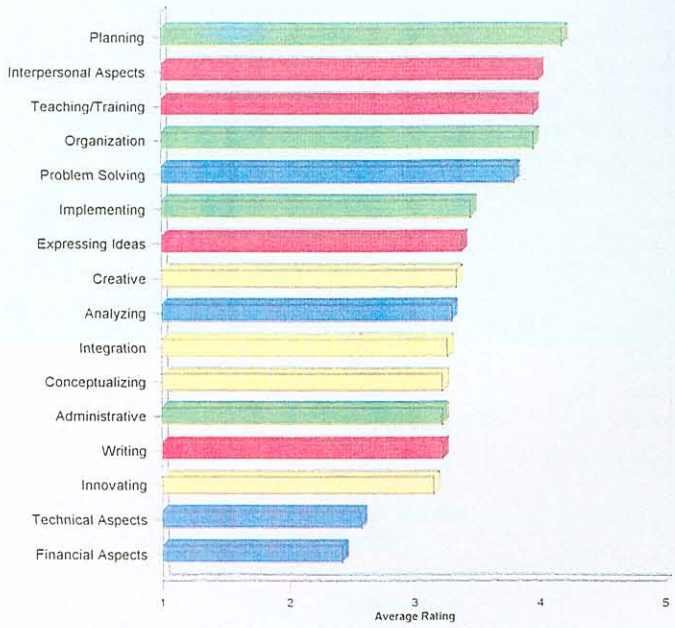

Figure 16: Work elements (professional communication pathologists).

The work elements depicted in Figure 16 correlate with the results obtained for the thinking style preferences of the professional communication pathologist. Higher ratings were obtained for work elements in quadrants C and B as opposed to quadrants D and A.

A comparison of the proposed skills (Table 2), key descriptors (Figure 15) and work elements (Figure 16) is provided in Table 6.

Table 6: A comparison of proposed skills, less preferred key descriptors and work elements of poorer competency (professional communication pathologists).

Quadrant:	Associated skills:	Key descriptors (preference of less than 50%):	Work elements (competency of less than 4):
A	❑ Problem solving ❑ Business acumen ❑ Scientific attitude ❑ Professional norms ❑ Education ❑ Objectivity ❑ Clinical training	❑ Factual ❑ Quantitative ❑ Critical ❑ Rational ❑ Mathematical ❑ Logical ❑ Analytical	❑ Problem solving ❑ Analysing ❑ Financial aspects ❑ Technical aspects
B	❑ Planning ❑ Professional identity ❑ Priority setting ❑ Organising ❑ Time management ❑ Legal identity	❑ Conservative ❑ Controlled ❑ Sequential ❑ Dominant	❑ Implementing ❑ Administrative
C	❑ Team building ❑ Empathy ❑ Family support ❑ Personal philosophy ❑ Acceptance ❑ Conflict management ❑ Perspective ❑ Tactful ❑ Understanding ❑ Sensitivity ❑ Peer relationships ❑ Patience ❑ Tolerance	❑ Musical ❑ Spiritual ❑ Symbolic	❑ Expressing ideas ❑ Writing
D	❑ Creativity ❑ Innovation ❑ Curiosity ❑ Flexibility ❑ Risk-taker ❑ Managing diversity	❑ Artistic ❑ Holistic ❑ Synthesiser ❑ Simultaneous ❑ Spatial	❑ Creative ❑ Integrating ❑ Conceptualising ❑ Innovating

The results obtained in this comparison (Table 6) are indicative of aspects that are in need of further development. The strong relationship between preferences and competencies should be kept in mind, since one typically leads to another (Herrmann 1996).

For quadrant A the development of a greater preference for factual, quantitative, critical, mathematical, analytical and rational aspects is very important in order to comply with the proposed thinking style preferences of the communication pathologist. These aspects of lesser preference again correlated with the proposed characteristics associated with quadrant C. The results obtained for work elements in quadrant C, aspects of a profession that the individual considers himself to be less competent in, were again problematical since the above-mentioned skills of lesser competency are essential to the development of skills associated with communication pathology. The key descriptors of quadrant B indicated that there was a lesser preference for conservative, controlled, sequential and dominance aspects for the group of professional communication pathologists. The work elements identified, implementing and administrative skills, were again indicative of problems with the proposed skills. The above-mentioned skills cannot be developed without successful implementation and administration. The foundation of any communication pathology practice lies in successful implementation and administration of therapy. As mentioned above, musicality as a key descriptor of lesser preference is not essential for the success of a communication pathologist. It should be noted however that the development of a greater preference and competency in this aspect could lead to creative and interesting therapy sessions and therefore cost-effective service delivery. The development of a greater preference for symbolic use is important for the development of skills such as family support, acceptance, conflict management and sensitivity. The development of a greater competency in expressing ideas and writing (quadrant C) is of the utmost importance. Success in the communication pathology profession is not possible without these competencies since many of the proposed skills such as conflict management, team building, family support and good peer relationships cannot be developed without the above skills. Communicating with the client and his significant others, as well as report writing, forms an integral part of the profession, and the development of the above competencies of quadrant C is very important. The work elements of lesser competency for quadrant D, creativity, integration, conceptualising and innovation, need to be developed in order to comply with the proposed skills of the communication pathologist. For example: without creativity

and innovation, no risk-taking, flexibility or management of diversity can be achieved. The need for the development of greater preference for the use of artistic, holistic, synthesising, simultaneousness and spatial skills is apparent. The inter-relationship between preferences, competencies and skills is again obvious when looking at a skill like flexibility. One would have difficulty developing this skill without a preference for using the above-mentioned key descriptors.

When comparing the HBDI results obtained for professional communication pathologists with the proposed thinking style preferences for the communication pathologist (Table 2), it is again apparent that most of the proposed skills (ASHA 2000; Scheurle 1992; Craig & Sleight 1989) were concentrated in quadrant C. The key descriptors in Figure 15 emphasise the lesser preferences of the communication pathologist, especially in quadrants A, B and D. The work elements (Figure 15) identify areas in which lower competencies are apparent for the professional communication pathologist. The inter-relationship between preferences and competencies (Herrmann 1996) should be kept in mind in order to develop the necessary skills for the competent communication pathologist.

3.1.4 The *average* thinking style preferences of the communication pathologist (*N* = 91) using the Herrmann Brain Dominance Instrument

The *average* thinking style preferences for all the subjects (*N* = 91) in the study were determined in order to ascertain if there were any deviations from the results already obtained. The results of all the thinking style profiles of all the subjects who participated in the study are depicted in Figure 17. The *numerical values* obtained will again be used to determine the quadrant of greatest preference.

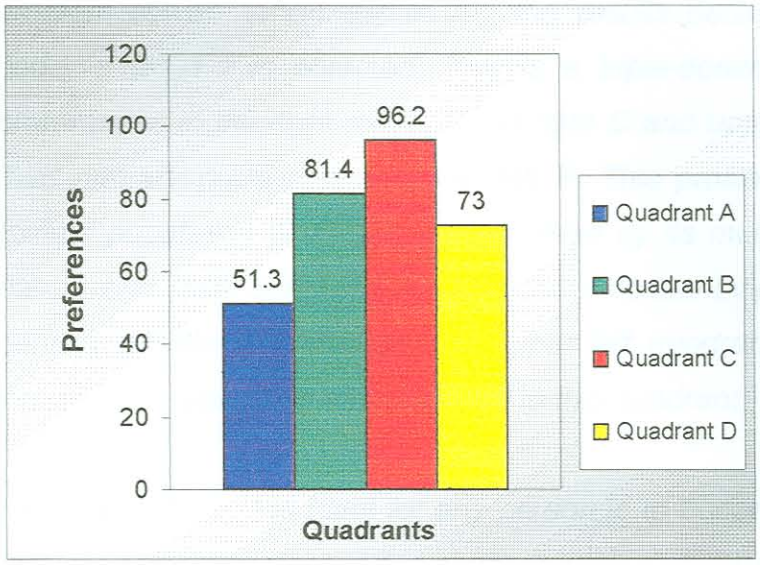

Figure 17: **The *average* thinking style preferences of the communication pathologist (students and professionals).**

The quadrant of intermediate to strongest thinking style preference for all the subjects in the study was quadrant C where 96,2 was obtained. The lowest score for an individual in quadrant C was 35 and the highest score, 131. A standard deviation of 17,6 was obtained for quadrant C. Quadrant B, the next quadrant of preference, scored 81,4. The standard deviation for quadrant B was 18, the lowest score obtained for an individual was 35, and the highest, 117. Quadrant D received an average of 73, with a standard deviation of 21,2. The lowest individual score was 26, and the highest was 131. Once again, quadrant A was the quadrant of intermediate preference with an average of 51,3. The standard deviation for quadrant A was 14,4, the lowest score was 20, and the highest, 84.

