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Perception and Language: Using the Rorschach with People with Aphasia

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PERCEPTION AND LANGUAGE: USING THE RORSCHACH WITH PEOPLE WITH APHASIA

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By

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PEOPLE WITH APHASIA

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ABSTRACT

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Dissertation supervised by Alexander Kranjec, PhD

This study explored the use of the Rorschach with eight individuals diagnosed with mild to moderate fluent or non-fluent types of aphasia to consider the extent to which the Rorschach captured aspects of language impairment not otherwise probed by traditional neurolinguistic measures. A ninth participant, with Wernicke's aphasia, produced non-scorable responses and was therefore left out of all analyses. Of primary interest was whether the Rorschach, historically understood as a projective psychological instrument, would allow individuals living with language impairment to recognize, retrieve and coherently express words that reflected their thoughts. At the same time, this study sought to explore how the ambiguous nature of Rorschach inkblots could be leveraged together with traditional neuropsychological and linguistic measures, to provide insight into the relationship between perception, thought, psychological process and language - a multimethod assessment approach to describe the complex phenomena surrounding aphasia.

This study demonstrated that individuals with reduced language function were able to provide responses to inkblots presented in a Rorschach assessment that were sufficient in number and quality to allow scoring and interpretation. Spearman's rank-order correlation coefficients were calculated for WAB-R AQ score, CLQT Language Functions Domain Scores, the Rorschach cognitive processing simplicity, complexity scores and, the thought and perception EII and severe cognitive scores. Correlations among neurolinguistic and Rorschach cognitive processing and thought and perception variables, indicate a clear and intuitive relationship between these different measures.

Finally, participants were administered a confrontation naming task in which a series of 10 black and white line drawings representing images of the most popular responses for each of the 10 Rorschach cards were presented. Results from that task confirmed that study participants could accurately retrieve the word for the most common responses, suggesting that object naming is not a limitation in the population of individuals with mild to moderate aphasia.

Although differences between small groups of individuals with fluent and non-fluent aphasia could not be validated with significance testing, descriptive analyses showed some differences in means and standard deviations of Rorschach variable scores between the two groups. Specifically, individuals in the non-fluent aphasia group, who had more impairment in language ability, provided more vague responses, were typically only able to provide one defining characteristic of the blot (i.e., blends), and produced more communicative distortions (as measured by the thought and perception variables) than compared to individuals in the fluent aphasia group. The participant group, as a whole, produced a high degree of vague responses, was found to produce more simplistic descriptions of the blot, and typically only produced one defining characteristic of the blot (i.e., blends) - as compared to the neurotypical population.

This study shows that the Rorschach can be administered to a population of individuals with mild to moderate fluent or non-fluent aphasia to generate scoreable results, with named objects comparable to those in norms derived from a neurotypical population. Limited amount and quality of supporting description of those named objects provided by the participants, however, limits the utility of the Rorschach from a psychological assessment perspective. In light of the dependence of this instrument on verbal ability, future studies might consider modified application of the Rorschach with administration that allows non-verbal responses (e.g., drawing, picture taking) as a means of supplementing participant verbal responses – to develop a richer understanding of the individual's perception, and insight into their psychological state.

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CHAPTER ONE

INTRODUCTION AND CONCEPTUAL FRAMEWORK

Communication, or the exchange of information with the intention to evoke understanding, lies at the very core of the human experience. Language, as the most flexible and diverse form of communication on earth, is considered a defining “species-specific attribute” (Oesch, 2000, p.3) that permeates all aspects of our lives. From an early age, we use language to dynamically share our otherwise private feelings, intents, thoughts, and desires to effectively and efficiently navigate the complex social and environmental systems of our world (Ash, et al., 2006; Oesch, 2000). One idea shared among anthropologists and evolutionary theorists is that the most important “selective advantage” of language is its psychological utility which, over time, has become instrumental in an individual’s capacity to form relational attachments and engage with the greater social world (Oesch, 2000, p.20). Because the ability to coherently and effectively articulate one’s thoughts and feelings is a cornerstone underlying human relationships, any impairment in this communicative ability can have adverse consequences for the ways in which individuals form bonds, relate to others, and internalize their world (Ash et al., 2006, p. 1405).

The focus of the present study is to introduce the use of the Rorschach with individuals diagnosed with mild to moderate aphasia. In this respect, this study explores the Rorschach as a measure that describes a different kind of process than those which are assessed by conventional tests. The goal is not to dispute the validity or the usefulness of conventional neuropsychological or linguistic tests, but to investigate whether the Rorschach captures similar and/or different aspects of language impairment than are assessed by these traditional measures. This study considers how the Rorschach, historically understood as a projective psychological instrument, may also be used to examine the ways in which individuals with significant language impairment convey their thoughts. Concomitantly, this study seeks to explore how the ambiguous nature of Rorschach inkblots might be leveraged together with traditional neuropsychological and psycholinguistic measures, to provide insight into the relationship between perception, thought and language. There is interest in both the perceptual approach of the Rorschach, which attempts to assess *how* the person perceives (location, form characteristics) and the content of a person's responses, which attempts to assess *what* the person sees (determinants, to be discussed later in the Rorschach chapter). Using a multimethod approach, these findings may inform both clinical applications and basic science questions.

Theory and Background

Within a psychoanalytic context, language represents a major developmental milestone, signifying a higher-order of psychic integration above that of producing gestures or other sensory cues (Carruthers, 2016). As such, language has been important to the field of psychology in three key ways. First, it provides insight to help understand how a person develops over time and is able to distinguish between the I and the non-I, or the subject and the object. That is to say, an individual's verbal expression can reveal to what extent they have realized that the I is separate from the non-I, and that the I and the non-I are also somehow related - the beginning of object relations. Second, because language discloses the ability to distinguish between subject and object, one is then able to create a mental representation of self and other - an important facilitating factor in the development of personal identity. Language, in this instance, forms a continuum, linking self and other, internal process from external world, and allows one to also create a mental representation of oneself across varied contexts. In other words, language allows us to contextualize and personalize our experiences. Our experiences are mapped onto our psyche mostly through language (but also through other sensory inputs), and it is through language that we make sense of our relationships and of our world. Third, language, together with one's experience of the world (context), becomes symbolized internally and therefore becomes meaningful. For example, shaking one's head in order to gesture "no", is not the same as shouting "no" while also shaking one's head. The gesture of shaking one's head along with the verbal expression "no", beyond simply expressing opposition to something, also expresses the affect and emotion assigned to that communication; making it a more meaningful communication (Carruthers, 2016). These three functions highlight the power that language has, not only in communicating our intentions or in influencing action, but in facilitating the development of our identity and how we view ourselves in the context of the external world with, and in comparison to, others (Carruthers, 2016).

Freud conceptualized language, the "speech apparatus", as an indispensable tool used to assimilate (visual, textural, and auditory) perceptual experience into the integrated whole that allows us to make sense of self, other, and the world (Freud, 1891/1953; Rizzutto, 1993). According to Freud, one of the main functions of language is to mediate external stimuli, such as perceptual experiences, and internal processes, such as affect and memory, into meaningful associations that can then be used to communicate one's emotional states, convictions, and thoughts. This conceptualization formed the basis for psychoanalytic technique, as attaching unconscious material to language (i.e., words) prompts unconscious thoughts and feelings to be released into consciousness and to be worked through; language, in this way, serves a "curative function" (Freud, 1891/1953; Rizzuto, 1997). Freud believed that any impairment in this language function, particularly like that in aphasia, disables one's ability to make important associative links necessary for integrating perceptual experiences and internal processes in making sense of the world. Jung (1910) similarly believed that words served as a "linguistic substitute for reality" in which they functioned as "condensed actions, situations, and things" (p. 223). In this way he theorized that words are always in context and evoke certain meanings (Jung, 1910). Freud held that, without the function of language, the full integration of sensory stimuli cannot be complete, and the depth of perceiving the world, self, and other and making meaning out of experience would be compromised.

While the present dissertation is not focused on describing the "curative aspect" of language, such as that emphasized in the psychoanalytic approach, Freud's early perspective on the important ways in which language functions work to integrate and mediate other internal processes is important to consider. According to both Freud (1891/1953) and more current neuropsychological models, language plays a role in how the "fragmented parts" of perception are integrated and used to make sense of the world and associated experiences and concepts (i.e., symbolisms, mental representation). When language is impaired, as in the case of individuals with aphasia, the breadth and depth of perception and of a communication of that perception may not be fully realized (Rizzuto, 1997). Freud's beginning work in aphasia has been important in describing both underlying psychological (e.g., emotional and psychological) and physiological processes (e.g., distinguishing cortical and subcortical areas of the brain) that subserve language. His work has also provided a historical context to related work in fields like psycholinguistics and neuroscience, and to the present study, which is generally concerned with thinking about normal language function and the consequences of a compromised network.

Vygotsky, an influential Russian developmental psychologist, was also interested in the relationship between thought and language. He contended that language and thought, together, play special roles. On one hand, they are psychological tools used to form other mental functions (Vygotsky, 2012). On the other hand, they are dependent on one another to provide context and meaning for the social world that exists around us (Vygotsky, 2012). Vygotsky (2012) believed that there was an “interfunctional reciprocal relationship” between thought and language, whereby the function of language was to shape and contextualize the processes underlying thought, therefore bringing about meaning (p. ii). Most profoundly, he believed that thought was “embodied through words” and that language was a “psychological interface” which connected otherwise private images with external symbolic meaning (Vygotsky, 2012, p. iii). Others, have also eluded to the intimate association between thought and language. Davidson (1975), for example, states that speaking is not simply about expressing thoughts, but also reveals the clarity, intentions, and meaning behind one’s thinking. He further explains that, although neither thought nor language can “fully explain” the other, and neither has “conceptual priority” over the other, it is clear that both need the other to be understood (Davidson, 1975). From the perspective of these writers, the absence of language would potentially disrupt the organization, interpretation, and meaning of the thoughts that represent one’s experience of the world.

One of the motivations of this dissertation is to consider how the Rorschach may shed light into the connection between thought and language in a population with aphasia. Impaired language function, as in the case of aphasia, occurs as a result of a significant cerebral incident, such as stroke. Depending on the severity and type of aphasia, individuals can have a range of language impairments, but all people have word finding impairments. This impairment can occur across many layers of phonological andsyntactic, and processes (Goodglass, 1993; Goodglass, & Kaplan, 1972; Kertesz, & McCabe, 1977; Luria, 1970; McKelvey, Hux, Dietz, & Beukelman, 2010). Research has suggested that several interrelated factors contribute to the difficulty people with aphasia have in naming objects. These factors include: frequency of the object or word, familiarity, word length, age-of-acquisition (estimated age they learned a particular word), imageablility and concreteness, and visual complexity (Laiacona, Lazzatti, Zonca, Guarnaschelli, & Capitani, 2001; Nickels & Howard, 1995). Recognizing and naming a picture requires several steps in processing, such as, visuo-perceptual interpretation, access to stored memory, semantic activation and lexical retrieval of the word that accurately depicts what is seen (Laiacona et al., 2001). Because there are many interrelated factors and several processing steps needed to activate object naming, it has been difficult to isolate the independent effects in a population as heterogeneous as individuals with aphasia. Using the Rorschach together with conventional measures, may help to further clarify the breakdown and provide some insight into how that breakdown resides in the larger context of the connection-disconnection between thought and language. The linguistic challenges described above, and their impact, will be described in greater depth in Chapter 2.

The conventional models used to describe linguistic impairments have included medical and neurolinguistic models, which have a strong physiological focus and often emphasize identifying the nature and degree of impairment in language function (Vandenborre, Visch-Brink, & Marien, 2015). These models have been influential in creating a platform for which assessments in aphasia have been developed. While these assessments have been very helpful in understanding the nature of aphasia, and in directing diagnostic and rehabilitative approaches, it is argued here, however, that those conventional assessments may fail to capture some dimensionality in this patient population (although no single measure or class of measures can capture this completely).

Vandenborre et al., (2015) recently asserted that contemporary aphasia test batteries do not necessarily address the kinds of “multifaceted problems” impacting individuals with aphasia. This is due, in part, to the different focus of traditional models used in the assessment of aphasia, including medical, neurolinguistic, and social models (Vandenborre, 2015, p. 1). Perhaps this is to be expected, because of the disparate focus of each of these models. While no one model adequately captures the full variability inherent in the impairment and its impact on the individual, the restricted focus of traditional assessment methods is important with respect to the present research. That is, a case will be made that the Rorschach is not only a projective test but also a relatively unique cognitive-perceptual test. The Rorschach may, in some ways, be particularly useful for collecting detailed observations at the intersection of perception, thought/cognition, personality and language. Yet the current project will itself not interpret Rorschach responses in isolation; rather, it will relate Rorschach data to those from traditional tests.

The Rorschach consists of a set of ambiguous and unstructured blots. The perceptual freedom provided by this open format may function to open the perceptual field of individuals with aphasia. The more open-ended nature of the probes (i.e., “What might this be?”) also may provide a spontaneous and uninhibited approach to responding, in comparison to tasks such as picture naming, and other relatively concrete tests that may restrict one’s field of perception and range of responses. It was the intention of Herman Rorschach that the amorphous shape of the blots might allow for a “multiplicity of interpretations” and to “elicit some form of reaction” in which an individual could impose upon the visual image (Schott, 2013,

p. 3). In fact, it is the open-ended nature of the Rorschach, the multiple possible interpretations of responses, and the test's ability to impose meaning on a meaningless shape which is of primary interest to the present dissertation project. This may provide novel insight into the mechanics underlying how people with aphasia interpret, organize and access ambiguous content.

Past Research and the Present Study

Past research (Gold, 1987; Pena, 1953; Perry et al., 1996; Rorschach, 1942) has highlighted the Rorschach's utility in assessing abstract problem-solving ability and the integration and impairment of cognitive, perceptual, and linguistic processes. Past and present research in neuropsychology, as it relates to linguistic impairment, reveals something about the limitations of traditional measures and the restrictive tasks used to access information about lexical and semantic level processes (Basso, 1997; Sarno, Postman, Cho, & Norman, 2005). Nickels & Howard (1995) state that many measures use a "restricted range of imagineablility/concreteness" in the stimuli used to probe questions about picture naming performance (p. 1297). Sarno et al., (2005) have expressed similar views, asserting that conventional fluency, picture-naming, and matching tasks are "somewhat unnatural linguistic exercises", as word retrieval and communication are based on "semantic concepts and not sounds" (p. 104). Basso (1997) states:

> Searching for words on a phonological basis is more similar to playing with words than any process necessary for actual communication, and it may be that 'playing with words' is what aphasic patients find difficult. (p. 549).

Purpose and Significance of the Present Study

This dissertation project explores how an open-ended instrument like the Rorschach may provide a means for people with aphasia to express their thoughts in a way that is otherwise constrained by relatively more concrete neurolinguistic tests. Exploring the extent to which people are able to express their thoughts through the Rorschach can not only shed light on how language impairment impedes word retrieval/word production and speech fluency, but may also reveal things about how language impairment interacts with others levels of the person's perception and psychology (Nickels, 2002). The more specific study aims are two-fold. The first aim is to gain insight into how the ambiguous/abstract and open-ended nature of the Rorschach inkblot can be leveraged to investigate questions about relations between language, perception, and psychological process in individuals with aphasia. This aspect of the project is concerned with whether language impairment impacts perceptual process and the quality of associations made in people with aphasia. The second aim is to explore if and how the combined application of objective and self-report/projective assessment techniques may contribute to the understanding of the individual living with aphasia. Because the research questions posed in the dissertation are exploratory and non-directional in nature (i.e., there are no predetermined implications or directional hypotheses), a small-N case study design employing pre-experimental quantitative analysis was used to describe both the Rorschach results and results from the other testing instruments used to measure linguistic, semantic and perceptual data. In addition, several research questions are raised by the aims of the study:

1. Can a population of people with mild to moderate aphasia produce scoreable responses on the Rorschach using the R-PAS system?

2. Do responses from people with aphasia on Rorschach cards look different than those in norms derived from neurotypical population?
3. Are there any patterns, specifically involving language errors, use and restriction of words, and a lack of a detailed response, that can be identified across the participants in the present study? Do people with different patterns of language impairment perform differently on the Rorschach?
4. What can neurolinguistic measures reveal about patterns of Rorschach responses in this population?

The chapters which follow provide a comprehensive discussion of the underpinning theoretical and clinical bases framing the state of understanding on aphasia as a language disorder (Chapter 2), and provide context on the historical and current use of the Rorschach as a tool for neuropsychological assessment (Chapter 3). These chapters are followed by a description of the Methods (Chapter 4), Results (Chapter 5) and Discussion (Chapter 6).

CHAPTER TWO

CONCEPTUALIZING APHASIA

Aphasia is a language disorder, that involves impairment in verbal production, comprehension, reading and/or writing, which often follows stroke or other brain injury (Goodglass, 1993; Goodglass & Kaplan, 1972; Kertesz, & McCabe, 1977). Because aphasia results from injury to the brain, aphasia is also often accompanied with deficits to nonlinguistic cognitive processes such as attention, memory, and executive functions (Lee & Pyun, 2014). According to the National Stroke Foundation, between 25 to 40% of all strokes cause aphasia (National Aphasia Association, 2016; National Stroke Foundation, 2008). There are approximately 180,000 new cases of aphasia each year, of these cases, an estimated 40 to 60% transition from acute to chronic aphasia (Meinzer, Streiftau, & Rockstroh, 2007; National Aphasia Association, 2016). Individuals diagnosed with chronic stroke, who comprise the sample in the present study, are defined by the length of their aphasia symptoms, on average lasting longer than 1 year (Lyon, 1998; Meinzer, Streiftau, & Rockstroh, 2007).

Aphasia occurs following significant damage to particular areas of the cerebral cortex, which depending on the location and severity of damage, can result in single or multiple disruptions to cognitive and language functions (Luria, 1970). Aphasia resulting from stroke can result from vascular damage through a lesion in the middle cerebral artery or can result from infarctions between the middle and anterior or posterior central artery (Berthier, 2005). Within the specific class of cerebral damage, ischemic infarctions, constrained to vascular arteries, are more common (80% of cases) than hemorrhagic damage which can involve more than vascular damage (Berthier, 2005). Because language is mostly left lateralized, right-handed (95%) and left-handed (5%) individuals alike, can experience significant impairment to various aspects of their language facility (e.g., phonology, semantics) (Fama & Turkeltaub, 2014). The severity of aphasia is often dependent on the severity of stroke, size of the lesion, and breadth of other issues (e.g., other comorbid health issues, age, other symptoms) (Yavuzer, Güzelküçük, Küçükdeveci, Gök, & Ergin, 2001). In general, the more severe the aphasia and the slower the recovery (i.e., much of the most rapid recovery is stated to happen within the first 12 months post-stroke), the poorer the outcome (Fama & Turkeltaub, 2014; Yavuzer et al., 2001).

Aphasia occurs along a continuum of severity of communicative difficulty such that some people experience minimal language impairment while others can experience significant impairment resulting in disruption in understanding others and reduced vocabulary or a dissolution in their ability to form the semantic units within language (Berthier, 2005; Hodges, Patterson, Oxbury, & Funnell, 1992). Some of the language related challenges for people with aphasia can include deficits in: auditory comprehension (i.e., understanding the speech and language of others), word retrieval, reading comprehension, writing, and in producing words and narratives that communicate their intents (Berthier, 2005; Goodglass, 1993; Goodglass & Kaplan, 1972; Hodges et al., 1992; Kertesz & McCabe, 1977; Luria, 1970; Tatemichi et al., 1994). People with aphasia can also experience nonlinguistic cognitive deficits in attention, working memory, visual-spatial skills, and executive functions.

Since people with aphasia present with a complex symptom profile, general parameters used to make distinctions between categories of aphasia syndromes are assessed through brain lesion location (anterior versus posterior lesions), severity of speech fluency deficit, word retrieval, language comprehension, and paraphasia or lexical errors (Berthier, 2005; Dell et al., 1997). Using the above parameters, the classification of aphasia has commonly been formulated using two broad categories, namely fluent or expressive aphasia and non-fluent or receptive aphasia. Fluent aphasia (i.e., Wernicke's aphasia, conduction aphasia, and anomic aphasia) is defined by the number of words per phrase, by the number and type of paraphasias, and comprehension deficits (Berthier, 2005; Dell, 1997). Typically, people with fluent aphasia may speak rather fluently (i.e., producing long sentences) but depending on the severity of their language impairment, the words they use may be unrecognizable. Additionally, they may have difficulty understanding verbal and written communication. Non-fluent aphasia is defined by interruptions in speech fluency but relatively intact comprehension (e.g., Broca's aphasia). However, some people with non-fluent aphasia (i.e., people with global aphasia) still present with notable comprehension impairments. People with non-fluent aphasia generally have significant difficulty articulating their thoughts, speak in shorter sentences, and may omit words. Table 1 describes the main characteristics (although the degree to which these characteristics are present may vary within the category) for distinguishing each type of aphasia within the two broad categories, fluent and non-fluent[1]. Despite these categorizations which clinicians often use to better understand the profile of skills and impairments in people with aphasia, each person with aphasia presents with different characteristics (Nickels & Howard, 1995).

[1] Only aphasia types used within the present dissertation were described in the table

Table 1. Qualitative Description of Aphasia Types of Participants Included in the Study

Type of Aphasia	Fluent or Nonfluent	Conversational Speech	Auditory comprehension	Repetition	Naming	Typical Primary Lesion Location
Anomic Aphasia	Fluent	Fluent, normal utterance length and well-formed sentences	Good for everyday conversation, difficulty with complex syntax	Good	Word finding problems	Left posterior lesions
Conduction Aphasia	Fluent	Fluent with normal utterance length but has paraphasias (substitutions, omissions)	Good for everyday conversation, difficult with complex syntax	Paraphasias during repetition	Word finding problems	Lesions to the left supramarginal
Broca's aphasia	Nonfluent	Slow, halting speech production, utterances are of reduced length with simple grammar Articulation problems	Good for conversational speech, difficulty with complex syntax	Limited to single words and short phrases	Word finding impairment, especially for low frequency words	Lesion in and around Broca's area and can include motor area Often have right-sided paralysis (hemiplegia)

Reference: University of Arizona Aphasia Research Project. (n.d.). Retrieved from http://www.u.arizona.edu/~ajgulbis/MedLinks/Neuroscience/NeuroscienceType/Aphasia%20Table.doc

Although there are many symptom distinctions among and between fluent and non-fluent aphasia categories, when assessed through tasks such as picture-naming and word-picture or synonym matching tasks, all people with aphasia are affected by lexical and sub-lexical errors (Dell et al., 1997). That is, people within all categories appear to be impacted by reduced naming, general word production disruption and errors occurring at the basic phonological level (Dell et al., 1997). Common factors that appear to impact the above performance variables are word frequency, word/concept familiarity, and word length (Laiacona et al., 2001; Nickels & Howard, 1995).

The chapter is organized according to the following subsections: models of language; speech fluency; word Production, and language errors; comprehension and semantic naming deficits; and, traditional methods of understanding and assessing language impairment.

Models of Language

Within the realm of aphasia, it is important to consider how models of language have evolved over time. These models describe the process through which language is organized according to specific brain functions, and represent the theoretical foundation on which the clinical platform of aphasia assessment has been built; most dominantly around medical and neurolinguistic models (Vandenborre, Visch-Brink, & Marien, 2015). Review of these language models will provide insight into the evolution of the underpinning theory, and highlight the limitations presented in their practical application in assessment in terms of not fully accounting for the interplay between cognitive, linguistic, and psychological sequela resulting from aphasia (Vandenborre et al., 2015).

