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# Interpreter Cognitive Aptitudes

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The phenomena regarding individual differences among interpreter students' apparent potential to succeed in the field has long been discussed among interpreter trainers. Interpreter trainers may or may not act on intuitive or ostensible signs that a student does or does not have "it"—that heretofore undefined set of qualities that allow for an individual to become an expert interpreter. Based on the dilemma that we do not know what foundational capabilities are necessary in order to learn interpreting skills, potential aptitudes were researched in the following areas: spoken and signed language interpreter processing; second language acquisition; and cognition, specifically memory, intelligence, information and language processing, decision-making, problem solving, multitasking, skill acquisition, expertise, and human performance. The culmination of this research resulted in the development of a theoretical framework of interpreter aptitudes categorizing cognitive faculties into major and sub-domains while delineating relationships among the aptitudes. This dimensionality reduction, in conjunction with a similarly structured second language acquisition aptitudinal theoretical framework, will serve as the foundation for empirical research and aptitude measurement.

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## Introduction

The wide range of skills among individual sign language interpreters, as well as the range of success rates among interpreting students, gives cause to investigate the reasons for such differences. The goal of this paper is to introduce a theoretical framework of foundational cognitive attributes that serve as an understructure to learned and acquired interpreting skills (including second language acquisition). These

foundational cognitive characteristics are being proposed to be aptitudinal in nature. In other words, without these abilities, an individual will be unlikely to succeed as an interpreter.

This study is limited to cognitive aptitudes for interpreting and does not take into account personality types, the level of maturity of the student or interpreter, or the amount of knowledge an individual has at any specific time in his or her life.

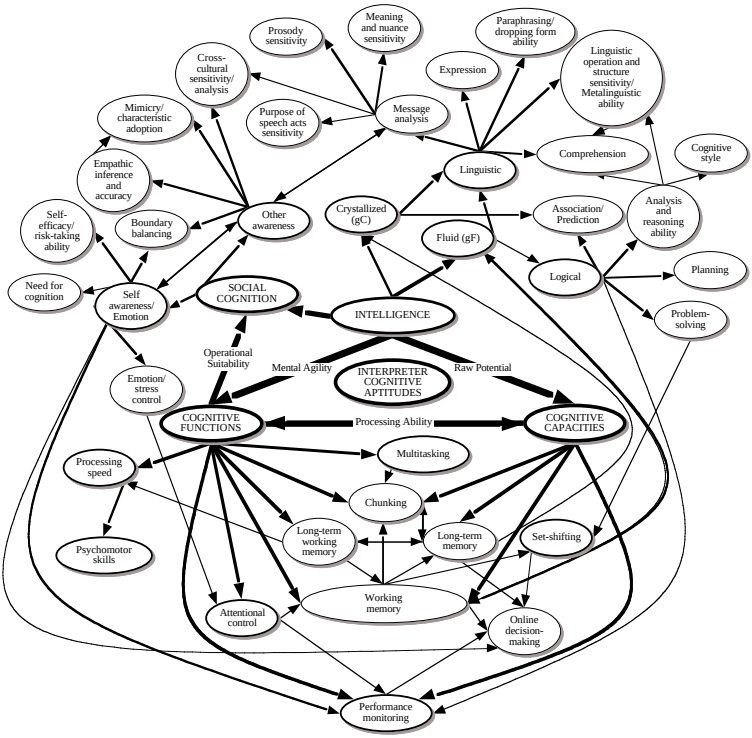
## The Need for an Aptitudinal Model

Within the field of sign language interpreting, there is a paucity of tools to assess interpreter potential. Because of this paucity, several negative situations can occur: a) prospective interpreters have little way of knowing whether or not they will become successful interpreters and invest a great deal of time and money on education and training that may not lead to a career, or may lead to an unsatisfying career, b) interpreter educators only have subjective tools to evaluate students and may have subconscious biases causing academic or career counseling discordance to actual potential, and c) some students are passed through their courses even though they do not have the ability to become skilled interpreters, and, depending upon the level of regulation in the locale, graduated students without sufficient interpreting skill can be placed in situations where life-altering communication occurs.

Before an aptitude test can be developed, the criteria to be measured must be defined and analyzed. Based on theoretical research in the domains of second language acquisition, spoken and signed language interpreting, and cognitive psychology, I have developed a working model of cognitive substrates that serve as the understructure for interpreting aptitude (see Figure 1). The model also possesses a secondary goal: to serve as a tool for working interpreters to analyze their own cognitive strengths and weaknesses.