The results of 3.1.1, 3.1.2, 3.1.3 and 3.1.4 indicate that according to numerical values*, all the subjects that participated in the study showed an intermediate to strong thinking style preference for quadrant C, with the accompanying characteristics: interpersonal, emotional, musical, spiritual and talker. Thinking style preference for quadrants B and D were also intermediate to strong. The intermediate thinking style preference, on average, was in quadrant A, with the accompanying characteristics: logical, analyser, mathematical, technical and*

problem solver. When expressing the results obtained in a four-digit numerical code, a 2-1-1-1 is obtained. This is a triple-dominant profile with two primary preferences in the right mode, lower right C and upper right D quadrants, and the third primary preference in lower left B. This profile, seen in the majority of the female population (24%), is characterised by its multi-dominant and "generalised" nature and fairly balanced amounts of understanding and ability to use the three primary quadrants. Although the upper left quadrant A was least preferred, the individual is typically quite functional in this quadrant.

As stated above, the ideal for any person is to become "whole-brained". The need for further development of this concept is very obvious in the light of the data on the key descriptors and work elements of each of the three groups. The question can therefore be asked: "Why does the communication pathologist need to develop these key descriptors and work elements?" In order to comply with the greater demands and changes in the profession (Ashby 1995), the communication pathologist needs to acquire more information on a wide variety of subjects and apply the information and skills in the workplace (Campbell and Taylor 1992). The greater demands for the provision of cost-effective and measurable services imply that the communication pathologist must not only comply with the traditional role of "humanitarian", but also with the new roles as "thinker, organiser and innovator". The navigation of reimbursement systems, the complexities of the healthcare system, legislation and patient advocacy (http://www.asha.org/students/changing.htm) indicate that the use of the quadrant of strongest preference (quadrant C) would not necessarily be enough to overcome the many obstacles that face the communication pathologist. Craig and Sleight (1989) demand that communication pathologists need to be independent life-long learners with entrepreneurial attitudes and management skills (http://www.asha.org/students/changing.htm), skills which are clearly associated with quadrants A, B and D. Ashby (1995) also indicates that the communication pathologist needs to develop greater skills in team work, marketing and cost containment.

In order to survive as a successful communication pathologist, development of the discussed key descriptors, and therefore, the development of the quadrants of

lower preference, is of the utmost importance. The proposed changes in the existing traditional, tertiary education programmes (Hugo 1998) are indicative of the utilisation and role of tertiary programmes in the development of the key descriptors, work elements and "whole-brained" communication pathologists.

3.2 Differences between the thinking style preferences of the speech-language pathologist, audiologist, and the speech-language pathologist *and* audiologist

The biographical questionnaire that was included with the Herrmann Brain Dominance Instrument was used to obtain information on the specific type of communication pathologist that the subjects considered themselves to be, namely: a speech-language pathologist only, an audiologist only or both a speech-language pathologist *and* audiologist.

3.2.1 Thinking style preferences of speech-language pathologists (first-year students, final-year students and professional communication pathologists).

Statistical methods were used to determine the thinking style preferences of individuals in communication pathology who considered themselves to be speech-language pathologists ($N = 18$). The results of the Friedman two-way analysis of variance test indicated that there was no significant *statistical* difference between any of the quadrants ($p = 0{,}0000$). Although *numerically,* quadrant B was the quadrant of preference, statistically speaking, no quadrant could be considered more dominant than the other. Figure 18 depicts the thinking style preferences of speech-language pathologists.

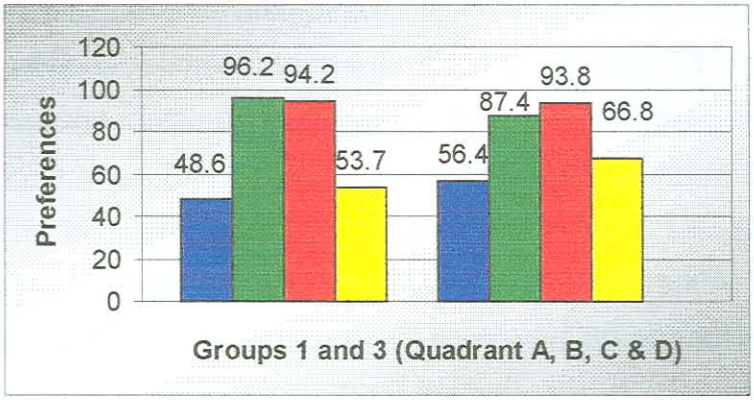

Figure 18: Thinking style preferences of speech-language pathologists (first-year students and professional communication pathologists).

The results obtained for the first-year students in communication pathology indicate that there was a slightly stronger preference for quadrant B (96,2) over quadrant C (94,2). An intermediate to strong preference for the use of these two quadrants was therefore indicated. The lowest score obtained for quadrant B was 72 and the highest score, 117. A standard deviation of 15,8 was found for quadrant B. A score of 74 was the lowest score obtained for quadrant C and 114, the highest. The standard deviation for quadrant C was13,7. An intermediate preference was found for the use of quadrant D, with 53,7. The lowest score in this quadrant was 35, the highest was 75 and the standard deviation, 15,4. Quadrant A was once again the quadrant of lowest preference with a value of 48,6. The lowest score obtained for this quadrant was 33 and the highest was 65.

According to the results obtained from the biographical questionnaire, none of the final-year students in communication pathology considered themselves to be speech-language pathologists.

Quadrant C was the quadrant of intermediate to strongest preference (93,8) for professional communication pathologists who considered themselves exclusively speech-language pathologists. The standard deviation for quadrant C was 13,7, the lowest individual score was 78 and the highest, 119. An intermediate to strong

preference was also indicated for Quadrant B with a value of 87,4. The lowest individual score obtained in quadrant B was 78 and the highest was 110. The average obtained in quadrant D was 66,8, indicating an intermediate to strong preference. The lowest individual score in quadrant D was 26 and the highest, 84. The standard deviation for quadrant D was 21,6. The value of 56,4 indicates an intermediate preference for the usage of quadrant A. The standard deviation for this quadrant was 13,4, the lowest score was 39 and the highest, 75.

According to these results, quadrants B and C were dominant for the first-year subjects who preferred to be seen as speech-language pathologists. When using the four-digit profile proposed by Herrmann (1995), it was found that first-year subjects who considered themselves speech-language pathologists exclusively, had a 2-1-1-2 profile. This profile is a double-dominant profile with the two primaries in the lower left B and lower right C quadrants. The profile is characterised by very strong preferences for conservative thinking and controlled behaviour with a desire for organisation and structure, as well as detail and accuracy. The primary in the lower right C quadrant would manifest itself in emotional and interpersonal preferences, an interest in music and a sense of spirituality (Herrmann 1995). Occupations typical of individuals with this profile include nurses and other members of the "helping professions".

One of the most obvious results obtained for the final-year students in communication pathology was the absence of any subjects who considered themselves solely speech-language pathologists. The reason for this was impossible to explain and more detailed information would be required (possibly through an extensive interview). It could be hypothesised however that the subjects who participated in the study might have had bad experiences during their speech-language therapy course, for example, no successful discharge of patients, the lengthy time of therapy or poor supervision by lecturers.

For professional communication pathologists who considered themselves speech-language pathologists exclusively, a 2-1-1-2 profile was also found. As discussed

above, these individuals have a double primary in the limbic area and may have problems with internal conflict due to the opposing qualities of control and structure versus emotions and interpersonal feelings.

3.2.2 Thinking style preferences of audiologists (first-year students, final-year students and professional communication pathologists)

Statistical methods were used to determine the thinking style preferences of individuals in communication pathology who considered themselves audiologists ($N = 18$). The results of the Friedman two-way analysis of variance test indicated that there was no significant *statistical* difference between any of the quadrants ($p = 0{,}0000$). Figure 19 depicts the thinking style preferences of audiologists.

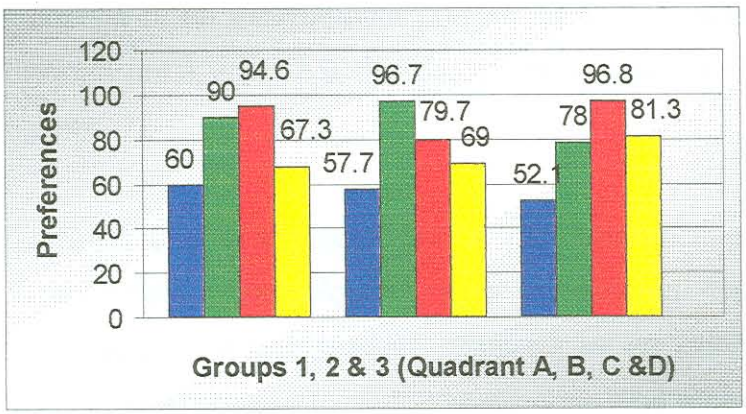

Figure 19: The thinking style preferences of audiologists (first-year students, final-year students and professional communication pathologists).

Quadrant C was indicated as the quadrant for which an intermediate to strong preference (*numerical*) was present in first-year students who considered themselves audiologists (94,6). The lowest individual score obtained in this quadrant was 72 and the highest 111. The standard deviation for quadrant C was 20,3. Quadrant B followed with slightly less, namely 90. The lowest score obtained was 81 and the highest, 96. The standard deviation for quadrant B was 7,9. An intermediate to strong preference (76,1) was obtained in quadrant D, with a standard deviation of 11,9. The lowest score in quadrant D was 59 and the highest score, 81. Quadrant A obtained an average score of 59,7, indicative of an

intermediate preference. The standard deviation for this quadrant was 13,3, the lowest individual score was 51 and the highest was 75.