Beginning over a century ago, traditional models of language centered on biological-medical explanations, and emphasized separate and distinct areas of language development, identifying the left hemisphere as the primary region for language, specifically the inferior frontal area, “Broca’s area”, and the superior temporal region, “Wernicke’s area” (Poeppel & Hickok, 2004, p. 1). These models have been most impactful not only in the identification of the neuro-anatomical basis for language but also guiding research around diagnosis and treatment (Poeppel & Hickok, 2004). Following from these traditional medical models, language function was divided into two forms, *comprehension* with breakdown resulting in receptive aphasias (i.e., fluent aphasia), and *production* with breakdown resulting in expressive aphasias (i.e., non-fluent aphasia) (Poeppel & Hickok, 2004). Each function is assumed to have its own localized neural basis such that specific language functions are assigned to specific anatomical areas (i.e., production and syntax in motor areas; comprehension and semantics in sensory areas). Perceptual processes are regarded as separate (D’Ausilio, Criaghero, & Fadiga, 2012; Gernsbacher & Kaschak, 2003; Hickok, 2000; Poeppel & Hickik, 2004). However, the archetypal language model may have some flaws which include: 1) the symptom profile of aphasia is not homogeneous and entails a “complex architecture” for which there are variable and complex symptom profiles, 2) neural and linguistic domains are not monolithic and therefore cannot be considered separate or isolated structures, and 3) there are many more subdivisions within linguistic and neural domains and much more interaction between subsystems (e.g., language and perception) than once thought (Hickock, 2000; Poeppel & Hickok, 2004, p. 4).

Recent research suggests that there is interplay (rather than independence) of functions between different neural systems (i.e., greater interaction between sensory and motor areas of the brain). The “monolithic” or “encapsulated” nature of brain localization of language function has given way to include a more dynamic relationship between perception, speech production, and comprehension (D’Ausilio et al., 2012; Poeppel & Hickok, 2004). For example, D’Ausilio et al., (2012) reported that while traditional language models separated perceptual process from language production and aligned them only to distinct brain regions, contemporary models contend that there is much more interaction between temporal, parietal, and frontal areas of the brain that function together at several levels of language processing. Evidence suggests that sensory and motor systems interact during speech perception and production and can impact many levels of language processing, including lexical and phonological access, recognition of conceptual representation, comprehension, quality (e.g., rich sentences versus short, simple words) and quantity of speech output (i.e., economy and complexity of speech) (Christiansen & Chater, 1999; D’Ausilio et al., 2012; Nickels, 2010).

These more recent models are supported by results from brain imaging (e.g., functional magnetic resonance imaging) studies which often find that multiple areas of the brain are simultaneously activated during tasks that might have previously been regarded as enlisting discrete forms of speech processing (D’Ausilio, Criaghero, & Fadiga, 2012, p. 330; Poeppel & Hickok, 2004). While such studies are important for identifying brain-behavior relationships, both traditional and contemporary linguistic models are thought to be oversimplified and too course in their characterization of neurologically based language deficits. Most current models depict language impairment as primarily effecting only a small sample of language-based functions (phonology, syntax, semantics, or speech perception, lexical processing) (Poeppel & Hickok, 2004). That is, although research has progressed theoretically and experimentally since the identification of language regions, particularly in Broca and Wernicke’s area (19^{th} century), some studies continue to neglect an integrative profile that uses broadband assessment (i.e., instruments or tests that cover multiple different areas of the phenomena).

Failure to include multimethod assessment techniques may limit the degree to which clinicians can examine how the primary neurological deficit functions across other dimensions of an individual's life, including perceptual, psychological and emotional changes, relational disturbances, and their overall ability to make meaning from their limited ability to communicate (Mihura, Meyer, Dumitrascu & Bombel, 2013; Perry, Potterat, Auslander, Kaplan, & Jeste, 1996). An integrative model may influence a different aspect of assessment that might not only affect the way the "what" of the problem is viewed but also may help direct rehabilitative services.

To gain insights into how language impairment can function to interfere with both perception and the many layers of effective communication (i.e., from choosing the correct word to completing a coherent sentence fluency) a discussion around speech fluency and word production is necessary. The dependence on the individual's abilities to perceive an object and make sense of what he or she sees through coherent spoken language (e.g., fluency necessary for providing a narrative versus providing single-words for a naming task), make the Rorschach a particularly relevant and effective tool to probe the nature of these complex interrelationships, while concomitantly gaining insights into the individual's perceptions of the presented abstract image. As compared to objective personality and neurolinguisitic measures, the Rorschach provides an open space (e.g., the absence of questions with objective right or wrong answers) for individuals to perceive, conceptualize and abstract whatever they find meaningful (or can turn into meaning) without having to be cued.

Speech Fluency

Speech fluency is particularly important in the present project, as the use of the Rorschach requires some level of fluent or spontaneous speech to communicate what the person sees and to expand on his or her response. Impairment in the ability of a person to fluently deliver thoughts through words could make it more difficult for participants to produce both individual one-word responses and responses with richness of detail. As such, it may be reasonably expected that an individual with aphasia may provide responses that are deficient in complexity and interconnectivity between image descriptions, as scored based on the individual's Rorschach responses, even if their perceptions and thoughts (intended responses) are not. Interruptions at any level of fluency not only have an impact on the totality of what is communicated but may also alter the meaning within that communication.

Speech fluency is defined as the smoothness or the flow of speech that is uninterrupted by breaks in syllables, repetition of sounds, and word perseverations (Fiorin, Ugarte, Capellini, & Moço Canhetti de Oliveira, 2015). Speech fluency is determined by several language components including prosody, rhythm, phrase length, number of words, interrupted speech, lexical and sublexical errors. These language components work within an integrated cognitive, linguistic, and motor network which together can impact several variables related to speech fluency, including: word fluency and flexibility of word usage; use of meaningful speech (as opposed to non-words); coherence and clarity of speech; rhythm of speech; grammar; use of complex vocabulary; and, comprehension (Damico, Muller, & Ball, 2010; Fiorin et al., 2015). Language variables that have been identified to explain the reasons for interruptions in speech fluency include: deficits in concept formation; reduced syntax and grammar; interference in the ability to transfer visual concept into languageable word forms; deficits in the semantic field; and, inability to elaborate on concepts (Nadeau, Cross, & Gonzalez-Rothi, 2000).

Research around speech fluency often assesses how the spoken language of people with aphasia conforms to standard language rules and quantifies their language use by measuring number of words, syllables, and content units per minute (Nicholas & Brookshire, 1993; Nicholas, Obler, Albert, Helm-Estabrooks, 1985). In one study, researchers analyzed components which contributed to disrupted speech fluency in a group of individuals diagnosed with fluent aphasia; specifically, anomic and Wernicke's aphasia. Through quantifying various differences in discourse, results revealed that individuals with Wernicke's aphasia produced significantly more deictic terms (e.g., this, that), neologisms (e.g., non-words with no relation to target word), paraphasias, and indefinite words (e.g., nonspecific nouns – "thing") compared to normal controls (Nicholas et al., 1985). Differences were also noted in individuals with anomic aphasia, who were found to produce significantly more semantic paraphasias (e.g., real words semantically related to target word – boy instead of man), repeated words and conjunctions (e.g., "but" or "so") than compared to normal controls (Nicholas et al., 1985).

On the one hand, the above research highlighting components which affect speech fluency is helpful as a means for providing behavioral measures which distinguish among individuals with different types of aphasia (Nicholas et al., 1985). These quantitative measures are also valuable for providing a general picture of the linguistic deficits and describing how these deficits may contribute to disrupted speech flow or to empty speech (i.e., words or sentences that detract from a coherent description of a targeted stimulus) (Nicholas et al., 1985). On the other hand, this research seems to be missing a fuller picture of what happens when there are multiple breakdowns in a person's flow of speech. Specifically, when there are deficits in language, not only are specific linguistic and motor processes impacted (e.g., rate, rhythm, word length) but the wholeness of the meaning within the communication is lost. The openness of the Rorschach may be able to describe a kind of depth and integration of cognitive and perceptual factors that is not captured within the parameters of cued-picture-naming tasks with a small set of possible correct responses (Ash et al., 2006). The Rorschach may provide an alternative to the typical rule-based, limit testing type of tasks characteristic of many neurolinguistic assessments, through an emphasis on describing an integrated and complex breakdown of language, cognition, perception, and psychological process.

Word Production and Language Errors

There are many “information processing steps” involved in helping an individual to both identify an object and successfully name it; they include: 1) the perceptual or visual analysis of the object, or object recognition, 2) activation of the semantic system (i.e., retrieving knowledge about the object), and 3) production of a spoken word that best represents what was seen (accessed through phonological and semantic systems) (Morrison net al., 1992, p. 707). These steps provide a context that is useful to consider deficits that may be observed in object naming tasks as a result of brain injury-related impairment. Deficits in object recognition are most commonly identified in individuals with brain injury resulting in agnosia rather than in people with aphasia (refer to Table 1). Nickels & Howard (1995) found that, in their sample of 15 participants with aphasia, naming performance was not significantly predicted by visual complexity in a stimulus in any participant. They found a contrasting result in individuals with agnosia, whose performance on recognition tasks was impacted by visual complexity - further supporting the assertion that difficulty with object naming is less of an issue in individuals with aphasia (Nickels & Howard, 1995). Word production deficits, on the other hand, are reported to be one of the most “consistent and persistent symptoms” among people with all types of aphasia (Borman, Kulke, Wallesch, & Blanken, 2008; Cloutman et al., 2009; Dell et al., 1997; Jeffries & Ralph, 2006; Robson, Sage, & Ralph, 2012; Sarno et al., 2005). This dissertation will, therefore, focus only on word production deficits and language errors that are more common challenges faced by individuals with various types of aphasia (due to brain damage)

Deficits in word production involve the inability to produce an appropriate word choice. There are a multitude of factors contributing to difficulties in naming an object (Laiacona et al., 2001; Nickels & Howard, 1995). These factors are commonly attributed to the properties of individual words or concepts, including: word/object familiarity (how often a word/object is seen, heard or how usual or unusual an object is in person's experience), word frequency, word length, age-of-acquisition (age at which the person believed they learned the word), visual complexity (a picture composed of many elements), and imagineability/concreteness (the ease with which one can create a visual or auditory image corresponding to a particular word) (Laiacona et al., 2001; Nickels & Howard, 1995). Imageability/concreteness has been further investigated and showed to have a significant effect on naming performance (Nickels & Howard, 1995). Imageability is defined as how easy it is to create an image of the corresponding word, whereas concreteness is defined as how accessible a word is to sensory experience (Nickels & Howard, 1995). The authors concluded that although imageability and concreteness showed a significant effect on naming, it may have less to do with the ease with which a picture or a word is imageable or accessible to experience and may have more to do with the "richness of the semantic representation" of that picture or word (Nickels & Howard, 1995, p. 1297). While the present methods do not make it possible to distinguish the contribution of each of the above factors of naming on individual performance, an inspection of the current population's responses on the Rorschach may provide useful insights into issues related to object naming specifically.

Word production is also strongly linked to recognition and lexical retrieval both at the phonemic (i.e., sound of a word) and semantic (i.e., meaning of word) levels of linguistic processing. Difficulty recognizing or retrieving words can often resemble slips of the tongue or involve a complete loss of one's ability to produce a word in either sound or meaning (Dell et al., 1997). Recognition and lexical retrieval difficulty generally falls under two categories: 1) lexical errors, in which a word is substituted for another word or non-word and, 2) sublexical errors, in which there is distortion at the phonological level of the word either by substitution, deletion, or some alteration of the word (Dell, 1997). Lexical errors can alter the target word in sound (phonological errors) (e.g., lacon → bacon), meaning (semantic errors) (e.g., cat → dog), sound and meaning (e.g., monkey → money), theme (thematic errors) (e.g., she ate cereal with a fork), or have no relationship to the target word at all (non-words) (Dell, 1997). These differing types of errors function with respect to the type of aphasia (e.g., Wernicke's or Broca's), severity of aphasia, and the different cognitive processes that have been affected by the neurological impairment (Dell, 1997).

Word production and fluency have been linked to difficulty with impaired lexical retrieval (both at the word form and word meaning levels) both at the single-word and sentence level (Asch et al., 2006). As such, individuals with aphasia are more vulnerable to word retrieval errors (compared to those without aphasia) and more likely to restrict their verbal output to specific categories and to limit their word choice to words with fewer syllables or simple words (Sarno et al., 2005). In one study employing a word/letter fluency task, researchers reported that both fluent and non-fluent individuals with aphasia generally had lower performance scores on word producing tasks and that the quality of words produced was generally less sophisticated in comparison to people without aphasia (Sarno et al., 2005). Further, results revealed that at 3-months post stroke, half of the words produced by the participants with aphasia were monosyllabic and the average word length was 1.52 syllables per word (Sarno et al., 2005). However, these same researchers found that, over time, even though the number of words produced was unaltered, the quality of words produced significantly changed, and became more complex. They explained this finding as the result of a highly educated sample of participants with aphasia (e.g., professors) who provided increasingly more abstruse and low frequency words, providing an argument that in light of the fact that word production was significantly lower in comparison to normal participants, production of rare words was possible (Sarno et al., 2005).

Overall, it seems that many related studies have provided parallel evidence to suggest that word production of individuals with aphasia is generally lower, fewer unique words (low frequency) are produced, and sentence-level fluency is significantly reduced compared to normal controls (Asch et al., 2006; Basso et al., 1997). With regard to the Rorschach, exploring the quality, frequency and complexity of words used to describe the features of the inkblot is of particular interest for the present study, since these are variables (i.e. thought complexity vs. simplicity) assessed based on the individual's responses to the inkblots.

As a general rule, word retrieval is also vital for sentence-level speech fluency. Word finding errors may also affect how a communication partner understands the message communicated (Christiansen, 1999). Fluency and coherence in discourse is sometimes also affected by comprehension deficits, lexical errors, underlying cognitive impairment, and type of aphasia (Christiansen, 1999). For example, research has provided support for the observation that individuals with Wernicke's aphasia have difficulty coherently speaking, others have trouble understanding their communication, and also perseverate on words, compared to conduction aphasia, Broca's aphasia and neurotypical individuals (Christiansen, 1999). In one study investigating the ability of people with conduction aphasia to produce coherent narratives, results revealed that although these patients produced a similar number of propositions as age-matched normal controls, their stories were less coherent and relevant in comparison (Christensen & Chater, 1999). In comparison to the participants with Broca's or conduction aphasia, individuals with Wernicke's aphasia were three standard deviations below normal on measures of relevance and coherence of speech (Christensen & Chater, 1999). In a second study, while investigating the narratives of people with aphasia, researchers found that reduced speech fluency was impacted by difficulty with word retrieval, poor lexical access and lexical errors, and effortful speech, therefore contributing to reduced speech output (Ash et al., 2006). Similar questions using the Rorschach are posed by the present study. For example, to what extent and in what specific ways do word finding and lexical errors impact participant's performance on the Rorschach?

Comprehension Deficits and Semantic Naming Deficits

When considering an overall profile of language impairment, semantic naming and comprehension deficits account for a significant amount of lexical errors in people with aphasia (Bormann et al., 2008; Budd et al., 2010; Cloutman et al., 2008). These deficits are important to consider, because when information is improperly recognized, misunderstood, or mislabeled, the coherent communication of one's intentions can become more inhibited. There are many processes presumed to be involved in attempting to understand the language of a speaker. Swaab, Brown, & Hagoort (1997) state that the listener has to first recognize the words uttered by the speaker and then transpose the sounds form those words into meaning; into lexical and semantic forms. Tyler (1988) asserts that to comprehend the spoken language of another, the listener has to "translate the speech into a meaningful representation" (p. 376).

This translation process involves a set of internal mental processes which generate mental representations, and are assumed to have lexical (vocabulary of a language), syntactic (word/sentence structure) and semantic (meaning level) level properties (Tyler, 1988). When translation across these processes (lexical, syntactic, and semantic) has been integrated and a mental representation is formed, comprehension of spoken language is said to have occurred (Tyler, 1988). Several factors have been identified in contributing to the production of spoken language comprehension deficits in individuals with aphasia. These deficits are presumed to occur at many levels of internal processing and include: context in which the words are presented; word recognition problems; difficulties mapping sensory input onto lexical systems; disruption in accessing and integrating lexical, syntactic, and semantic level processes; and, “disruptions in the semantic organization of the lexicon” (Marshall, Pound, White, Thomson, & Pring, 1990; Swaab et al., 1997; Tyler, 1988, p.378).

Depending on the severity of impairment, individuals with aphasia can also produce many errors in naming. Semantic naming errors, at a basic relational level, can involve substituting the target word for a word that is semantically related, such as, naming a “cat” as a “dog”, but can also be associative in nature such as, naming a “tree” a “forest” (Bormann et al., 2008 ;Cloutman et al., 2009). Research suggests that semantic errors are a result not only of the level of neurological impairment but also a result of a dysregulation in access to both phonological and semantic representations, and difficulty accessing target words when there is a stream of competing alternatives (Budd et al., 2010; Cloutman et al., 2009). In one study research showed that among different types of semantic errors, individuals with acute aphasia made more associative semantic errors in comparison to all other lexical errors (Jeffries & Ralph, 2006). In a second study, results revealed that individuals with aphasia not only made a significant amount of semantic errors, but also found that semantic errors were more frequent for "highly competitive" versus "low" competitive items" (Borman et al., p. 28). Specifically, semantic errors seemed to increase in frequency when target words came from "a large semantic category with many semantic competitors" (Bormann et al., 2008, p.28.).

In the context of the present study, consideration is given to how these deficits may impact responses provided to ambiguous Rorschach cards. Both single-word responses to cards and more detailed, sentence-level responses may provide some information about possible breakdowns in language and thought resulting, particularly, from spoken language deficits including semantic naming errors. Exploring the possible differences in Rorschach responses between study participants and a normed neurotypical population on variables assessing thought disturbance, thought complexity and simplicity, could also offer insights into how naming problems and comprehension deficits may manifest by interfering with the individual's ability to clearly articulate thoughts.

These studies also provide evidence for the observation that semantic naming and lexical access are reflective of a complex interaction between the severity of neurological deficit, impairment to conceptual/semantic representations, phonological and semantic access, and above all deficits in more general cognitive processes (Bormann et al., 2008; Budd et al., 2010; Cloutman et al., 2009). While these studies have provided evidence in identifying and describing some of the psycholinguistic processes underling particular levels of impairment, there still remain questions around the complexity across perception, thought, and language systems, and perhaps the different causes that may be attributed to particular breakdowns in expressive language and comprehension deficits (Basso et al., 1997; Budd et al., 2010; Kimbarow, 1991; Nickels & Howard, 1995; and, Sarno et al., 2005). While the present dissertation cannot address these limitations either, investigating the responses of people with aphasia on an open-ended measure like the Rorschach may provide a novel lens for thinking about the relations among these processes in a way that previous studies have not.

Traditional Methods of Understanding and Assessing Language Impairment

Conventionally, alterations in spoken language and cognitive processes in people with aphasia have been assessed through a standard set of neuropsychological, linguistic and non-linguistic tests that primarily evaluate performance on tasks related to object naming, picture matching, word generation, word-picture matching, writing, as well as visuospatial and memory related activities (Hodges, Patterson, Oxbury, & Funnell, 1992). Often the foci of these standard neuropsychological and linguistic battery of tests has been to describe the cognitive processes subserving language and to identify how damage to particular neural structures impacts language (Gordon, 1985; Lezak, 2000). The theoretical underpinnings of these neurocognitive and linguistic assessment methods as they relate to language facility, have, in part, relied on research that support models of "normal" language development and theories of brain function that allow for the identification and diagnosis of neurolinguistic capability (Helm-Estabrooks, 2001; Nickels, 2002; Poeppel & Hickok, 2004).

While a considerable amount of the research in language, particularly within aphasiology, has relied upon traditional neuropsychological and psycholinguistic measures, much of the focus has been to identify and understand the nature and severity of language impairment and to link this impairment back to specific functional and anatomical architecture (Vandenbore et al., 2015). Some of these measures include: the Halstead screening test, Boston Diagnostic Aphasia Examination (BDAE3), Communication Skills in Daily Living test (CADL-2), and the Porch Index of Communicative Ability (PICA). These measures require people with aphasia to name objects, identify letters and words, differentiate between words/pictures, enunciate, and so forth. While not limited to these parameters, these measures also tend to rely on quantifying several characteristics of language output that include: (1) relying on performance that is dichotomized as either successful or unsuccessful (i.e., % correct); (2) measuring the number of errors found at the single-word or sentence-level of speech; (3) measuring the number of words found or repeated back; (4) sampling and isolating specific language functions (e.g., testing only expressive vs. receptive language functions); and, (5) focus mainly on the quantification of particular language related errors (e.g., grammatical, number of perseverations).

Although these neuropsychological batteries have proved to be valuable for differential diagnosis, prognosis, and establishing the severity of language deficit, especially for the purposes of language-specific rehabilitation, the clinical utility of such measures as a means to describe more in-depth perceptual and psychological processes remains limited. For instance, Vandenborre et al., (2015) state that the limitations inherent within many of the linguistic and neuropsychological test batteries used in aphasia work are that they focus mainly answering the question of "what" to treat (e.g., "What is impaired?" "What is lacking?") rather than "how" to treat beyond language (e.g., "How can we gain a better understanding of the impairment to treat a wider network of issues impacting the patient?") (p. 191).

Overall, these conventional assessments are focused on isolating and classifying the dissolution of function, and how it impacts brain-behavior relations, but are limited in their ability to place that dissolution in the broader context of how an individual makes meaning of, and interacts with, their world. Given the specific focus of many conventional neuropsycholgical/linguistic tests and the predominate reliance on one form of assessment method (features described above), a multimethod type of assessment (like one proposed in the present dissertation) that captures a different set of dimensions and is more inclusive in considering variables from a diversity of viewpoints (linguistic, cognitive, and psychological) is needed (multimethod assessment will be described in Chapter three.) In this regard, the Rorschach can potentially provide a link between perceptual and language measures that place the individual's condition within the accepted generalized structure of aphasia, and a qualitative and highly personal, but clinically meaningful, therapeutic psychological context - to marry the structured, nomothetic approach within an idiographic framework. One goal of the present study, therefore, is to explore how language, together with exploring perceptual and psychological processes, measured by the Rorschach, and coupled with traditional language measures, may explain a different dimensionality of individuals with aphasia.

CHAPTER THREE

ASSESSMENT AND THE RORSCHACH

Psychological assessment is steeped within a long history, with more contemporary approaches evolving progressively over the past century. In general, assessments were developed to measure various aspects of a person's experience, encompassing their sensory input/output, intelligence, personality and psychopathology. The earliest form of more contemporary psychological assessment, over one hundred years ago, was the clinical interview. The clinical interview used unstructured questions attempting to conceptualize a person's underlying personality structure through their personal and familial history, behavior, thoughts, and relationships (Groth-Marnat, 2009). Near the beginning to middle part of the twentieth century, advances were made to minimize the subjective nature of the clinical interview (i.e., less reliance on clinical intuition) by developing structured psychological tests used to reach more reliable and valid conclusions about a person's internal make-up. These structural advances within psychological assessment were largely a result of the emerging importance placed on the technical robustness of tests, such as reliability and validity. These psychological assessments varied in type of format (i.e., self-report versus objective tests), level of standardization, administration, and interpretation practices.

Historically, the overarching goal of psychological assessment has been to measure as many data points of the clinical problem as possible to fully clarify and classify internal psychological processes associated with both outward behavior, inner cognition and personality structure (Mihura et al., 2013). Measuring psychological phenomena with as many different data points as possible, is the cornerstone of psychological assessment and is further cemented within Campbell and Fiske's (1959) seminal article on the multitrait-multimethod.