Second language learning aptitudes are depicted in a separate dimensionality reduction (see Figure 5) following interpreting aptitudes. Abilities in this domain are assumed for college-age non-bilingual individuals.

*Figure 1*




*Foundational Cognitive Aptitude Model*

## Operational Suitability: Social-Cognitive Aptitudes

Moving from a macro perspective to a micro view, the ability of the interpreter to function in dynamic settings with a variety of people and content is first considered. Broadly defined, social-cognition is the science of cognition affected by social encounters and structures, including one's view of one's self in relation to others. Social cognitive aptitudes include interpersonal and intrapersonal skills. How an individual's endogenous processes and exogenous behavior are influenced by others affect how well an individual operates on a daily basis. Stable personality traits that affect emotion-cognition interaction constrain the quality of learning and suitability of performance.

**Emotion-Cognition Interaction and Self-Awareness**

Interpreting can provoke anxiety and other heightened emotional states due to a multitude of factors. Heightened stress or emotion can occur due to contextual factors such as interpreting a medical appointment communicating a devastating diagnosis or from internal factors such as experiencing performance pressure when feeling evaluated by others. Fear, stress, and anxiety consume attentional resources reducing cognitive capacity for information processing. As a result, the individual experiencing the negative emotion often experiences clouded judgment, paralyzed thinking, inaccurate encoding, and poor planning, problem solving, and multitasking (Goleman, 2005; Moser-Mercer as cited in Luccarelli, 2000). As Sandra Gish (1978) points out in her manuscript, *I understood all the words, but I missed the point: A goal-to-detail/detail-to-goal strategy for text analysis (1978)*, interpreter students have difficulty reasoning based on context clues especially in moments that cause additional stress such as during receptive fingerspelling. The ability to regulate one's own emotions regains attentional control needed for information processing, language production, and performance monitoring. An individual who is prone to worrying will often experience performance difficulty when interpreting.

Fortunately, positive-level emotions such as motivation and belief in the potential of self (self-efficacy), enhance performance ability. Individuals with higher levels of self-efficacy are often more mentally organized, more flexible in their thinking, and generally less anxious. Good moods increase mental flexibility, problem solving, circumspection and creativity (Goleman, 2005).

The ability to take risks and the self-efficacy required to take risks also play an important role in the day-to-day functions of an interpreter. Having a belief in one's potential to succeed is necessary in most performance-based careers, including interpreting. Higher levels of self-efficacy allow individuals to not be confined to a limited number of "safe" choices when interpreting concepts or types of interactions, but to make choices based on the needs of consumers and what is most appropriate for the situation. Not only will higher levels of risk sensitivity likely lead to more literal interpretations and source language interference, but the individual is less likely to increase processing time due to fear in forgetting content.

Interpreters must not only be willing to make decisions that are most appropriate for the situation but also be able to analyze the situation and the options in order to choose the best option. Need for cognition refers to motivation to engage in effortful cognitive activities. Individuals high in the need for cognition are more willing to perform complex problem solving, consider various perspectives and make decisions based on analysis as opposed to opting for the least cognitively effortful choice. Individuals low in the need for cognition, those unwilling to make thoughtful decisions or consider various perspectives, are not well suited for an interpreting career.

**Other-Awareness**

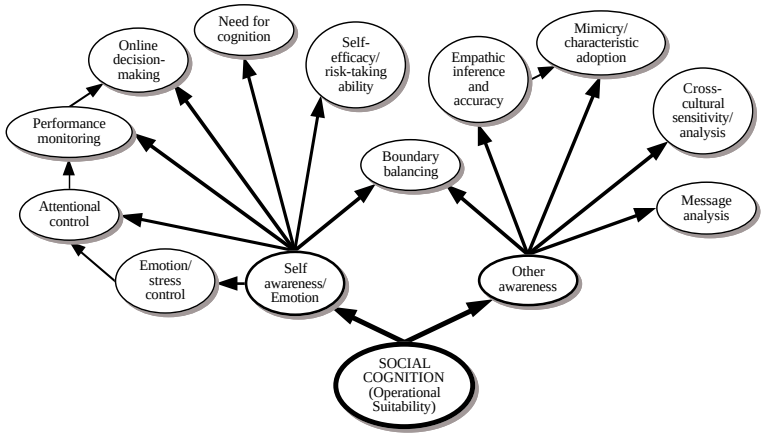
Boundary balancing relies on awareness of the self and others. Interpreters work in a practice profession where interpersonal and intrapersonal demands can be high. Boundary balancing skills allow an interpreter to not be overly (emotionally) involved in the situation in order to perform optimally without disconnecting from the affective functions of conveying communication such as assessing others' perspectives.

