

# Examining the Link between Personality Traits, Cognitive Performance, and Consecutive Interpreting

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## Declaration

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## Contents Page

### Contents

Declaration .....	ii
Acknowledgments .....	iii
Contents Page .....	iv
List of Figures.....	vii
List of Tables .....	viii
<b>Abstract .....</b>	<b>x</b>
<b>Chapter One: Introduction .....</b>	<b>1</b>
Background of the Study.....	1
Rationale of the Study .....	3
Research Questions .....	6
Overview of Chapters .....	8
<b>Chapter Two: Literature Review .....</b>	<b>10</b>
Personality Traits .....	10
Openness .....	16
Conscientiousness .....	18
Extraversion .....	19
Agreeableness.....	22
Neuroticism.....	24
Cognitive Abilities .....	27
Abilities in the Domain of Memory .....	28
Abilities in the Domain of Attention .....	34
Abilities in the Domain of Thinking.....	38
Abilities in the Domain of Emotion.....	42
Abilities in the Domain of Language .....	44
Consecutive Interpreting.....	47
The Effort Model.....	50
The Interactant Model.....	55
Meaning-based Model of Interpreting.....	56
Foundational Cognitive Aptitude Model .....	58
Attentional Control Model .....	61
The Relationship Between Personality, Cognitive Ability, and Interpreting .....	63
Personality and Cognitive Ability .....	63
Personality and Interpreting .....	70
Cognitive Ability and Interpreting.....	76
<b>Chapter Three: Methodology .....</b>	<b>83</b>
Choice of Personality Theoretical Model .....	83
The California Psychological Inventory .....	84
The Eysenck Personality Questionnaire .....	85
The Sixteen Personality Factor Questionnaire.....	86



The Myers-Briggs Type Indicator .....	87
The Big Five Inventory .....	89
Choice of Cognitive Abilities .....	94
Working Memory .....	95
Attentional Control .....	96
Multi-tasking .....	98
Speed of Information Processing .....	99
Psychological Endurance .....	101
Measurement of variables .....	103
Measurement of personality .....	104
Measurement of Cognitive Ability .....	105
Measurement of Interpreting .....	109
Choice of Analysis .....	110
Ethics .....	111
Epistemological Position of the Researcher .....	113
Chapter Four: Experimental Study .....	116
Participants .....	116
Design .....	117
Materials .....	119
Procedure .....	122
Pre-data Collection .....	122
Data Collection .....	124
Post-data Collection .....	126
Chapter Five: Results .....	128
Reliability and Validity of Measures .....	129
Results of Research Question One .....	130
Results of Research Question Two .....	136
Results of Research Question Three .....	142
Results of Research Question Four .....	147
Chapter Six: General Discussion .....	174
Summary of Key Findings .....	174
Possible Explanations of Findings .....	176
Implications .....	186
A Tentative Model for the Relationship between Three Elements and Interpreting Success .....	191
Chapter Seven: Conclusion .....	196
Overview of the Current study .....	196
Strengths and Limitations of the Thesis .....	197
Contribution to Knowledge .....	201
Future Research .....	203
References .....	205
Appendices .....	251
Appendix A: The Big Five Personality Questionnaire .....	251
Appendix B: Attentional Control Questionnaire .....	259

<b>Appendix C: Psychological Endurance Questionnaire.....</b>	<b>263</b>
<b>Appendix D: Physical Experiment Material for Working Memory .....</b>	<b>265</b>
<b>Appendix E: Physical Experiment Material for Multi-tasking .....</b>	<b>270</b>
<b>Appendix F: Physical Experiment Material for Speed of Information Processing.....</b>	<b>271</b>
<b>Appendix G: Consent Form .....</b>	<b>272</b>

## List of Figures

Figure 2.1: Working Memory Model (Baddeley, 2000).....	33
Figure 5.1: Diagram of Moderating Effect (Baron & Kenny, 1986).....	148
Figure 5.2: Hypothesized Diagram of Moderating Effect of Personality Traits on the Correlation Between Interpreting Training and Cognitive Abilities. ....	149
Figure 5.3: Mediator Model.....	156
Figure 5.4: Three-stepped Regression Analysis (Wen et al, 2004).....	157
Figure 5.5: Hypothetical Relations between Openness, AC/PE and Interpreting Training .....	158
Figure 5.6: Mediation Diagram of Interpreting Training on Openness and Attentional Control.....	160
Figure 5.7: Hypothetical Relations between Conscientiousness, WM/AC/PE and Interpreting Training.....	161
Figure 5.8: Mediation Diagram of Interpreting Training on Conscientiousness and Working Memory .....	162
Figure 5.9: Mediation Diagram of Interpreting Training on Conscientiousness and Attentional Control.....	163
Figure 5.10: Hypothetical Relations between Extraversion, AC/PE and Interpreting Training.....	165
Figure 5.11: Mediation Diagram of Interpreting Training on Extraversion and Attentional Control.....	166
Figure 5.12: Diagram of Interacting Effect .....	168
Figure 5.13: Hypothetical Diagram of Interacting Effect between Interpreting Training and Personality Trait on Cognitive Abilities.....	168
Figure 5.14: Interacting Effect of Interpreting Training and Conscientiousness on Psychological Endurance .....	172
Figure 6.1: A Tentative Framework between Personality Traits, Cognitive Abilities and Interpreting Training.....	192
Figure 6.2: The Cognitive Model of Learning (Unger et al., 2009).....	193
Figure 6.3: A Tentative Framework between Personality Traits, Cognitive Abilities, Interpreting Training and Career Success.....	194

## List of Tables

Table 2.1: The Relationship between Personality Traits and Cognitive Abilities.....	70
Table 4.1: Demographic Characteristics of Participants.....	116
Table 4.2: Variables of Present Study.....	117
Table 5.1: Reliability and Validity of the Big Five Inventory, Attentional Control Scale and Psychological Endurance Scale .....	129
Table 5.2: Descriptive and Inferential Statistics of the Listening Span Test .....	131
Table 5.3: Descriptive and Inferential Statistics of the Attentional Control Scale.....	132
Table 5.4: Descriptive and Inferential Statistics of the Attentional Control Scale Sub-dimensions .....	133
Table 5.5: Descriptive and Inferential Statistics of the Linguistic Dual Task.....	133
Table 5.6: Descriptive and Inferential Statistics of the Digits Symbol Substitution Test	134
Table 5.7: Descriptive and Inferential Statistics of the Psychological Endurance Scale .	135
Table 5.8: Correlations between the Big-Five personality traits and Cognitive Abilities	136
Table 5.9: The Summarized Correlation between Big-Five Personality Traits and Cognitive Abilities.....	142
Table 5.10: Descriptive and Inferential Statistics of Openness .....	143
Table 5.11: Descriptive and Inferential Statistics of Conscientiousness .....	144
Table 5.12: Descriptive and Inferential Statistics of Extraversion .....	145
Table 5.13: Descriptive and Inferential Statistics of Agreeableness.....	145
Table 5.14: Descriptive and Inferential Statistics of Neuroticism .....	146
Table 5.15: Moderating Effect Test of Openness to Interpreting Training and Cognitive Abilities.....	149
Table 5.16: Moderating Effect Test of Conscientiousness to Interpreting Training and Cognitive Abilities.....	151
Table 5.17: Moderating Effect Test of Extraversion to Interpreting Training and Cognitive Abilities.....	152
Table 5.18: Moderating Effect Test of Agreeableness to Interpreting Training and Cognitive Abilities.....	153
Table 5.19: Moderating Effect Test of Neuroticism to Interpreting Training and Cognitive Abilities.....	154
Table 5.20: Mediating Effect Test of interpreting training on Openness and Attentional Control.....	159
Table 5.21: Mediating Effect Test of Interpreting Training on Openness and Psychological Endurance .....	160
Table 5.22: Sobel Testing of Interpreting Training on Openness and Psychological Endurance .....	161
Table 5.23: Mediating Effect Test of Interpreting Training on Conscientiousness and Working Memory .....	162
Table 5.24: Mediating Effect Test of Interpreting Training on Conscientiousness and Attentional Control.....	163
Table 5.25: Mediating Effect Test of Interpreting Training on Conscientiousness and	