What is significant about Campbell and Fiske's multitrait-multimethod is that many forms (i.e., self-report, objective, personality) of assessment must be used to converge on the observed phenomenon, and discriminate from other related phenomena. For example, those who have depression should present with depressive symptoms but also be differentiated from people who do not have depression. The present dissertation focuses on one part of the multitrait-multimethod concept, and applies a multimethod approach (neurolinguistic tests coupled with the Rorschach) in an attempt to capture a different dimensionality of an individual living with a significant language impairment.

Additionally, psychological assessment has been useful in helping to recognize, describe, and explain altered states of consciousness or processing (thought) resulting from either intrapsychic disruption (i.e., pathological disorders believed to be caused by environment and personal history) or more organic causes (i.e., brain injury). The Rorschach, a special case of psychological/psychodiagnositc assessment, created by Herman Rorschach in 1921, and translated from German to English in 1942, was originally created to empirically investigate perception (Rorschach, 1921/1962) among patients in an in-patient psychiatric hospital with a particular interest in schizophrenic patients. Since Rorschach believed that perception was created through one's subjective experiences, he wanted to see how people would make sense of ambiguous and novel stimuli. Rorschach, like Freud, believed that subjective experiences create particular associations to things and to people (i.e., objects), and were embedded within memory via language (Freud, 1891; Rorschach, 1921/1962). For example, in an individual with a repressed fear of their father, seeing and describing a scary looking monster figure in response to card IV, could also evoke an image of their father, because of the shared emotional response evoked by those two symbols. It is through the language of the individual's verbal response, and with the benefit of other psychological, cognitive, and perceptual processes, that this association can come to light. It is this associative process, that Rorschach believed would be a powerful way to describe the many layers of a person's experience of the world and inner life; accessed primarily through the function of language.

Through quantifying the quality of a person's responses, based on color, form, location, and content characteristics (whether the response includes color for example, these are known as determinants), Rorschach and others began to see the tool as a way to diagnose levels of pathological disturbance based on the distribution of responses (i.e., determinant score variability; e.g., no color vs. many color responses, and so forth) (Mihura et al., 2013; Rorschach 1921/1962). The above parameters (form, color, etc.) were also used to differentiate intelligent from "unintelligent" individuals based on the quality of their response, or more specifically how well their response visually "fit" the inkblot (Kimball, 1950).

Following Herman Rorschach's premature passing, the Rorschach evolved into a viable assessment method that has been used not only to assess psychological pathology and thought disturbance (as found in schizophrenic pathology) but also "organic damage" based on the quality of an individual's verbal skills, organization and problem-solving ability (Perry et al., 1996, p. 352). Colleagues of Rorschach, such as Oberholzer and Piotrowki, also viewed the use of the Rorschach as a way to ascertain how an organically impaired person (i.e., an individual with cerebral damage) may be able to synthesize details of images into coherent units of information, efficiently verbalize perceptual experiences, and effectively express an intact "inner life" (internal cognitive and psychological structure) (Mihura et al., 2013). Over the years and through an abundance of empirical research, the Rorschach has been used across multiple sub-disciplines within psychology to describe an individual's ability to conceptualize, abstract, problem solve, and coherently articulate thoughts (Perry et al., 1996). In these ways it is not only considered a projective measure but also a cognitive-perceptual task

The following section highlights how the Rorschach has been used historically in the clinic, with respect to neuropsychology in general, and questions of language in particular. It reviews research in support of its value as a perceptual and psychological assessment technique that is able to access patterns of thought, underlying psychological processes (wishes, intentions, personality), and affectivity through the medium of language. The chapter is organized according to the following subsections: historical and current use of Rorschach in neuropsychological assessment; the clinical utility and research evidence supporting the Rorschach in neuropsychological populations; and, the role of verbalization in Rorschach assessment.

Historical and Current Use of the Rorschach and Its Position in Neuropsychological Assessment

The Rorschach consists of a series of 10 ambiguous inkblot designs: 5 black and gray ink blots on a white background, 2 black and red ink blots on a white background, and 3 multicolored ink blots on a white background. Individuals are asked about their perceptions as to what they see or how they interpret the designs they see. Originally, Rorschach did not intend for his tool to be used as a projective instrument but rather as a means to create a diagnostic profile of how individuals with schizophrenia thought about and saw the world through amorphous looking pictures (Rorschach, 1921/1942; Schott, 2013). However, following Herman Rorschach's Psychodiagnostik's (1921) translation into English (1942), the Rorschach became popular and was eventually ranked as the second most used personality assessment method within psychology in the United States (by clinical psychologists and psychiatrists) (Mihura et al., 2013). Its use was in part due to the fact that psychologist's typically use more than one assessment method to make a diagnosis, and because the Rorschach had gained recognition as a valuable alternative to paper-and-pencil type formats (i.e., various objective formats using multiple choice responses). The Rorschach also became valued because of its ability to describe more in-depth personality traits of normal versus pathological individuals (Benjamin & Ebaugh, 1937; Mihura et al., 2013).

Initially, Rorschach (1884-1922) referred to the inkblots as a "form interpretation test", out of which a combination of artistic and abstract forms could be used as a method to tap into a particular perceptual process that provided access to the pattern of a person's thought process (e.g. organized versus disorganized) and how they experienced the world (associations involving latent cognitive, affective and psychological processes) (Acklin & Loiveira-Berry, 1996, p.429; Gold, 1987; Schottt, 2013). Secondary to this goal, he speculated that the visual features of the blot might also provide qualitative information, within a psychotherapeutic context, about a patient's inner emotions/psyche and how these could be projected and interpreted from an ambiguous blot (Scholl, 2013). As stated by Rorschach (1921 cited in Scholl, 2013, p. 1), "The interpretation of the chance forms falls in the field of perception". Because the Rorschach presents a series of 10 distinct ambiguous ink blots within an open-ended framework, it "harnesses the ubiquitous ability to see significant things in amorphous shapes" and encourages a diverse array of perceptual and contextual interpretations that are in some way meaningful to the individual (Schott, 1987, p.2). The meaning that is projected onto an amorphous and meaningless object is then believed to provide rich information not only about a person's perceptual process but also provide some insight into how cognitive and underlying psychological processes might interact. In this way, the Rorschach has been used and is believed to be useful for revealing basic personality dimensions that are supported by and involve both cognitive, affective, and personality structures (Gold, 1987).

Following the Rorschach's translation in 1942, the method became so well recognized that among practicing clinical psychologists in the 1960's, through the 80's in the United States, the Rorschach was the third or fourth most commonly used instrument; following only Weschler tools (i.e. WAIS and WISC) and the MMPI (Camara, Nathan, & Puente, 2000; Watkins, Campbell, Nieberding, & Hallmark,1995). A similar level of popularity and use was also found in several European and South American countries (Muniz, Prieto, Almeida, & Bartram, 1999). Butcher and Rouse (1996) have further emphasized that the Rorschach is the second most researched personality assessment tool (7,000 research references), following the MMPI and Wechsler instruments (Meyer, 2004).

Although the Rorschach became very popular throughout the middle to late part of the twentieth century, the instrument was also met with much criticism from the psychology community, for what many referred to as the tool's lack of scientific rigor (Benjamin & Ebaugh, 1937; Hertz & Rubenstein, 1939; Mihura et al., 2013). The main critiques relate to the lack of instrument standardization, coding, and interpretation practices. In response to this criticism, initially, five primary scoring systems were created to increase the psychometric reliability and validity of the Rorschach. These five systems included: the Beck, Klopfer, Hertz, Piotrowski, and Rapaport-Schafer systems (Hertz & Rubenstein, 1939; Mihura et al., 2013). Although these scoring systems were helpful in establishing systematic use and to quantify Rorschach responses, each system operated differently and as such had significant limitations. In attempts to reduce the administration, scoring and interpretative limitations posed by all five systems, Exner (1969), compared all five systems in a psychometric review. Following this review and in addition to his own research, he developed the Exner Comprehensive Scoring System (Exner, 1969; Mihura et al., 2013). Beginning in the early 1970's, Exner's Comprehensive Scoring system became the predominately used method for using the Rorschach, as it had an increased standardized way of administering the tool (as compared to the 5 previous Rorschach systems), and had developed defined scoring an interpretative criteria, along with the use of a normed sample on which to base interpretations. Recently, Meyer and colleagues (2012) furthered the work of Exner and taking on most of the Comprehensive systems practices, created the Rorschach Performance System (R-PAS). This system was used in the current study and will be described in detail within the methods section.

Research investigating the psychometric features of the Rorschach has provided several years of evidence as to the validity and reliability of the variables measured. This evidence has shown that many of the Rorschach variables, specifically the thought and perception variables, are psychometrically (construct validity and reliability across normal and clinical populations) sound, and, are in line with the scientific comparisons made between the Rorschach and the MMPI (Mihura et al., 2013). These are the main variables used in the present dissertation. Further, convergent validity combining both the Rorschach and MMPI has been evidenced across several studies (Mihura et al., 2013). Despite surmounting research evidence, the Rorschach continues to be criticized on the basis of psychometric rigor from recycled historical biases, most predominately by the neuropsychological discipline, but also within general psychology.

Although the Rorschach is still one of the most widely used psychological instruments within the field of personality assessment (Hunsley & Bailey, 1999; Meyer & Archer, 2001; Meyer, 2001), it seems that it has been less widely used in adjacent clinical related disciplines, such as neuropsychology. In a recent study collating the assessment practices and test usage patterns of neuropsychologists in the United States and Canada, researchers found that neuropsychologists frequently evaluate a diverse array of domains (intelligence, memory, language, personality), but use mostly objective cognitive based tests in their practice (Rabin, Barr & Burton, 2005). In fact, of the top 40 most utilized tests among 747 neuropsychologists, 63.1% and 42.7% reported using the Wechsler Adult Intelligence Scale-(WAIS-III) and the Working Memory Scale (WMS-R/WMS-III), respectively (Rabin et al., 2005). Further, only 1.1% of the same group of neuropsychologists reported ever using the Rorschach in their practice. In comparison, these percentages are incongruous with a study sampling 187 clinical psychologists that found 154 of the sample used Rorschach in their assessment practice either "occasionally" or "always" (Piotrowski, Sherry, & Keller, 1985). A second, more recent study, found that 77% of clinical psychologists used the Rorschach as part of their assessment practices (Camara et al., 2000). The low usage rate of projective personality tests in neuropsychology is particularly interesting given the diversity of domains and patient populations neuropsychologists assess. The almost exclusive reliance on cognitive based tests, with little to no focus on projective-based testing and rather limited personality testing in general, suggests that the status of the Rorschach as an assessment tool within the context of neuropsychological evaluation has not been well defined. This is in part due to neuropsychology's historical emphasis on cognition versus general personality traits, its tendency to conceptualize thought and cognition as separate from personality, and the distinct aims of neuropsychology as compared to clinical psychology (Hunsley & Bailey, 1999; Rabin et al., 2005).

The limited use of the Rorschach in neuropsychology may also be explained by the different focus of the test and the weight placed on establishing specific psychometric rigor (convergence with other neuropsychological measures, sensitivity of measure to diagnosis). The validity of a neuropsychological assessment generally concerns the test's sensitivity to describe the severity of a behavioral deficit and localize brain damage, function, and change (Acklin & Wu-Holt, 1996). Lezak (1983) however, asserts that neuropsychological assessment should not only include a process that is sensitive to describing the function of the brain through "examining the behavioral product" (p.170), but also describes one's perceptual process and perceptual capabilities in order to examinine what a patient sees and makes meaning out of given their impairment (Lezak, 1983). Due to the ambiguous stimuli and the significance of understanding an individual's perceptual and thought process, Lezak (1983) suggests that the Rorschach is a worthy testing tool in assessing three key areas in brain injured patients:

> (a) accuracy of percept or are they able to clearly identify that an object that exists; (b) subject's ability to process and integrate multiple stimuli or how they make sense from what they see; and, (c) reliability or can the result be proven repeatedly (e.g. many brain injured patients do not trust their perceptions) (p. 170).

Since one of the main objectives of the Rorschach is to provide insight into a person's internal representational world out of one's perceptual process (measured by their responses), this type of assessment may be a useful tool in the field of neuropsychology for not only describing the extent of damage caused to psychological and cognitive processes but for understanding how this damage has altered a person's ability to view themselves in the context of the world (Reitan, 1954; Reitan, 1955; Gold, 1987; Acklin, 1994, p. 171). One general goal when using the Rorschach involves understanding the sort of structural representation that is activated when viewing an ambiguous percept, and how the verbal responses related to this process can inform us about a person's inner world or character. This study also seeks to explore how responses from individuals living with aphasia can provide clues about the potential breakdown between thought and language and how this can be described by an assessment such as the Rorschach.

The Clinical Utility and Research Evidence Supporting Rorschach

Within the tradition of psychoanalytic thought, the Rorschach (Klopfer, Ainsworth, Klopfer, & Holt, 1954; Klopfer & Keller, 1946; Larson, 1958; Rorschach, 1942) has been used as a projective psychological measure to help reveal important unconscious processes by way of better understanding a person's perceptual process (i.e., what one sees and how one sees it). Responses have also been used to establish "central cognitive and personality structures" (Gold, 1987). While the Rorschach has been widely used within the field of psychology and psychiatry, its potential for use in particular neuropsychological populations has been less obvious. However, the fact that little past or present research uses this kind of psychological assessment for people with aphasia, in particular, suggests that novel findings could be of value with respect to general psychological, perceptual and language-related questions. Addressing this gap in understanding may bring to light additional utility of the Rorschach assessment across disciplines and populations, which could help to better understand issues that the population, specifically individuals with aphasia, are experiencing.

Although few neuropsychological studies have used the Rorschach, a few have, several of which actually targeting people with aphasia. Reitan (1954) first used the Rorschach to describe "perceptual differences" in patients with and without aphasia. Reitan's research participants consisted of three groups: 1) patients with brain injury and aphasia (brain injury in left hemisphere), 2) patients with brain injury without aphasia (brain injury in right hemisphere), and 3) hospitalized patients with no organic brain disturbance (control group). He postulated two hypotheses: 1) the effects of brain damage would be revealed on the Rorschach test results in the two brain injured groups compared to the control group and 2) "verbal dysfunction" resulting from the brain injured group with aphasia would negatively impede performance on the Rorschach compared to the two other research groups (Reitan, 1954, p. 199). Somewhat surprisingly, results revealed that there was no significant difference between people with aphasia and both groups of people without aphasia. In fact, the mean number of total responses across the 10 cards was 27.61 for the group who had aphasia and 24.2 for the group without aphasia (Reitan, 1954, p. 203). Reitan (1954) concluded as a result of the limited "differentiation" between those with aphasia and those without, "verbal expression did not impose itself too heavily in determining" the Rorschach test results (p. 208).

Although, the present study is similar in some respects to Reitan's published work, particularly in comparing Rorschach performance between people with aphasia and a neurotypical normed population, the current project addresses several limitations inherent to prior work. Specifically, Reitan's 1954 study which found no differences between those with and without aphasia may reflect a lack of diagnostic accuracy, and a too-diverse sample, as it was conducted before significant progress was made in understanding distinct forms of aphasia. Group composition (i.e. heterogeneity) would seem, in this case, to have explained the non-significant findings between groups. Additionally, the Rorschach in the 1950's remained largely unstandardized in both administration of procedures and scoring methods and, did not provide normed-referenced data. This lack of standardized protocol and normed population would also likely have impacted Reitan's findings. The present study overcomes these two limitations in particular, as there are now better norms for the Rorschach, a set of standardized procedures for their administration, scoring and interpretation of the measure and more sophisticated diagnostic criteria for categorizing distinct kinds of aphasia.

In a second study using the Rorschach, Pena (1953) compared the perceptual organization and functioning of patients with organic cerebral damage (irreversible brain trauma), patients with schizophrenia (hebephrenic or catatonic) and normal children and adults. Results revealed that the individuals in both pathological (traumatic brain damage and schizophrenic) groups perseverated more than normal controls, and that those individuals in the traumatic brain damage group provided more simplistic and "common" responses as compared to either the schizophrenic group or neurotypical controls. That is, the patients in the traumatic brain damage group gave what the researchers labelled "mediocre" responses, restricted to the form of the blot, whereas the other groups were more diverse in their responses alluding more to the finer details of the blot (Pena, 1953, p. 196). The authors concluded that although participants in the cerebral damaged group provided a certain level of organization to their responses and resembled the normal controls in their ability to structure their perception, the difference was seen in their "inflexibility and impoverishment of outlook" as observed in their vague and preservative responses and their inability to move beyond the whole features of the blot (Pena, 1953, p. 198).

In a third study, Zangwill (1945) investigated the repeated use of the Rorschach with two concussional head injury patients. The Rorschach was administered at an acute phase, a sub-acute phase, and a convalescence phase (Zangwill, 1945). At the acute phase, both participants were noted to be confused and were restricted in language showing signs of aphasia. At this acute phase, performance on the Rorschach revealed fewer responses to inkblots, limited use of Rorschach determinants used to describe the features of the blot, preservative themes, restriction of emotional content, and some evidence of bizarre and incoherent expression of ideas (e.g., conflating two opposing concepts) (Zangwill, 1945). As compared to the acute phase following injury, on the second and third administrations of the Rorschach, performance in these two participants was shown to be less restrictive in responses, less bizarre, and participants elaborated more on the details of the blot. The authors concluded that across these three rehabilitation stages, the Rorschach was a valuable tool in providing information about change to the patient's emotional state, perceptual organization and flexibility, and ability to "balance the demands of object perception…with free expression of phantasy" (Zangwill, 1945). This difference over time was mainly due to the more severe symptoms present in the acute phase of injury and therefore less access to language function compared to the rehabilitation stages, where language impairment continued to be present but was less severe.

Past and more recent studies suggest that the Rorschach may provide important insights about thought process and emotional states of people who have experienced brain injuries. These studies also point to the usefulness of the Rorschach in providing a platform to investigate an individual's reasoning abilities, planning, flexibility, and problem solving. What these studies lack however, is a deeper description of how language impairment restricts a person's response (i.e. simple versus complex word usage), limits one's ability to make meaning and, how the Rorschach directly compares to traditional neuropsychological and psycholinguistic measures. In general, these studies were methodologically limited, as they were conducted in the middle part of the twentieth century before many of the administrative and psychometric advances of the Rorschach, including coding, scoring and interpretative practices.

Role of Verbalization in Rorschach Assessment

The Rorschach requires respondents to interpret and verbally express their perceptions of the blots. Verbal responses, based on the perceptual and conceptual interpretations of ambiguous images, form the basis for understanding internal psychological processes providing insight into an individual's current psychological functioning (Gold, 1987). As a psychological instrument, the Rorschach can provide insight into the ways in which an individual perceives the world, processes information, organizes the world and copes with stress (Hunsley & Bailey, 1999; Weiner, 1986). The formal interpretation of a respondent's verbalizations can provide a kind of overview detailing the interaction among perceptual, cognitive, psychological, and linguistic processes (Gold, 1987).

Rorschach (1942) believed that the processes involved in responding to the inkblots included an "integration of sensory, memory, and associative processes" reflective of a deeper meaning that was symbolic of prior experience (Gold, 1987, p. 491). For example, interpreting an image to represent two women working together, may suggest a fond associative memory of one's mother and grandmother cooking in the kitchen together. The interpretation of responses as such can form the basis for understanding several personality dimensions of the person as well as possible linguistic impairments. Freud, as earlier discussed, described how meaning embedded within language can be attached to deeper (often unconscious) associations as part of larger symbolic representations informing our greater understanding of people, the world, and ourselves (Freud, 1891). Formalizing these ideas with respect to Rorschach analysis, Gold (1987) asserts that the role of verbalization provides a means to understand "internal cognitive process" and how these underlying processes intervene at many levels of linguistic, perceptual and psychological functioning (p. 489). Gold (1987) broke down the response phases of the Rorschach to include 3 levels of verbalization and associated cognitive processes. Level 1 involves the verbalization as a "direct report" of what is seen and is more associated with linguistic ability (Gold, 1987). Level 2 involves a "recoding" and organization of nonverbal stimuli into language before it can be effectively verbalized (Gold, 1987). Level 3 involves a higher level of cognitive processing that allows a person to synthesize abstract information, select among varying responses and purposefully verbalize the intended response (Gold, 1987).

There are many cognitive and linguistic layers underling the process of word production and spontaneity of speech that influence an individual's response to picture-cued or perceptual tasks. In people with aphasia, impairment in language function may interfere with successful verbalization of one's perceptual experience in many ways. This may include impairments in recognizing or comprehending the meaning of an image, retrieving the appropriate response that is reflective of the individual's "true" perceptual and psychological experience, and finally verbalizing this response. That is, because of any multitude of possible perceptual, conceptual, and linguistic impairments, a person may not recognize an object as familiar, identify an object's characteristics or know an object's function or be able to effectively communicate in one's internal representation of the world (Gold, 1987). Language impairments may even alter one's view of what actually is perceived (Also refer to the 3 levels within the Rorschach verbalization above). In contrast to traditional neurolinguistic measures that are designed to target specific relations between concrete images and specific verbal labels, the less constrained, but still formally structured, nature of the Rorschach may serve as a means to observe and bring coherence to, a broader set of information potentially helping to understand how a person transforms external stimuli cognitively, linguistically, and psychologically in novel ways.

What the Rorschach seeks to assess is not only a verbal account of one's perceptual experience and conceptual analysis, but the ability for the person to use language in such a way that it may expresses their "authentic, individual core experience" (Gold, 1987, p. 494). In the case of persons with aphasia, questions relating to verbalizations on the Rorschach concern how much of one's perceptual experience and thought process are restricted or altered by their language impairment (Gold, 1987). Moreover, in light of the many linguistic and cognitive errors made by individuals with aphasia, the difficulty with naming and recognizing an object, and the difficulty with phonological and semantic access, one of the questions posed by the present study concerns how their responses on the Rorschach, both at the single-word (response phase) and multiple sentence-level (clarification phase), differ from the normal population.

CHAPTER FOUR

METHODS

Research Design

The present dissertation work was exploratory in nature, employing a pre-experimental small-N case study design. Much of the knowledge base within neuropsychology has been derived from single case design studies (Nickels, 2002). McCloskey and Caramazza (1988) have argued for the value of the small-N case study approach because it allows researchers to make "valid inferences" about normal cognitive functioning from identifying specific cognitive and linguistic processes that have been affected by impairment (p. 585). Within the class of small-N case study design, there are several types of designs that can be used to investigate normal and impaired neuropsychological functioning. One among that set, the small group study approach (Nickels, 2002), is the focus of the present study.

The group study approach involves the selection of individuals based on some defining criterion or characteristic (e.g., type of aphasia, Broca's versus Wernicke's) (Nickels, 2002). In the present study, individuals were considered to demonstrate characteristics consistent with both non-fluent aphasia and fluent aphasia (3 and 5 individuals, respectively). Additionally, a formal assessment suggests that they have a mild to moderate aphasia, with relative better auditory comprehension than spoken expression. Differences and similarities within and between groups are based on aggregate data pooled across the selected group categories (Nickels, 2002). The disadvantage of this type of design is that because data are pooled and averaged across the group, not every individual may be represented in the most accurate sense, and therefore individual patterns may not be clearly defined (Nickels, 2002). However, one variation of the group study approach allows for comparisons between and across individuals increasing one's ability for inference-making. This approach may best address certain theoretical questions and is used in the present study (McCloskey & Caramazza, 1988; Nickels, 2002).