Assessing the perspective of another person based on nuanced behaviors is empathic inference. Empathic inference takes observation of others and, employing memory, knowledge and reason, infers the thoughts and feelings of other people (Ickes, 1997). The ability to analyze and infer meanings from a combination of observations from the language being used and subtle and apparent behaviors from the speaker/signer contributes significantly to an effective interpretation. The better an interpreter understands the thoughts and feelings of the speaker/signer, the better the interpreter will be able to adopt the characteristics of the speaker/signer. The higher one's empathy, the more skilled one is at mimicking (Lovell & Miltich, 2005). The interpreter uses mimicking to "take on" the emotions, personalities, and attitudes of the individuals for whom they are interpreting. The more accurate the interpreter's empathic accuracy, the more the goals, themes, undertones, hidden and implicit meanings and double meanings will be interpreted accurately. Empathic accuracy relies on the ability to incorporate cultural and idiosyncratic characteristics appropriate to the goal, theme, and affect of the message. Empathic inference also heightens one's sensitivity

to cultural characteristics. The ability to analyze the message from a culturally sensitive perspective also affects the accuracy of the interpretation.

According to the theoretical framework, the following are the social-cognitive aptitudes. Self-awareness includes emotional/ stress control; attentional control; performance monitoring; online decision-making; need for cognition; self-efficacy and risk-taking ability; and boundary balancing. Other awareness includes boundary balancing empathic inference and accuracy; mimicry/characteristic adoption; cross-cultural sensitivity and analysis; and message analysis.

*Figure 2*




*Social-cognitive aptitudes guiding operational suitability*

## Perspicacity: Intellectual Aptitudes

Perspicacity, the ability to acutely perceive, discern, and understand, guides aptitudes in the domains of awareness, comprehension, and analysis. Fluid intelligence refers to the ability to analyze, make inferences, and find relationships in novel information such as with problem-solving, learning and pattern recognition. Fluid intelligence is highly correlated to working memory capacity (Conway, Kane, & Engle, 2003). Crystallized intelligence is the ability to use skills, knowledge, and experience stored in long-term memory. The intellectual aptitudes described here affect operational suitability detailed

previously and processing abilities to be described in the following section.

**Fluid and Crystallized Intelligence**

Message analysis requires more than cultural sensitivity and empathic inference. Understanding the reason for the message, the goal of the speaker in delivering the communication, is crucial for understanding the Gestalt and forming an appropriate discourse driven by the speaker's goal in the target language. Ideally, the purpose of the speech act serves as the fulcrum of the interpretation. Sensitivity to meaning, including implicit and other nuanced meaning, allows the interpreter to accurately convey congruent pieces of information, making salient parts of the message that may not be presented overtly in the other language. The interpreter must also be aware of prosody for extracting meaning (affective and content-wise) and expressing speaker style. Message analysis is required for content and context analysis while synthesizing incoming information with previous knowledge (Cokely, 1992). An interpreter must analyze the message from the perspective of the speaker, taking into account subtle paralinguistic cues, and cultural, sociological, and idiosyncratic nuances in order to determine the meaning, goal or purpose of speech acts, attitude, delivery, and theme of the speaker (Colonomos, 2006).

Message analysis is part interpersonal skills and part linguistic aptitude. Other linguistic aptitudes include coherence of expression (Moser-Mercer as cited in Luccarelli, 2000) such as managing expressive fluidness, prosody, vocal dynamics, and diversity of expressive styles; the ability to "drop form"; comprehension; and metalinguistic or linguistic operation sensitivity. Linguistic operational intelligence is sensitivity to the nuances of language components and functions. A person with high linguistic operational intelligence is especially sensitive to the meaning of words and distinctions among synonyms, to the order of words and grammatical structure, to the prosody of the language, and to the purpose of the speech acts received and expressed (Gardner, 2004).

A critical part of the interpreting process is releasing the form of the source language to produce a coherent message appropriately formed in the target language without source language intrusions. There are times when it is not appropriate to release the source language form, such as with names or

numbers, or if one is performing a service more akin to coding the source language and manipulating the form. A successful interpreter is able to make decisions regarding retaining or releasing the source language form depending on the consumer needs, language needs, and cultural needs.