Psychological Endurance .....	164
Table 5.26: Sobel Testing of Interpreting Training on Conscientiousness and Psychological Endurance .....	164
Table 5.27: Mediating Effect Test of Interpreting Training on Extraversion and Attentional Control.....	166
Table 5.28: Mediating Effect Test of Interpreting Training on Extraversion and Psychological Endurance .....	167
Table 5.29: Sobel Testing of Interpreting Training on Extraversion and Psychological Endurance .....	167
Table 5.30: Interacting Effect between Personality Trait and Interpreting Training on Working Memory .....	169
Table 5.31: Interacting Effect between Personality Trait and Interpreting Training on Attentional Control.....	170
Table 5.32: Interacting Effect between Personality Trait and Interpreting Training on Multi-tasking .....	171
Table 5.33: Interacting Effect between Personality Trait and Interpreting Training on Speed of Information Processing .....	171
Table 5.34: Interacting Effect between Personality Trait and Interpreting Training on Psychological Endurance .....	172

## **Abstract**

Interpreting is a highly complex activity that not only demands proficient linguistic expertise, but also non-linguistic abilities such as non-linguistic cognitive performance (Macnamara, 2012; Riesbeck et al., 1978; Wang, 2004). In addition to this, individual differences in personality may also play a potential role in the interpreter's ability to perform their job (Barrick & Mount, 1991; Rothmann & Coetzer, 2003). The current study sought to examine whether there is a relationship between personality traits, cognitive ability, and consecutive interpreting. The five-factor model of personality (Costa & McCrae, 1988) was used to examine the personality of participants with its five categories of personality type (Openness to Experience; Conscientiousness; Extraversion; Agreeableness; and Neuroticism), and five cognitive ability tasks (Working Memory; Attentional Control; Multi-tasking; Speed of Information Processing; and Psychological Endurance) were chosen to examine their potential relationship with interpreting ability.

To fulfill this goal, an empirical study was conducted, collecting data from 80 participants in total (40 with consecutive interpreting backgrounds in the experimental group and 40 without interpreting foundations as a control group). Data was collected using online questionnaires and a set of cognitive tasks. The three online questionnaires, the Big Five (Goldberg, 1992), Attentional Control Scale (Derryberry & Reed, 2002) and Psychological Endurance Scale (Hamby et al., 2015) were used to examine participants' personality, Attentional Control and Psychological Endurance respectively, whilst the objective cognitive tasks were designed to measure participant Working Memory, Multi-tasking ability and Speed of Information Processing using the Listening Span Test (Liu et al., 2004), Digits Symbol Substitution Test (Kaufman & Lichtenberger, 2006; Wechsler, 1939) and Linguistic Dual Task (Stachowiak, 2015; Meyer & Kieras, 1997) respectively.

The main findings of the current results were: firstly, a significant difference was found in cognitive abilities between experimental and control group in the areas of Working Memory, Attentional Control, Multi-tasking and Psychological Endurance. Secondly, several personality traits correlated with scores on some cognitive abilities. For example, Openness to Experience positively correlated with Attentional Control and Psychological Endurance; Conscientiousness positively correlated with Working Memory, Attentional Control and Psychological Endurance; Extraversion positively correlated with Attentional Control and Psychological Endurance; whilst Neuroticism negatively correlated with Attentional Control and Psychological Endurance. Thirdly, several personality traits (Openness to Experience, Conscientiousness and Extraversion) appear to be significantly related more to the experimental group than the control group. Finally, mediation analysis appears to show that interpreting training has a mediating effect on the relationship between certain types of personality traits and cognitive abilities. In some cases, interpreting training and personality traits appear to exert an interacting effect and have a combining influence on some cognitive abilities. These findings can hopefully provide a foundation for future study and be applied in practice to help interpreting training projects and cognitive ability improvement.

Key words: interpreting training; personality; cognitive ability, the Big Five; Working Memory; Attentional Control; Multi-tasking; Speed of Information Processing; Psychological Endurance

# Chapter One: Introduction

## Background of the Study

Against the backdrop of globalization, communication among nations in trade, economy, culture, education and other fields is increasing unprecedentedly, with the main communication medium being that of language. Interpreting between different languages, whether this be simultaneous (at the same time) or consecutive (following after) interpreting, is playing a much more significant role in the global labor market and attracts worldwide attention (Xiao & Yu, 2017). China, as the largest developing country in the world, has opened its door to the outside world and respected all differences brought by diverse culture, race, color, and religion (Xinhua News Agency, 2008; China's State Council Information Office, 2018). Over the past few decades, Ministry of Education of the People's Republic of China have striven to expand enrolling students in Master of Translation and Interpreting (MTI) programmes in an attempt to foster more talents in translator or interpreter industry. Furthermore, it is worth mentioning that the assessment mechanism judging practitioners' interpreting ability has become more systematic over the recent years (Huang & Liu, 2017). One of the most authoritative examinations in this field is the CATTI (China Accreditation Test for Translators and Interpreters), which has been listed as one of the top ten Chinese high-value certifications by mainstream media including *People's Daily* (CATTI Center, 2019). Hence, people, including but not limited to students who major in MTI, tend to take the CATTI examination to sharpen additional skills.

The trend for interpreter training is not exclusive to China, but is also seen in many countries which strive to build connections with the rest of the world (Xiao & Yu, 2017). The worldwide interpreter organization, International Association of Conference Interpreters (AIIC), has witnessed the bloom of the interpreting industry, as it has developed into an institution with 3083 top-class spoken and sign language



interpreters providing 80 languages service in 106 countries since its founding in 1953 (AIIC, 2022). On account of the increasing population base interested in interpreting worldwide, interpreting has drawn attention from both employment markets and academic circles, which promote development of the interpreting discipline to a great extent.

During the process of interpreting, in addition to linguistic factors, a number of non-linguistic factors may also play a role in the interpretation to a large extent (Wang, 2004). With regard to linguistic factors, it is almost undeniable that bilingual competence is of great significance for this subject (Carrasco Flores, 2021). However, even people who are capable in bilingual aspects still have a long way to go before becoming a qualified interpreter, as non-linguistic factors also play a vital role in interpreting performance. Different from the oneness of linguistic factors, non-linguistic factors comprise various elements. Chinese scholar Xinhong Wang (2004) categorizes memory, attention, interpreter's rate of speech, ear-voice span, and health status as non-linguistic factors in simultaneous interpreting. Macnamara (2012) suggests a Foundational Cognitive Aptitude Model, in which many cognitive factors such as stress control, intellectual aptitude, performance monitoring, Multi-tasking, Attentional Control, memory, chunking, online decision-making, speed and depth of processing have been examined. As these sub-branches of non-linguistic factors are diverse and may overlap with each other to a certain degree, the current thesis will discuss and use five cognitive abilities in the research process: Working Memory (Baddeley & Hitch, 1974), Attentional Control (Derryberry & Reed, 2002), Multi-tasking (Salvucci & Taatgen, 2008), Speed of Information Processing (Posner, 1978), and Psychological Endurance (Masten, 2001). The reason for choosing these five as the representative cognitive abilities of interpreting trainees in the study will be explained in the Methodology section (Chapter Three).

In addition to examining whether there is a relationship between cognitive abilities and interpreting performance, this thesis will also examine whether personality traits play a role in interpreting ability. The exploration of personality

traits is a scientific concept analyzing individual differences reflecting people's characteristic patterns of thoughts, feelings and behaviors (Matthews & Corr, 2016). For example, the Massachusetts Institute of Technology summarized 638 words standing for 638 primary personality traits (Bilgin, 2018), among which 37% described positive traits such as confident, independent and optimistic; 18% described neutral traits such as competitive, dreamy and obedient; with 46% of words describing negative traits such as dogmatic, greedy and selfish. It is believed that people who gain fruitful achievements in their career usually share common traits such as responsible, careful, etc. (Rothmann & Coetzer, 2003). Moreover, personality traits are often regarded as a reliable predictor of workplace activity, because they feature two major characteristics: consistency and stability (McCrae & Costa, 1990; Rothmann & Coetzer, 2003). Therefore, it may be the case that personality traits will exert a positive or negative affect upon an interpreter's job performance and language acquisition to some extent. Based on the above analysis and the abundant literature, it is inferred that there may be a connection between personality, cognitive abilities, and interpreting. However, previous research that has focused on all of these three elements simultaneously is relatively scarce, which leads to the current situation that the inter-connection among personality, cognitive ability and interpreting is still ill-defined. Therefore, this thesis aims to examine the relationship between these three elements. In short, the research is a cross-disciplinary study combining the subjects of language interpreting and psychology, specifically cognitive and personality psychology.