The results indicating the thinking style preferences of final-year audiology students showed that the quadrant of intermediate to strongest preference was B with 96,7. The lowest score obtained in this quadrant was 78, and the highest, 107. The standard deviation for quadrant B was 16,2. Quadrant C followed with an average of 79,7, indicative of an intermediate to strong preference for using this quadrant. The lowest score was 74, 87 was the highest and 6,7 the standard deviation. Quadrant D gave 69 points. The lowest score obtained by an individual was 60 and the highest, 75. The standard deviation for quadrant D was 7,9. The quadrant indicative of an intermediate preference was A, with 57,7. The standard deviation for quadrant A was 12,9; the lowest score obtained by an individual was 47, and the highest, 72.

Quadrant C was the quadrant of intermediate to strongest preference (96,8) for communication pathologists who considered themselves to be audiologists exclusively. The lowest score obtained by an individual was 75, and the highest, 122. An intermediate to strong preference was also apparent in quadrant D (81,3). The standard deviation for quadrant D was 26,6; the lowest score obtained by an individual was 39 and the highest, 131. Quadrant B followed with slightly less than quadrant D, 78 (an intermediate to strong preference). The lowest score for an individual was 45 and the highest score, 99. The standard deviation for quadrant B was 18,3. An intermediate preference for the use of quadrant A was shown with a score of 52,1. The lowest score obtained by an individual for quadrant A was 30 and the highest was 71. The standard deviation for quadrant A was 12,1.

Quadrant C was dominant for the first-year subjects who considered themselves to be audiologists, closely followed by quadrant B. These subjects had a 2-1-1-1 profile (Herrmann 1995). This profile is typical of professions in human resources, or occupations that require an understanding and ability to function on many levels, such as social workers and supervisory nurses.

The final-year students who considered themselves audiologists showed dominance in quadrant B, followed by quadrants C and D. A sharp increase in the value was also obtained for quadrant A. These subjects had a greater preference for the following characteristics, namely: logical, analyser, mathematical, technical and problem solving. Quadrant C was the most dominant quadrant for professional communication pathologists, closely followed by a preference for using quadrants B and D. A 2-1-1-1 profile was found for final-year students and professional communication pathologists who considered themselves to be audiologists.

3.2.3 Thinking style preferences of speech-language pathologists *and* audiologists (first-year students, final-year students and professional communication pathologists).

Statistical methods were used to determine the thinking style preferences of individuals in communication pathology who considered themselves to be both speech-language pathologists and audiologists ($N = 18$). The results of the Friedman two-way analysis of variance test indicated that there was no significant *statistical* difference between any of the quadrants ($p = 0{,}0000$). Figure 20 depicts the thinking style preferences of speech-language pathologists *and* audiologists.

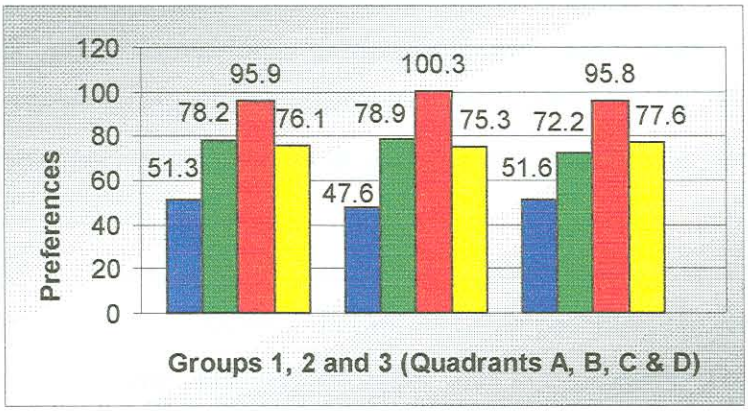

Figure 20: The thinking style preferences of speech-language pathologists *and* audiologists (first-year students, final-year students and professional communication pathologists).

The results obtained for first-year students in communication pathology indicated that quadrant C (95,9) was the quadrant in which an intermediate to strongest

preference was present. The lowest score obtained by in individual was 63, and the highest, 122. The standard deviation for this quadrant was 17,5. Quadrant B (78,2) was the next highest score (intermediate to strong preference). The standard deviation for quadrant B was 15,5, the lowest score was 44 and the highest score, 110. Quadrant D obtained an average of 76,1 (also an intermediate to strong preference). The lowest score obtained for this quadrant was 36 and the highest, 111. The standard deviation for quadrant D was 20,6. The quadrant for which an intermediate preference was shown was quadrant A, with 51,3. A standard deviation of 14,3 was obtained, with the lowest score 20 and the highest, 77.

The area for final-year students in communication pathology in which the intermediate or strongest preference was apparent was quadrant C, with 100,3. The standard deviation for quadrant C was 20,3; the lowest individual score was 35, and the highest, 128. Quadrant B obtained 78,9, which is indicative of an intermediate to strong preference for using this quadrant. The lowest score obtained in quadrant B was 35, and the highest was 117. The standard deviation for quadrant B was 23,5. Quadrant D (intermediate to strong preference) gave a value of 75,3 with a standard deviation of 20,6. The lowest score obtained by an individual was 47 and the highest, 117. Quadrant A obtained 47,6 points, indicative of an intermediate preference for using this quadrant and the associated characteristics. The standard deviation for quadrant A was 16; the lowest score obtained by an individual was 21, and the highest, 84.

Quadrant C was the quadrant of intermediate to strong preference (95,8) for the group of professional communication pathologists who considered themselves both speech-language pathologists *and* audiologists. The lowest score obtained by an individual in this quadrant was 50, and the highest score, 131. The standard deviation for quadrant C was 29,7. An intermediate to strong preference was also apparent for quadrant D, where 77,6 was obtained. The standard deviation for quadrant D was 20,4, the lowest score obtained was 54 and the highest score, 108. The professional communication pathologists who participated in the study showed an intermediate to strong preference for quadrant B (72,2). The standard deviation

was 13,9, the lowest score obtained was 54 and the highest was 92. An intermediate preference for the use of quadrant A and the accompanying characteristics was shown (51,6). The lowest score obtained by an individual was 24, and 74 was the highest. The standard deviation for quadrant A was 20,3.

Quadrants B and C were dominant for those first-year subjects, final-year subjects and professional communication pathologists who considered themselves to be both of the above professions (a 2-1-1-1 profile). This profile is typical of professions in human resources, or occupations that require an understanding and ability to function on many levels, such as social workers and supervisory nurses. This indicates that all the subjects preferred the associated characteristics of quadrants B and C, namely: controlled, conservative, planner, organisational, administrative, interpersonal, emotional, musical, spiritual and talker.

When looking at the results obtained in 3.2.1, 3.2.2 and 3.2.3 it is clear that the results of quadrant A (first-year students) (Figure 17) showed higher values for the audiology students than for the speech-language pathology students (Figure 18) and the speech-language pathology and *audiology students (Figure 19). A possible explanation for this dramatic increase (48,6 to 60 and 51,3 to 60) in the results from quadrant A lies in the demands of the profession of audiology. Herrmann (1995) explains that a profession should be chosen in the area of strongest preference and greatest competence. The students who identified themselves as audiologists may have been aware of these preferences and competencies and had therefore chosen to specialise in audiology. It should however be remembered that an individual is the product of both nature (30%) and nurture (70%) (Herrmann 1996) and the development of new skills in an individual is always possible. A definite decrease in the values for quadrant B for first-year students was apparent when comparing the results of the speech-language pathologist, the audiologist and the speech-language pathologist* and *audiologist (96,2 to 90 to 78,2). The implication of these results is that the preference for characteristics associated with quadrant B decreased when professions such as speech-language pathology* and *audiology were chosen. The values of quadrant C remained quite stable for these*

professions. There was a large increase in the values obtained for quadrant D for the subjects who considered themselves to be audiologists and those who considered themselves speech-language pathologists and audiologists. This might indicate that the work done by the audiologist, and the speech-language pathologist and *audiologist demands more imaginative, synthesising, artistic, holistic and conceptual skills than the work done by individuals who consider themselves speech-language pathologists only.*

An interesting feature was present in quadrant B for the final-year subjects who considered themselves to be both speech-language pathologists and *audiologists (Figure 19). A significant decrease was seen when the values obtained for Audiologists (Figure 18) and speech-language pathologists* and *audiologists (Figure 19) were compared. The implication of this is that subjects who considered themselves to be both the above professionals had a lower preference for the following characteristics: controlled, conservative, planner, organisation and administration. The values for quadrants C and D of speech-language pathologists* and *audiologists increased significantly when compared with the values obtained for subjects who considered themselves audiologists only. The reason for this might again lie in the nature of the combined professions. An individual who is actively involved in both speech-language pathology* and *audiology will develop more skills that are associated with quadrants C and D respectively. The nature and nurture concepts of Herrmann (1995) are again applicable here.*