In order to excel in comprehension, one should have a certain level of competence in analytical and reasoning skills such as pattern recognition, association, and problem solving. An interpreter's cognitive style, the propensity to process material holistically or analytically, affects reasoning ability. Field independents, a type of cognitive style, are more likely to analyze information into subcomponents and distinguish between the essential and the superfluous (Dornyei & Skehan, 2003).

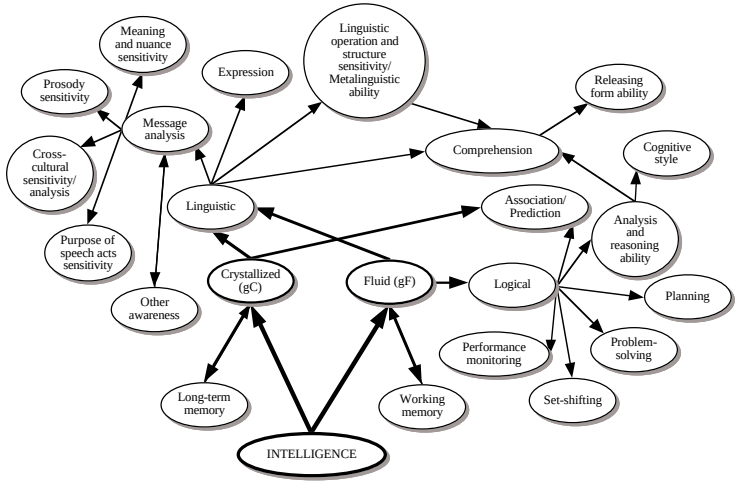
Reasoning is used throughout the interpreting process and allows the interpreter to understand the consumers' messages, plan the production of the target language interpretation, and monitor the process. By monitoring, the interpreter should be aware of the process at a meta-level, as well as the production of the interpretation, and the perspectives of the consumers. For example, the more an interpreter can monitor his or herself as though he/she was listening or watching as the consumer, the better the interpreter can regulate the process and performance. Additionally, interpreters must be able to be mentally flexible. If an interpretation, strategy, approach, or understanding does not seem to be successful, then the flexibility to shift to a different interpretation, strategy, approach, or understanding, based on monitoring, must be initiated to improve the interpretation process. The better the interpreter can understand and manipulate novel information as well as knowledge, skills, and experience, the more the complex information processing of interpreting can succeed.

Interpreters' logical intelligence is continuously called upon to analyze incoming linguistic, environmental, and affective information. Through analysis, the interpreter can deduce, infer, and recognize patterns to determine structure, operation, relationships, and to plan. Reasoning, pattern recognition, analysis, and association combine to enhance problem-solving and prediction skills. Predictions may be about the message content, speaker goals, or the individuals involved (Cokely, 1992; Colonomos, 2007) and are crucial to decision-making and planning. The better an interpreter can plan the message

formulation, the clearer the interpretation can be. Prediction comes from the interpreter's previous knowledge (schema) allowing conceptual relations to be activated quickly (Moser, 1977). Additionally, the interpreter may need to plan strategies for problem solving while interpreting. Planning to obviate problems could include cultural mediations, environmental disturbances, or intrapersonal challenges (Colonomos, 2006).

Crystallized intelligence is associated with long-term memory and includes the following aspects: association, prediction and linguistic abilities, namely message analysis (also influenced by social-cognition), including other-awareness, purpose of speech acts sensitivity, cross-cultural sensitivity and analysis, prosody sensitivity, meaning and nuance sensitivity; expressive abilities; linguistic operation and structure (metalinguistic) sensitivity and comprehension. Fluid intelligence is associated with working memory and includes the following aspects: linguistic abilities noted under crystallized intelligence and logical intelligence, including performance monitoring (also influenced by social-cognition); set shifting; problem-solving; planning; association and prediction; and analysis and reasoning ability that affects cognitive style, comprehension and the ability to release the linguistic form of a message. (See Figure 3.)

*Figure 3*




*Intellectual aptitudes*

## Processing Ability: Cognitive Skills and Cognitive Capacities

Cognitive skills and cognitive capacities are influenced by one's level of intelligence. The relationship between intelligence and cognitive abilities is one's mental plasticity while the relationship between intelligence and cognitive capacities is one's raw potential. Cognitive abilities and cognitive capacities create processing ability. Mental plasticity and processing ability tap into the raw potential, the capacity of the individual, to manipulate available stores and perform complex tasks (Macnamara, 2008).

### Performance Monitoring and Regulation

Performance monitoring and regulation are conducted through metacognitive awareness. Metacognition is both a capacity and a skill. As a capacity, metacognition is a specific type of knowledge set: an awareness of the self, tasks, and strategies. As a skill, metacognitive regulation uses metacognitive knowledge to oversee cognitive processes, plan, evaluate, problem solve, make decisions, and monitor the process and outcome (Livingston, 1997).