## **Rationale of the Study**

In this section, I will briefly explain the initial reasons igniting me to explore this subject in relation to these three elements. First and foremost, there is a saying that is universally accepted in the field of interpreting that interpreters are not born but made (Mackintosh, 1999), which indicates that every interpreter must undergo constant practice to improve their comprehensive ability including the proficiency in

both source and target language. However, individual differences cannot be ignored during language and cognitive practice process. Through years of unremitting efforts, it has been found that the scores introvert and extravert students achieved on their English listening tests differed significantly, with the introvert samples gaining higher scores on English listening tests than their extravert counterparts (Travolta et al., 2018). With regard to response speed and accuracy, extraverts have been found to respond more quickly but less accurately than introverts (Eysenck, 1994).

Examination of the relationship between extraversion and cognition has found that outgoing people generally appear to have advantages on cognitive tasks such as dividing attention and better short-term memory, whilst introverts are more adept at focusing attention tasks, solving intricate problems and long-term memory (Matthews et al., 2003). Another study found similar results, that extraverts appear to possess better verbal skills, which require short-term recall, while introverts perform better when it comes to long-term memory (Dewaele & Furnham, 1999).

For interpreters, the ability to mobilize both long-term and short-term memory in an interpreting task is a key requirement. To be specific, interpreters need to translate speech orally according to their short-term memory of the speech, but the target speech quality is also related to their long-term memory. This is primarily because extra-linguistic knowledge (or professional background knowledge of the interpreting meeting) is generally stored in long-term memory and would be invoked at any time in the interpreting process (Baddeley, 1992; Baddeley & Hitch, 1974; Gile, 1995). Interpreting is a high-demand task that requires interpreters to convert auditory source language to oral target language within a short response time, which requires the sophisticated coordination of listening and expression ability, accuracy and fast-response as well as short-term and long-term memory (Gile, 1995; Macnamara, 2012). Therefore, whether extraverts (high score in oral, responding time and short-term memory) or introverts (high score in listening, accuracy and long-term memory) would possess advantage in interpreting performance is the first initial point that aroused my curiosity in this field.

The second motivation for me to research this issue is that non-linguistic factors or cognitive abilities are generally ignored in the field of interpreting. Through interpreting training, it is undeniable that novices could improve their bilingual competence to a great extent (Garcia et al., 2020) since they need to practice switching from one language to another instantly and accurately. However, I believe that interpreting trainees can not only enjoy the benefits from a linguistic perspective, but more importantly, cognitive abilities (e.g., trainees could improve their Working Memory or Attentional Control after interpreting practice, which in turn benefits interpreting performance for some individuals.). Cognitive ability refers to the capacity of the human brain to think, reason, manipulate, keep and fetch information (Kiely, 2014), which is one of the most important capacities for people to complete tasks successfully. Therefore, the current thesis will examine whether there might exist a significant difference between individuals who have received interpreting training for a period and individuals who have not received training. Due to high-frequency practice, interpreting trainees' cognitive abilities such as Working Memory and Attentional Control could be exercised from time to time, thus embodying an improvement and difference from others. If the hypothesis is tenable, the significance of interpreting training could be expanded, not only exclusive to linguistic training, so as to promote development of the interpreting discipline.

To conduct an empirical study combining personality traits, cognitive ability and consecutive interpreting is the third original element of this research. It is undeniable that there have previously been a number of empirical research studies related to personality traits or interpreting performance; however, with the exception of Working Memory, the other four cognitive abilities mentioned above are less studied by scholars in an empirical context, let alone examining the integration between cognitive abilities, personality traits and consecutive interpreting. Therefore, exploring the inter-relationship between these elements will address a gap in the current research literature. Moreover, this thesis aims to draft a framework identifying future research regarding the relationship between interpreting training,

personality traits and cognitive abilities. To achieve this an examination of the moderating, mediating or interacting effects that may exist in this relationship between the variables will also be carried out. Via this empirical study, individual differences in cognitive abilities and personality traits may attract attention from interpreting trainers, which is beneficial for them to educate trainees on the basis of their own cognitive aptitude and personality trait. An outstanding interpreter can only be fostered under the condition that all his or her potential has been inspired and knowing the personality trait of interpreting students is the key to achieve this goal. Finding out the secret of this guidance key cannot be realized without abundant empirical data and rigorous analysis.

Finally, it is widely acknowledged that cognitive abilities such as memory and reasoning are vital to personal progress and career development (Rothmann & Coetzer, 2003). Educators worldwide pay much attention to students' subject learning such as language and science, and make great efforts to design curriculum syllabus. Beyond all question, enriching students' disciplinary knowledge is essential for them to become a productive member of society. Nevertheless, few education institutions try to practice students' cognitive abilities to help them lay a solid foundation of meta-cognition which can help them absorb new knowledge better and quicker. In principle, individual's cognitive abilities are not only pre-determined through biological mechanisms, but also can be cultivated through upbringing and practice (Chipman, 2017; Kiely, 2014). Through conducting experiments between interpreting and cognitive ability, it may provide new insights into how we can improve cognitive ability within this domain. Given the above four motivations, I hope that this thesis will provide greater knowledge and understanding of the relationship between these three major elements: interpreting abilities, cognitive abilities, and personality traits.

## **Research Questions**

The overall aim of this study is to examine the relationship between the three

major elements of this research, namely interpreting training, cognitive ability and personality traits. Instead of theoretically believing interpreting training is beneficial to cognitive abilities, statistics collected from fieldwork would provide evidence to test the inferences derived from related theories. Based on empirical statistics, a relationship model between interpreting training, cognitive ability and personality trait is expected to be set up.

Given the background and purpose of this study, the primary research questions are listed as follows:

1. Is there a significant difference in cognitive abilities between experimental (interpreter) and control (non-interpreter) group?
2. Is there a significant relationship between personality traits and cognitive abilities?
3. Is there a significant difference in personality traits between experimental and control group?
4. Is there a significant relationship between interpreting training, personality traits and cognitive abilities?

The Results Chapter of this thesis will address each of the four research questions above, and the General Discussion chapter will consider how this may occur and what it means for the field of interpreting dependent upon the results found.

The current study, building upon research in the domains of psychology and language interpreting, is an interdisciplinary study that focuses upon the relationship between interpreting training, personality traits, and cognitive abilities. The overall purpose of the present study is to examine the relationship between these three factors. To achieve the goal of this research, an empirical research study was conducted to examine whether the personality traits and cognitive abilities of individuals who enter interpreting training (experimental group) differ from those who do not enter training (control condition).

## Overview of Chapters

For the sake of achieving the purpose of this research, the layout of this thesis is composed as follows:

Chapter 1 presents an overall introduction to the whole thesis, including the background, rationale and general purpose of the study. In addition to this, research questions are illustrated succinctly. Through reading this chapter, readers will have a general overview of what the thesis will examine from a panoramic perspective.

Chapter 2 refers to the literature review, illustrating the definition and theory of basic concepts in this research such as personality, cognitive ability and interpreting. Moreover, literature in terms of the relationship between personality and cognitive ability, personality and interpreting as well as cognitive ability and interpreting are presented with a review of the academic achievements of previous studies.

In Chapter 3, the methodology relating to choice of personality theoretical model, cognitive abilities and analysis are set out in more detail. This chapter also provides specific information relating to measurement of variables, ethical considerations, and epistemological position of the researcher.

Chapter 4 provides specific details of the experimental study carried out, including participants, study design, materials and procedure.

Chapter 5 provides the results of this experimental study. The chapter presents data demographic characteristics, the reliability and validity of each specific measurement and the findings relating to each of the four research question.

Chapter 6 is a general discussion. It includes the summary of key findings, possible explanations of findings and implications of the current study. A tentative model for the relationship between personality traits, cognitive abilities and interpreting training is also proposed in this chapter.