The results obtained for quadrant A (both professions) (Figure 19) again showed a decrease when compared to the values of quadrant A for the subjects who considered themselves solely speech-language pathologists (Figure 17) and those who considered themselves solely audiologists (Figure 18). The decrease in these values was subtle, but the question can be asked, "why this is happening?" It could be hypothesised that the practising speech-language pathologist and *audiologist is no longer faced with challenging activities (Sarason 1977) and therefore is neglecting the characteristics associated with quadrant A. The decrease in quadrant B from the speech-language pathologist (87,4), to the audiologist (78), to*

the individual who considered herself to be a speech-language pathologist as well as an audiologist (72,2) might be indicative of the structure of activities that form an integral part of the different professions. The speech-language pathologist should be more of an organiser because of the nature of therapy sessions. Active planning, organising, administration and control are essential in order to provide measurable and cost-effective services (http://www.asha.org/students/changing.htm). Once again there was a large increase in the values obtained for quadrant D for the subjects who considered themselves to be audiologists and those who considered themselves speech-language pathologists and *audiologists. Some people might be of the opinion that the type of work done by the audiologist (hearing evaluations, interpretation of results, hearing aid fitting and more) demands more imaginative, synthesising, artistic, holistic and conceptual skills than the work done by individuals who consider themselves speech-language pathologists only.*

3.2.4 The *average* thinking style preference of speech-language pathologists

The *average* thinking style preferences of all the subjects (first-year students, final-year students and competent professionals) that considers themselves to be speech-language pathologists (*N* = 18) are depicted in Figure 21. *Numerical values* are again used for this discussion.

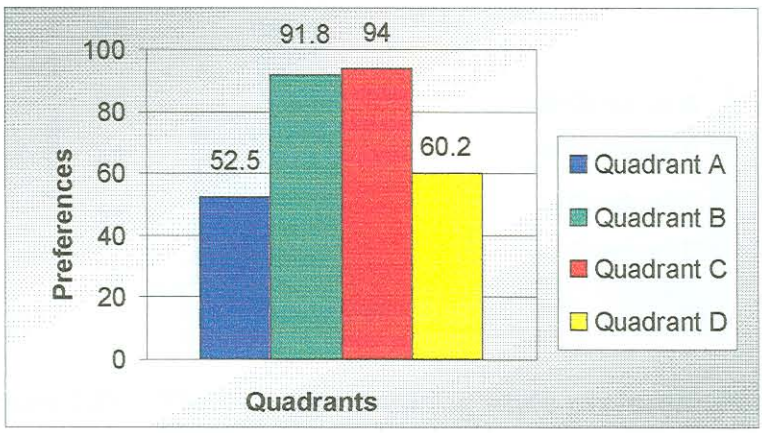

Figure 21: The *average* thinking style preferences of speech-language pathologists.

Quadrant C was on average the quadrant of intermediate to strongest preference (94). The lowest points obtained for this quadrant were 74 and the highest 119. The standard deviation for quadrant C was 13,3. The results obtained for quadrant B (91,8) were only slightly lower than those for quadrant C, therefore also indicative of an intermediate to strong preference for the use of the characteristics of quadrant B. The standard deviation for quadrant B was 13,4; the lowest score obtained by an individual was 72 and the highest, 117. Quadrant D obtained an average of 60,2 (intermediate to strong preference), with a standard deviation of 19,4. The lowest results obtained by an individual for quadrant D were 26, and the highest, 84. An intermediate preference was suggested by the results for quadrant A (52,5). The minimum score obtained by an individual was 33 and the maximum score was 75. The standard deviation for quadrant A was 12,6.

3.2.5 The *average* thinking style preference of audiologists

The *average* thinking style preferences for all the subjects (first-year students, final year students and competent professionals) who considered themselves audiologists (N = 18) were determined through statistical procedures. A depiction of the *numerical* results is shown in Figure 22.

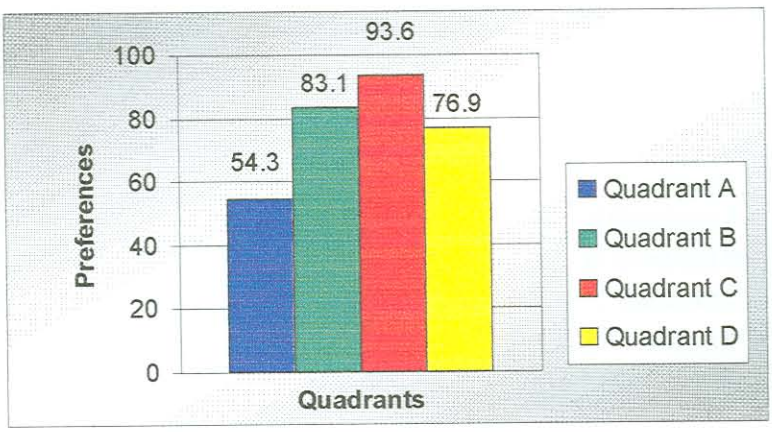

Figure 22: The *average* thinking style preferences of the audiologist.

The highest average was obtained in quadrant C with 93,6. These results indicate that audiologists have an intermediate to strong preference for using the

characteristics of quadrant C. The average minimum score obtained was 72 and the maximum score, 122. The standard deviation obtained for quadrant C was 17,1. Quadrant B obtained an average of 83,1 (an intermediate to strong preference). The minimum score obtained was 45, and 107 was the maximum for quadrant B. The standard deviation for quadrant B was 17,8. The average result obtained in quadrant D was 76,9. An intermediate to strong preference existed for individuals to use the associated characteristics of quadrant D. An individual minimum score of 39 and a maximum of 131 were obtained for quadrant D. The standard deviation for quadrant D was 22,9. Quadrant A's results (54,3) were indicative of an intermediate preference for using the associated characteristics of that quadrant. The standard deviation for quadrant A was 12,1, the minimum individual score was 30 and the maximum score obtained was 75.

3.2.6 The *average* thinking style preference of speech-language pathologists *and* audiologists.

The *average numerical* thinking style preferences of subjects (first-year students, final-year students and competent professionals) who considered themselves both speech-language pathologists *and* audiologists (N = 50) are depicted in Figure 23.

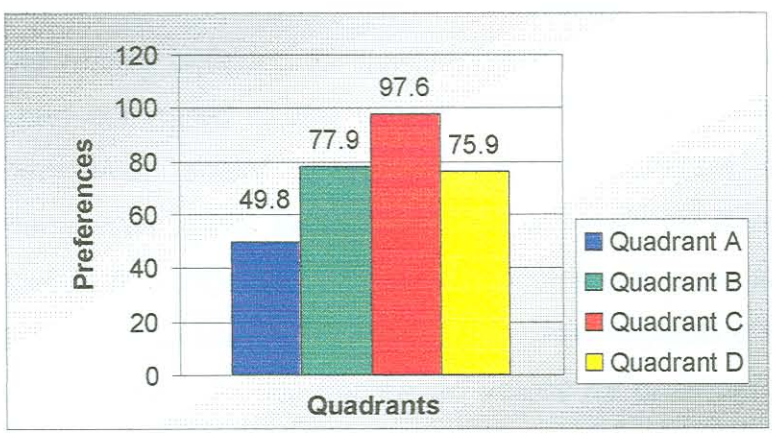

Figure 23: The *average* thinking style preferences of the speech-language pathologist *and* audiologist.

Once again quadrant C was the quadrant of intermediate to strong preference (97,6). The minimum score obtained was 35 and the maximum, 131. The standard

deviation for quadrant C was 19,7. The result obtained for quadrant B was 77,9 (intermediate to strong preference). The standard deviation for this quadrant was 18,7; the minimum score obtained was 35, and the maximum score, 117. Quadrant D obtained 75,9, also indicative of an intermediate to strong preference for using the characteristics associated with this quadrant. The minimum score obtained for quadrant D was 36, and the maximum score, 117. A standard deviation of 20,2 was obtained for quadrant D. An intermediate preference for the use of the associated characteristics of quadrant A was indicated with the results obtained (49,8). The standard deviation for quadrant A was 15,4, the minimum score obtained was 20, and the maximum score, 84.