Metacognitive knowledge of self is crucial for accurate interpretation. All individuals have filters and paradigms of how they view the world and perceive messages of others. Interpreters must be aware of their own views as the message can be misunderstood and skewed in the interpretation by subconscious biases (Colonomos, 2005, 2006). Individuals with this type of metacognitive awareness not only are more aware of their filters and biases but also how they process information and their own cognitive processes (Livingston, 1997).

Metacognitive knowledge of tasks and strategies is awareness of the nature of the task and the demands it will place on cognitive ability (Livingston, 1997). Metacognitive knowledge draws heavily from logical intelligence. An interpreter must be aware of tasks that are difficult for himself/herself in order to be able to apply strategies or coping mechanisms.

Metacognition regulation, or executive control, works to appropriately allocate cognitive resources based on feedback from cognitive components (Livingston, 1997). Metacognitive regulation is used during interpreting, in part by monitoring. The interpreter monitors his or her own process as well as outside sources such as a team interpreter and clients in order to

make decisions about the process. In addition, the interpreter is monitoring accuracy of predictions based on schema, allocation of focus, and adjustments to processing based on observations through monitoring.

**Attentional Control**

Attentional control refers to conscious mental effort allocation or concentration. Selective attention allows us to choose which sensory information receives focus and which is filtered out (Ashcraft, 2006). This is concentration, the ability to focus mental effort on selected stimuli, allocate the attentional resources and filter out distracting stimuli that are not pertinent.

Interpreters must have attentional control (Moser-Mercer, 2000) such as the ability to filter out interference (Cokely, 1992) and concentrate (Colonomos, 1997). Attentional control is the first step in order to logically reason, analyze and retain information memory stores. Attentional resource allocation is required throughout the interpreting process.

Attentional control is moderated by the ability to control stress and emotions, as stress and negative emotions interrupt one's ability to attend (Goleman, 2005), and attending is also moderated by metacognitive control and working memory. Attentional control must be moderated appropriately to be effective. For example, many novice interpreters devote their attention to the target language production, thus reducing attentional capacity for processing the information and causing them to interpret on the lexical level (Moser, 1977).

**Memory**

Attention filters perceptions that then are stored in short-term memory. Working memory processes information perceived and synthesizes information stored in long-term memory. The central executive is the attentional controller of working memory. It manages the other components by directing and allocating attention, including filtering out of unnecessary stimuli (Baddeley, 2000).

Working memory is both a capacity and a developed active function, thus it is a capacity and a skill. Attentional control allows for functional working memory. Working memory directly interacts with long-term memory, chunking and extemporaneous decision-making while processing and

multitasking (online decision-making.)

Memory is used throughout the interpreting process from the information stored and chunked into units of meaning ( Cokely, 1992; Moser, 1977) to the search for equivalent meaning in the target language. Processing in working memory allows interpreters to process language, plan, reason, problem-solve (Cohen, Peristein, Braver, Nystrom, Noll, Jonides, & Smith, 1997), and process online (Christoffels, de Groot & Waldorp, 2003). Working memory also plays a part in an individual's learning and comprehension (Baddeley & Della Sala, 1996) and is highly correlated with fluid intelligence (Conway, Kane, & Engle, 2003).

**Chunking**

Chunking can be viewed as an extension of comprehension in addition to a sub-process of working memory and a major factor determining cognitive load. Higher cognitive processes, such as information processing, occur within working memory, and working memory has a limited capacity. Subsequently, information processed within this capacity, such as while interpreting, uses "chunking." The classic theory regarding cognitive load was first proposed by Miller (1956), in which he stated that humans could process and retain seven, plus or minus two, "chunks" of information at a time.

The chunks vary in size depending upon familiarity (Miller, 1956). The more familiar an interpreter is with the content, the larger the chunks can be and the chunks may contain substantial amalgamated information, thus consuming less cognitive capacity and reducing cognitive load. Attention can be less allocated to concentration and temporary storing and the interpreter can have the luxury of using the attention spared for other parts of the process.

According to Seleskovitch (as cited in Mackintosh, 2007), interpreters chunk incoming information, holding it for a few seconds in short-term memory until "cognitive complements" transform the lexical units into larger units of meaning. Once the units of meaning are formed, they converge into even larger units of meaning and can be analyzed for meaning and chunked into larger pieces by the interpreter. These chunks can be analyzed at the lexical, phrasal, sentential, or discourse level and are retained for analysis until a complete understanding

has been achieved or when the chunk is converged with another chunk (Cokely, 1992).