Target Population and Sample

Participants in this study were eight right-handed adults with aphasia secondary to left hemisphere stroke. Participants were recruited from an urban, university speech and language outpatient clinic by a speech-language pathologist and selected based on their interest in participating in the study and the inclusion/exclusion criteria described below. Mean time post-stroke for the group was 108 months (n=6) (Range = 119; SD =52) (refer to Table 2 in the Results section). The group was comprised of 2 women and 6 men with an average age of 55 years (Range = 26; SD = 7.3 years). Participants were diagnosed with varying types of aphasia according to Western-Aphasia Battery-Revised (WAB-R) Aphasia Quotient (AQ) scores (Kertesz, 2006) (1 with conduction aphasia, 3 with Broca's aphasia, and 4 with anomic aphasia) and all had left-sided cerebral hemispheric damage. Severity of aphasia was based both on their WAB-R AQ scores and a diagnosis from a licensed speech-language pathologist. Of the 8 participants, 4 participants were diagnosed with mild aphasia and the remaining 4 participants were diagnosed with moderate aphasia.

Inclusion and Exclusion Criteria

Participants were included in the present study if they met the following criteria: adults between the ages of 18-80 years; pre-morbid proficiency (speaking, reading, and writing) in American English; at least 6 months post onset of aphasia; no known impairment in hearing or vision; and, no history of psychological or other neurological impairment (i.e., dementia or traumatic brain injury). Participants were only enrolled in the present study if they understood sentence level information and could name objects, as determined by their overall performance on the *WAB-R AQ* assessment (refer to Instruments subsection for detailed listing of subtests used). Participants were also included either because of their performance on the *WAB-R* AQ assessment or because they were determined to have aphasia by the speech and language pathology clinic at Duquesne Unveristy (and also via their neurologist).

One participant, a 67 year-old Caucasian male, diagnosed with Wernicke's aphasia, was excluded from the present study because of the severity of his aphasia. He provided many single-word responses on the Rorschach, however these responses were either preservative, did not meet other response criteria (i.e., providing at least 1-3 different responses for each card), and/or were composed mainly of non-words that could not be coded for further analysis. As a result, I determined not to include any participants with a current diagnosis of Wernicke's aphasia for the remainder of data collection.

Instruments

There were three assessment forms used in the present study, which included: WAB-R AQ portion (Kertesz, 2006), the Cognitive Linguistic Quick Test (CLQT) (Helm-Estabrooks, 2001), and the Rorschach scored and interpreted using the R-PAS system (Meyer et al., 2012). In addition to the test instruments, a confrontation picture-naming task was also used to determine if participants could name images depicting the most popular responses reflected in each of 10 Rorschach cards. These three instruments are described in detail below under their individual headings.

The Western Aphasia Battery Revised Aphasia Quotient (WAB-R AQ)

The WAB-R AQ portion is designed to identify the level of language function, and the presence and type of aphasia in an adult population (Kertesz, 2006). Specifically, the WAB-R

AQ evaluates overall language functions in the areas of content, fluency, naming, auditory comprehension, and repetition (Kertesz, 2006). The WAB-R is an evaluation tool used in the rehabilitation of people with aphasia. This assessment provided an overall template of language function for the current study participants and a description of performance across language domains. With the exception of 1 participant, a speech-language pathologist at a University Speech and Language Clinic administered the WAB-R, as part of the standard protocol followed at the clinic, and scores were obtained (with participants' consent) via the participants' clinic file. I also administered the WAB-R AQ to one of the study participants.

The Cognitive Linguistic Quick Test (CLQT)

The CLQT (Helm-Estabrooks, 2001) is a standardized assessment tool administered in the present study. I had previous formal experience administering similar cognitive and linguistic tests as the subtests found in the CLQT, and with similar neuropsychological populations and, was therefore qualified to administer the full test to participants. The purpose of administering the CLQT for the present study was to describe each participant's cognitive and linguistic strengths and weaknesses. Additionally, adopting a multimethod approach, I wanted to collect data that used multiple formats (i.e., objective neurolinguistic tests) that together with the Rorschach would provide a comprehensive profile of the individual (perhaps establishing patterns or relationships between different tests formats).

The CLQT evaluates five domains and includes a total of 10 tasks measuring an adult's cognitive and linguistic functioning. These domains and tasks include: attention (symbol cancellation, clock drawing, story retelling, symbol trails, design memory, mazes, design generation), memory (personal facts, clock drawing, story retelling, symbol trails, naming, design memory), language (personal facts, confrontation naming, clock drawing, story retelling, generative naming), executive function (symbol cancellation, clock drawing, symbol trails, generative naming, maze, design generation), and visuospatial skills (clock drawing, symbol trails, design memory, mazes, design generation) (Helm-Estabrooks, 2001).

All of the tasks were administered to the present study's participants and required them to answer questions, describe pictures, manipulate and name common objects, follow directions, repeat words, write, symbol search, remember stories, and match pictures to printed words and sentences (Helm-Estabrooks, 2001). I administered the CLQT to 7 of the study participants. The other participant completed the CLQT with a speech-language pathologist prior to the start of the present study. For the purposes of the present study, the language domain was the only performance score used in both descriptive and correlational analyses. The language domain was used as a proxy measure for describing linguistic functioning. The executive function domain was included in the study but only used as a descriptive measure, to further describe any similarities or differences within and between study participants. The executive function domain was excluded from correlational analyses because it is not considered a pure measure of executive functioning ability, as it relies on and includes some level of verbal ability in its calculation.

Rorschach

Central to the present dissertation, was the Rorschach using the Rorschach Performance Assessment System (R-PAS) (Meyer et al., 2012). Herman Rorschach developed the Rorschach (1921/1942) in 1921. In order to add psychometric robustness to the Rorschach, 5 different scoring and interpretation systems were created in the 1930's. These 5 systems were very different in their administration, coding, scoring, and interpretation. In order to overcome the limitations of these 5 different systems, and to further elaborate on the theoretical and psychometric robustness of the Rorschach, Exner created the Rorschach Comprehensive System (CS) in the early 1970's. Exner's CS method also was the first to provide normed-referenced populations and quickly became the dominantly used method for using the Rorschach (Meyer, 2012).

Exner laid the groundwork for the version of the Rorschach assessment that was used for the present study, namely the R-PAS (Meyer et al., 2012). The R-PAS has maintained many of the same features of Exner's comprehensive system, specifically: the same two response phases, i.e., the response and clarification phases; many of the same coding procedures; many of the same variables known as determinants, cognitive codes and thematic codes that describe the content and location of what was seen; and, many of the same interpretation categories (refer to Appendix A). The major changes that have occurred from the Comprehensive system to the R-PAS include: 1) less prompting during the response phase (only prompt to get 2 to 3 different responses not an indefinite amount); 2) an elimination of several variables based on a lack of empirical support (while maintaining those variables with the more empirical support) and variable redundancy; 3) a new computerized system in which standard scores (SS) scores (standardized clinical scores) are provided; 4) a description of all variable computations and algorithms; and, 5) a new international normative sample, which includes 640 individuals represented across 13 countries (Meyer et al., 2012).

After receiving direct formalized training and supervision, from a practicing clinical psychologist in the administration, scoring, and interpretation of the Rorschach protocol, and after several training sessions with neurotypical individuals, I administered the Rorschach, specifically the R-PAS (2012) version, to all study participants. Meyer et al. (2012) stated that after 2 to 3 Rorschach administrations, including scoring and interpretation, the assessor has sufficiently been trained to proceed to independent administration. Thus, prior to the start of the present study, I administered, scored and interpreted 5 separate Rorschach protocols to individuals without language impairment.

The Rorschach consists of 10 8.5 x 11 inch inkblot design cards: 5 black and gray ink on white background, 2 black, gray and red ink on white background, and 3 multicolored ink blots on white background. The Rorschach involves three main steps divided formally in two *phases*. The first step, activated *within* the Response Phase, has been commonly referred to as the "perceptual stage," at which the individual perceives the inkblot and generates a number of possibilities that reflect the whole or parts of the blot (refer to Appendix A) (Exner, 1978). The second step, the *Response Phase* (Phase I), involves a rank-ordering and eventual choosing and verbalization of all possible responses (2 to 3 different responses) per card, which Exner, like Rorschach, thought were influenced by a person's unconscious motivations, drives, needs, wants, personality, situational and contextual factors (Exner, 1978; Gold, 1987).

The third step, the *Clarification Phase* (Phase II), involves a verbal description of the inkblot, in terms of where the response is seen on the blot (location), how much of the blot is seen, what the blot looks like as best can be described (e.g., determinant features like, content, form, color) and, how popular the response is determined to be compared to the normed population. These popular responses are defined as objects seen across each of the ten cards with the highest frequency in a normed population (Meyer et al., 2012). There are 13 popular responses across 10 cards, and have been operationalized as "objects reported by at least one of every three people" (Meyer et al., 2012, p. 43). Popular responses involve seeing what most others see on every given card (R-PAS, 2012). For example, on Card V, most people report seeing a bat. In these ways, the Rorschach may be considered a kind of neuropsychological assessment approach, that measures how a person can take an ambiguous and abstract image, and through the integration of cognitive functions, problem-solving skills, and concept formation, communicate a coherent response (Perry et al., 1996).

Confrontation Naming Task

Participants were administered a confrontation naming task, consisting of a series of 10 black and white line drawings (Appendix B.) that were chosen from a search of images via the internet. These line drawings reflected images of the most popular responses for each of the 10 Rorschach cards. The purpose of this task was to determine if participants could accurately retrieve the word for the most common responses provided by the normed group (based on the scores in the R-PAS manual). For example, on Card V, most people report seeing a bat. Therefore, for the Confrontation Naming task, I showed participants a card with a black and white line drawing of a bat and asked participants to name the item. I conducted this task with 6 of 8 of the study participants because it was added to the protocol after the first 2 participants had already been enrolled.

Scoring and Interpretation

Western Aphasia Battery Revised (WAB-R)

The Aphasia Quotient (AQ) score is a measure of language ability and reflects the severity of language impairment in aphasia (Kertesz, 2006). The AQ is comprised of 10 weighted subtests that form domains and provide an overall composite score (Kertesz, 2006). The maximum score for AQ is 100 with 93.8 or above considered normal; a higher score is associated with less severe language deficit (Kertesz, 2006). The WAB-R AQ portion also provides an aphasia classification type based on scores in each domain. After producing individual scores, the type of aphasia is determined according to prescribed ranges for each subcategory. For example, for a Wernicke's classification, an individual would have to achieve scores between 5-10 on fluency, 0-6.9 on comprehension, 0-7.9 for repetition, and 0-9 for naming (Kertesz, 2006).

The Cognitive Linguistic Quick Test (CLQT)

The CLQT is comprised of 10 subtests which are weighted differently in the calculation of 5 domain scores Except for the clock drawing task, a score on one of the 9 weighted subtests adds to a severity rating for one or more of the 5 domains. (Helm-Estabrooks, 2001). Individual subtest scores can fall into multiple domains. The severity ratings are mild, moderate, severe and within normal limits (Helm-Estabrooks, 2001). A normed severity rating table for individuals aged between 18-69 years is provided in Appendix B. I calculated all subtest scores and severity ratings, however, only the language and executive functions domains were used in the analyses.

The Rorschach

A detailed coding system is outlined in the R-PAS manual to limit the amount of subjectivity in the scoring and interpretation of the Rorschach (Meyer et al., 2012). The core of scoring includes coding the response according to all of the blot features that have contributed to the formation of the response (refer to Appendix A). Two steps were involved in the coding process which allowed for scoring and interpretation of the Rorschach protocol. The first step involved entering data into the computerized scoring system (R-PAS) and coding the following features: the actual (verbatim) responses including documentation of the location of the response with specific attention to whether the response was reflective of the whole blot or a specific detailed area of the blot; the orientation of the card (e.g., if they turned the card to the right); and, determining whether the response was a popular response (i.e., objects seen with the highest frequency). For example, if an individual held Card V upright without turning and stated that his perception of the whole inkblot reminded him of a “bat”, the response BAT would be coded as W for whole blot (location) and P for a popular response (frequency). If, for example, in a second response, the individual turned the card to the left and identified a specific area of the blot as looking like a “dog,” depending on the commonness (how common that specific area is identified as looking as an animal and specifically a dog) of that detail, the response would be coded as *D* for detail along with a number specifying the exact location on the blot, followed by a direction symbol (*< or >)* identifying that the person turned it to the left or right in the process of forming this second response. Depending on the commonness of the detail and location, the response may or may not be a popular response.

Location, as alluded to earlier, is also a critical aspect of the Rorschach, specifically indicating whether one’s response captured the whole image or some detailed aspect of it. Location is subdivided into two categories: whole object or some detailed aspect of the object. For example, on the one hand what the person sees can include the whole object denoted by *W* as in the first example, and on the other hand, it can include a specific detail of the blot denoted by *D*, as in the second example (refer to Appendix A. for coding categories).

The second step in the scoring process involved coding the quality of the content provided during the clarification phase (Phase II) (refer to Figure 1.). The coding is systematic and follows manualized instructions from the R-PAS describing when and how to code content (Meyer et al., 2012). The responses from the clarification phase were scored according to the following categories: content (type, or category of object reported, such as human or animal); determinants or features of the blot (e.g., features like color, shape, texture), cognitive codes or illogical thought processes (e.g., unusual verbalizations, etc.); and thematic codes which identify meaningful content features (e.g., aggressive movement) (Meyer, 2012). Once codes were entered into the computerized scoring system, a structural summary of the participant's assessment results were computed and an output was provided and organized according to 10 summary sections. The 10 summary sections included: 1) response and administration (number of responses, number of prompts and pulls), 2) location (number of whole or detailed areas), 3) space (space reversal or integration), 4) content (category of the object), 5) object qualities (synthesis vs. vagueness of explaining the blot), 6) form quality and popularity of response, 7) determinants (features of the blot), 8) cognitive codes (illogical thought verbalizations), (9) thematic codes, and, 10) other calculations, such as complexity of response and thoughts patterns (Meyer et al., 2012).

For all categories within the structural summary, there are 10 summary sections with counts and calculations provided for each section. Counts are sums derived from the total number of codes per category (e.g., the number of whole responses across 10 blots) (Meyer et al., 2012). Calculations involve complex sums, such as, differences scores, standard deviations, percentages, and proportions (Meyer, 2012). Individual responses are compared to normed referenced data in which clinical comparisons can be made. Interpretations of the Rorschach protocol involve behavioral factors related to the response phase, for example interpreting how many times the individual turned the card and how many times he or she needed to be prompted to respond (Meyer et al., 2012). Interpretations are also based around aspects of cognitive processing (e.g., the simplicity and complexity of a response, "thought and perceptual process" or the number and type of illogical verbalizations) (Meyer et al., 2012).

Confrontation Naming Task

Performance was scored by adding the number of accurate responses (i.e., correctly identifying the image representing a popular Rorschach response).

Data Collection and Procedures

Diagram 1 details the steps and procedures followed in the present study. Consent was obtained from all study participants prior to the start of all study activities. Participants completed one 2-3 hour individual session that included administration of the study assessments described above. Demographic information and details regarding their diagnosis, level of impairment, and prior speech and language assessment (particularly performance scores for the WAB-R) were accessed through a speech and language pathology outpatient clinic at Duquesne University. Sessions occurred at an outpatient University Speech Language Pathology Clinic and at participant's homes. Except for the WAB-R AQ, all assessments (i.e., the Rorschach and 2 of the CLQT tests) were administered and scored by me. Except for the first two study participants, six of the participants received twenty dollars for their participation in the study; this was also an added feature of the revised study protocol.

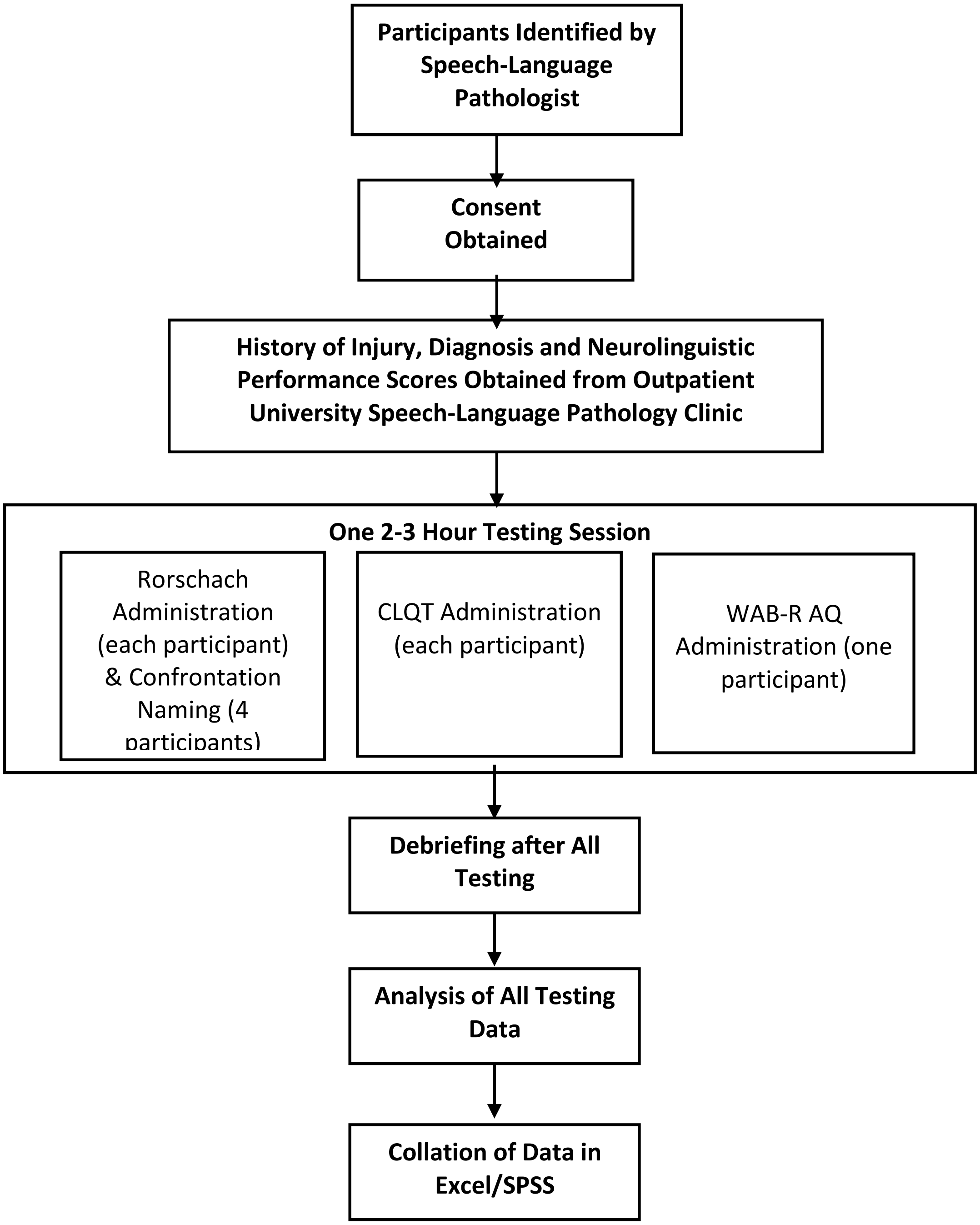
Participants were identified by a speech-language pathologist familiar with the study and the criteria for study inclusion. Following consent, participants were introduced to the Rorschach, asked questions about their history taking the Rorschach and explained the general purpose and instructions around current administration of the Rorschach assessment. I then administered the R-PAS (2012) version of the Rorschach. During Phase I, the response phase of the Rorschach administration, I presented participants with 10 individual inkblot cards and asked, "What might this be?" Participants were asked to provide between two to three different responses for each inkblot card presented. If participants did not provide at least 2 to 3 different responses, I probed for additional responses. I recorded verbatim all responses and behaviors (e.g., card turning, number of times probed) during the administration of the Rorschach on paper.

Following the receipt of all responses across all 10 cards, Phase II, the clarification Phase, of Rorschach was administered. In Phase II, the clarification phase, administration consisted of me reviewing responses provided across all 10 cards, asking participants to show the location of the response and to provide a detailed description of their response. The descriptions provided in Phase II are critical, as they not only provide greater clarity around what participants saw but are also needed for coding the Rorschach protocol, which is necessary for scoring and interpretation. More specifically, the descriptions of the responses should provide information about the content and contextual features of what was seen by the participant. For example, if the participant stated they saw an "elephant" on one of the cards in the Response Phase (Phase I), questions in Phase II would involve more specific queries about where on the blot the participant saw the elephant, and what specific features of the blot made it look like an elephant (e.g., gray color, form of the blot). Questions the examiner might ask include: "You said that this part of the blot looked like the trunk of the elephant because it had rough edges – can you tell me how you see rough edges?" The average amount of time it took all 8 participants to complete the Rorschach was 77.5 minutes (range = SD = 21.8). This range is similar to the time it takes people without language impairments to complete the Rorschach (between 60 -120 minutes).

Following the administration of the Rorschach, participants were presented with a confrontation naming task. I handed each participant a series of 10 black and white line drawings and asked them: "What is this?" (Figure 1). Participants were not timed (however, it often took up to approximately three minutes to administer) and all correct and incorrect responses were recorded verbatim. The last part of the session included the administration of the CLQT. The CLQT took up to 40 minutes to complete across 6 of the study participants; 1

participant did not complete the CLQT due to time constraints and could not be reached at a later date. The second participant was administered the CLQT at a separate time by another examiner. Therefore, the full CLQT was administered to a total of 7 participants (see instrument section for specific subtest details) and all responses were recorded on a standardized protocol form. The CLQT was administered according to standardized administration instructions and was scored conforming to the procedures stipulated in the test manual. A full debriefing of the study including any emotional or psychological content that may have arisen as a result of the assessment materials used occurred immediately after all assessments were administered. Participants will be receiving feedback about aggregate study data following the defense of this dissertation.

Figure 1. Flow Chart of Procedures and Data Collection



Data Analysis

All data were compiled from the instruments (CLQT and Rorschach) conducted across one session, along with instruments conducted prior to the start of the study (i.e., WAB-R AQ). There were three steps involved in analyzing the data. First, (1) demographic information and other data related to type and severity of the participants' aphasia were used to describe the sample. Second, (2) frequencies and descriptive statistical analysis were used to describe the performance of the sample on neurolinguistic measures, specifically scores from the CLQT executive function and language domains, and performance on the confrontation naming task. Using the same descriptive analyses, performance on Rorschach variables, specifically, blot characteristics, cognitive processing, and thought and perception scores were used to describe the sample and compare to normative data, from an international population of 640 adults, available from the R-PAS system. Third, (3) correlational analyses were used to explore the relationships among several Rorschach variables, the WAB-R-AQ score, and the CLQT language domain score. All statistical analyses were completed using Excel and SPSS 24.0.

CHAPTER FIVE

RESULTS

Review of Study Purpose and Goals

The purpose of this dissertation project was to add to the knowledge base on the utility of Rorschach assessment in a neurologically impaired population. It seeks to explore the value of the Rorschach as a measure that describes a different kind of process than commonly assessed by conventional tests. Specifically, this project seeks to explore how the ambiguous nature of Rorschach inkblots could be leveraged together with traditional neuropsychological and psycholinguistic measures to provide insight into the relationship between perception and language – a multi-method approach to assessment in this particular population. As such, the findings from this project may inform both clinical applications and basic science questions.

The study aims are two-fold. The first aim is to gain insight into how the ambiguous/abstract and open-ended nature of the Rorschach inkblot can be leveraged to investigate questions about relations between language, perception, and psychological process in individuals with aphasia. Specifically, the project is interested in whether language impairment impacts perceptual/thought process, responses to images (Rorschach) and, quality of associations made in people with aphasia. The second aim is to explore if and how the combined application of objective and self-report/projective assessment techniques may contribute to the understanding of the individual living with aphasia.

The research questions posed in the dissertation were exploratory and non-directional in nature (i.e., there are no predetermined implications or directional hypotheses). A small-N case study design employing pre-experimental quantitative analysis was used to describe variables from both the neurolinguistic measures and the Rorschach.