Quadrants B and C were the most dominant quadrants for individuals who considered themselves speech-language pathologists only or audiologists only. The individuals who considered themselves to be both speech-language pathologists and *audiologists showed quadrant C to be of greatest preference.*

When constructing the four-digit profile of Herrmann (1995) it was again found that the speech-language pathologist had a 2-1-1-2 profile and the audiologist, and the speech-language pathologist and *audiologist, a 2-1-1-1 profile.*

The results obtained for quadrant A (both professions) again showed a decrease when compared to the values for quadrant A for the subjects who considered themselves solely speech-language pathologists and those who considered themselves solely audiologists. It can again be hypothesised that the practising speech-language pathologist and *audiologist is no longer faced with challenging activities (Sarason 1977) and is therefore neglecting the characteristics associated with quadrant A. The decreased values for quadrant B from the speech-language pathologist (91,8), to the audiologist (83,1), to the individual who considered herself to be a speech-language pathologist as well as an audiologist (77,9) might again be indicative of the structure of activities that form an integral part of the different professions. The speech-language pathologist should be more of an organiser because of the nature of therapy sessions. Active planning, organising,*

administration and control are essential in order to provide measurable and cost-effective services (http://www.asha.org/students/changing.htm). Once again there was a large increase in the values obtained for quadrant D for the subjects who considered themselves to be audiologists and those who considered themselves speech-language pathologists and *audiologists. Some people might be of the opinion that the type of work done by the audiologist (hearing evaluations, interpretation of results, hearing aid fitting and more) demands more imaginative, synthesising, artistic, holistic and conceptual skills than the work done by individuals who consider themselves speech-language pathologists only.*

3.3 Learning and teaching strategies relevant to thinking style preferences

The results obtained from the HBDI and presented in 3.1 and 3.2 indicated that the quadrant of thinking style preference for the communication pathologist was quadrant C with a score of 96,2. Quadrant B followed with a slightly lower score (81,4), which was then followed by quadrants D (73) and A (51,3) (Figure 16). When presenting these results in a four-digit numerical code, a 2-1-1-1 was obtained. As discussed, this profile is characterised by its multi-dominant and "generalised" nature and a fairly balanced amount of understanding and an ability to use the three primary quadrants (B, C and D). Although quadrant A was the least preferred quadrant, the individual can typically function in this thinking style.

This knowledge should be kept in mind by lecturers and students in communication pathology, in order to avoid the occurrence of any mismatch between the prevailing teaching style and the learning style of the student, which may lead to lower grades, and a loss of interest in the course material and therefore the chosen profession (Felder and Silverman 1988).

The Whole Brain Teaching and Learning Model (Herrmann 1995) (Figure 4) suggests that students with a thinking style preference in the C quadrant are participative and feelings driven. The Whole Brain Learning and Design Considerations (Herrmann 1995) (Figure 3) therefore offer suggestions for C

quadrant learners. According to these considerations the student with a thinking style preference in the C quadrant will respond to the following:

- Experiential opportunities;
- Sensory movement;
- People-orientated cases;
- Discussions and
- Group interaction.

Successful learning for students with a thinking style preference in quadrant C will be achieved by:

- Listening and sharing ideas;
- Integrating experience with self;
- Moving and feeling;
- Harmonising with the content and
- Emotional involvement.

One very important fact should be kept in mind. Although the prevailing thinking style preference for the communication pathologist was in quadrant C, the development of skills and key descriptors and work elements (see 3.1) in the other three quadrants is essential for "whole-brain" development (Herrmann 1995). It is therefore important that the person working with and training the diverse population of communication pathologists realises that major transformations in teaching styles are not necessary in order to achieve the desired balance (http://www.2ncsu.edu/unity/lockers...blder/public/Papers/Secondtier.html).

The idea is not to teach each student exclusively according to his or her preferences, but rather to strive for a balance of instructional methods (Figure 3). If this balance is achieved, the communication pathology student will be taught partly in a manner he/she prefers (quadrants B, C and D), which leads to an increased comfort level and willingness to learn, and partly in a less preferred manner, which

provides feedback in ways of thinking and solving problems with which he/she may not initially be comfortable, but which he/she will have to use to be a fully effective professional (quadrant A) (http://www2.ncsu.edu/unity/lockers...felder/public/ LearningStyles.html). Some strategies or additional teaching methods that should be used to compliment all four quadrants are as follows (http://www.2ncsu.edu/ unity/lockers...blder/public/ Papers/Secondtier.html):

- Motivate the presentation of theoretical material with prior presentation of phenomena that the theory will help to explain, and problems that the theory will solve;
- Balance concrete information;
- Make use of sketches, plots, schematics, vector diagrams, computer graphics and physical demonstrations in addition to oral and written explanations and derivations in lectures and readings;
- To illustrate abstract concepts or problem-solving algorithms, use at least some numerical examples to supplement;
- Use physical analogies and demonstrations to illustrate the magnitude of calculated quantities;
- Give some experimental observations before presenting the general principles and have the student see how far he/she can get towards inferring the latter;
- Provide time in class for the students to think about the material being presented and for active participation;
- Encourage or mandate co-operation on homework and
- Demonstrate the logical flow of individual course topics, but also point out connections between the current material and other relevant material in the same course, in other courses in the same discipline, in other disciplines and in everyday experiences.

Through the use of these strategies, expansion of the individual's learning style, according to the preferred thinking style of the individual, is made possible (http://www.bergen.org/ETTC/courses/LearningStyles/Introduction. html).

4. CONCLUSION: IMPLICATIONS FOR CLINICAL PRACTICE AND FURTHER RESEARCH

The ***aim*** of this study was to describe the thinking style preferences in communication pathology. The results presented and discussed have shown that the aims of the study have unequivocally been achieved. There are a number of important conclusions that can be drawn from the present study, and these conclusions will be discussed under the proposed sub-aims.

4.1 Implications

- *To determine the thinking style preference of the subjects in the study using the Herrmann Brain Dominance Instrument and establish possible patterns of brain dominance pertaining to the three groups that participated in the study.*

The *numerical* results obtained regarding the thinking style preferences of the subjects in the study ($N = 91$) clearly indicated that the majority thinking style preference was quadrant C. The next *numerical* thinking style preference, for which an intermediate to strong preference was indicated, was quadrant B. Quadrant D followed next, also with an intermediate to strong preference for using this quadrant. The *numerical* results of this study indicated that all of the subjects' least preferred thinking styles were in quadrant A. When using the four-digit numerical code, a 2-1-1-1 was obtained. The communication pathologist therefore has a balanced amount of understanding and ability to use the three primary quadrants and is quite functional in the least preferred quadrant.

The implications of these results are that the communication pathologist will be able to comply with the ever-growing demands of an expanding and increasingly technical and specialised profession (Oratio 1977; Campbell & Taylor 1992). The results indicated that the communication pathologist will be functional in the least preferred quadrant (quadrant A), but it is important to note that "functional" might not be enough. The increasingly technical practice (Craig & Sleight 1989), the navigation of reimbursement systems, understanding of the complexities of the

healthcare system (http://www.asha.org/students/changing/htm) and skills needed for cost containment (Ashby 1995) accentuate the need for the development of skills associated with quadrant A. The aspect of "africanization" (Hugo 1998) also has important implications when considering thinking style preferences. In order to adapt to the new challenges, the communication pathologist needs to develop skills associated with quadrant B. According to the results of the study the communication pathologist is quite capable of functioning in this quadrant, but this topic needs to be discussed thoroughly in the tertiary institution since the student in communication pathology needs to be prepared to give health-education, counselling, community-based services and rehabilitation and preventative services (Hugo 1998) when qualified.

- *To determine if there is any differences in the patterns of brain dominance of the speech-language pathologist, the audiologist, and the speech-language pathologist* and *audiologist.*

The average results obtained for subjects who considered themselves exclusively speech-language pathologists indicated that the quadrant of greatest preference was quadrant C, followed closely by B. Quadrant D followed in the third place as an intermediate to strong preference and quadrant A was considered the least preferred thinking style.

The average audiologist also showed a preference for quadrant C, followed respectively by quadrants B, D and A. An interesting aspect that should be noted is the sharp increase in the values obtained for quadrant D when compared with the average speech-language pathologist (60,2 to 76,9). This implies that audiologists have a greater preference for using quadrant D than do speech-language pathologists.

The subjects who considered themselves both speech-language pathologists *and* audiologists showed a preference for using quadrant C. This was followed by

quadrants B, D and then A. The value obtained for quadrant D again showed an increase compared to the value for quadrant D for speech-language pathologists.

The results for the three groups (speech-language pathologists, audiologists and speech-language pathologists *and* audiologists) indicated that quadrant A was generally the least preferred thinking style.

Herrmann (1995) suggests that the nature of any work is largely dependent on mental processes and this implies that the highest productivity will be achieved when there is a positive correlation between the chosen profession and the preferred mental modes. Knowledge regarding mental preferences is therefore essential for choosing the right job within a certain career. The results of this study imply that a certain type of person with a particular thinking style preference will be successful in these different professions, namely: speech-language pathologists, audiologists and speech-language pathologists *and* audiologists. When an individual is selected to the undergraduate course, proposals can be made regarding the choice between the different professions.

- *To determine learning and teaching strategies relevant to the brain dominance of the subjects.*

The results obtained indicate that learning strategies and methods should be used which are relevant to the characteristics of quadrant C. It is crucial however that characteristics and skills of the other three quadrants be developed in order to become "whole-brained". It is implicated that the lecturer should use diversity in teaching strategies in order to develop fully effective professionals.

The development of new curricula should also consider the thinking style preferences of the communication pathologist as well as the learning and teaching strategies associated with these thinking style preferences. Emphasis could be placed on aspects that are in need of further development in order to prepare the student for successful practice as a communication pathologist. This knowledge

regarding thinking style preferences and the associated learning and teaching strategies also has implications for the evaluation of students in tests, assignments and during examinations. Questions or assignments should be constructed in such a way that all the preferences of the student are considered. Since more emphasis is placed on community-based rehabilitation and intervention, this approach to the education of the community should also be followed. Although no information is available regarding the specific thinking style preferences of a particular community, use of a diversity of methods when training and educating them should be sufficient.