Chunking allows the interpreter's mental capacity to be more available for other cognitive tasks such as problem solving, decision-making, monitoring, association, and further analysis than if the interpreter is not chunking. Familiarity and practice play an important role in encoding and chunking information and are a major distinction between novices and experts in types of problem solving. De Groot (as cited in Sweller, 1988) performed the pioneering research on memory in problem solving in chess. Both experts and novices would search for solutions with the same depth and breadth. The difference rested in the experts' ability to remember and encode longer sequences of moves and configurations, thus being able to work with more information in pre-acquired schemas than novices (Sweller, 1988).

Online schema acquisition (i.e. schema acquired "in the moment" while interpreting), which is a product of working memory, aids chunking while processing. However, if the interpreter is having difficulty with the incoming information or needs to problem solve more than usual, schema acquisition may be difficult as problem solving uses a large amount of cognitive processing capacity (Sweller, 1988).

**Multitasking**

The adaptive executive control allows simultaneity of cognitive tasks, otherwise known as dual-tasking or multitasking. Multitasking quickly consumes the mental resources or attentional capacity. Simultaneous interpreters likely cannot perform cognitive tasks at full capacity because of the cognitive load occurring simultaneously in the other parts of the process (Moser, 1977). Familiarity decreases the amount of cognitive load and thus allows for more multitasking, as does practice and in the best case, automaticity (Schumacher, Lauber, Glass, Zurbriggen, Gmeindl, Kieras, & Meyers, 1999). Full automaticity is not required for multitasking; however, an increase in automatization decreases the difficulty of the task and allows the executive control to re-allocate attentional resources, based on priority and strategy, to other demanding tasks (Schumacher, et al.).

In interpreting, attention is divided to accommodate the many simultaneous tasks. The more the tasks are automated,

the more attention can be allocated to other tasks such as analysis, attending to the message in order to comprehend it, and analysis of the goal of the speaker, planning, decision-making, etc.

**Online Decision-Making**

An individual reaches a decision by assessing available information and predicting potential outcomes. Influencing factors include how the outcome will affect the individual and other individuals, what the probability of the outcome is, and the potential risk. Social norms, values, and confidence, as well as cognitive control and process management color perspectives on risk. To complete the decision-making process, the individual integrates all of the aforementioned by applying knowledge, emotions, and dispositional tendencies (Parker & Fischhoff, 2005).

Decisions can be greatly affected by time-pressure and emotions. One reason for this is that emotion processing, working memory, and part of the decision-making process are operated in the orbitofrontal cortex of the brain, causing stress to "clog" the ability to process information efficiently. Another reason that emotions affect decision-making ability is that decision-making is influenced by bioregulatory process signals that are often expressed in emotions. These feelings can influence a variety of operations in the decision-making process and can be conscious or unconscious (Bechara, Damasio & Damasio, 2000).

Stress from time-pressure galvanizes a different response system in decision-making processes for decisions that must be handled immediately versus those that do not carry urgency (Sylwester, 2005). Time-pressure-influenced decisions are often based on emotional influences, whereas in making decisions that do not need to be handled immediately, the brain responds more slowly and analytically (Sylwester). However, "snap judgments" that occur almost instantly but do not carry time-pressure stress may be analytical decisions processed quickly in the subconscious (Gladwell, 2005).

Decision-making relies on stress regulation ability; logical intelligence such as analysis, reasoning, problem solving and memory; metacognition; and tendencies of the individual. In 1998, Campbell divided interpreter tendencies into four categories: risk-taking, prudence, persistence, and capitulation

(as cited in Clark, 2007). None of these tendencies that guide decisions are better than others in a clear-cut sense. Instead, the situational demands determine the best approach to making decisions in the interpreting process (Clark). Metacognition allows for the awareness and monitoring of tendencies and their effects in the decision-making process.

**Set Shifting**

Online decision-making relies on working memory, long-term memory, metacognition and set-shifting abilities. Cognitive set shifting (Grant & Berg, 1948) is flexibility of approach or strategy when faced with a new challenge, rule, or reinforcement (Owen, Roberts, Hodges & Robbins, 1993). Set-shifting flexibility is essential to adaptation. Interpreters locked into particular interpretations can neither adapt nor modify based on new signals such as a team feed or feedback from a client that indicates that the interpretation is not being understood or is not clear. The ability to adapt or shift set would occur after being presented with new stimuli and is connected to decision-making. In other words, if new information is presented and the decision-making process is activated, switching set can only be deemed as an option and carried out if one has the flexibility with which to do so.