Sample Demographic Data

The present study comprises a sample of eight English-speaking adults (seven Caucasian, one African-American). All participants were right-handed. The mean age of study participants was 55 years (SD=7.3), and all had completed post-secondary education with five participants obtaining a college degree. All participants acquired aphasia as a consequence of stroke, the mean time post-stroke was 108 months (n=6) (SD=56.4); two participants were left out of some analyses as they had incomplete information. Data on type of stroke were not provided for participants. All participants had left-sided cerebral hemispheric damage. The sample included five fluent and three non-fluent individuals with aphasia; these broad categories are described in detail in Chapter 2 and summarized in Table 1. Refer to Table 2 for a summary of demographic data.

Table 2. Demographic Data

Type of Aphasia	Age (years)				Months Post-Stroke			
	n	Mean	SD	Min. – Max. (Range)	n	Mean	SD	Min. – Max. (Range)
Fluent (Conduction and Anomic	5	58.2	5.2	53 – 67 (14)	4	122	69.8	60 – 183 (123)
Non-Fluent (Broca's)	3	50.3	8.6	41 – 58 (17)	2	93.5	14.8	83-104 (21)
Whole Sample	8	55.2	7.3	41 – 67 (26)	6	112.5	56.4	60-183 (123)

Descriptive Data on Neurolinguistic Measures

Data on conventional neurolinguistic measures, specifically the WAB-R AQ subtests scores and the CLQT Language and Function Domain scores were used to identify severity of language impairment in the participants.

Participants were diagnosed with varying types of aphasia according to their WAB-R-AQ scores. The WAB-R-AQ score is a summary score derived from four verbal and auditory comprehension subtests, including spontaneous speech, auditory verbal comprehension, repetition, naming, and word finding. The scores on these subtests are used to distinguish between types of aphasia. The maximum AQ score is 100; the higher the score the less severe the language impairment. An AQ score of 93.8 or above represents normal language (Kertsz, 1982). The mean AQ score for the sample was 76.25 (SD = 17.76) (refer to Table 3). Even though correlational analyses will compare data based on total group scores, there were some differences across dimensions of neurolinguistic measures, noted between those diagnosed with fluent and those with non-fluent aphasia types. Specifically, the mean AQ score was lower for individuals diagnosed with greater language impairment, the non-fluent aphasia group, as compared to the fluent aphasia group who had higher scores or less impairment in language function. Results also revealed that those in the non-fluent group had notably lower spontaneous speech and repetition scores compared to those with fluent aphasia. However, this was expected, given that those with non-fluent aphasia often have more breaks in their continuous flow of speech and have difficulty with repetition, unless the task is limited to single words. The scores across subtests that determine the WAB-R-AQ score might also have been lower for the fluent aphasia group, as one of the participants in this group had been diagnosed with Conduction aphasia, a type of aphasia marked with greater difficulty with repetition.

Table 3. WAB-R-AQ Score Comparisons

Type of Aphasia	***WAB-R-AQ Score***				***Spontaneous Speech (Max. score = 20)***				***Auditory Comprehension (Max score = 10)***				***Repetition (Max. score = 10)***				***Name/Word Finding (Max. score = 10)***			
	n	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***
Fluent (Conduction and Anomic	5	86.3	15.2	60-97	4	18	1.2	17-19	4	9.4	0.7	8.3-10	4	8.5	2.0	5.6-10	4	8.9	0.8	8.2-9.7
Non-Fluent (Broca's)	3	60.6	4.2	57-65	3	12	2	10-14	3	7.4	0.2	7.1-7.6	3	4.5	0.3	4.1-4.8	3	6.3	0.5	5.9-7
Whole Sample	8	76.2	17.7	57-97	7	15.4	3.5	10-19	7	8.5	1.2	7.1-10	7	6.7	2.5	4.1-10	7	7.8	1.5	5.9-9.7

The CLQT was also administered in the present study. The CLQT describes a person's cognitive and linguistic strengths and weaknesses based on five domains, which include: attention, memory, language, executive function, and visuospatial skills. Two domains, language and executive function, were included in the present analyses. However, the executive function domain score was only used to describe any possible differences and similarities within the sample. Severity ratings (composite scores) are provided for each domain and range between mild, moderate, severe, and within normal limits (WNL) (refer to Appendix B). The lower the score received, the more severe the impairment in that specific domain. Participants were excluded from the analyses if they had incomplete data on measures; thereby lowering the *n* across some variables.

In the present study, severity ratings were compared between individuals with fluent and non-fluent aphasia types as well as within the whole sample. Results revealed that participants with fluent aphasia (x = 26.6, n=5) obtained a mild severity rating of language function compared to those in the non-fluent group (x=15.5, n=2) who received a severe language function rating (refer to Table 4). This result is consistent with language function scores obtained on the WAB-R AQ measure. Overall, the group mean rating for language function was 23.43 (out of 28) (n = 7) placing the group in the moderate severity range. For the executive functions domain, the whole group obtained a mild severity rating (x = 23.14, n = 7). However, there were also small differences in severity on scores attained on the executive function domain, specifically, participants in the fluent aphasia group (x = 24.6, n=5) had milder severity ratings than compared to the non-fluent aphasia group (x=19.5, n=2).

Overall, results for the neurolinguistic measures revealed that language function was mildly to moderately impaired in study participants. Executive function was also noted to range from normal to mildly impaired in the fluent and non-fluent aphasia groups. However, because some of the executive functioning tasks also included a verbal component, cognitive scores might be lower than actual cognitive ability due to impaired verbal output.

Table 4. CLQT Severity Ratings Scores

Type of Aphasia	***CLQT Language Domain (Mild, Moderate, Severe, Within Normal Limits)****				***CLQT Executive Functions Domain (Mild, Moderate, Severe, Within Normal Limits)*****			
	n	***Mean***	***SD***	***Min.-Max. (Range)***	***n***	***Mean***	***SD***	***Min.-Max. (Range)***
Fluent (Conduction and Anomic	5	26.6	3.9	21-30 (9)	5	24.6	3.8	20-30 (10)
Non-Fluent (Broca's)	2	15.5	0.7	15-16 (1)	2	19.5	2.1	18-21 (3)
Whole Sample	7	23.4	6.2	15-30 (15)	7	23.1	4.1	18-30 (12)

*Language – Mild (28-25), Moderate (24-21), Severe (20-0), WNL (37-29)

**Executive Functions – Mild (23-20), Moderate (19-16), Severe (15-0), WNL (40-24)

Descriptive Data on Rorschach Variables

Three questions at the core of the present study were addressed using descriptive analysis of Rorschach assessment results from study participants. The first question posed by the present study was whether individuals with mild to moderate aphasia could produce scoreable responses on the Rorschach using the R-PAS system. The second question asked whether responses from people with aphasia on Rorschach cards differed from those in norms derived from the neurotypical population. The third question asked whether there were any patterns in language impairment that could be identified in study participants and whether there were particular differences between aphasia group types (fluent and non-fluent). In other words, do people with different patterns of language impairment perform differently on the Rorschach? I researcher explored possible differences and patterns in study participants and between aphasia type groups through examination of language errors (e.g., distorted verbalizations on Rorschach cards), use and restriction of words (e.g., unpopular and simplicity in responses), and responses with limited detail (e.g., vague responses).

To explore these questions, counts (sums derived from counting the specific number of responses within a code) and calculations which produce a structural summary of test results, were generated from Phase I and Phase-II codes and entered, by the evaluator, into the R-PAS scoring system (refer to Appendix C; Meyer et al., 2013). Phase I, the *Response Phase*, refers to the initial response, in which the person verbalizes what he or she sees on the blot. That is the examiner prompts the person to produce between 2 to 3 different responses per card. Phase II, the *Clarification Phase*, involves a verbal description of the inkblot. The examiner probes for more information about where the response is seen on the blot (location) and asks the person to provide greater detail about how they saw what they saw (as best can be described) (refer to Methods section).

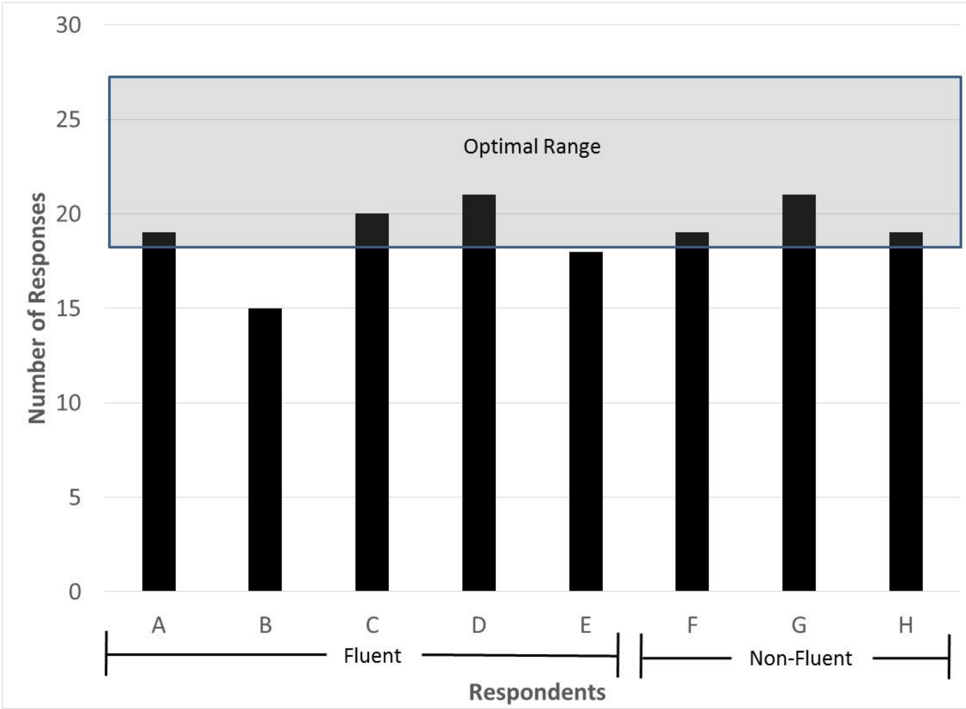
I transformed the counts and calculations into standard scores (SS) via the R-PAS. The SS indicate the position of a raw score relative to the mean of the reference group using the standard deviation as a standard for comparison. SS are used to describe how sample participants performed across key variables. Clinically, SS are helpful because they communicate how different a person's response is from the normal population. With respect to the interpretation of the Rorschach, SS have a mean of 100 and a SD of 15 for all Rorschach variables. Therefore, performance of the present study's participants was compared to these standardized scores (i.e., normalized Rorschach scores from a neurotypical population).

Blot characteristics

I considered the number of responses, the number of times I had to ask for an additional response (prompt) or remove a card (pull) (as a result of too many responses), the number of times the card was rotated (card orientation), and the location of the responses (whole versus detail of blot) across all 10 cards to determine whether study participants produced scoreable responses. Data revealed that all participants produced a mean of 19 responses (SD=1.9) across 10 cards, resulting in scoreable Rorschach protocols for 8 participants. Of the participants producing scoreable protocols, the lowest number of responses was 15 and the highest was 21 which is represented in Figure 2. Seven of eight study participants provided 18 or more responses; meeting response records that were considered in the optimum range. Meyer et al. (2012) assert that the optimum number of responses for the Rorschach is between 18-27 responses. The reason for this optimum number of responses, is because shorter (fewer responses to Rorschach cards) Rorschach protocols may be more tenuous in conclusions made and may miss or underestimate salient personality and cognitive features of the person because of reduced variability in which to compare responses. Across study participants, word finding problems may have contributed to difficulties in producing sufficiently numerous (i.e., two to three responses per card) and descriptive responses to each of the 10 cards. A similar amount of responses was produced by individuals with fluent aphasia (x=18.6, SD=2.3) and those with non-fluent aphasia (x= 19.6, SD=1.1) (Figure 2). Participant nine did not produce a scoreable Rorschach protocol as the responses he provided were perseverative or composed mostly of non-words. As a result his data was excluded from all further testing and subsequent analyses.

The number of times the evaluator had to prompt participants for additional responses or pull the Rorschach cards were also recorded and analyzed. The number of times the evaluator had to prompt (x=93, SD=32.3) for an additional response or pull (x=82, SD=26) after receiving more than the required amount were fewer than the average for the normal population. In terms of how participants organized information to produce a response, more responses were descriptive of a specific common or frequently identified detail (D) (mean percentage=62%) compared to the whole (W) blot (mean percentage=24%) or an unusual/infrequently identified detail (Dd) (mean percentage =14%) of the blot. Most interestingly, when coding for card turning, which is the number of times a person rotates the card and then produces a response, study participants rotated the card more often than the normed population (mean of the normalized card turning scores, x=106, SD=16.1). Further, consideration of card turning behavior within the group showing that participants in the non-fluent aphasia group had a higher mean number of card turns (x= 110, SD=14.2) compared to the participants in the fluent aphasia group (x=103, SD=18.2). However, the variability within each group suggests that this difference wasn't meaningful. Similarly, these scores were not meaningfully different than the normal population. Further investigation of individual variability across participants revealed that some respondents turned the card more than a standard deviation above the normed mean.

Figure 2. Number of responses for study participants.



Object Qualities of the Rorschach Blot

Object or form quality refers to how well the individual describes the blot outline or form and how this description fits that area of the inkblot. The responses provided fall into five possible categories:

1. Vague – responses that are diffuse and lack specific detail about the form of the blot and how it fits the area of the inkblot (e.g., clouds, abstract art)
2. Ordinary – common, easily seen and explained forms of the blot, that are typically seen by others
3. Unusual – uncommon responses, not easily seen, and not typically seen by others
4. Minus – a distorted or unrealistic response which describes the form, not typically seen by others

5. Popular – frequently seen responses in which most people (1 in 3) see the same form of the blot

Study participants provided numerous vague responses (x=119, SD=21.8), that were 1 standard deviation greater than reported by those in the normal population suggesting that they had some difficulty with providing enough specific detail about the blot (Figure 3). Vague responses were greater for study participants who were in the non-fluent aphasia group (x=143, SD=8.6) than those in the fluent aphasia group (x =104, SD =10.7). Participants in the non-fluent aphasia group produced vague responses that were more than two standard deviations compared to that reported in the normal population. Other blot characteristics like, commonly (x=91, SD=20.1) (Figure 4) and unusually (x=84, SD=12) (Figure 5) seen blot forms were similarly distributed in both study participants and the normal population. However, participants in the non-fluent group had slightly less (not significant) ordinary, unusual, and minus responses compared to both people in the fluent aphasia group and the normed population (refer to Table 5 for further breakdown of blot characteristic data).

Across all of the form quality responses, form quality minus (FQ-) (Figure 6) responses were the most frequently coded for the entire participant group (x=102, SD=9.0). Additionally, means for individuals in the fluent aphasia group (x=106, SD=5.1) were higher than the means for the non-fluent aphasia group (x=97, SD=12.7). Form quality minus responses demonstrate some perceptual distortion or an indication that a person misinterprets an object. For example, a person may report seeing a spider for an object that looks like a dog to most people. This distortion with respect to the current participants may relate to their impaired language function. That is, participants' responses may be less due to their perception and instead may be consequence of their impoverished language function.

The mean number of popular responses (x=99, SD=17.9), or frequently seen responses, was comparable to the number of responses reported by the normal population (x=100, SD=15). Although, the trend seemed to be that participants in the non-fluent group (x=93, SD=23.4) had slightly fewer (not significant) popular responses than either the participants in the fluent aphasia group (x=103, SD=15.5) or the normal population (Figure 7).

Confrontation Naming Results

Four participants were also administered a confrontation naming task. Three of the participants were diagnosed with mild aphasia and the fourth with a moderate degree of aphasia. The confrontation naming task (as described in more detail in the Methods section) consisted of a series of 10 black and white pictures (Appendix D) that reflected images of the most popular responses for each of the 10 Rorschach cards (Appendix E). These popular responses are defined as objects seen across each of the 10 cards with the highest frequency in a normed population (Meyer et al., 2012) (Appendix F). Scores for this task were calculated by summing the total number of popular responses reported by four of the study participants. Results revealed that three of four study participants verbalized nine of ten common responses, and one participant named eight out of ten popular responses. For example, the most commonly reported response for Card V by most normal individuals (as reported by the R-PAS) is a bat. All four participants said *bat* when shown with a picture of a bat in the confrontation naming task. Importantly, all study participants (n=8) verbalized that they saw either a bat or some kind of popular animal when administered the Card V from the Rorschach. The results from the confrontation naming task suggests that participants could accurately retrieve the word for the most common responses provided by the normed group for each card.

Table 5. Object Qualities of the Rorschach Blot

Type of Aphasia	**Object Vagueness**				**Object Ordinary**				**Object Unusual**				**Object Minus**				**Popular**			
	n	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***
Fluent (Conduction and Anomic)	5	104	10.7	86-112	5	101	17.2	64-82	5	83	14.6	64-101	5	106	5.1	98-111	5	103	15.5	80-119
Non-Fluent (Broca's)	3	143	8.6	133-148	3	73	9.0	86-128	3	85	12.0	74-98	3	97	12.7	90-112	3	93	23.4	73-119
Whole Sample	8	119	21.8	86-148	8	91	21.0	64-128	8	84	12.8	64-101	8	102	9.0	90-112	8	99	17.9	73-119

Figure 3. Individual Scores for Object Quality of Rorschach Blot – Vagueness.

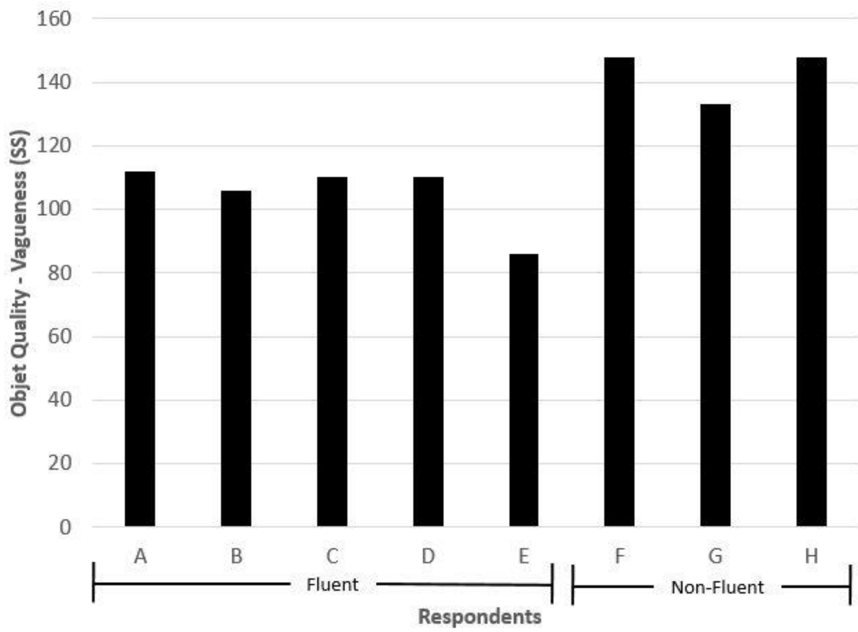


Figure 4. Individual Scores for Object Quality of Rorschach Blot - Ordinary

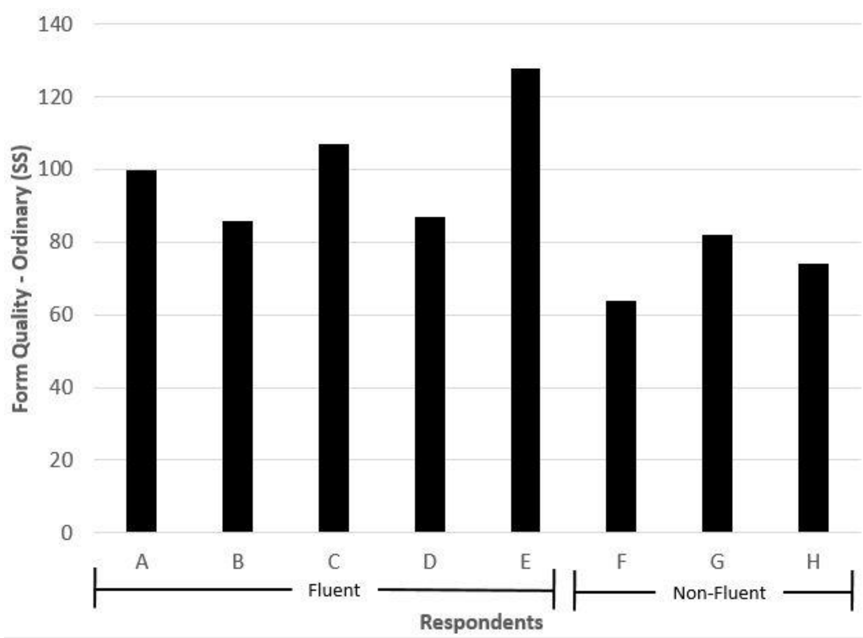


Figure 5. Individual Scores for Object Quality of Rorschach Blot – Unusual.

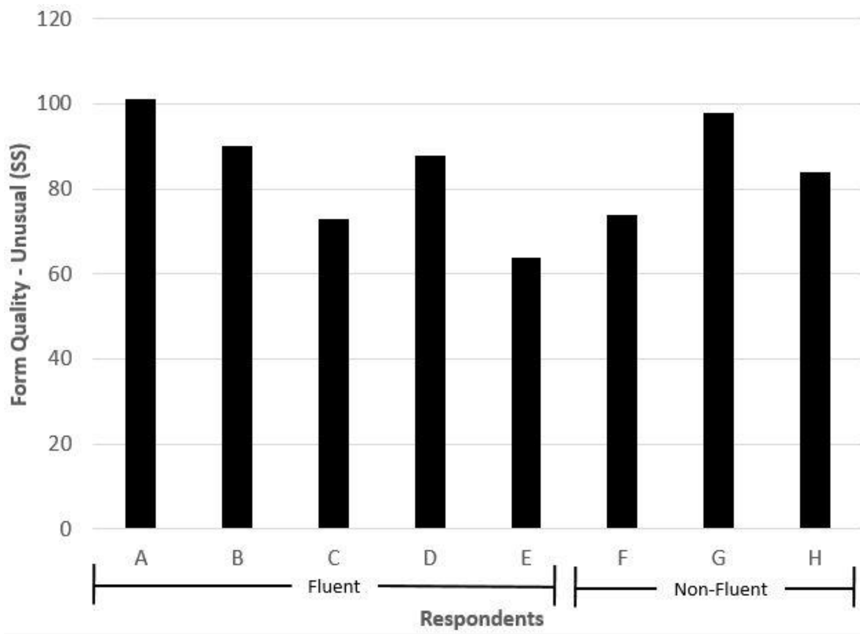


Figure 6. Individual Scores for Object Quality of Rorschach Blot – Minus

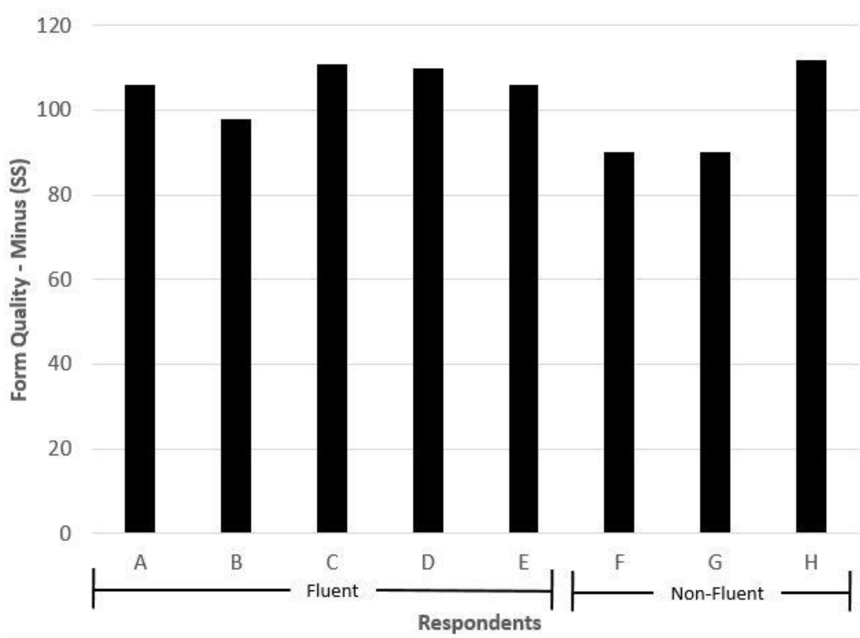
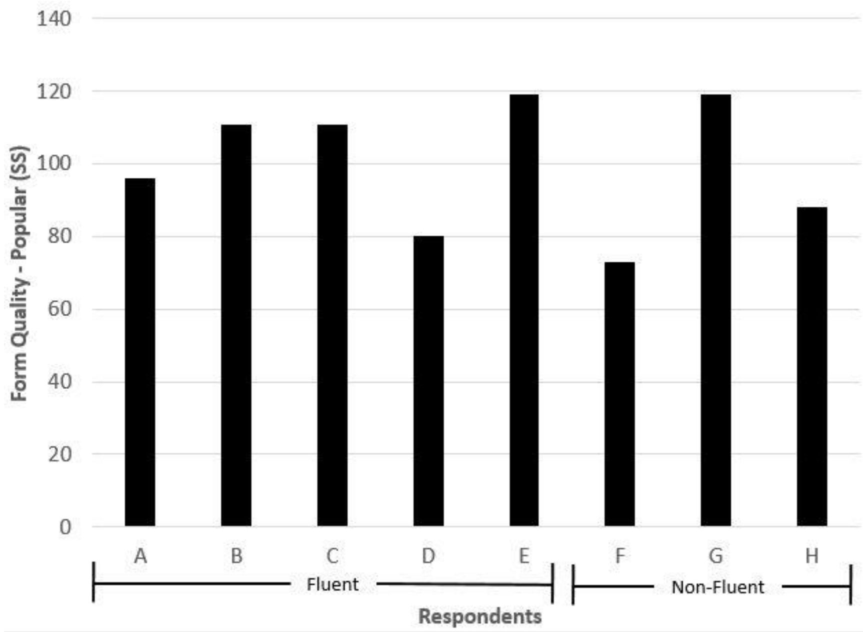


Figure 7. Individual Scores for Object Quality of Rorschach Blot – Popular.