Chapter 7 is the conclusion, and the final chapter of this paper. It comprises of a retrospective summary of the current study and an outlook for the future, including the overview of the current study, strengths and limitations of the thesis,

contribution to knowledge in the field and future research implications.



# Chapter Two: Literature Review

Based on the brief introduction in the previous chapter, it is of great importance to retrospectively examine what other scholars have conducted in the related field. This chapter is an overall literature review in terms of the three major elements in this research. Firstly, personality traits, especially Big Five personality traits, are unfolded in the beginning of this chapter. I will then review the literature regarding cognitive abilities from different aspects, including abilities in the domain of memory, attention, thinking, emotion and language. The third part of the chapter reviews the literature in terms of consecutive interpreting, and interpreting theories such as the Effort Model (Gile, 1995). In addition to reviewing the three major elements of this research individually, examining the relationship between or among them is also vitally significant. I have also collected the preceding literature focusing on the relationship between personality and cognitive ability, personality and interpreting as well as cognition and interpreting. This literature review should lay a solid foundation for the empirical study conducted in the research, as it plays an important role in understanding the research proposal, experimental study and research findings.

## Personality Traits

The word “personality” originated from “persona”, a Latin expression for face mask (Drace-Francis, 2019). It refers to the tool actors used to disguise themselves on the stage, implicating the character of its role to the audience through different decorative design, extending to the meaning of personality afterwards. To give a definition of the word “personality” is one of the most perplexing issues puzzling psychologists, since it is irresolute for them to define it according to their subdivision of psychology. According to the American Psychological Association (2014), personality is a steady collection of behavioral and experiential features of an individual. Admittedly, this definition is not carved in stone, but this is a good start

for us to better understand personality features, theories and applications.

Almost all sets of personality features are a unity of opposites, which means they both coexist and are interdependent. Firstly, personality is unique and typical (Shirayev, 2017). Just as each of us is one and only, so is personality a feature. On the one hand, every individual boasts their own personality character because of the difference in internal genes. It is totally out of the question to find two individuals with 100% selfsame personality features. Even monozygotic twins cannot be exactly alike, since the difference is originated from the different placement in the womb and quantities of nutrition and hormones during their mother's pregnancy period (Segal, 2012). On the other hand, the uniqueness of individual personality is also due to diverse external environments. Extant studies suggest that both gene and environment factors co-contribute to the formation of personality (Burt, 2008). Jang et al. (2005) found that family environment, acting as one of environmental main effects, would impact the influence of genes on emotional instability. However, it is this obvious uniqueness that leads to typicalness since every individual's specificity is typical (Shirayev, 2017). Being typical is gathering the common ground of the overwhelming majority.

Secondly, personality characteristics is central and peripheral. Central personality features tend to be general in the majority of people, places and time; while peripheral personality features are associated with the central but tend to be more distinct and relevant to certain circumstances (Shirayev, 2017). For instance, pessimism can be regarded as a central feature, because it refers to persistent attitudes and beliefs of undesirable outcomes; and cynicism can be its peripheral personality feature for some people who distrust others in most cases (ibid). Research suggests that central personality features are determined by biological factors to a great extent, whilst peripheral characters may adjust in line with external social circumstances and different lifestyles, and usually change without affecting central personality features (McCrae & Costa, 1999; Shirayev, 2017).

The third set of personality features is that personality is stable and evolving.

Research has shown that our personalities are relatively stable through our lifespans (McCrae & Costa, 1990). This is especially true for central personality features, which change even slowly, and peripheral ones faster. The pace of change is impressionable to stages of life. Childhood is the period during which personality-related changes occur most often, and the change frequency declines with age (Roberts & DelVecchio, 2000; Shiraev, 2017). Personality usually becomes stable in middle age and less variable after the age of fifty (Roberts & DelVecchio, 2000). At the same time, personality is also supposed to be evolving since change and stability are both adaptive characters (Shiraev, 2017). Personality is undergoing evolution during the time when individuals adapt to ever-changing social and physical environment (ibid).

Fourthly, personality is rooted in nature and nurture. The nature-nurture debate is a broad topic among social scientists and psychologists concerning how biological and social variables influence human development, behavior, and experience (Shiraev, 2017). Some scholars believe biological factors play a crucial role in human development, whilst others emphasize social factors (ibid). A standpoint that the development of human beings is the joint result of both biological and social factors is pointed out and accepted by many people (Munsterberg, 1915). Taking pseudobulbar affect (a syndrome featured with uncontrollable emotional outbursts such as laughing and crying) for example, it is caused by natural factors from medical perspective. Yet these natural elements have a serious impact on patients' study, work, social interaction and daily communication. Thus, it is common for people suffering from pseudobulbar affect to form the character of over-anxiety and shyness (Colamonic et al., 2012; Gordon, 2012).

The last set of personality features is that personality is active and reactive. We, as human beings, respond to the circumstances we live and adapt to the world that changes constantly. Classical psychological experiments conducted by several psychologists have found that children from wealthy families tend to underrate the size of coins, while their counterparts from impoverished families are prone to see

coins as larger than they actually were (Bruner & Goodman, 1947; Dawson, 1975). Such phenomenon is interpreted as a scarcity mindset: a reaction to resource shortage (Shiraev, 2017). These experimental data imply that our personalities seem to be the “product” of our outer environment and inner world, so it is active to reply to these situations. Nevertheless, psychologists strongly urge against fatalism, which holds that humans are not the master of their own selves, but under the control of something or somebody such as God, fate, or chance as a programme or machine (Shiraev, 2017).

Throughout the history of psychological development, all schools of thoughts contend for attention, represented by behavioral learning tradition, trait tradition, cognitive tradition and so on. These schools of thoughts nourish many different personality theories and applications. The current research mainly focuses on the trait tradition since trait theory has been applied to measure participants’ personality traits in order to examine their relationship with cognitive performance and consecutive interpreting.

The trait tradition in personality psychology aims to identify and measure traits, which are defined as the distinct and consistent patterns of behavior and experience (Shiraev, 2017). There are several acquiescent principles about traits accepted by psychology community. First, different from “states”, traits are more stable and changeless, since they are not just onefold emotional response (Steyer et al., 2015). Second, traits would affect individuals completely, including behaviors and emotions. In other words, we can speculate on an individual’s reaction, thinking pattern and feeling under certain circumstance according to his or her traits (Shiraev, 2017). Third, traits can be measured as a dichotomy in most cases, or as a point on a continuum, which means that every individual can locate themselves along the trait spectrum (Shiraev, 2017).

Over the last few decades, several different psychologists have contributed to the trait tradition. The American psychologist Gordon Allport was the forerunner of personality trait measurement (Shiraev, 2017). He distinguished the concept of

personality from that of character. The former, personality, referred to the objective self, while character was seen as a moral category. Allport and his colleagues searched for the words that describe people's mental states in the dictionary, and finally identified 17,953 terms related to personality, behavior and feeling such as extraverted, calm, respectable and so on (Allport & Odbert, 1936). Individual personality traits are too complicated to figure out just within limited single words, so Allport classified personality traits as cardinal, central, and secondary. This initiative suggested that personality features can be central and peripheral from another perspective. Cardinal traits are the most dominant and could explain people's behavior and determining mechanism. Cardinal traits can influence central traits, which can be viewed as the cornerstone of personality. In terms of secondary traits, they are less prominent than the previous two traits, and only reveal themselves on some particular occasions (Shiraev, 2017).

Similar to Gordon Allport, Raymond Cattell, a British American psychologist, also devoted time to personality measurement (Cattell, 1965, 1983). He simplified the long list of human traits based on factor analysis, an approach for dealing with vast numbers of observable variables that are supposed to reflect fewer underlying variables (Cattell, 1978). Furthermore, Cattell designed a well-known self-report called the Sixteen Personality Factor Questionnaire (16PF) to measure individual's personality traits (16PF will be further elaborated upon in Chapter three). It has been one of the most popular personality questionnaires which has been translated into several languages and applied in many fields.