**Speed and Depth of Processing**

Multitasking, cognitive load, and chunking contribute to the brain's ability to process language and information. The better the interpreter's ability to multitask, chunk, and save capacity, the faster processing can be. The faster the process of accessing information from working memory or long-term memory, the more capacity that is saved during these stages, and the more attentional capacity that is available for the processing of incoming information (Moser, 1977).

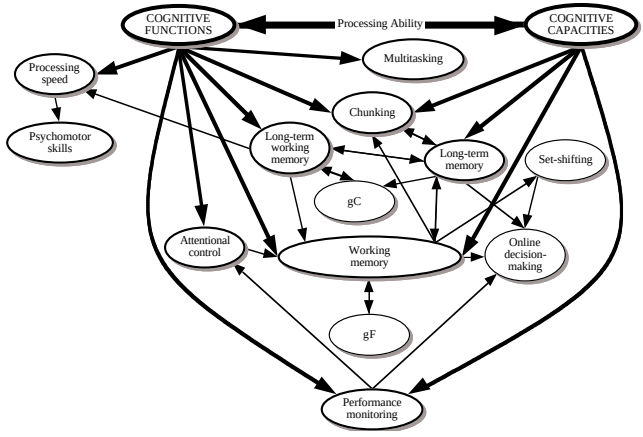
Analysis, memory and available cognitive capacity aid in an individual's ability to process information more deeply. Processing depth ranges from sensory to semantic-associative (Craik & Lockhart, 1972). Semantic-associative level processing is more likely to be retained and retrieved from memory (Craik & Lockhart). Interpreters must be able to process incoming information with various levels of knowledge and be able to process at various depths. Variant depth processing restructures cognition in interpreters likely allowing deep processing to

occur more naturally.

An aspect of restructured cognition is long-term working memory. Experts employ long-term working memory strategies in order to retrieve chunks of information from long-term memory efficiently. This structuring of accessible chunks in long-term memory improves processing speed (Moser-Mercer, 2000). Processing speed (including psychomotor speed) according to recent research by Hinze, Bunting, and Pellegrino (unpublished), is an indicator of potential when comparing competency and expertise. Working memory capacity is a strong indicator of skill acquisition until one is competent. After a certain level of proficiency and experience, processing speed appears to be more influential in skill level (competent v. expert).

Cognitive skills and cognitive capacities include the following dimensions in the theoretical framework: working memory, its relationship to fluid intelligence and its influence on chunking, online decision-making, set-shifting, and long-term memory; attentional control and its influence on working memory; performance monitoring and its influence on attentional control and online decision-making; long-term memory, its relationship to crystallized intelligence and its influence on working memory, online decision-making, processing speed and chunking; set-shifting and its influence on online decision-making; processing speed and its influence on psychomotor speed; and multitasking. (See Figure 4.)

*Figure 4*




*Processing ability based on cognitive skills and cognitive capacities*

## Second Language Learning Aptitudes

Second language learning (for the purposes of this paper, acquisition and learning are not differentiated) and the aptitudes for second language learning are prerequisites to interpreting learning. The following categories, sets, and subsets are assumed necessary for college-age, non-bilinguals to achieve competency in a second language. Many aptitudes are similar to those needed for interpreting learning or interpreter performance.

### Cognitive Orientations

The cognitive orientations are bifurcated into "self" and "other" similar to the social-cognitive aptitudes of interpreting. Self-oriented cognition includes self-efficacy and risk-taking, motivation, cognitive style and need for cognition. Producing a second language while one is learning and not yet fluent is often anxiety provoking. Guiora et al. (1972) conducted an experiment measuring second language learners' pronunciation ability while consuming varying amounts of alcohol. A quadratic effect occurred, supporting the hypothesis that small amounts of alcohol reduced inhibition and increased expressive performance while larger amounts of alcohol had the opposite effect. This study showed that inhibition played a role in language production abilities.

Motivation plays a counter-balancing role to inhibition. Without motivation, one is not open to learning and therefore does not acquire knowledge to one's potential. Motivation to learn and perform well encourages self-monitoring and self-regulatory measures to ensure development as well as motivation to perform effortful cognitive tasks. Need for cognition, the desire to perform effortful cognitive tasks such as language learning, is likely to influence the amount of motivation one has for language learning.