Content and determinants

Content describes what is seen in the blot in terms of semantic categories. There are a total of 17 possible content codes (see Appendix A.). The most frequently seen content codes reported across participants were either human or animal responses. For example, in response to Card IV, one participant reported seeing a “gorilla”, whereas another participant reported seeing a “scary human figure”. The first response would be coded as an animal response, the latter as human response. As a group, participants reported seeing an equal amount of human (x=93, SD=17.3) and animal (x=93, SD=9) responses compared to the normed population.

Determinants or characteristics of the blot were also explored. Determinants are the characteristics attributed to the blot that *determine* what people see. There are six major categories (Form, Reflections, Color, Movement, Texture, and Shading) and a total of 14 possible determinants, including: Form (F), Form Dimension (FD), Human Movement (M), Animal Movement (FM), Active Movement (a), Passive Movement (p), Chromatic Color (C), Achromatic Color (C'), Texture (T), Vista or Dimensionality (V), Diffuse Shading (Y), Reflection (r), and Blends (B) that can be coded from the responses provided by participants (refer to Appendix A.). Movement and Color responses are the most commonly referenced determinants across the normal population (Meyer et al., 2012). Overall, participants reported less human movement (x=86, SD=11.5), animal movement (x=96, SD=13), and color (x=97, SD=6.7) compared to the normal population, but scores were well within 1 SD of norms. A similar pattern of responding was reported across participants with fluent aphasia and individuals with non-fluent aphasia. Pure form is coded for responses in which form is the only characteristic or determinant reported. Pure form responses reflect a simplification of the blot, and a lack of or failing to see the other determinant possibilities within the blot. Across the whole group, pure form responses were comparable to the normed population (x=101, SD=8.2). Participants in the non-fluent group (x=106, SD=8.0) had slightly more pure responses compared to the fluent group (x=98, SD=7.7), however, neither of the groups demonstrated performance differing by more than one standard deviation from the normal population.

Responses that included multiple blot characteristics, referred to as Blend responses, were also explored. Blend is a code given when more than one determinant is recorded. For example, someone may report seeing human movement active (notation is "M" for movement and "A" for active) and also a color (notation is "C" for color) response (notation is "MA, C"). Blends are thought to reflect perceptual sensitivity and complexity in cognitive processing. See the Discussion section for further detail.) Blend responses were more than 1 standard deviation lower for the whole participant group (x=77, SD=5.6) as compared to the normal population.

Blend responses were also equally distributed across individuals with fluent aphasia (x=77, SD=6.0) and those with non-fluent aphasia (x=76, SD=6.3). On average, participants in the present study identified only one determinant or blot characteristic or confined their responses only to the form or contours of the blot.

Cognitive processing and thought-perception

Cognitive processing and thought-perception variables were explored. Cognitive processing variables assess one's ability to organize and synthesize information about the blot. Thought-perception variables assess distortions of thought. There are a total of 6 different cognitive variables, referred to as *special scores*, which characterize several kinds of unusual verbalizations including: deviant verbalization (DV), deviant response (DR), incompatible (INCOM), fabulized (FAB), peculiar (PEC), and contaminated (CONTAM). (Refer to Appendix A. for more detailed description of these categories.) These cognitive variables or special scores are then rated as a Level 1 or Level 2, to characterize the level of bizarreness, with level 2 ratings indicating a more bizarre response. An individual can receive more than one cognitive or special score. For example, "two green polar bears climbing a waterfall", contains two cognitive or special scores; an INCOM1, "two green polar bears", and FAB2, "climbing up a waterfall".

The R-PAS interpretation of cognitive processing reflects abilities related to task engagement, perceptual sensitivity, ability to synthesize abstract information, and the ability to articulate ideas. Cognitive processing is also thought to be associated with psychological resilience, sophisticated processing, and flexible approaches to coping and thinking (Meyer et al., 2012). Cognitive processing is broken down into two variables: 1) the cognitive processing complexity score and 2) the cognitive processing simplicity score. Cognitive processing is an aggregate score based on combining several response items from the Rorschach protocol including, weighted sums of location, space, object qualities, content, and determinants. These weighted quantities are summed across all responses to produce an overall cognitive processing score. Refer to Table 6 for further breakdown of processing results.

Table 6. Cognitive Processing and Thought-Perception of the Rorschach Blot

Type of Aphasia	**Cognitive Processing Complexity**				**Cognitive Processing Simplicity**				**Perception & Thinking (EII)**				**Perception & Thinking Severe Cognitive**			
	n	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***	***n***	***Mean***	***SD***	***Min.-Max.***
Fluent (Conduction and Anomic	5	70	5.3	61-75	5	107	6.6	99-113	5	97	16.1	82-120	5	103	13.6	94-123
Non-Fluent (Broca's)	3	60	4.0	56-63	3	114	7.7	106-121	3	106	15.5	92-123	3	126	15.8	113-144
Whole Sample	8	66	6.6	56-75	8	110	7.5	99-121	8	100	15.5	82-123	8	112	17.8	94-144

Cognitive complexity/simplicity scores reflect responses describing movement, color, dimensionality, shading, depth, and symmetry features (Mihura et al., 2013). Results from the present study revealed that study participants were one and a half standard deviations lower than the normal population with regard to the cognitive processing complexity score (x=66, SD=6.6) (

Figure 8 8). The complexity score was lower for individuals with non-fluent aphasia (x=60, SD=4.0) than compared to those with fluent aphasia (x=70, SD=5.3). These scores are well below the scores from the normal population. With regard to the cognitive processing simplicity score, the whole sample was nearly one standard deviation higher than the normal population (x=110, SD=7.5) (Figure 9). Between sub-groups of study participants, individuals with non-fluent aphasia had higher simplicity scores (x=114, SD=7.7) than compared to participants with fluent aphasia (x=107, SD=60.6). However, none of these differences exceeded one standard deviation above the mean of normal scores.

Figure 8. Individual Scores for Cognitive Processing-Complexity.

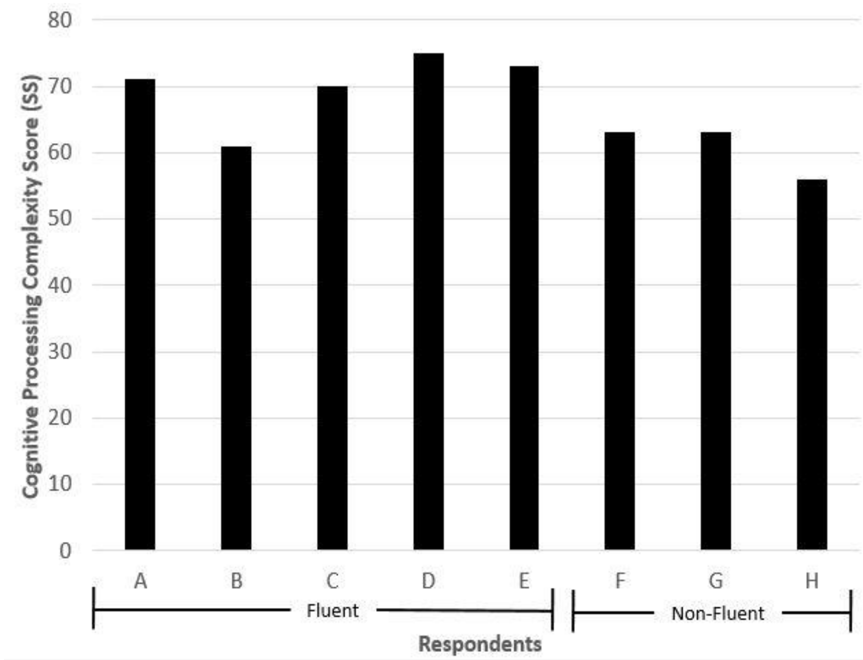
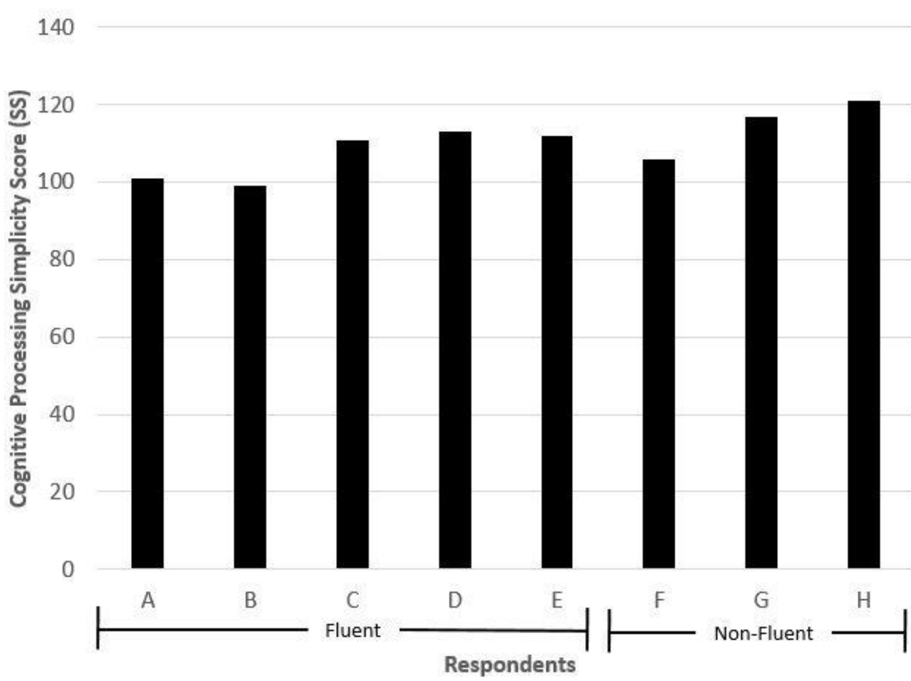


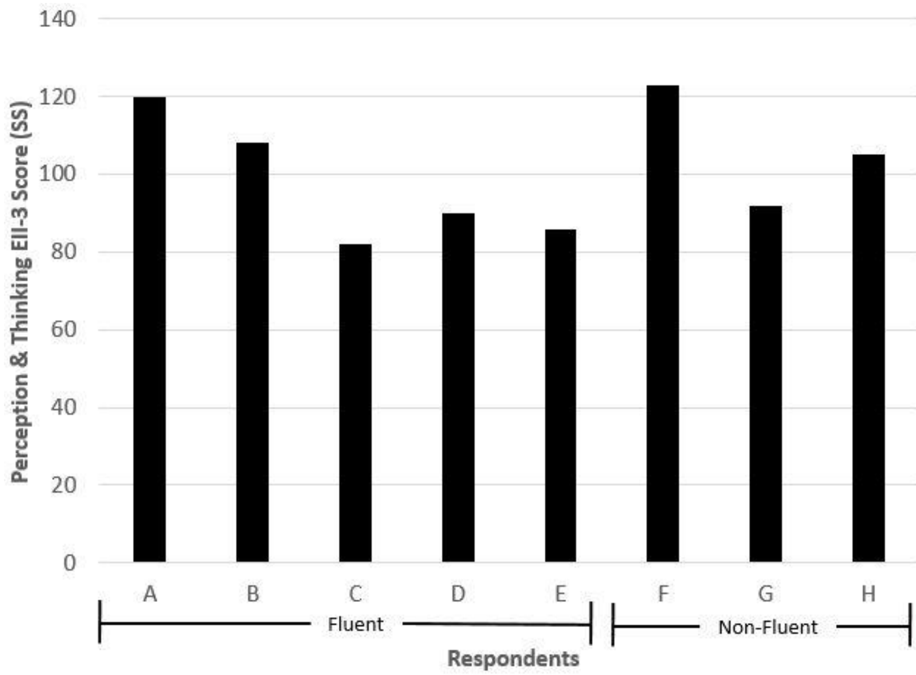
Figure 9. Individual Scores for Cognitive Processing-Simplicity.



Thought-perception variables reflect the quality of one's thinking. Problems in thinking, judgment, and perception may be reflected by thought-perception scores. As described in the paragraph above, a total of 6 different cognitive variables, referred to as *special scores*, are considered in determining thought-perception distortions. These categories include: deviant verbalization (DV), deviant response (DR), incompatible (INCOM), fabulized (FAB), peculiar (PEC), and contaminated (CONTAM) (refer to Appendix A. for more detailed description of these categories).

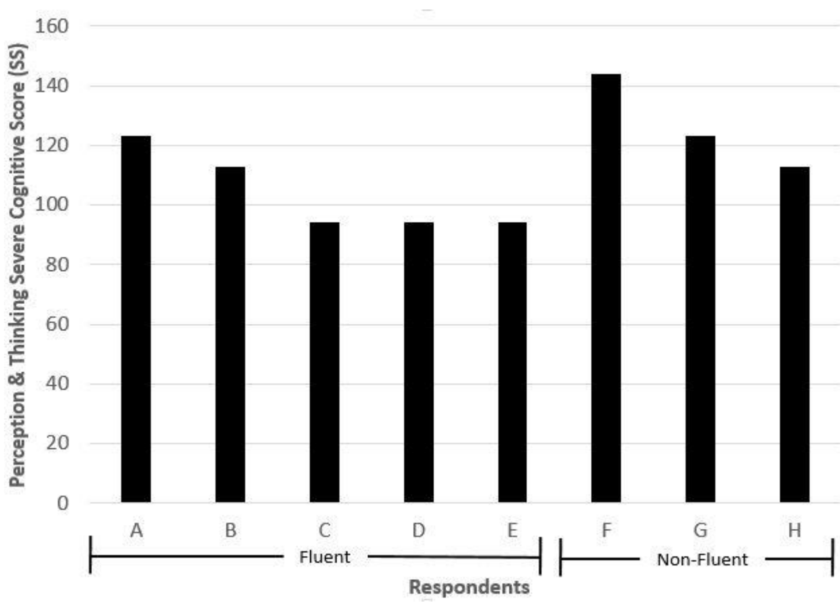
Often, thought-perception variables are used when considering severe psychopathology, like that seen in psychotic disorders (e.g., schizophrenia), where major distortions in thought processes may be present. There are two primary variables used to assess thought and perception. These include: 1) Ego Impairment Index-3 (EII-3) and 2) Severe cognitive (SevCog). The EII-3 is an aggregate score derived from weighted sums of form quality responses and responses identified with cognitive codes (e.g., deviant response). For example, if in response to card IV a person stated that he or she saw a horse with a pig's head, this would be coded as an incongruous combination (INCOM) because two images have been inappropriately merged into one. The code would then be evaluated as a level 1 or 2 response, depending on the level of bizarreness of the response (Level 2 if considered a more bizarre response). The kind of deviant response and the level of the bizarreness to the response are included in the aggregate score of the variable. The responses of study participants were comparable to that seen in the neurotypical population and in the average range (x=100, SD=15) (Figure 10). Between study sub-groups, participants with non-fluent aphasia (x=100, SD=15.5) were similar on the EII-3 to those with fluent aphasia (x=97, SD=16.1).

Figure 10. Individual Scores for Thought & Perception-EII.



The severe cognitive variable score was also explored. The severe cognitive variable is an aggregate score derived from weighted sums of responses that contain cognitive codes across all cards. This variable reflects severe disruptions in thought processes assumed to underlie severe distortions in conceptualization of content, reasoning ability, communication, and thought organization. Although study participants had slightly elevated scores on the severe cognitive measure (x=112, SD=17.8) than compared to the normal population (Figure 11), they were well within a standard deviation. The participants with non-fluent aphasia (x=126, SD=1.8) were more than one standard deviation higher than those with fluent aphasia (x=103, SD=13.6). That is, participants in the non-fluent aphasia group produced words that were categorized with some level of bizarre quality. For example, describing Card I, one participant with non-fluent aphasia reported seeing “groundhogs kissing.” Since groundhogs are animals and kissing is a human action, this response was coded as a level one deviant verbalization. Although individuals with non-fluent aphasia tended to have more severe cognitive scores, this result may be more reflective of reduced word retrieval or poor word association that reflective of a true thought distortion.

Figure 11. Individual Scores for Thought & Perception-Severe Cognitive.



Correlational Analyses

Spearman’s rank-order correlation coefficients (Spearman rho) were calculated for the following variables: the WAB-R-AQ score, CLQT Language Functions Domains Scores, the Rorschach cognitive processing simplicity, complexity scores and, the thought and perception EII and severe cognitive scores. The cognitive processing and thought perception variables were chosen for further analyses in the present study for three primary reasons:

1) they are Rorschach variables with the strongest validity (Mihura et al., 2012); 2) they are variables that are most applicable to the research questions posed in the present study, and; 3)

because there were few participants, employing correlational analyses on too many variables is cautioned, as it can lead to violations of basic statistical assumptions.

Spearman's rank-order correlation is a non-parametric alternative to the Pearson-Product Moment correlation, and is used mostly for ordinal level data. This correlation method is used to measure the strength of associations or relationship between variables. The correlation values, r_s range from -1 to +1. An r_s of +1 indicates a perfect positive relationship, while an r_s of -1 indicates a perfect negative relationship. A correlation of 0.30 to 0.50 is considered moderate. Correlations greater than 0.60 are considered high. The closer the values are to 0 the weaker the associations. Spearman rank-order correlation was used to address the following questions: do psycholinguistic and Rorschach variables share any relationship with each other? And, what can psycholinguistic measures reveal about patterns of Rorschach responses in this population? Of note, many of these correlations did not reach statistical significance and therefore they should be interpreted with caution.

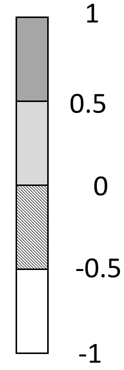
Table 7 presents the correlation results for the neurolinguistic and Rorschach variables. In a meta-analysis conducted by Mihura et al., (2013), results revealed that the Rorschach variables with the strongest support ($r > 0.33$, $p < .0001$) assess cognitive (i.e., cognitive processing indices) and perceptual reasoning processes (i.e. perceptual and thinking indices). These variables were used in the present dissertation to explore, the relationships between each other and among neurolinguisitc measures. Among the four Rorschach variables (cognitive complexity, cognitive simplicity, ego impairment index and the severe cognitive scores), results revealed that there was a weak negative relationship between the cognitive processing simplicity and complexity scores ($r_s = -0.14$, $p = 0.76$) and a moderate negative relationship between the cognitive processing complexity score and the thought and perception EII score ($r_s = -0.39$, $p =$

0.38) as well as the thought-perception severe cognitive score (r_s = -0.47, p = 0.28). This result suggests the higher the complexity and sophistication expressed in language on responses (i.e., quality of words invoked, greater detail), the lower the distortion in thought or perception.

Relationships were also explored between neurolinguistic and Rorschach variables. Results revealed that the WAB-R AQ score was positively associated with the cognitive processing complexity score (r_s = 0. 71, p = 0.07), suggesting that the more intact their language ability the better able the participants were able to describe, with increased language sophistication, the Rorschach blot. In contrast, the WAB-R AQ score was negatively related to the cognitive processing simplicity score (r_s = -0. 32, p = 0.48). The WAB-R AQ score was also strongly negatively associated with two thought and perception variables, the EII-3 (r_s = -0. 57, p = 0.18) and the severe cognitive score (r_s = -0. 86, p = 0.01). This result suggests that the greater the participant's language ability the lower their thought distortion scores. The CLQT language domain score was also shown to share a strong positive association with the Rorschach complexity score (r_s = 0. 72, p = 0.06) and a significantly strong negative association with the severe cognitive score (r_s = -0. 87, p = 0.00). Considered together, the correlations among neurolinguistic and Rorschach cognitive processing and thought and perception variables, indicate a clear and intuitive relationship between these different measures.

Table 7. Correlation matrix for neurolinguistic and Rorschach variables based on Spearman's rho

	WAB-R AQ	CLQT LFD	CPCS	CPSS	PTEII-3S	PTSCS
WAB-R AQ		.937**	.714	-.321	-.571	-.869*
CLQTLFD			.721	-.306	-.559	-.877**
CPCS				-.143	-.393	-.472
CPSS					-.250	.000
PTEII-3S						.794*
PTSCSC						



*significant relationship at p <0.05, **significant relationship at p <0.01

Abbreviations: Western Aphasia Battery-Revised Aphasia Quotient (WAB-R AQ), Cognitive Linguistic Quick Test Language Domain Function (CLQTLDF), Rorschach Cognitive Processing Complexity Score (CPCS), Rorschach Cognitive Simplicity Score (CPSS), Rorschach Perceptual & Thinking Ego-Impairment-3 Score (PTEII-3S), Rorschach Perceptual & Thinking Severe Cognitive Score (PTSCS)

Case Examples – Participant Seven

To better contextualize and unpack the Rorschach sessions and results from above, two case examples are described in detail. The first example is that of participant Seven. Participant Seven, a right-handed 52 year-old Caucasian male, with 16-years of education, was diagnosed with non-fluent Broca's aphasia, 83-months after experiencing a left-hemispheric stroke. Speech and language testing were conducted with participant seven prior to beginning the study. His subtest scores on standard measures of language function, specifically the WAB-R AQ and the CLQT are provided in Table 8 and Table 9, respectively. His overall WAB-R AQ score was 57.4, indicating moderate level of language impairment. His subtest scores on the WAB-R AQ showed difficulties on measures of spontaneous speech, auditory verbal comprehension, repetition, as well as word naming and finding. Moderately impaired language scores in these areas would indicate reduced speech production and truncated sentences, difficulty with syntax, limited word choice and difficulty producing low frequency words. Similarly, his performance on the CLQT (refer to Table 9) was also noted to be in the moderate to severe impairment range for the executive functions and the language functions domains, respectively. However, when participant Seven's executive function domain score was broken down further into two subtests (design generation and mazes) that require minimal language abilities, his scores indicated less impairment.