Hans Eysenck is famous for his research in two major personality dimensions: extroversion and neuroticism (Eysenk, 1948). He believed that extroversion is closely linked with a person's brain level of arousal. In other words, extraverts are very likely to be under aroused or tedious, so they chase novel experiences to meet their arousal level. It is therefore understandable that extraverts are sociable and seeking external stimulation. On the other hand, introverts tend to be over aroused or jittery. Thus, they keep calm and quiet to attain their optimal level of arousal. With regard to

neuroticism, this describes the degree of emotionality. High-neuroticism people are more likely to feel depressed and anxious, and less stable in emotion facing challenges or new situations. They are dangerous in many people's opinion, since they are quick-tempered and restless (Shirayev, 2017). Low-neuroticism people behave oppositely; they are prone to control their negative emotion and stay calm under pressure.

Apart from the measurements mentioned above, the Big Five, also called as OCEAN, is another personality measurement that carries a big weight in psychology. It was put forward by a new generation of scholars on the basis of preceding theories, and eventually received global recognition (Goldberg, 1993). The Big Five labels personality traits into five dimensions:

openness, conscientiousness, extroversion, agreeableness, and neuroticism. This trait assessment is chosen to apply in the present study for several reasons. Firstly, the Big Five Model has been widely applied in studies worldwide, showing consistent well performance in reliability and validity for nonclinical sample groups with different backgrounds and cultures, including Chinese people (John & Srivastava, 1999; Luo et al., 2016). Secondly, the Big five Inventory has been adapted into different versions with diverse number of items, such as 240 NEO-PI-R version and 44-item Big Five Inventory. Researchers could choose the version considering the actual situation of study purpose and design (John & Srivastava, 1999; Shirayev, 2017). This study selects the concise version with a view to the time taken to complete the whole questionnaire (including personality traits and cognitive abilities), since there is a correlation between longer questionnaires and lower response rates (Heberlein & Baumgartner, 1978; Yammarino et al., 1991). Thirdly, instead of assessing personality traits in dichotomy (e.g., either extravert or introvert), the Big Five Model measures personality traits in a continuity interval, which is more rational to get a score ranging from one to five in each personality dimension. By reasons of the foregoing, the Big Five is chosen as the measuring scale in this study, and the five dimensions included will be elaborated in sequence as follows.

## Openness

Openness represents Openness to Experience, including six facets or dimensions: fantasy (a vivid imagination), aesthetic (an appreciation of art and beauty), feelings (depth of emotions), actions (an eagerness to try innovation), ideas (intellectual curiosity) and values (being liberal; Costa & McCrae, 1992). Broadly speaking, it is described as a personality trait linked to intellectual curiosity and interests (McCrae, 1987). On the one hand, from the perspective of motivation, people scoring high in Openness tend to be more unconventional and curious to both inner and outer world, compared to their conservative counterparts with low scores in Openness. They prefer activities that require more thought and are challenging from the perspective of low-Openness person (McRae & Tobert, 2004). On the other hand, structurally, individuals with a high score in Openness tend to lead a fluid style of consciousness that usually make creative associations between rarely connected ideas. By contrast, closed to experience people prefer to choose familiar or traditional ideas and experience (McRae & Tobert, 2004). Therefore, individuals who are highly open to experience are likely to read books related to a wide range of topics (Gosling, 2008).

There are several methods generally applied to measure the degree of Openness to Experience involving self-report, peer-report and third-party observation. Thereinto, self-report is broadly used in this domain due to its convenience and economy-friendly nature and is based on lexical or statement assessment (Goldberg et al., 2006; Thompson, 2008). Lexical assessment reflects different degree of Openness via uniparted adjectives such as creative, philosophical, etc. (Goldberg, 1992), whilst statement assessments comprise more words which measure different facets of Openness at the same time (Thompson, 2008). Acknowledged scales represented by NEO PI-R (NEO Personality Inventory; Costa & McCrae, 1992), Five Factor Model are all self-report statement measurement, in which Openness is one of the five assessed personality dimensions.

Some scholars are interested in the relationship between Openness and physical,

mental and cognitive health, and thus conduct abundant research on it. From a physical perspective, associations are found between Openness and longevity: studies have found that individuals who enjoy a high preference for novelty (Openness to actions) are less likely to take risk of all-cause mortality, and people who appreciated art and beauty (Openness to aesthetics) had a reduced risk of cardiac death (Jonassaint et al., 2007). From a mental health perspective, though Openness, unlike Neuroticism, is not a strong predictor of mental disorders, it may help to differentiate among similar but distinct disorders. For example, it is the defining trait in making a distinction between major depressive disorder (MDD) and bipolar disorder (BD; Barnett et al., 2011). During the COVID-19 pandemic, Nikcevic et al. (2020) examined the relationship between personality traits and general anxiety and depression caused by COVID-19 psychological distress and found that Openness was negatively correlated with generalized anxiety and depressive symptoms. As for the relationship between Openness and cognitive health, open individuals are perceived to be expressive and verbally fluent, which is an apparent characteristic throughout their lifetime (Bates & Shieles, 2003; Sharp et al., 2010). Open young adults tend to outperform those who score low on openness on vocabulary and comprehension tasks, and open older adults score higher on verbal measures of cognition than those who score low on openness (ibid). Openness can not only be regarded as a personality trait of individuals, but a characteristic of regions, since studies have found that different regions may have diverse psychological profiles. In a study of 28 cultures and regions, French-speaking Switzerland, Austria, Germany, and Serbia showed the highest levels of openness; Croatia, Spain, Hong Kong, Malaysia, and India scored the lowest. Although the reason behind these results is not clear, scholars inferred a general finding that contemporary, advanced and well-educated countries are higher in Openness than traditional and conservative countries, although some exceptions exist (Sutin & Widiger, 2017). Over years of development, Openness is no longer a trait so trivial that it is not worth noticing, but a prominent dimension in personality measurement.



## Conscientiousness

Conscientiousness plays an indisputably important role in personality, since it is a strong predictor of life's significant outcomes such as longevity and health (Jackson et al., 2015; Moffitt et al., 2011). Like all other Big-Five personality traits, Conscientiousness can be subdivided into six lower-order facets: competence; order; dutifulness; achievement; self-control; and deliberation. It refers to self-control and the active process of planning, organizing and executing assignments (Barrick & Mount, 1993). Conscientious people are more eager to complete a task effectively with a serious attitude. They are self-disciplined, aspiring and prefer to draw up a plan instead of relying upon spontaneous behavior (Thompson, 2008). Therefore, conscientious individuals are generally associated with adjectives such as systematic, hard-working and dependable, but extreme high Conscientiousness may lead to perfectionism or workaholism (ibid). People with a low score on Conscientiousness are less goal-oriented and success-driven, and are more likely to engage in anti-social action (Ozer & Benet-Martinez, 2006).

As with Openness to Experience, self-report is also the most general measurement of assessing Conscientiousness (Goldberg, 1992; Thompson, 2008). There are many types of self-report measurements that can be applied to assess people's Conscientiousness such as the Chernyshenko Conscientiousness Scales (CCS; Chernyshenko, 2002; Hill & Roberts, 2012), NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) and Abridged Big Five Dimensional Circumplex Model (AB5C; Hofstee et al., 1992). Researchers could choose the most appropriate assessment for participants according to their different need and time constraints.

Conscientiousness appears to exert a positive affect to many major life domains such as academic performance, employment, romantic relationships, and health. It is considered to be the best psychological predictor in these aspects, even performing better than other potential predictors such as social status and intelligence (Roberts et al., 2007). For example, students scoring high on Conscientiousness are more likely

to perform better on academic grades, which is especially true for those who get higher scores on the sub-facet self-control (Noftle & Robins, 2007; Paunonen & Ashton, 2001; Poropat, 2009; Trautwein et al., 2009). Ponnock et al. (2020) found that Conscientiousness was a strong predictor of students' grades, even more efficient than students' consistency of interest. Conscientiousness also links to success in the workplace. Studies have found that individuals who score higher in Conscientiousness tend to earn more money and promotions, thus are more satisfied with their jobs and likely to achieve their career goals (Ng et al., 2005; Roberts et al., 2011). Ellen et al. (2021) show that Conscientiousness is one of the most important predictors of workplace deviance. Conscientiousness can also predict physical health to some extent (Hampson, 2012). The association between Conscientiousness and physical health exists across the whole lifespan. It is a marker related to a decrease in major diseases such as stroke or heart attack, and even appears to help increasing longevity in some studies (Freidman et al., 1993; Hill & Roberts, 2011; Sutin et al., 2011; Weston et al., 2015). Carvalho et al. (2020) found that higher level of Conscientiousness was linked to higher means of social distancing and handwashing, which implies that the Conscientiousness trait may be related to COVID-19 interventions. Furthermore, Conscientiousness interestingly plays a part in a successful maintenance of romantic relationship. People with a higher score in Conscientiousness are found to be less likely to get divorced in marriage (Roberts et al., 2007). It is likely to be explained that high Conscientiousness levels represent higher levels of commitment and relationship satisfaction (Dyrenforth et al., 2010). In short, the influence of Conscientiousness stretches to various domains. Conscientiousness is undoubtedly a principal personality trait that deserves more attention due to its positive influence exerted on people's daily life.