4.2 Evaluation of the research methodology

As is the case in any research, the methodology followed in this study has certain limitations.

The ***first limitation*** of this study was that a limited number of subjects were used. Although in total 91 is not considered a small sample, when divided up as has been done in this study, the resulting sub-samples may be a small number of subjects and the study then of less value.

The ***second limitation*** concerns the geographical area from which the subjects were selected. Since a convenience, non-probability sample was used, only subjects in the researcher's immediate environment were included in the study. The thinking style preferences of students in communication pathology and graduate communication pathologists in other provinces and from other universities were not included in this study.

A ***third limitation*** of the study was that the Herrmann Brain Dominance Instrument is only available in English. Although a list is provided to explain certain word used in the questionnaire it could still have influenced the results obtained.

Advantages of this study include:

The results obtained in this study improve the understanding of oneself and of the mental diversity that exists in individuals. This could then improve communication and interaction between communication pathologists as well as the understanding of colleagues, bosses and lecturers. Knowledge regarding the different learning and teaching styles and how they affect personal learning has been made available and the student and the lecturer will have greater insight into individual differences. The results obtained by the HBDI will therefore enhance creativity and innovation of students and lecturers alike (http://www.ozemail.com.au/~hrmint/ hbdi.htm).

A further ***advantage*** is that research is now available regarding the thinking style preferences of the communication pathologist. The determination of thinking style preferences using the HBDI is a relatively new concept in South Africa and research on this subject is essential to update the available database regarding thinking style preferences using the HBDI.

4.3 Recommendations

- It is recommended that further research on the subject of thinking style preferences of the communication pathologist be done on a larger sample. This sample should include subjects from different provinces and universities.

- Although not a sub-aim of the present study, it was noted that development in certain quadrants had taken place over time when comparing the first-year students, final-year students and graduate professionals. Further research regarding the development in quadrants or thinking styles is therefore required.

- Research should also be undertaken on the present curricula of tertiary institutions and the thinking style preferences of students registered at each specific institution.

- Further research should also be done on the use of the Herrmann Brain Dominance Instrument as a selection instrument for the course B. Communication Pathology.

4.4 Concluding remarks

As discussed above, society places expectations on us to enjoy our chosen professions and to experience satisfaction and fulfilment in the workplace. Ideally, one's personality and the choice of occupation should be congruent (Edison 1994). The rationale of this study was an attempt to describe the thinking style preferences in communication pathology in order to determine if the subject's personality and chosen profession was congruent. The results obtained emphasise the importance of the different thinking style preferences of the communication pathologist and the essential development of certain characteristics in order to become fully effective professionals.

> *"One of the saddest experiences which can come to a human being is to awaken, gray-haired and wrinkled, near the close of an unproductive career, to the fact that all through the years he has been using only a small part of himself."*
>
> (V.W. Burrows in *The Creative Brain,* Herrmann 1995).

APPENDIX A

Universiteit van Pretoria

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Faks (012) 420 3517 *http://www.up.ac.za*

Departement Kommunikasiepatologie
Spraak- Stem- en Gehoorkliniek

Beste spraak-taalterapeut en/of oudioloog

Ek is tans besig met my Meestersgraad in Kommunikasiepatologie aan die Departement Kommunikasiepatologie van die Universiteit van Pretoria. Om aan die graadvereistes te voldoen word daar van my verwag om navorsing oor die onderwerp van my keuse uit te voer. Die titel van my navorsingsprojek is: "Thinking style preferences in communication pathology".

Ten einde hierdie studie suksesvol te voltooi, vra ek u vriendelik dat u asseblief die twee ingeslote vraelyste voltooi. Die eerste vraelys behels basiese vrae om meer inligting omtrent u te verkry, terwyl die tweede vraelys die voltooiing van die "Herrmann Brain Dominance Instrument" behels. Die resultate van die studie sal u aan u verskaf word indien u dit so verkies. Wees asseblief verder verseker dat alle inligting as streng vertroulik beskou sal word.

Baie dankie vir u tyd en samewerking.

Groete

Carina Avenant
Student
Telefoonnommer: 082 92 15 726

Prof. S.R. Hugo
Hoof: Departement Kommunikasiepatologie
Telefoonommer: (012) 420 2355

APPENDIX B

AFRIKAANSE VRAELYS:

1. **Naam:**

_____

2. **Hoe lank is u aktief in die beroep spraak-taalterapie en/of oudiologie betrokke:**
   Merk asseblief die korrekte opsie.

0 tot 5 jaar	5 tot 10 jaar	10 jaar +

3. **As wat beskou u, uself?**
   Merk asseblief die korrekte opsie.

Spraak-Taalterapeut	Oudioloog	Beide

ENGLISH QUESTIONNAIRE:

1. **Name:**

_____

2. **How long have you been a practising speech-language pathologist and/or audiologist:**
   Please mark the correct option.

0 to 5 years	5 to 10 years	10 years +

3. **As what do you consider yourself?**
   Please mark the correct option.

Speech-language pathologist	Audiologist	Both

APPENDIX C

HBDI

Herrmann Brain Dominance Instrument

Thinking Styles Assessment

This 120-question survey form results in a profile of your preferred thinking styles. By understanding your thinking style preferences you can achieve greater appreciation for how you learn, make decisions, solve problems, and communicate, and why you do these things—and others—the way you do. The survey measures preferences rather than skills. It is not a test; there are no wrong answers. You will gain the greatest understanding by answering the questions frankly and sincerely.

The Ned Herrmann Group, Inc.

2075 Buffalo Creek Road, Lake Lure, NC 28746
(704) 625-9153 or (800) 432-HBDI
Fax: (704) 625-1402
E-mail: thinking@hbdi.com

INSTRUCTIONS

A profile of your mental preferences will be determined by your responses to the following 120 questions. Answer each question by writing in the appropriate words or numbers, or checking the boxes provided. **This is not a test**, and there are no right or wrong answers. You are only indicating your preferences. Please respond to questions as authentically as possible, keeping in mind your **total self, at work and at home.** When you have completed the survey form, confirm that you have answered every question. Then complete the name and address information on the back of the form, and send or fax pages 2 through 5 to the Ned Herrmann Group at the address on the cover.

Refer to the glossary of terms for clarification of the terms used. Save the glossary page for reference when you receive your profile results.

GLOSSARY OF TERMS

analytic • Breaking up things or ideas into parts and examining them to see how they fit together.

artistic • Taking enjoyment from or skillful in painting, drawing, music, or sculpture. Able to coordinate color, design, and texture for pleasing effects.

conceptual • Able to conceive thoughts and ideas; to generalize abstract ideas from specific instances.

controlled • Restrained, holding back, in charge of one's emotions.

conservative • Tending toward maintaining traditional and proven views, conditions, and institutions.

creative • Having unusual ideas and innovative thoughts. Able to put things together in new and imaginative ways.

critical • Exercising or involving careful judgement or evaluation, e.g., judging the feasibility of an idea or product.

detailed • Paying attention to the small items or parts of an idea or project.

dominant • Ruling or controlling; having strong impact on others.

emotional • Having feelings that are easily stirred; displaying those feelings.

empathetic • Able to understand how another person feels, and able to communicate that feeling.

extrovert • More interested in people and things outside of self than internal thoughts and feelings. Quickly and easily exposes thoughts, reactions, feelings, etc. to others.

financial • Competent in monitoring and handling of quantitative issues related to costs, budgets, and investments.

holistic • Able to perceive and understand the "big picture" without dwelling on individual elements of an idea, concepts, or situation. Can see the forest as contrasted with the trees.

imaginative • Able to form mental images of things not immediately available to the senses or never wholly perceived in reality; able to confront and deal with a problem in a new way.

implementation • Able to carry out an activity and ensure fulfillment by concrete measures and results.

innovating • Able to introduce new or novel ideas, methods, or devices.

integration • The ability to combine pieces, parts and elements of ideas, concepts and situations into a unified whole.

intellectual • Having superior reasoning powers; able to acquire and retain knowledge.

interpersonal • Easily able to develop and maintain meaningful and pleasant relationships with many different kinds of people.

introvert • Directed more toward inward reflection and understanding than toward people and things outside of self. Slow to expose reactions, feelings, and thoughts to others.

intuitive • Knowing something without thinking it out - having instant understanding without need for facts or proof.

logical • Able to reason deductively from what has gone before.

mathematical • Perceiving and understanding numbers and being able to manipulate them to a desired end.

metaphorical • Able to understand and make use of visual and verbal figures of speech to suggest a likeness or an analogy in place of literal descriptions, e.g., "heart of gold."

musical • Having an interest in or talent for music and/or dance.

organized • Able to arrange people, concepts, objects, elements, etc. into coherent relationships with each other.

planning • Formulating methods or means to achieve a desired end in advance of taking actions to implement.

problem solving • Able to find solutions to difficult problems by reasoning.

quantitative • Oriented toward numerical relationships; inclined to know or seek exact measures.

rational • Making choices on the basis of reason as opposed to emotion.

reader • One who reads often and enjoys it.

rigorous thinking • Having a thorough, detailed approach to problem-solving.

sequential • Dealing with things and ideas one after another or in order.

simultaneous • Able to process more than one type of mental input at a time, e.g. visual, verbal, and musical; able to attend to more than one activity at a time.

spatial • Able to perceive, understand and manipulate the relative positions of objects in space.

spiritual • Having to do with spirit or soul as apart from the body or material things.

symbolic • Able to use and understand objects, marks, and signs as representative of facts and ideas.

synthesizer • One who unites separate ideas, elements, or concepts into something new.

technical • Able to understand and apply engineering and scientific knowledge.

teaching/training • Able to explain ideas and procedures in a way that people can understand and apply them.

verbal • Having good speaking skills; clear and effective with words.

writer • One who communicates clearly with the written word and enjoys it.