Table 8. WAB-R AQ scores across all participants

Type of Aphasia	WAB-R AQ Scores					
	Participant	AQ (100)	Spontaneous Speech (20)	Auditory Comprehension (10)	Repetition (10)	Naming/Word Finding (10)
Fluent	1	60.9	17	9.55	5.6	8.3
	2	83.8	17	8.3	8.4	8.2
	3	93	*n/a	*n/a	*n/a	*n/a
	4	**96.8**	**19**	**9.9**	**9.8**	**9.7**
	5	97.4	19	10	10	9.7
Non-Fluent	6	65.5	14	7.15	4.6	7
	7	**57.4**	**10**	**7.6**	**4.8**	**6.1**
	8	59	12	7.5	4.1	5.9

*n/a = (data) not available

Table 9. CLQT scores across all participants

Type of Aphasia	Participant	CLQT Severity Scores			
		CLQT Language Function Domain *(Mild, Moderate, Severe, Within Normal Limits)***	CLQT Executive Function Domain ***(Mild, Moderate, Severe, Within Normal Limits)****	CLQT Design Generation Subtest****	CLQT Mazes Subtest****
Fluent	1	21	26	5	8
	2	24	20	6	8
	3	29	22	n/a*	8
	4	**30**	**25**	**5**	**8**
	5	29	30	7	8
Non-Fluent	6	n/a*	n/a*	n/a*	n/a*
	7	**15**	**18**	**5**	**8**
	8	16	21	5	8

*n/a – data not available
**Language – Mild (28-25), Moderate (24-21), Severe (20-0), WNL (37-29)
***Executive Functions – Mild (23-20), Moderate (19-16), Severe (15-0), WNL (40-24)
**** Design Generation – Maximum score = 8, Mazes – Maximum score = 13

Participant Seven followed the Rorschach's administration instructions and produced scoreable responses across 10 cards. However, his language impairment, specifically interrupted flow of speech and word finding problems, seemed to impact his production of particular words and in depth descriptions. Even with his effortful language production, participant Seven produced 21 responses across 10 Rorschach cards, placing him in the optimum range for producing responses on the Rorschach. Related to response behavior, participant Seven reported more detailed (d) aspects of the blot compared to the whole (w) blot, and responded with more human content compared to animal content. His initial response behavior, for Phase 1, the *Responses Phase*, of the Rorschach (number of responses, card turning, location of response, and semantic labeling) was observed to be comparable to the normal population (refer to Table 10). Some of his responses were, "a butterfly", "a bat", and "a chicken". However, once I asked participant Seven, during Phase II, the *Clarification Phase*, to describe what he saw for each of the responses he provided, his explanations were sometimes vague and it appeared difficult for him to produce clear and well-articulated language to elaborate on his responses.

Table 10. Rorschach response behavior scores across all participants

<table>
<tr><th rowspan="2">Type of Aphasia</th><th colspan="6">Rorschach Response Behavior Scores (ss)*</th></tr>
<tr><th>Participant</th><th>N. of Responses</th><th>Card Turning</th><th>Location – Whole% (w)</th><th>Location D% – (d)</th></tr>
<tr><td rowspan="5">Fluent</td><td>1</td><td>19</td><td>129</td><td>98</td><td>75</td></tr>
<tr><td>2</td><td>15</td><td>104</td><td>85</td><td>75</td></tr>
<tr><td>3</td><td>20</td><td>112</td><td>93</td><td>85</td></tr>
<tr><td>4</td><td>21</td><td>86</td><td>92</td><td>85</td></tr>
<tr><td>5</td><td>18</td><td>86</td><td>107</td><td>75</td></tr>
<tr><td rowspan="3">Non-Fluent</td><td>6</td><td>19</td><td>126</td><td>90</td><td>114</td></tr>
<tr><td>7</td><td>21</td><td>98</td><td>81</td><td>85</td></tr>
<tr><td>8</td><td>19</td><td>107</td><td>98</td><td>75</td></tr>
</table>

*ss – standard scores (mean=100; SD=15)

During the Clarification Phase, he produced many responses that were considered popular or commonly seen responses; however, he description of the details (or object qualities of the blot) was limited (refer to Table 11). At times, he was observed to struggle when explaining what he saw, many times stopping himself, wincing, saying “no”, or trying to gesture a response as opposed to verbalizing it. For example, on card I he stated that he saw a “bat”. When I asked how he saw a bat he stated, “wings”, I probed further and he stated “I don’t know”. As a result, on measures of object quality, referring to how well the individual describes the blot form, he produced many vague responses (standard score (SS) =133); two standard deviations more than the normal sample. Vague responses are defined as diffuse and lack specific detail, as in the example just described. Vague responses were also consistent with the number of pure form responses he provided; responses that were restricted only to the form of the blot and no other feature. Of all responses, 87% (SS=117) of participant Seven’s verbalizations were pure form responses. For example, when I asked, “What makes this look like a leaf?” he stated, “shape, maple leaf”. When I asked “What about the leaf looks like a maple leaf?” he stated “I don’t know”. This would be an example of both a vague and pure form response, as the response is restricted to the blot form and no other content or explanation of the content is described.

Table 11. Rorschach response behavior across all participants

Type of Aphasia	Rorschach Response Behavior Scores (ss)*					
	Participant	Vagueness	Ordinary	Unusual	Minus	Popular
Fluent	1	112	100	101	106	96
	2	106	86	90	98	111
	3	110	107	73	111	111
	4	**110**	**87**	**88**	**110**	**80**
	5	86	128	64	106	119
Non-Fluent	6	148	64	74	90	73
	7	**133**	**82**	**98**	**90**	**119**
	8	148	74	84	112	88

*ss – standard scores (mean=100; SD=15)

Similarly, on measures of cognitive processing, participant Seven was more than two standard deviations below the mean on cognitive complexity and one standard deviation above the mean in cognitive simplicity (refer to Table 12). The response complexity/simplicity variables assess how well an individual can synthesize and organize the features of the blot and, infer to the real world, how well the person is able to problem solve and organize their environment (Meyer et al., 2013). Last, on thought-perception variables, which measure thought distortion, and problems in thinking and judgment, participant Seven produced some responses that were considered unusual in thought or perception, as his severe cognitive score was more than one standard deviation above the mean (SS=123). An example of a response that was deemed incompatible (INCOM), was a response to card VII, in which he described seeing a “woman” and then described that the blot looked like a “woman”, because the woman had a “face and a tail”. A tail can be considered an incompatible feature of a human and therefore was scored with a severe cognitive or thought distortion code.

Table 12. Rorschach object quality scores across all participants

Type of Aphasia	Rorschach cognitive processing and thought & perception scores (ss)*				
	Participant	Cognitive Complexity	Cognitive Simplicity	Perception & Thinking - EII	Perception & Thinking Severe Cognitive
Fluent	1	71	101	120	123
	2	61	99	108	113
	3	70	111	82	94
	4	**75**	**113**	**90**	**94**
	5	73	112	86	94
Non-Fluent	6	63	106	123	144
	7	**63**	**117**	**92**	**123**
	8	56	121	105	113

*ss – standard scores (mean=100; SD=15)

Participant Four

The second example is that of participant Four. Participant Four, a right-handed 56 year-old Caucasian female, with 16-years of education, was diagnosed with fluent Anomic aphasia, several years after experiencing a left-hemispheric stroke. Speech and language testing was conducted on participant Four prior to and during the testing portion of the present study. In contrast to participant Seven, who was considered to have a moderate level of language impairment, participant Four's performance on standard measures of language function were higher showing a mild language impairment. Her language scores on the WAB-R AQ and the CLQT are provided in Table 8 and Table 9, respectively. Her overall WAB-R AQ score was 96.8, indicating a mild level of language impairment. Her subtest scores on the WAB-R AQ were also consistently in the mild impairment range, showing good ability on measures of spontaneous speech, auditory verbal comprehension, repetition, word naming and finding (refer to Table 8). Participant Four's performance on these measures would indicate greater ability with conversational speech and ability to find and name words more readily than compared to the scores obtained for participant Seven. Similarly, her performance on the CLQT was in the mild impairment range for the executive functions and the language functions domains, respectively (refer to Table 9). As stated earlier, consideration of two nonverbal executive function subtests confirmed less severe executive function impairments than the domain score reflects.

Although participant Four seemed to understand the task, as she followed the Rorschach's administration instructions and produced scoreable responses across 10 cards, similar to participant Seven, she had some difficulty stringing together complex sentences with intact syntax and had some difficulty finding words. This impacted her ability to produce particular words and to describe what she saw in depth. Participant Four produced 21 responses across 10 Rorschach cards, placing her in the optimum range for producing responses on the Rorschach. She saw more whole (w) than detailed (d) aspects of the blot, and responded with more human content compared to animal content. Her initial response behavior, for Phase 1, the *Responses Phase,* of the Rorschach (number of responses, card turning, location of response, and semantic labeling) was observed to be comparable to the normal population, however she produced less popular responses; one standard deviation less than the normal population. Some of her responses were, a "butterfly", a "bat flying at night", and an "alligator". These responses were similar to and different than participant Seven in several notable ways. Participant Four used short sentences, for example, "a Skelton of the hip", compared to participant's Seven's single word responses. However, once I asked participant Four during Phase II to describe what she saw for each of the responses she provided, her explanations were sometimes vague and effortful. During the Clarification Phase, she seemed to have some difficulty describing the details of what she saw. At times, she was observed to be quiet in thought or to take some additional time before speaking and, sometimes she would correct herself multiple times before she found the appropriate word choice. For example, on card III, she verbalized seeing a “skeleton of the hip”; however, when I asked her, “What makes it look like that?” she stated, “legs go here and waist here”. When I probed further, she stated “don’t know, what I see”. As a result, on measures of object quality, reflecting how well the individual describes the blot form, she produced many vague responses (standard score (SS) =110). This result was similarly observed in participant Seven.

Similarly, to participant Seven, on measures of cognitive processing, participant Four was more than one and a half standard deviations below the mean on cognitive complexity and almost one standard deviation above the mean in cognitive simplicity (Table 12). Last, on thought and perception variables, which measure thought distortion, participant Four’s scores were slightly below average but indicating no presence of thought disturbance. This result was different than what was observed for participant Seven who’s scores indicated more evidence of thought disturbance. This may reflect the severity of his language impairment which made it more difficult for him to clearly articulate his thoughts.

CHAPTER SIX

DISCUSSION

Verbal communication is a distinctly human function, which not only permits for the external expression of thoughts but allows humans to engage within a larger, shared social context (Davidson, 1975; Oesch, 2000; Vygotsky, 2012). Although the details linking language and thought are not clearly established, Vygotsky (2012) contended that each require the other to make sense of the world around us (Davidson, 1975). Vygotsky believed that language is a vehicle helping to shape the processes underlying thought, allowing for the communication of one's attributions, intentions, and beliefs (Davidson, 1975; Vygotsky, 2012). Language may also play a significant role organizing the complex system of perception, interpretation, and thought that give rise to human experience. According to Freud and contemporary neuropsychological models, language plays a role in how the "fragmented parts" of perception are integrated and used to make sense of the world and associated experiences and concepts (i.e., symbolisms, mental representation) (Freud, 1891/1953). When language is impaired, as in the case of individuals with aphasia, the breadth and depth of perception and of a communication of that perception may not be fully realized (Rizzuto, 1997).

This study explored the use of the Rorschach with individuals diagnosed with fluent and non-fluent types of aphasia to consider the extent to which the Rorschach captures aspects of language impairment not otherwise probed by traditional neurolinguistic measures. Of primary interest was whether the Rorschach, historically understood as a projective psychological instrument, would allow individuals living with language impairment to recognize, retrieve and coherently express words that reflected their thoughts. At the same time, this study sought to explore how the ambiguous nature of Rorschach inkblots could be leveraged, together with traditional neuropsychological and linguistic measures, to provide insight into the relationship between perception, thought, psychological process and language - a multimethod assessment approach to describe the complex phenomena surrounding aphasia.

In the present study, the Rorschach was administered to explore whether individuals with aphasia could find words that adequately described their perceptual experience of what they saw. The objective was to provide potential insight into the process of seeing and describing ambiguous objects in people with aphasia; and how the breakdown of this process might inform our understanding of the connection-disconnection between thought and language. Despite the open-ended nature of the measure, and the ambiguous forms of the blots, the Rorschach requires many steps in the production of a response. It requires that the respondent be able to perceive an object form, retrieve an appropriate word in which to label what he or she see, and to then coherently articulate that label and describe it in more detail. These steps employ many underlying perceptual, cognitive, and verbal processes that allow an individual to organize and synthesize their perception, choose among words that best describe their experience, and communicate what it is they have seen. As Herman Rorschach believed, this measure is not just a test identifying underlying psychological processes but is also a cognitive-perceptual task, evaluating how a person is able to synthesize, organize, and transform external stimuli into coherent and meaningful language (Rorschach 1921/1962, Meyer et al., 2013). In light of this dual utility of the Rorschach, participant responses were considered, in conjunction with other neurolinguistic measures, to address two complementary study aims:

- How the Rorschach inkblot may be used to gain insight into patterns and relations between language, perception, thought, and psychological process in individuals with aphasia, and
- How neurolinguistic and projective personality forms of assessment may be applied together to illuminate a different dimension of the individual and their impairment, not otherwise captured with objective and singularly focused measures.

This discussion addresses each of these study aims, then attempts to synthesize findings from each into a coherent picture that, at the same time, identifies critical study limitations and identifies areas where future work may be directed.

Using the Rorschach to Elucidate Patterns and Relationships between Language, Perception, Thought, and Psychological Process

The first study aim was to probe how the ambiguous and open-ended nature of the Rorschach inkblot could be used to gain insight into questions about the patterns and relations between language, perception, thought, and psychological process in individuals with aphasia. This aspect of the project was concerned with whether language impairment impacted perceptual and thought processes (e.g., what was seen on the inkblot). Even though this question could not be answered directly, I analyzed responses relating to Rorschach behavior and blot characteristics, such as, the number of responses produced and the kind/quality of responses/associations made, to better understand how these variables impacted performance differentially among participants identified with fluent and non-fluent aphasia types.

Rorschach Response Tendencies and Implications for Word Finding

Qualitative language differences observed on neurolinguistic measures in the present study's sample, between individuals with non-fluent and fluent aphasia, was also explored within the context of the Rorschach data. To explore possible differences and patterns between study participants, I examined the number and quality of responses used to describe features of the blot. Specifically, I attended to differences in the use and restriction of words (e.g., unpopular and simplicity in responses), responses with limited detail (e.g., vague responses), and language errors (e.g., distorted verbalizations on Rorschach cards) between individuals in the fluent and non-fluent aphasia groups and compared to the normal population. Four major results were revealed from a detailed exploration of Rorschach response tendencies.

First, results demonstrated that all but one participant, who had more severe language impairment and was unable to provide intelligible words, produced scoreable Rorschach protocols. Eight participants provided a mean of 19 responses (SD=1.9) across 10 cards. Meyer et al. (2012) assert that the optimum number of responses for the Rorschach is between 18-27 responses. The reason for this optimum number of responses, is because shorter (fewer responses to Rorschach cards) Rorschach protocols may be more tenuous in conclusions made and may miss or underestimate salient personality and cognitive features of the person because of reduced variability in which to compare responses. Response behavior suggest that compared to the neurotypical population, participants in the present study were able to recognize certain features of the ambiguous blot forms and provide common responses in identifying what they saw. It is noteworthy that the number of responses provided by participants was on the lower end of the optimal range. While study participants were able to work through the task, the lower number of responses suggests that difficulty with one or more of the underlying subtasks, restricted the magnitude of response production. Word finding, rather than object recognition problems, could explain difficulties in producing sufficiently numerous (i.e., two to three responses per card) and descriptive responses across the 10 inkblot cards. For example, one participant with non-fluent aphasia (participant Four) reported for each of cards I, III, and VII, that he saw either a man or woman. While he may have seen a man or woman across these three cards, it may have also been the case that because he had limited language function, finding a diverse array of words with which to describe the blot became problematic. Nickels and Howard (1995) assert that difficulties with picture-naming tasks in individuals with aphasia have less to do with the extent to which the individual can recognize an object (as is the case with agnosia) but more to do with linguistic attributes or properties of a particular word.

Although psycholinguistic data like word frequency and familiarity was not analyzed in the present study, a better understanding of these variables could potentially help us to understand the results. Word frequency has been shown to affect the naming success of individuals with aphasia. With respect to making Rorschach responses to the same blot, it may be the case that mild to moderate forms of language impairment permits greater access to higher frequency words (e.g., cat or dog) while inhibiting access to lower frequency words (e.g., possum or aardvark). Because the present study does not report word frequency data for (normed) popular responses or participant responses, it may be the case that popular responses are also high frequency words in English making them more accessible to participants with aphasia. A better understanding of the relationship between word length, familiarity, and other obtainable psycholinguistic data from existing databases for both normed popular responses and aphasia participants may provide further insights.

Second, with regard to behavioral response tendencies or how participants organized information to produce a response, some evidence is suggestive of differences between people with aphasia and a neurotypical population. Card turning, defined as the number of times a person rotates the card before producing a response, may occur more frequently in some people with aphasia than in the normed population (x=106, SD=16.1). When investigating further, participants in the non-fluent aphasia group had higher scores on card turning (x=110, SD=14.2). Although there was no meaningful or statistical difference found, this was an interesting behavioral observation. Rotating the inkblot card one or more times, as was observed in the response behavior of several study participants, may have been related to difficulty finding the appropriate word to match to their perceptual experience. One could hypothesize that rotating the card allowed more opportunity to perceive an object. This may be attributed to the lack of concreteness or degree of imageability in the inkblot, and the increased processing demands for responding to ambiguous visual stimuli. For example, when a word is not "imagineable" or "accessible to sensory experience", naming performance may be negatively impacted (Nickels and Howard, 1995, p. 1297). Nickels and Howard (1995) further state, that because imageability and concreteness "reflect the richness of the sematic system" deficits in these two dimensions might make it difficult to successfully name objects (Nickels & Howard, 1995, p.1297). The increased perceptual processing demands afforded by the ambiguous Rorschach blots, with their lack of directly accessible concrete features, may have played some role in delaying activation of a semantic representation and/or inhibiting word finding and verbalization (Warrington, 1975). From this perspective card turning may represent either a "search" for absent features in the blot or a means of affording the participant more time to process and generate a response.

Third, results revealed that people from both the fluent and non-fluent aphasia type groups provided a comparable number of popular responses or frequently produced responses when compared to the normal population (x=99 and x=100, respectively). Further, when presented with a confrontation naming task, three of four study participants who completed this task verbalized nine of ten common responses, and one participant saw eight out of ten popular responses. This provides further support that participants recognized and accurately generated common single-word responses, as compared to the normed group; however, these same participants had difficulty providing descriptive characteristics beyond the single word. Consistently, it seemed to follow, that while study participants could verbalize many commonly seen responses at the single-word level, verbally describing the depth of that perception or sentence level descriptions, seemed challenging.

Last, the quality of responses (object or form quality), referring to how well the individual described the blot form and how this description fit that area of the inkblot, was explored in study participants. Overall, participants appeared to have some difficulty providing specific detail about the blot. A high number of vague responses was a performance feature for all study participants, with a mean (x=119, SD=21.8) one standard deviation greater than reported by those in the normal population. This result was driven by participants in the non-fluent aphasia group (x=143, SD=8.6) who made more vague responses as compared to participants in the fluent aphasia group (x=104, SD =10.7). Vague response scores for the non-fluent aphasia group were more than two standard deviations greater compared to that reported in the neurotypical population. An example of a vague response might be: “A human figure” (tell me what makes it look like a human figure?) “not sure, it looks like a human”. A common clinical interpretation of vague Rorschach responses would be that an individual is attempting to avoid offering an appropriate response or is unwilling to engage fully in the task (Bornstein & Masling, 2005). A second clinical interpretation might be that a vague response is reflective of one’s inability to organize and synthesize the stimuli abounding the blot, which then causes a breakdown in the ability to fully articulate one's perception of the blot (Bornstein & Masling, 2005). With respect to the present study's participants, production of vague responses seemed to be an example of the second clinical interpretation described above, reflecting difficulty organizing and communicating information in any depth or beyond a single-word level. It seemed to further demonstrate that because poverty of language function may have restricted responses to single-word level, the characteristics of the blot were oversimplified.

This was further demonstrated when analyzing the low number of Blend scores; responses that include multiple (i.e. more than one determinant) blot characteristics (e.g. animal, human, form, color, movement) and which reflect perceptual sensitivity and complexity in cognitive processing. Overall, blend responses were more than 1 standard deviation lower for the whole participant group (x=77, SD=5.6) compared to the normed group. The numerous vague and form restricted responses and lack of detail expressed, suggest that while the present study's participants could name an aspect of the blot, they had difficulty synthesizing and describing the blot in more elaborate detail. This would seem to be related to the participant's reduced language function and the strong possibility that more detailed characterization of the blot requires more complex grammatical constructions; constructions not readily available to individuals with significant impairment across multiple layers of language function.

Thought and Perception Variables

Cognitive processing, as well as thought and perception variables were explored to further assess processes that are presumed related to task engagement, perceptual sensitivity, ability to synthesize abstract information and, the ability to articulate ideas. Cognitive processing is thought to be associated with psychological strength, sophisticated processing, and flexible approaches to coping and thinking (Meyer et al., 2012). Cognitive processing is broken down into two variables: 1) the cognitive processing complexity score and 2) the cognitive processing simplicity score. Results from the present study revealed that study participants were two standard deviations lower than the normal population with regard to the cognitive processing complexity score (x=66, SD=6.6). The complexity score was even lower for individuals with non-fluent aphasia (x=60, SD=4.0) than compared to those with fluent aphasia (x=70, SD=5.3). With regard to the cognitive processing simplicity score, the whole sample was almost one standard deviation higher than the normal population (x=110, SD=7.5). Between sub-groups of study participants, individuals with non-fluent aphasia had higher simplicity scores (x=114, SD=7.7) as compared to participants with fluent aphasia (x=107, SD=6.6). Low complexity has been related to simplistic processing, deficits in cognitive processing and inadequate psychological resourcefulness.

The disruptions in speech fluency, reduced utterance length, truncated phrases, and reduced ability to form grammatical constructions observed in study participants, may have further served to restrict the degree to which participants were able to describe the ambiguity of the blot. The greater the severity of language impairment, as in the case of individuals in the non-fluent aphasia group, the lower the capacity for describing complexity appeared to be. Haarmann, Just, and Carpenter (1997) assert that because sentence complexity is associated with greater memory and processing demands, the more severe the language impairment the less able the person is to produce complex constructions. Problems generating complex sentences are exacerbated by deficits in comprehension in individuals with aphasia. Another explanation is related to the lack of integration across language processing levels. Haarmanm et al., (1997) point to the possibility of a break in the integration between perceptual input, lexical access (word recall/retrieval), and verbal output (production). This integration is further impacted when there are impediments, such as cognitive deficits, and when the tasks are more complex requiring a higher level of processing that may not be available or difficult to fully access in individuals with significant language impairments.