## **Extraversion**

Extraversion is the most frequent trait that people usually discuss when talking about personality traits. It is included in all prominent personality models since Jung

(1921, 1971) first introduced the term Extraversion. Extraversion is one of the basic personality dimensions in the Big Five Model, defined as a perspective showing individual differences in the propensities to experience positive affect, decisive thinking and conduct, and social attention-seeking (Thompson, 2008). It also includes six sub-facets: warmth; gregariousness; assertiveness; activity; excitement seeking; and positive emotion. Extravert people are often labeled as sociable, energetic, forceful, adventurous, enthusiastic and outgoing, thus they may seem to be more dominant in social settings due to their high group visibility (Friedman & Schustack, 2016). Conversely, people scoring low on Extraversion are often quiet, low-key, prudent, and reluctant to set up connections with the outer world, so they have tended to show lower social engagement in social situations (Rothmann & Coetzer, 2003).

The development of Extraversion is thought to be influenced by strong biological issues (Johnson et al., 1999). It found that extraverts have more blood flow in the parts of the brain responsible for sensory and emotional experience, including the temporal lobes, posterior thalamus, and the anterior cingulate gyrus (ibid). Outgoing performance could benefit extraverts throughout childhood (Asendorpf & Van Aken, 2003; Newcomb et al., 1993). Research has indicated that children, aged from five to twelve years old, who are more expressive and sociable are more welcomed and enjoy a higher degrees of peer support, and are less likely to experience rejection (ibid). It is unclear whether this is the reason behind Smits et al.'s argument that societies are becoming more extraverted. In a study of nearly 9000 university students in Netherlands, the average score of Extraversion presented a distinct positive trend from 1982 to 2007 (Smits et al., 2011). Similar results have also been found in other regions with different cultural backgrounds, in Western cultures in particular. Reasons for this may be attributed to less strict parenting styles, increasing job demands in service industry, and emphasizing the value of sociable traits by societies (Cain, 2013; Smits et al., 2011).

A number of previous studies have focused on exploring the relationship

between Extraversion and other domains, “ABCD” in short (A stands for affect; B for behavior; C for cognition; and D for desire). To be specific, the relationship between Extraversion and positive affectivity is one of the meaningful results in personality field, with the Extraversion trait having been shown to have an association with positive affectivity such as feeling happy and energetic (Smillie et al., 2014). Experiencing positive feeling is the essential feature of both trait and state Extraversion (Watson & Clark, 1997). Another major difference between extraverts and introverts shows in behavior. Extraverts are usually socially adept, and they report themselves as more keen on going to parties, dating with people, doing exercise and drinking alcohol (Funder et al., 2000; Paunonen, 2003). This suggests that Extraversion is highly related to interpersonal behaviors, but this does not signify that introverts are asocial and ignore social interactions. In fact, introverts are often as talkative as extraverts in one-to-one conversation, but less expressive as group size increases (Antill, 1973). They attach more importance to quality instead of quantity when they socialize with others, preferring chatting with several close friends instead of a large number of acquaintances (Cain, 2013). Focalizing on the different behavior of extraverts and introverts during the COVID-19 pandemic, Rolon et al. (2021) found out that participants who had been infected with novel coronavirus were more sociable than others, which is one of the facets of extraversion. The result echoes with another finding conducted by Carvalho et al. (2020) that higher scores of extraversion were strongly correlated to lower social distancing. As for the relationship between Extraversion and cognition, studies have found that outgoing people generally show advantages in cognitive tasks such as dividing attention and short-term memory, while introverts are better at focusing attention tasks, solving intricate problems and long-term memory (Matthews et al., 2003). With regards to desire, Extraversion is linked with higher motivation for social connection, intimacy, power, and status (Emmons, 1986; King, 1995; King & Broyles, 1997; Olson & Weber, 2004). This suggests that extraverts are more likely to be attracted by affiliation and agency, driven by a will of getting ahead (Depue & Morrone-Strupinsky, 2005; Hogan,

1982). The application of the Extraversion personality trait is not exclusive to “normal” function, but can be extended to psychiatric disorders (Eysenck, 1957). Extreme high Extraversion levels could pose risks for personal pathology, engaging in extreme self-disclosure and exhilarating manners (McCrae et al., 2005). On the other hand, extreme introversion can also be negative to individuals, relating to maladaptive personality functioning. In brief, Extraversion is a basic personality dimension that often wins widespread attention from the general population and academic researchers.

## **Agreeableness**

Agreeableness is also one of the major personality dimensions of the Big Five Model, regarded as a summary label of individual differences in the motivation to keep positive relationship with others and social harmony (Hogan, 1998; Sutin & Widiger, 2017). Like other personality dimensions of the Big Five, the degree of Agreeableness can be assessed by diverse self-report scales such as NEO Personality Inventory (Costa & McCrae, 1992). Analyses measuring results show that an agreeable person often displays altruistic and sympathetic features, whilst disagreeable people are often more egocentric and skeptical (Jensen-Campbell & Graziano, 2001). Studies have found that individuals with high scores in Agreeableness can better control their negative emotions such as anger, hence they tend to use conflict-avoidant tactics when facing conflict situations. However, people who score low in Agreeableness tend to choose coercive tactics to solve conflicting problems (Jensen-Campbell & Graziano, 2001).

Similarly to other traits in the model, there are six sub-facets included in the Agreeableness dimension: altruism; compliance; modesty; straightforwardness; tender-mindedness; and trust (Matsumoto & Juang, 2012). To be more concrete, altruism can also be understood as the concept of social interest proposed by Alfred Adler, which refers to a tendency of pursuing the betterment of the whole society instead of one’s own (Adler, 1964). Individuals who score low on altruism are more

selfish or greedy, whilst those with high scores on altruism tend to be more selfless. Compliance reflects how an individual handles conflict. High level on compliance represents being meek and mild to conflicts, while low scorers are more likely to be aggressive and quarrelsome (Costa & McCrae; 1991). The third sub-facet, modesty, refers to a person's self-concept. Individuals who score higher on modesty are prone to be more modest, while lower scorers are haughtier (Costa & McCrae, 1991). Straightforwardness represents the quality of forthrightness and truthfulness when communicate with others. Individuals who get high score on straightforwardness tend to connect with others in an honest manner, whereas low scorers are generally deceitful and less forthright (ibid). With regards to tender-mindedness, it means the degree to which an individual's attitudes are influenced by emotion. Tender-minded people tend to be more sensitive and empathetic. The last sub-facet, trust, is commonly mentioned in daily life. A higher level of trust represents the person as more benevolent. By contrast, those who scoring low on trust tend to be cynical, suspicious and dishonest (ibid).

Agreeableness is also an important predictor of mental health, positive affect and relationships with others throughout the lifespan. For mental health, Connolly and Seva (2021) found that Agreeableness is positively associated with life satisfaction. This means that the higher score of Agreeableness an individual produces, the more a person is likely to be pleased with life actuality. In addition, Agreeableness can exert a positive impact on social interaction involving trust (Stavrova et al., 2022). In terms of the relationship with others throughout the lifespan, an individual's Agreeableness level in childhood could exert an impact on Agreeableness in adulthood. Researchers have found that ill-tempered children have higher divorce rates as adults compared to their even-tempered counterparts (Caspi et al., 1987). It is also possible that Agreeableness level is also related to geographical region. For example, people who live in the West, Midwest and Southern part of the United States tend to get higher scores on Agreeableness on average than residents living in other regions of the US. One of the explanations is that these areas are less

urbanized, and residents there are more willing to know each other and care about their neighbors (Rentfrow et al., 2008). Therefore, Agreeableness is also a major dimension in personality system, reflecting individual difference in cooperation and social harmony.