BIOGRAPHICAL INFORMATION

Please complete **every** question according to the directions given. Each response, including your answers to questions 2, 3 and 4, provide important data. When directions are not followed or data is incomplete we are unable to process your survey, and must return it to you.

1. Name _____ 2. Sex: M ☐ F ☐

3. Educational focus or major _____

4. Occupation or job title _____

Describe your work (please be as specific as possible) _____

_____

HANDEDNESS

5. Which picture most closely resembles the way you hold a pencil?

A ☐  B ☐  C ☐  D ☐ 

6. What is the strength and direction of your handedness?

A ☐ Primary left B ☐ Primary left, some right C ☐ Both hands equal D ☐ Primary right, some left E ☐ Primary right

SCHOOL SUBJECTS

Think back to your performance in the elementary and/or secondary school subjects identified below. Rank order all three subjects on the basis of how well you did: **1** = best; **2** = second best; **3** = third best.

7. _____ Math 8. _____ Foreign language 9. _____ Native language or mother tongue

Please check that no number is duplicated: The numbers **1, 2,** and **3** **must be used once** and **only once**. Correct if necessary.

WORK ELEMENTS

Rate each of the work elements below according to your strength in that activity, using the following scale: **5** = work I do best; **4** = work I do well; **3** = neutral; **2** = work I do less well; **1** = work I do least well. Enter the appropriate number next to each element. **Do not use any number more than four times.**

10. _____ Analytical
11. _____ Administrative
12. _____ Conceptualizing
13. _____ Expressing Ideas
14. _____ Integration
15. _____ Writing
16. _____ Technical Aspects
17. _____ Implementation
18. _____ Planning
19. _____ Interpersonal Aspects
20. _____ Problem Solving
21. _____ Innovating
22. _____ Teaching/Training
23. _____ Organization
24. _____ Creative Aspects
25. _____ Financial Aspects

Please tally: Number of 5's_____, 4's_____, 3's_____, 2's_____, 1's_____. If there are more than four for any category, please redistribute.

KEY DESCRIPTORS

Select **eight adjectives** which best describe the way you see yourself. Enter a **2** next to each of your **eight** selections. Then change one **2** to a **3** for the adjective which best describes you.

26. _____ Logical
27. _____ Creative
28. _____ Musical
29. _____ Sequential
30. _____ Synthesizer
31. _____ Verbal
32. _____ Conservative
33. _____ Analytical
34. _____ Detailed
35. _____ Emotional
36. _____ Spatial
37. _____ Critical
38. _____ Artistic
39. _____ Spiritual
40. _____ Rational
41. _____ Controlled
42. _____ Mathematical
43. _____ Symbolic
44. _____ Dominant
45. _____ Holistic
46. _____ Intuitive
47. _____ Quantitative
48. _____ Reader
49. _____ Simultaneous
50. _____ Factual

Please count: seven 2's and one 3? Correct if necessary.

HOBBIES

Indicate a **maximum of six** hobbies you are actively engaged in. Enter a **3** next to your major hobby, a **2** next to each primary hobby, and a **1** next to each secondary hobby. Enter only **one 3**.

51. _____ Arts/Crafts
52. _____ Boating
53. _____ Camping/Hiking
54. _____ Cards
55. _____ Collecting
56. _____ Cooking
57. _____ Creative Writing
58. _____ Fishing
59. _____ Gardening/Plants
60. _____ Golf
61. _____ Home Improvements
62. _____ Music Listening
63. _____ Music Playing
64. _____ Photography
65. _____ Reading
66. _____ Sailing
67. _____ Sewing
68. _____ Spectator Sports
69. _____ Swimming/Diving
70. _____ Tennis
71. _____ Travel
72. _____ Woodworking
_____ Other _____
_____

Please review: Only one **3** and **no more than six hobbies**. Correct if necessary.

ENERGY LEVEL

73. Thinking about your energy level or "drive," select the one that best represents you. Check box **A**, **B**, or **C**.

a. ☐ Day person b. ☐ Day/night person equally c. ☐ Night person

MOTION SICKNESS

74. Have you ever experienced motion sickness (nausea, vomiting) in response to vehicular motion (while in a car, boat, plane, bus, train, amusement ride)? Check box **A**, **B**, **C**, or **D** to indicate the number of times.

a. ☐ None b. ☐ 1-2 c. ☐ 3-10 d. ☐ More than 10

75. Can you read while traveling in a car without stomach awareness, nausea, or vomiting?

a. ☐ Yes b. ☐ No

ADJECTIVE PAIRS

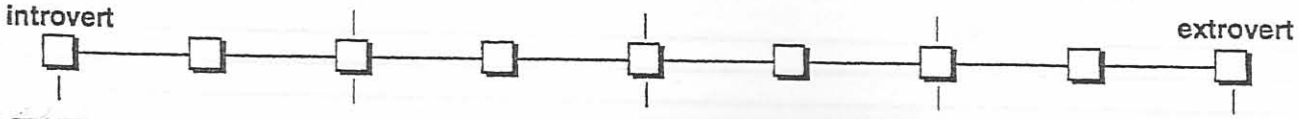
For **each paired item** below, check the word or phrase which is more descriptive of yourself. Check box **A** or **B** for **each** pair, even if the choice is a difficult one. **Do not omit any pairs.**

76. ..... Conservative ☐ / ☐ Empathetic
77 ..... Analyst ☐ / ☐ Synthesizer
78. ..... Quantitative ☐ / ☐ Musical
79 ... Problem-solver ☐ / ☐ Planner
80 ..... Controlled ☐ / ☐ Creative
81. ..... Original ☐ / ☐ Emotional
82. ..... Feeling ☐ / ☐ Thinking
83 ..... Interpersonal ☐ / ☐ Organizer
84. ..... Spiritual ☐ / ☐ Creative
85. ..... Detailed ☐ / ☐ Holistic
86. ... Originate Ideas ☐ / ☐ Test and Prove Ideas
87 ... Warm, Friendly ☐ / ☐ Analytical
88 ..... Imaginative ☐ / ☐ Sequential
89. ..... Original ☐ / ☐ Reliable
90. ..... Creative ☐ / ☐ Logical
91. ..... Controlled ☐ / ☐ Emotional
92 ..... Musical ☐ / ☐ Detailed
93. ..... Simultaneous ☐ / ☐ Empathetic
94. ..... Communicator ☐ / ☐ Conceptualizer
95. ..... Technical Things ☐ / ☐ People-oriented
96. ..... Well-organized ☐ / ☐ Logical
97. .... Rigorous Thinking ☐ / ☐ Metaphorical Thinking
98. Like Things Planned ☐ / ☐ Like Things Mathematical
99. ..... Technical ☐ / ☐ Dominant

Please review: Did you mark one and only one of each pair? Correct if necessary.

INTROVERSION/EXTROVERSION

100. Check one box to place yourself on this scale from introvert to extrovert:



TWENTY QUESTIONS

Respond to each statement by checking the box in the appropriate column.

	strongly agree	agree	in between	disagree	strongly disagree
101. I feel that a step-by-step method is best for solving problems.	☐	☐	☐	☐	☐
102. Daydreaming has provided the impetus for the solution of many of my more important problems.	☐	☐	☐	☐	☐
103. I like people who are most sure of their conclusions.	☐	☐	☐	☐	☐
104. I would rather be known as a reliable than an imaginative person.	☐	☐	☐	☐	☐
105. I often get my best ideas when doing nothing in particular.	☐	☐	☐	☐	☐
106. I rely on hunches and the feeling of "rightness" or "wrongness" when moving toward the solution to a problem.	☐	☐	☐	☐	☐
107. I sometimes get a kick out of breaking the rules and doing things I'm not supposed to do.	☐	☐	☐	☐	☐
108. Much of what is most important in life cannot be expressed in words.	☐	☐	☐	☐	☐
109. I'm basically more competitive with others than self-competitive.	☐	☐	☐	☐	☐
110. I would enjoy spending an entire day "alone with my thoughts."	☐	☐	☐	☐	☐
111. I dislike things being uncertain and unpredictable.	☐	☐	☐	☐	☐
112. I prefer to work with others in a team effort rather than solo.	☐	☐	☐	☐	☐
113. It is important for me to have a place for everything and everything in its place.	☐	☐	☐	☐	☐
114. Unusual ideas and daring concepts interest and intrigue me.	☐	☐	☐	☐	☐
115. I prefer specific instructions to those which leave many details optional.	☐	☐	☐	☐	☐
116. Know-why is more important than know-how.	☐	☐	☐	☐	☐
117. Thorough planning and organization of time are mandatory for solving difficult problems.	☐	☐	☐	☐	☐
118. I can frequently anticipate the solutions to my problems.	☐	☐	☐	☐	☐
119. I tend to rely more on my first impressions and feelings when making judgments than on a careful analysis of the situation.	☐	☐	☐	☐	☐
120. I feel that laws should be strictly enforced.	☐	☐	☐	☐	☐

Please review to make sure you have answered all 120 questions.