A third possibility may be that there are conceptual deficits which limit one's ability to communicate a certain level of complexity (Safran, Berndt, & Schwartz, 1989). The many task demands of the Rorschach, such as, synthesizing the ambiguousness of the blot, providing responses across many perceptual possibilities, and the open-format of the questions, may have overburdened participants at the level of input processing, interpretation, and response production. On the other hand, language impairment may have potentially constrained what participants were able to see and communicate in a way that could capture the entirety of their perceptual experience. The present methods cannot distinguish between these non-mutually exclusive explanations.

Thought-perception variables were also investigated as a means to capture problems in thinking, judgment, and perception. Thought-perception variables reflect the quality of one's thinking. Traditionally in a clinical setting, thought and perception variables are used in consideration of more severe psychopathology, like that seen in psychotic disorders (e.g. schizophrenia), specifically attending to distortions in thought processes. In the present study, two variables were used to assess thought and perception: 1) Ego Impairment Index-3 (EII-3) and 2) Severe cognitive (SevCog). The responses of study participants were similar to that seen in the neurotypical population and in the average range (x=100, S=15). However, between study sub-groups, participants with non-fluent aphasia (x=110, SD-15.5) were higher on the EII-3 variable than compared to those with fluent aphasia (x=97, SD=16.1).

The severe cognitive variable score was also explored. This variable reflects severe disruptions in thought processes assumed to underlie severe distortions in conceptualization of content, reasoning ability, communication, and thought organization. Study participants had higher scores on the severe cognitive measure (x=112, SD=17.8) as compared to the normal population. The participants with non-fluent aphasia (x=126, SD=1.8) were more than one standard deviation higher than those with fluent aphasia (x=103, SD=13.6). That is, participants in the non-fluent aphasia group produced words that were categorized with some level of bizarre quality. For example, one participant with non-fluent aphasia reported for Card VII that he saw "two animals conversing". Since animals do not talk or converse with one another, this response was coded as a level one incongruous combination (INC 1) – when implausible attributes are ascribed to an object. Although individuals with non-fluent aphasia tended to have more severe cognitive scores, this result may be more reflective of reduced word retrieval, restricted word choice and/or and difficulties in communication rather than a consequence of a true thought distortion.

Often, after they had produced a more bizarre response, it was observed that participants would nonverbally communicate that they were frustrated with the response that they had provided. For example, one participant responded that he saw "a popuse". When I asked him to describe this further, he became visibly frustrated, eyebrows furrowed and frowning, stating, an "animal, four legs, a popuse." This appeared to be an attempt to describe enough detail as he could, so that I may be able to piece the details together to form the word of the animal he was thinking. However, due to the restrictions of my role, and in maintaining proper standardization procedures I could not name the word(s) for him. This dissatisfaction and frustration with word choice, and the non-word response, demonstrates that language impairment interfered with participants'' ability to fully communicate what they thought – the response may not have been concordant with the participants' intentions. There often seemed to be discord with what the participants wanted to say and what they did say as a result of the interference caused by the language impairment. Safran et al., (1989) assert that because many individuals with aphasia have difficulty producing grammatically correct sentences or produce truncated sentences, even though they may know what they want to say they often cannot communicate their intended message using accurate or appropriate "syntactic forms" (p. 441). As a result of these language difficulties, words are often misused, omitted, or improperly substituted, thereby altering the intended meaning of the communication (Safran et al., 1989). This result was a consistent finding in the present study, where participants often had difficulty not so much at the single-word level but in producing multiple words at the sentence level of language. As discussed above, this result could have been a consequence of: 1) word frequency, familiarity, and word length variables 2) ambiguity of the blot, and/or 3) a break between perception, access to an appropriate semantic representation, and word finding (Nickels & Howard, 1995; Warrington, 1975).

The results of this study are in some ways supportive of, and in other ways divergent from, findings of an early study by Reitan (1954) using the Rorschach with individuals with left-hemispheric aphasia. Reitan (1954) used the Rorschach to describe "perceptual differences" in three groups: 1) patients with brain injury and aphasia, 2) patients with brain injury without aphasia, and 3) hospitalized patients with no organic brain disturbance (control group). He postulated that "verbal dysfunction" resulting from the brain injured group with aphasia would negatively impede performance on the Rorschach compared to the two other research groups (Reitan, 1954, p. 199). Results revealed that there were no significant differences found between people with aphasia and both groups of people without aphasia. In fact, the mean number of total responses across the 10 cards was 27.61 for the group who had aphasia and 24.2 for the group without aphasia (Reitan, 1954, p. 203). Reitan (1954) concluded as a result of the limited "differentiation" between those with aphasia and those without, "verbal expression did not impose itself too heavily in determining" the Rorschach test results (p. 208).

Similar to Reitan (1954), the present study found that all study participants produced a sufficient number of responses to allow for scoreable Rorschach profiles. In contrast to that prior work, however, the present study also observed that responses produced by participants with varied degrees of language impairment, was frequently quite effortful; in some cases speech was distorted, and the complexity and detail within the communication in which to describe the features of the Rorschach blot were deficient. For example, one participant stated that he saw an object "dead" but could not expand his response in more specific detail. Another participant stated that he saw a "popuse", described as an animal, but was not able to provide other, specific details. A third participant, who was ultimately excluded from the study due to a more severe language impairment, produced more than the number of responses needed to score the protocol, but those responses and related descriptions were comprised almost entirely of non-words - making his protocol unscoreable.

These patterns were apparent throughout the whole sample, but were markedly different for individuals with more severe language impairment - the non-fluent aphasia group. The differences found between the present study and Reitan's (1954) work might be due to the fact that Reitan's study (1954) occurred before there was significant progress in understanding distinct forms of aphasia. Additionally, Reitan (1954) conducted his study in the 1950's, a time when the Rorschach remained largely unstandardized in both administration of procedures and scoring methods, and did not provide normed-referenced data. The present study overcame these two limitations in particular by distinguishing between fluent and non-fluent forms of aphasia and using R-PAS methods and scoring, which therefore may account for the differences observed across all participants in the present study, as compared with results reported in the study conducted by Reitan (1954). As such, the present approach may have provided more sensitive methods for detecting differences within aphasia groups and between responses from neurotypical people and those with aphasia.

Co-application of Differing Forms of Assessment to Enrich Understanding of the Individual, in the Context of their Aphasia

The second aim of the present study was to explore how objective and self-report/projective forms of assessment converge and diverge (i.e., overlap and contrast) in individuals with aphasia, and how together they may account for a different dimension of the individual and his or her impairment, not otherwise captured with more objective and singularly focused measures. Within the realm of clinical psychology, a clinician draws from a set of credible tests of various forms, to design a suite of measures that effectively probe the individual and their condition – often considering a broad and complex phenomena (Mihura et al., 2013). This kind of assessment practice is referred to as broadband or multi-method assessment (Mihura et al., 2013), and the effectiveness of the clinician's assessment is impacted both by the appropriateness and completeness of that test design, and by the quality of its application and interpretation. Considering information together from two or more complementary tests can provide value that the interpreting clinician can use to support or eliminate different working hypotheses.

The Rorschach, like most self-report measures, requires the individual to be introspective and report on “mental events and past experiences” (Mihura et al., 2013, p. 554). However, the Rorschach is also different than most objective and self-report psychological measures, not only because it is believed to measure underlying psychological and cognitive processes but because it may allow the tester to observe and learn something about those complex and subtle mechanisms that individuals develop and employ to help them function in the real world – providing perspective that other conventional measures may not. This benefit does come at the cost of rigorous delineation of more objectively identifiable aspects of the patient’s impairment – as is effectively mapped using more conventional neurolinguistic tests. As will be touched on later, the benefit in considering *together* the data and information provided by these tests may be the construction of a model of the individual that is more nuanced and dimensionally rich.

Spearman’s rank-order correlation analysis (Spearman rho) was used to explore the relationships among the following variables: the WAB-R AQ score, CLQT Functions Domains Scores, the Rorschach cognitive processing simplicity, complexity scores and, the thought and perception EII and severe cognitive scores. Results revealed that the WAB-R AQ score was strongly and positively associated with the cognitive processing complexity score (r_s = 0. 71, p = .07), suggesting that the more intact their language ability the better able the participant was able to describe, with increased language sophistication, the Rorschach blot. In contrast, the WAB-R AQ score was negatively related to the cognitive processing simplicity score (r_s = -0. 32, p = .48), suggesting that the less severe their language impairment the less likely they produced responses that were oversimplified and vague; more characteristic of the individuals in the fluent aphasia group. The WAB-R AQ score was also strongly negatively associated with the two thought and perception variables, the EII-3 (r_s = -0. 57, p = .18) and the severe cognitive score (r_s = -0. 86, p = .01). This pattern of results suggests that the greater the participant's language ability the lower their thought distortion scores, probably because their relatively intact language abilities permit one to better communicate their thoughts. For example, one participant with non-fluent aphasia, stated that she saw, "an ocean of sea animals." Another participant in this same language category stated that she saw, "two ladies dancing". Both of these participants had WAB-RAQ scores above 90, indicating a mild form of aphasia. These participants produced more words that were coded less for bizarre qualities. In contrast, two participants in the non-fluent aphasia group, both of whom received WAB-R AQ scores in the mid-50's, suggesting moderate language impairment, provided more unusual responses. One verbalized that he saw, "a popus" (an unidentified animal) with another seeing "dead space". Both of these responses were coded with some degree of bizarre quality. In these instances, the greater impairment in language ability (marked by truncated words and sentences, and interruptions in flow of speech) potentially contributed to a different word choice than was intended.

The CLQT language domain score was also shown to share a strong positive association with the Rorschach complexity score (r_s = 0. 72, p =.06) and a significantly strong negative association with the severe cognitive score (r_s = -0. 87, p = .00). This suggests that individuals who were less impaired linguistically were better able to communicate their intentions and do so with greater complexity as compared to those with greater impairment. Considered together, the correlations among neurolinguistic and Rorschach cognitive processing and thought and perception variables indicate a clear and intuitive relationship between these different measures.

Conclusion

This study demonstrated that individuals with reduced language function were able to provide single-word responses to inkblots presented in a Rorschach assessment that were of sufficient number and quality to allow for analyses. Although differences between small groups of individuals with fluent and non-fluent aphasia could not be validated with significance testing, descriptive analyses demonstrating differences in mean and standard deviations of Rorschach variable scores between the two groups were noted. Specifically, individuals in the non-fluent aphasia group, who had more impairment in language ability, as determined by the WAB-R AQ and CLQT scores, provided more vague responses, were typically only able to provide one defining characteristic of the blot (i.e., blends), and produced more communicative distortions (as measured by the thought and perception variables) than compared to individuals in the fluent aphasia group. The participant group, as a whole, produced a high degree of vague responses, were found to produce more simplistic descriptions of the blot, and were typically able to only produce one defining characteristic of the blot (i.e., blends) - as compared to the neurotypical population.

The findings of the present study point to two key observations related to the utility of the Rorschach to better understand the condition of individuals with aphasia. First, while study participants could verbalize many commonly seen responses at the single word level, providing more nuanced and descriptive responses using sentence-level constructions appeared challenging. These difficulties were present despite the relative mild severity of most study participants' aphasia. Observations from the present study and findings from previous research suggest that a variety of factors related to properties of the word or naming deficits, may have contributed to those participant difficulties. Potential difficulties that may have influenced naming in the present study may have been related to complexity of the blot, lack of familiarity, or the multiplicity of objects seen that occluded one's ability to identify features in an object.

Second, findings suggest that the Rorschach more generally, may not be an effective tool for psychological assessment in the subset of the population with aphasia without significant modifications. In particular, individuals with severe aphasia or Wernicke's aphasia will likely not be appropriate for a Rorschach assessment. This was evidenced in a participant with severe language impairment (i.e., Wernicke's aphasia), who was excluded based on providing an abundance of non-words which led to an unscoreable Rorschach protocol. Difficulties in fully describing one's perceptual experience because of limited verbal access limits the degree to which valid interpretations about the structure and function of one's perceptions, thoughts, and overall psychological condition can be made. So, while the Rorschach, a complex picture naming task, may have a role in better understanding relations between thought and language processes in individuals with aphasia, it may not be useful as a valid measure in assessing a person's thoughts or psychological functioning as typically conceptualized and targeted in clinical assessments.

The present study also provides some results that may be considered to support Freud's belief that, without the function of language, the full integration of sensory stimuli cannot be complete, and the depth of perceiving the world, self, and other and making meaning out of experience is compromised (Freud, 1891). Freud's early perspective on the important role that language plays in how the "fragmented parts" of perception are integrated and used to make sense of the world and associated experiences and concepts (i.e., symbolisms, mental representation) were demonstrated, to some degree, in the performance of the study participants (Freud, 1891). Individuals with more impaired language function were found to have reduced ability to fully communicate their perceptions; in some cases, they were observed to be unable to communicate their intended message. These observations point to Freud's assertion that impairments in language interfere not only with communication, but with the person's perceptual experience itself (Rizzuto, 1997).

Study Limitations and Future Directions

Limitations in this study include the small sample size, both for the total set of study participants, and the number of participants from each of the two aphasia categories considered. A larger sample with more heterogonous types of aphasia would allow more complete and statistically meaningful evaluation of the differences and similarities among Rorschach variables – both in comparison of populations of individuals with aphasia to the normed population, and in comparison of results from individuals with different types of aphasia. A second limitation concerns the lack of transparency provided in the R-PAS manual of normed Rorschach data. Because specific information regarding means and standard deviations are not provided, we could not perform Baysian statistics for small-N case studies, needed for significance testing (Crawford & Garthwaite, 2007).

A third limitation concerns the lack of information on lesion location, lesion size, and other characteristics related to the severity of the initial brain injury. In so far that functional-anatomical relations can be used to describe behavior in individuals with brain injury, information regarding lesion location, size, and possible comorbid conditions resulting from the initial brain injury (e.g., excessive bleeding, other conditions) would have provided useful information to help better understand the extent that language-specific impairment may have played a role in producing results. A related, fourth limitation concerns the lack of data on the degree of cognitive impairment. Improved data on non-language specific cognitive impairments across multiple domains would help to form a more complete picture of how cognitive deficits further impacted language ability in the present population.

A fifth limitation concerns the lack of assessment relating to the properties of a word that are cited in the literature to create difficulties in naming for people with aphasia (Morrisson et al., 1992; Nickels & Howard, 1995) A future direction might be to measure and acquire a better understanding of the relationship between word length, familiarity, and other obtainable psycholinguistic data from existing databases for both normed popular responses and aphasia participants. This many provide further insights about deficits underlying naming.

A sixth limitation concerns the lack of other kinds of psychological measures, particularly affective measures, with which to best describe mood and personality differences and how these differences can potentially further impact one's communicative ability. For example, depression and a reduced quality of life have been reported in individuals with aphasia and have been found to be significantly different than in individuals with no brain injury (Ross & Wertz, 2014). Lastly, an exploratory case study approach is beneficial in initially describing the features of a sample relative to the variables under study, however, a more comprehensive and powerful research design would be important to use in future research to directly describe patterns, differences, and relationships among groups and measures variables.

In light of the dependence of this instrument on verbal ability, future studies might consider modified application of the Rorschach with administration that allows non-verbal responses (e.g., drawing, picture taking) as a means of supplementing participant verbal responses – to develop a richer understanding of the individual's perception, and insight into their psychological state.

Overall, the present study explored how well individuals living with a significant language impairment were able to communicate their experience of ambiguous stimuli, though their responses were significantly below those of the neurotypical population on many measured variables. Associations between the Rorschach and neurolinguistic measures were also observed, suggesting that level of language impairment appears to affect performance on the Rorschach. There were also negative associations between neurolinguistic measures and the Rorschach which suggest that related processes may be differently captured by both kinds of measures. These negative associations also suggest that reduced language ability, as measured by the WAB-R AQ and CLQT, also impacts a certain kind of specificity and detailed description of the blots (i.e., Rorschach cognitive processing and thought and perception variables.

There is potential value in further exploring the utility of the Rorschach with a population of individuals with aphasia that is mild to moderate in severity. Future researchers should, however, recognize the dependence of this instrument on verbal ability and bear in mind the potential limitations noted in this study. Nonetheless, the ambiguity and visual complexity of the Rorschach inkblots offers potential value in probing relations between thought and language.

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APPENDIX A: Variable Names and Definitions

Main Variables in the r-pas system (definitions and example responses)

Variable Name	**Variable Definition**	**Example Response**
Number of Responses	Number of responses given to each card	"I see two women"
Orientation (< (left turn), > (right turn), @ (turned 360 degrees)	Turning the card in order to form a response	
Prompts and Pulls	The number of times the examiner had to pull a card because of too many responses or to prompt for more responses.	
Location of Response (*W, D, Dd*)	The location of where the percept is seen on the card	"I see a bat; the whole blot looks like a bat"
Space SR (Space Reversal), SI (Space Integration)	Use of white space on the card is used within the response.	"This space looks like a spaceship" (responding to the white space in the middle of a black inkblot)
Content (22 possible content codes) (e.g., human vs. animal content; active vs. passive movement; response with further description, like morbid, explosive, art content and so forth)	Content categories to which the response belongs. There are	"I see a lady wearing a red sequenced dress"
Developmental Quality - Synthesis and Vagueness	Describing the quality in the formation of the response. Also, determines how the blot is verbalized in a meaningful way. A synthesized response involves 2 or more objects described in relation to each other. A vague response is a formless response.	"This looks like a cloud" (vague). "This looks like 2 lions climbing up the side of a mountain"
Pair	Reponses indicates 2 of the same object located on the blot	"I see 2 monkeys climbing a tree"
Form Quality Ordinary (o), Unusual (u), minus (-)	Degree to which the responses are common and fit the blot area. Commonness is determined by referring to the normed tables included in the	"I see a bear"

	r-pas, which have been gathered by hundreds of individuals	
Popular (p)	Responses defined as objects seen across each of the ten cards with the highest frequency in a normed population. There are 13 popular responses across 10 cards	"I see a bat"
Content Codes (17 possible codes) e.g., Human, Animal	Describe what is seen in the card	
Determinants (6 broad categories of determinants and a total of 15 determinants codes) e.g., Human Movement	Qualities that describe why a response is what it is	
Form or Form Dimension	Responses based completely on the form of the blot	"These are the wings and this is the head of the bat"
Reflections	Responses indicate mirror images or reflections	"A woman looking at herself in the mirror"
Movement (active vs. passive vs. inanimate movement)	Responses that indicate human movement, species-specific animal movement or intimate movement	"I see a flying bat"
Color	Degree to which responses are based on the colorfulness of the blot	"This looks like a man with a red bow tie"
Achromatic color	Black, grey or white responses	"This is a black and white dog"
Texture	Gradations of light dark indicate tactile quality	"I see a big, furry bear"
Vista	Subtle gradations of dark and light indicate depth	"I see water at the bottom of a canyon"
Shading	Gradation's of light and dark ink	"This looks like a shadowy image of a man"
Cognitive Deviant Verbalization Deviant Response Incompatible Fabulized Peculiar Contaminated	Responses that signal unusual verbalizations or features of the blot. These responses are differentiated as Level 1 (uncommon response) or Level 2 (uncommon and bizarre response) responses. A response can meet criteria for more than 1 cognitive	"Two lions jumping over the moon" (incompatible)

	code.	
Thematic Morbid Aggressive Movement Aggressive Content Cooperative Personalized Mutuality of Autonomy Abstract Presentation	Responses that indicate ideas or attitudes.	"I see a dead animal on the road"
Good Human/Poor Human	Human images that are either logical and non-aggressive or illogical and aggressive	"Two women hitting each other"
Oral Dependency Language (ODL)	Responses which include themes of nurturance or oral material.	" A girl eating a sandwich"

Adapted from Mihura et al., 2013

APPENDIX B: CLQT Severity Ratings

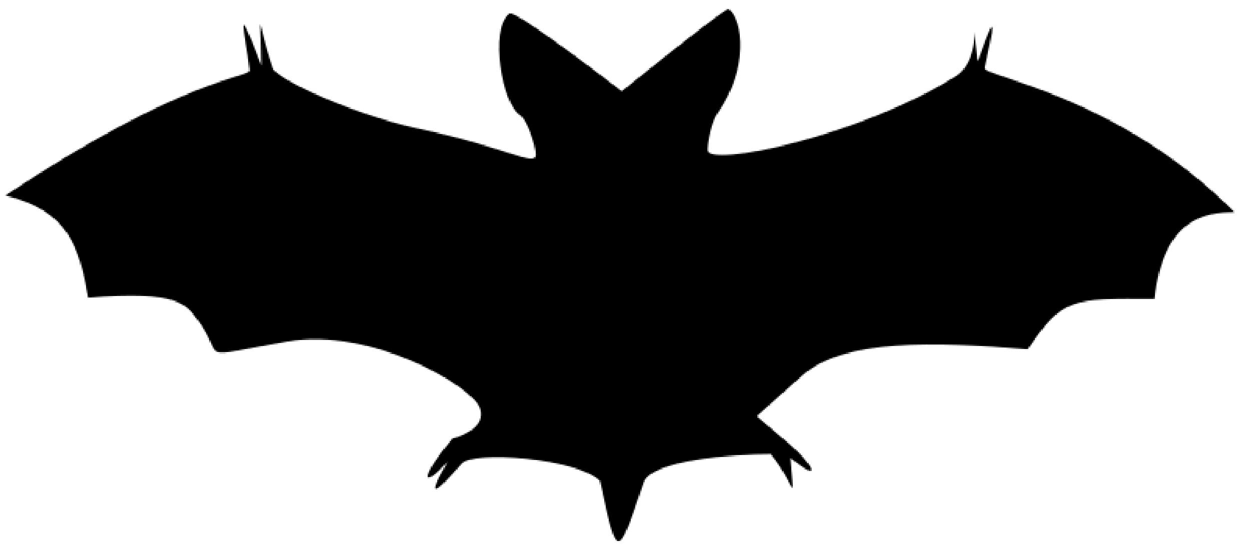
Severity ratings table for ages 18-69 years				
Cognitive Domain	Within Normal Limits	Mild	Moderate	Severe
Attention	215-180	179-125	124-50	49-0
Memory	185-155	154-141	140-110	109-0
Executive Functions	40-24	23-20	19-16	15-0
Language	37-29	28-25	24-21	20-0
Visuospatial skills	105-82	81-52	51-42	41-0
Clock drawing skills	13-12	11-10	9-8	7-0

Helm-Estabrooks, 2002

APPENDIX C: Rorschach Response Level Codes

Response & Administration	Form Quality and Popular
Location	Determinants
Space	Cognitive Codes
Content	Thematic Codes
Object Qualities	Other Calculations

APPENDIX D: Example of a Black and White Picture for Confrontation Naming Task



APPENDIX E: Semantic Responses for Confrontation Naming Task

Item Number	Participant 1	Participant 2	Participant 3	Participant 4
1	Butterfly	Butterfly	Butterfly	Butterfly
2	Bear	Lion	Bear	Bear
3	Man	Man	Man	Man
4	Ape	Ape	Gorilla	Monkey
5	Bat	Bat	Bat	Bat
6	Shark*	Nose*	Cape*	Ground Hog*
7	Neck*	Man	Boy	Man
8	Hyena	Hyena	Wolf	Wolf
9	Man	Robot	Person	Woman
10	Crab	Crab	Hermit Crab	Crawfish

***incorrect items**

APPENDIX F: Popular Response across 10 Rorschach Cards from Normative Data

Rorschach Card Number	Response	Line Drawing Used
I	Bat or Butterfly	Butterfly
II	Animal Forms	Bear
III	Human Figure	Human Figure
IV	Animal Form	Animal Form
V	Bat or Butterfly	Bat
VI	Animal Skin/Rug	Animal Skin Rug
VII	Human figure	Human Figure
VIII	Whole Animal Figure	Whole Animal Figure
IX	Human or Human-like Figure	Human-like Figure
X	Variations of Multilegged Animals/Crab	Crab