## **Neuroticism**

As the last element of the Big Five Model, Neuroticism indicates an individual's response of regulating emotion, negative emotion in particular. It can be divided into six facets: anxiety; angry hostility; depression; self-consciousness; impulsiveness; and vulnerability. Neuroticism refers to the propensity to feel negative emotions such as rage, anxiety, depression or emotional instability (Jeronimus et al., 2014). People who score high on Neuroticism respond worse to stress and are emotionally reactive. They tend to experience negative life events in a more negative way and are more inclined to interpret common situations in a worse setting (Jeronimus et al., 2014). At the other end of the Neuroticism scale, individuals with a low Neuroticism score are less likely to feel upset in general. They typically display emotional stability, serenity, and the absence of residual negative emotions (ibid).

The trait Neuroticism can be both influenced by genetic and environmental elements (Leonardo & Hen, 2006). Genetic studies of Neuroticism have focused on the 5-HTTLPR repeat polymorphism of the serotonin transporter gene, which is responsible for emotional processing (ibid). Meta-analyses suggest significant differences in Neuroticism scores between people with at least one short 5-HTTLPR allele and individuals with only long alleles, supporting the genetic hypothesis (Munafo et al., 2005; Schinka, 2005). Apart from genetic influences, environmental factors also appear to exert an influence on Neuroticism. Environmental variance can be roughly divided into two types, shared environmental influences (people growing up in the similar environment) and non-shared environmental influences (people growing up in different environments). Studies suggest that substantial differences are found in individuals' Neuroticism levels under non-shared environment (Fullerton,

2006; Lake et al., 2000).

In addition, Neuroticism is closely associated with people's mental and physical health. It demonstrates consistent and robust connections with mental disorders across the lifespan such as personality disorders (Clark & Watson, 1991; Klein et al., 2011; Tackett, 2006; Widiger & Smith, 2008). A great number of previous studies and research has found that Neuroticism is associated with all major forms of psychopathology from a moderate to strong level (Sutin & Widiger, 2017). In addition to the association with mental health, Neuroticism is also associated with physical health (Lahey, 2009). Many investigations indicate that higher levels of Neuroticism are strongly related to many different types of physical health problems such as asthma, atopic eczema, cardiovascular disease and irritable bowel syndrome (Buske-Kirschbaum et al., 2001; Huovinen et al., 2001; Spiller, 2007; Suls & Bunde, 2005). A recent study shows that individuals with high scores on Neuroticism paid more attention to COVID-19 related information and were more concerned with the effect of the pandemic (Kroenke et al., 2020). The study suggests that Neuroticism is a convective predictor of emotional responses to major health crises (ibid). Hence, Neuroticism can be regarded as a predictive utility for longevity, including for people diagnosed with chronic diseases and cancer. Scholars have carried out empirical studies focusing on the treatment of cancer, finding out that higher levels of Neuroticism were linked to 130% greater mortality rate than individuals with lower levels of Neuroticism (Nakaya et al., 2006). Neuroticism is also an important predictor of life quality. People with high Neuroticism scores tend to suffer from psychological stress, excessive demands and impulses, and experience unpleasant emotions such as anger, anxiety, and depression (Gattis et al., 2004; Lynn & Steel, 2006; Ozer & Benet-Martinez, 2006). Low Neuroticism score often indicate high emotional stability. This so-called "emotional stability" is robustly linked to many positive outcomes, including higher marital satisfaction, greater occupational achievement as well as quality of life (ibid). Low level of Neuroticism are also argued to represent lower levels of burnout and emotional exhaustion, while higher scores on Neuroticism are



linked to social impairment, beyond what is accounted for by other personality traits (Armon et al., 2012; Mullins-Sweatt & Widiger, 2010).

Furthermore, differences in Neuroticism are found to exist in groups of people who differ in age, gender, and geographic patterns. Studies show that Neuroticism tends to decrease slightly with age, indicating that those with higher degree of Neuroticism are young individuals who are at high risk of affective disorders (Donnellan & Lucas, 2008). As for gender, levels of Neuroticism are higher in females than males based on a large number of samples (Ormel et al., 2013). Geographically speaking, related studies found correlations between low Neuroticism and economic vitality and entrepreneurship atmosphere. For example, in the United Kingdom, most low Neuroticism scores are found concentrated in urban areas (Rentfrow & Jokela, 2016). In sum, Neuroticism is a fundamental personality trait and is of great significance to psychopathology, physical health, and life quality.

Studies using the five-factor model have been conducted in more than fifty countries and can be regarded as one of the best models for measuring personality traits. Undeniably, trait theory can help people better understand themselves through self-report scales. However, only understanding personality theory is insufficient to examine the link between personality trait, cognitive ability and consecutive interpreting. Cognitive ability and consecutive interpreting will be discussed in the following sections.

## Cognitive Abilities

Cognitive ability, according to Carroll (1993), refers to any ability that concerns some class of cognitive tasks. Most cognitive tasks are complicated, but can be analyzed into distinct processes, stages, or components. For instance, Sternberg (1977) segmented cognitive process into encoding, inference, mapping, application, justification, and preparation-response. In addition, the discipline of cognitive psychology is developed to study human cognition by examining how humans behave and perform in cognitive tasks such as learning, memory, language, problem-solving and reasoning (Eysenck & Keane, 2020). Executive functions and other higher-level mental activities are supported by cognitive control, which is a fundamental construct with a limited capacity (Chen et al., 2020). Cognitive load theory is an influential psychological theory, which aims to explain psychological or behavioral events that emerge as a result of learning (Plass et al., 2010). There are three sources of cognitive loads in the learning environment, namely intrinsic load, extraneous load, and germane load (Wickens et al., 2012). Specifically, intrinsic load is connected to the targeted task being learned; extraneous load is the amount of work that is placed in the training or learning environment but is unrelated to the task being learned; germane load refers to a portion of the learning process itself, including aspects such as rehearsal and making choices (Plass et al., 2010; Wickens et al., 2012).

With the rapid development of society, the cognitive skill contemporary people need to master is different from people lived in the past (Reed, 2020). A Princeton investigator group conducted a survey in 2017, aiming to explore the new workplace skill needed as a result of shifting from an industrial-oriented to information-oriented economy. They found that oral communication is the most highly requested skill and concluded a set of cognitive skills as “21st-century skills” which include critical thinking, problem solving, interpersonal and intrapersonal skill (ibid). For interpreters, a job with high demands in oral communication, cognitive performance is of great

importance (Nour et al., 2020). In this chapter, I will recount previous studies about cognitive abilities from different domains, including memory, attention, thinking, emotion, and language, and further link these cognitive abilities with interpreting job.

## **Abilities in the Domain of Memory**

Memory is the capacity of the brain to encode, keep, and recall data or information as needed. It is the process of retaining information throughout time to affect future actions (Sherwood, 2015). One of the most well-known theories of memory is the multi-store model, proposed by Atkinson and Shiffrin (1968). This model divided the memory system into three categories: sensory register, short-term store, and long-term store. In the human memory system, when a stimulus is presented there is an instant registration of that stimulus within the proper sensory dimensions (visual, auditory and other sensory system), which is the first basic component of memory. With regard to interpreters, the primary sensory dimension they perceive information in is the auditory system. They should extract information from speakers' speech as the foundation of interpreting output. However, the information in sensory memory can only be held briefly and then decays at a rapid speed. To avoid information loss, some information that is attended would be transferred into the short-term store, the second basic component of the memory system.