FROM

You must provide an address and indicate the method of payment in order to receive your HBDI results. Please print.

Name _____ Date _____
Company _____
Division _____
Company address _____
_____
Daytime phone (____) _____ Evening phone (____) _____ Fax (____) _____
Home address _____
_____
E-mail address _____

Note: There is a fee for processing this survey form.
Payment method (if specific arrangements have not been made, please provide credit card info):

❑ credit card type: _____ (#) _____ Exp. Date _____
❑ other payment has been prearranged. Event date_____ Payment code_____

CONFIDENTIAL RESEARCH

The following questions are not used in scoring the HBDI. However, the answers to these questions are valuable in our continuing brain dominance research. Skip any question you wish, but please answer as many as you feel you can.

Indicate the birth order of your brothers, sisters, and self by checking the appropriate symbols. Then circle the symbol representing yourself.

MALE ➡	♂	♂	♂	♂	♂	♂	♂	♂	♂	♂	♂	♂ ⬅ MAL
	Oldest	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
FEMALE ➡	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀ ⬅ FEMAL

Date of birth _____ Years in current occupation _____ Job satisfaction high ❑ ❑ ❑ ❑ ❑ low

Citizenship _____ Native language _____ Are you bilingual? ❑ yes ❑ no

Ethnicity: ❑ American Indian ❑ Black ❑ Caucasian ❑ Hispanic ❑ Asian ❑ Other: _____

Do you consider yourself religious? ❑ yes ❑ no Religious affiliation: ❑ Catholic ❑ Protestant ❑ Jewish ❑ Other: _____

Level of participation: ❑ minimal ❑ trained but not practicing ❑ casual ❑ devout ❑ other _____

If you are a parent, please indicate: number of children _____ age of oldest _____ age of youngest _____

Couple status: ❑ married ❑ separated ❑ divorced ❑ living together ❑ widow/widower ❑ single
Have your parents divorced? ❑ yes ❑ no

To what extent were you formally educated for the field you are now working in?
❑ not at all ❑ somewhat ❑ to a great degree ❑ fully

What time(s) of the day do you feel most mentally capable?
❑ midnight - 6 a.m. ❑ 6 a.m. - noon ❑ noon - 6 p.m. ❑ 6 p.m. - midnight

Have you ever experienced any learning disabilities?
❑ dyslexia ❑ reading ❑ speech impediments ❑ hearing impediments ❑ attention deficit disorder ❑ other
Please describe _____ age of onset _____ age when ceased _____

Have you filled out the HBDI survey previously? If so, and your name or address has changed since then, please specify the previo
name or address _____
_____
_____

How do you see yourself? Please distribute 100 points between these four descriptions:
Rational _____ Organized _____ Interpersonal _____ Imaginative _____

Please check the best descriptor indicating your mood or the way you felt at the time you were completing this survey:
❑ happy ❑ enthusiastic ❑ interested ❑ OK ❑ relaxed ❑ indifferent ❑ distracted ❑ tired ❑ unhappy

Lys van terme (Eng/Afr) wat in die Herrmann Brein Dominansie Instrument (HBDI) gebruik word:

analytic / analities • Opbreek van dinge en gedagtes in dele en die ondersoek van die dele om te bepaal hoedat hulle inmekaarpas.

artistic / kunssinnig • Hou van of vaardig in verf, teken, musiek of beeldhouwerk. In staat om kleur, ontwerp en tekstuur te kombineer vir strelende effek.

conceptual / konseptueel • In staat om gedagtes en idees voort te bring – om abstrakte begrippe vanaf spesifieke voorbeelde te vorm.

controlled / in beheer • Terughoudend, in beheer van jou eie emosies.

conservative / konserwatief • Neig daarna om tradisionele en bewese standpunte, omstandighede en instellings te handhaaf.

creative / kreatief • Om ongewone idees en oorspronklike gedagtes te hê. In staat om dinge op nuwe en oorspronklike maniere saam te stel.

critical / kritiies • Uitvoering of insluiting van noukeurige oordeel of evaluering, met ander woorde, beoordeling van die lewensvatbaarheid van 'n idee of produk.

detailed / gedetailleerd • Gee aandag aan die fyner besonderhede of dele van 'n idee of projek.

dominant / oorheersend • Beheer en kontrole; het sterk impak op ander.

emotional / emosioneel • Raak maklik gevoelsmatig betrokke; wys ook die gevoelens.

empathetic / meelewend • In staat om te weet hoe 'n ander persoon voel en ook in staat om hierdie gevoel oor te dra.

extrovert / ekstrovert • Meer geïnteresseerd in mense en dinge buite jouself as in jou eie gevoelens. Kan gedagtes, reaksies, gevoelens met gemak aan ander openbaar maak.

financial / finansieel • Vaardig in die monitering en hantering van numeriese data mbt uitgawes, begrotings en beleggings.

holistic / holisties • In staat om die 'groot prent' te sien en te verstaan sonder om in klein dele van 'n saak verstrengel te raak. Bv. sien 'n bos in plaas van net die bome.

imaginative / met verbeelding • Kan gedagtebeelde van sake vorm wat nie deel van direkte waarneming is nie of ook nooit ten volle in werklikheid waargeneem kan word nie. In staat om op 'n nuwe manier na 'n oplossing vir 'n probleem te soek.

implementation / uitvoering • In staat om 'n aktiwiteit uit te voer en toe te sien dat dit 'n uitkoms met resultate het.

innovating / innoverend (oorspronklik) • In staat om nuwe, unieke idees, metodes of voorwerpe voor te stel.

integration / integrering • Die vermoë om stukkies, dele en elemente van idees, konsepte en situasies in 'n sinvolle geheel saam te stel.

intellectual / intellektueel • Besit besondere redenasievermoëns. In staat om kennis te verwerf en te behou.

interpersonal / interpersoonlik • Kan maklik betekenisvolle en aangename verhoudings met verskillende mense aangaan en behou.

introvert / introvert • Meer gerig op innerlike refleksie en begrip eerder as op ander mense en sake buite die self. Stadig om reaksies, gevoelens en gedagtes aan ander te openbaar.

intuitive / intuïtief • Weet iets sonder om dit te bedink – verstaan dadelik sonder dat feite of bewyse voorgelê is.

logical / logies • In staat om afleidings te maak uit iets wat al gebeur het.

mathematical / wiskundig • Waarneem en verstaan van getalle en in staat om hulle te manipuleer tot die bereiking van 'n verlangde resultaat.

metaphorical / metafories • In staat om gebruik te maak van visuele en verbale beskrywings om iets voor te stel sonder om iets letterlik te beskryf. Ook in staat om sulke voorstelle te verstaan. Bv. " 'n hart van goud".

musical / musikaal • Belangstelling in of talent vir musiek en/of dans.

organized / georganiseerd • In staat om mense, idees, voorwerpe, ens in samehangende verbande te voeg.

planning / planmatig • Formulering van metodes of wyses om 'n bepaalde doel te bereik voordat met die aktiwiteit begin word.

problem solving / probleemoplossing • In staat om deur beredenering oplossings te vind vir ingewikkelde probleme.

quantitative / wat meetbaar is • Ingestel op numeriese verwantskappe, soek presiese versyfering van data.

rational / rasioneel (met rede) • Neem besluite gegrond op rede in teenstelling met besluit wat berus op emosie.

reader / leser • Iemand wat graag lees en dit geniet.

rigorous thinking / presiese denkwyse • Om 'n deeglike, gedetailleerde benadering tot probleemoplossing te hê.

sequential / opeenvolgend • Hanteer dinge en idees, een na die ander, in volgorde.

simultaneous / gelyktydig • In staat om meer as een inset gelyktydig te hanteer, bv. visueel, verbaal, musikaal. Kan aan meer as een aktiwiteit gelyktydig aandag gee.

spatial / ruimtelik • In staat om die relatiewe posisie van objekte in die ruimte waar te neem, te verstaan en te manipuleer.

spiritual / spiritueel • Het te doen met gees in teenstelling met liggaam of materiële dinge.

symbolic / simbolies • In staat om objekte, merke en tekens wat feite en idees voorstel, te verstaan en te gebruik.

synthesizer / samesteller • Iemand wat verskillende idees, elemente of konsepte in iets nuuts kan saamvoeg.

technical / tegnies • In staat om ingenieurs- en natuurwetenskaplike kennis te verstaan en toe te pas.

teaching/training / onderrig/opleiding • In staat om idees en prosedures só te verduidelik dat mense dit kan verstaan en toepas.

verbal / verbaal • Goeie praatvermoë. Helder en effektief met woorde.

writer / skrywer • Iemand wat duidelik dmv die geskrewe woord kan kommunikeer en geniet om dit te doen.

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