Cognitive style, the propensity of an individual to process holistically or analytically, has been researched extensively in second language learning. The results suggest that field independents are superior to field dependents on linguistic analysis and second language learning in general due to the analytic style of reasoning, but that field dependents, who process information as a holistic structure, are typically more sociable and are more likely to learn a second language if

communicative benefits are apparent and accessible (Dornyei & Skehan, 2003).

Attitude will also affect one's openness to language learning. If a student has a negative attitude toward learning, the language, or the native users of the language, or is not willing to communicate with the native users of the language for inhibitory or attitudinal reasons, learning will stagnate.

Having a healthy attitude toward learning, the language, and the native language learners will open a learner to observing cultural characteristics and to process the differences without being judgmental. Linguistic operational sensitivity, cross-cultural sensitivity, and empathic inference will increase a learners' ability to learn and reproduce aspects of the second language.

**Set Shifting**

Second language learners must release a learned set of rules, such as native language's linguistic and cultural rules, in favor of learning a new set of rules. One cannot become bilingual if unable or unwilling to apply rules in a new language that contradict the rules in the first language. Mental flexibility will affect cross-cultural sensitivity and analysis.

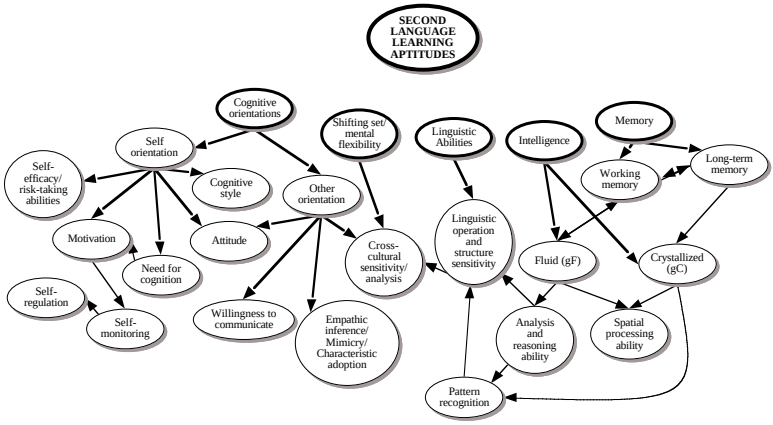
**Linguistic Abilities, Intelligence and Memory**

Fluid intelligence and working memory capacity predict learning task ability. One's ability to analyze, reason, and recognize patterns will typically translate into linguistic operation and structure analytical ability. In addition, spatial processing ability is influenced by intellectual ability. Spatial processing ability is the only aptitude unlikely to be crucial for learning most spoken languages. While signed languages are processed in the same language centers of the brain as spoken languages, when one is first learning a signed language, the visuo-spatial features are likely not yet coded in the brain as linguistic. For this reason, spatial processing abilities may be needed at least during the early stages of signed language learning.

The second language learning theoretical framework includes the following aptitudes: self-efficacy and risk-taking ability; need for cognition, its affect on motivation and motivation's affect on self-monitoring and self-regulation; attitude toward learning, the language, and the native users

of the language; cognitive style; willingness to communicate; empathic inference and mimicking abilities; mental flexibility and its affect on cross-cultural analysis; linguistic operation sensitivity and its affect on cross-cultural analysis; analysis and reasoning skills and their affect on pattern recognition and language analysis; spatial processing ability; intelligence and working memory and long-term memory. (See Figure 5.)

*Figure 5*




*Second language acquisition aptitudes*

## Conclusion and Future Research

Every individual is cognitively unique and career suitability varies. There is a dearth of research describing which cognitive tasks are required in interpreting. The goal of this paper is not only to recognize the cognitive functions, but also to recognize at a more foundational level which cognitive characteristics are needed to perform the cognitive functions necessary for interpreting. The theoretical frameworks of interpreting aptitudes (refer to Figure 1) and second language learning aptitudes (refer to Figure 5) are serving as a structure for empirical research. Both correlational and experimental studies are underway to collect data that will either support or refute the dimensionality reduction in its present form. Examples of future studies include measuring various cognitive abilities of working interpreters and interpreter student graduates who

did not succeed in the field as well as longitudinal studies of interpreting students over time in order to predict skill acquisition. This data will be evaluated using latent growth modeling and other structural equation models. Empirical research and psychometric studies need to be carried out to develop an aptitude test for interpreters. An aptitude test can serve as an objective measurement tool to predict abilities. This tool will aid in career selection, more streamlined education, and an increase in percentage of skilled interpreters entering the field.

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