Short-term memory is the ability to keep a limited amount of knowledge in mind in an activated, accessible state for a brief period of time without changing it. The duration of short-term store is longer than that of sensory memory but with very limited capacity, around fifteen to thirty seconds (Eysenck & Keane, 2020). Research suggests that human short-term memory span is approximated to seven plus or minus two items or chunks (Miller, 1956). However, the result of number seven plus or minus two may vary in tests using different types of information material. For instance, Cowan (2010) suggests that the capacity of central memory store is limited

to three to five meaningful items or chunks. Despite holding different ideas on the number of items or chunks, the concept of chunking, putting similar information together, suggests that it is feasible to store far more individual items of information into a chunk. The notion of chunking provides people a new method to expand memory capacity. People who work in the industry with demanding requirements of memory faculty (e.g., stenographers or interpreters) could group together similar items, storing more information potentially. In the context of short-term memory, forgetting is a natural or progressive occurrence in which memories cannot be retrieved from memory storage. Forgetting, or called disremembering refers to the apparent loss or alteration of information already stored and retained in an individual's memory (Maddox et al., 2011). Different explanations have been put forward to understand the mechanism of forgetting. The trace decay theory claims that when something is learned for the first time, a neurochemical, physical "memory trace" is produced in the brain, which tends to erode with time. Short-term memory can merely hold information for a short period of time, roughly fifteen to thirty seconds, according to this idea, unless it is rehearsed. The information will gradually vanish and degrade if it is not practiced (Eysenck & Keane, 2020). Another explanation of forgetting in short-term memory is displacement. According to Miller (1956), seven plus or minus two items or chunks are the maximum and minimum capacity of short-term memory can hold. Thus, when short-term memory is "full", fresh-new information replaces or "pushes out" old information and takes its place (Eysenck & Keane, 2020). Therefore, for fear of unavoidable forgetting, consecutive interpreters would take note to record key information, helping them recall the speech uttered one or two minutes ago.

The third component of the multi-store model, long-term store, can hold a large capacity of information, potentially for a lifetime. Generally speaking, long-term memory can be categorized into two major categories: explicit memory and implicit memory (Atkinson & Shiffrin, 1968). All memories, such as factual information, previous experiences and concepts, that are consciously available are referred to as

explicit memories (Ullman, 2004). It involves conscious recall and is accompanied by the awareness of such process (Wang, 2020). By contrast, implicit memory such as memory of skills or visual patterns, refers to memory that does not rely on conscious recollection, and is acquired and used unconsciously, and affect thoughts and behaviors (Schacter, 1987; Wang, 2020). With regard to interpreters, both explicit and implicit long-term memory would be activated and associated with filtered information in short-term memory. It is primarily because interpreters should not only possess linguistic knowledge, but extra-linguistic knowledge (professional background information about the source speech) as well (Gile, 1995). Those extra-linguistic knowledge and interpreting related skills are stored in long-term memory, which is the indispensable condition of qualified interpreting performance. Therefore, if the interpreter works in a particular field that he or she is familiar with professional knowledge or at ease with related terminology, it relies more on long-term memory and less short-term memory (Szabo, 2021). It is worth mentioning that forgetting also happens in the context of long-term memory despite it holding a large capacity of information. According to the interference theory, forgetfulness happens in long-term memory because of memories interfering and disrupting one another (Baddeley & Logie, 1999). Except from the interference theory, lack of consolidation theory also explains the reason of forgetting in long-term memory from a biological perspective. There will be a pattern of stimulation and inhibition if you envisage a network of neurons connected by synapses. This pattern of inhibition and stimulation has been proposed as a possible basis for storing information (Bramham & Messaoudi, 2005; Dudai, 2004). Consolidation is the process of altering neurons in order to establish new permanent memories (Parkin, 1993). The more a consolidation process happens, the more information is transferred from short-term memory to permanent long-term memory (Eysenck & Keane, 2020).

The multi-store model has undergone multiple criticisms over the past few decades. Firstly, it was thought improbable that a single, distinct short-term memory system could be in charge of processing other cognitive tasks as well as retaining

memory objects (Plancher & Barrouillet, 2019). Secondly, the idea that rehearsal is the only mechanism for transfer to long-term storage has led to criticism of the multi-store model (ibid). Lastly, the multi-store model presupposes that in the absence of rehearsal for preserving the memory traces, information degrades from the short-term memory. Nevertheless, there is still much dispute in the literature about the existence of temporal decay of memory traces, with some models supporting decay and others contending that only interference can explain forgetting in working memory (Oberauer et al., 2016; Plancher & Barrouillet, 2019).

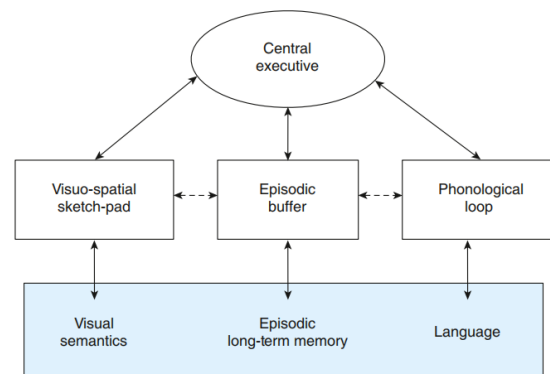
Alongside the multi-store model (Atkinson & Shiffrin, 1968), the Working Memory Model (also known as multi-component model; Baddeley & Hitch, 1974) is also of great importance. The term Working Memory refers to a component of the cognitive system that retains and manipulates information temporarily in order to perform challenging cognitive processes including reasoning, learning, and language comprehension. Originally, many people would regard short-term memory in the same concept as Working Memory (Cowan, 2008; Diamond, 2013). It is admitted that both short-term and Working Memory hold information for a short period of time, but the difference remains that Working Memory retains the information in an attempt to manipulate it, while short-term memory does not manipulate information (ibid). Proposed by Baddeley and Hitch, the Working Memory Model is composed of three sub-components: the central executive, the visuo-spatial sketch pad, the phonological loop (Baddeley, 1992; Baddeley & Hitch, 1974). To be specific, the central executive is believed to be an attentional-controlling system (Baddeley, 2012). It is the most crucial and versatile component of Working Memory because it takes part in almost all complex cognitive activities such as problem solving and multi-tasking.

Baddeley suggests that the central executive, the first sub-component of Working Memory is associated with executive processes (e.g., dividing and switching attention, interfacing with long-term memory). The second sub-component, the visuo-spatial sketch pad, manipulates visual images and spatial movement. It

temporarily stores the information about what the visual pattern is and where the spatial processing is involved. Logie (1995) further subdivided the visuo-spatial sketch pad into visual cache (storing information about visual shape and color) and inner scribe (storing information about spatial and movement information). Baddeley (2003) mentioned two major contributions of visuo-spatial Working Memory to understand language. Firstly, visuo-spatial Working Memory would be involved in memorizing page layout during reading (Altarriba & Isurin, 2012; Baddeley, 2003). Readers can accurately fix positions of previously read words, which is embodied in precise regressive eye movement (Kennedy et al., 2003). Another contribution of Working Memory to language according to Baddeley (2003) is that visuospatial Working Memory may also be helpful in understanding spatial information. Regarding the phonological loop, the third component of Working Memory, it retains and rehearses speech-based information, and consists of two portions: speech perception (a passive phonological store) and speech production (an active articulatory process giving access to the phonological store). Therefore, the relationship between phonological loop Working Memory and language is also close-knit. Baddeley et al. (1998) believed that the phonological loop is useful when learning a language. It also found that the phonological loop is indispensable for the acquisition of both native and second-language vocabulary (Eysenck & Keane, 2020). In the year 2000, Baddeley (2000) added a fourth component to the model, the episodic buffer, which holds representations that incorporate phonological, visual, and spatial information, as well as possibly information not covered by the inferior systems (e.g., musical information, semantic information). The reason why this element was added is that the original version was thought to be limited due to the separate function of each sub-component. It stores verbal data from the phonological loop and for visual and spatial data from the visuo-spatial sketchpad (Eysenck & Keane, 2020). The current model of Working Memory is shown as Figure 2.1 below.

**Figure 2.1**

*Working Memory Model (Baddeley, 2000)*



In contrast to a precise model that allows for accurate predictions, Baddeley highlights that the Working Memory Model still consists of a somewhat loose theoretical framework (Baddeley, 2012). According to Lakatos (2015), the effectiveness of the framework should depend not only on its ability to explain current data but also on the productivity in generating tractable questions related to empirical techniques that can be widely used. In addition, another critical comment on the Working Memory Model is that many methods simply refer to working memory as activated long-term memory (Cowan, 2005; Ruchkin et al., 2003). However, according to Baddeley's perspective on this issue, working memory necessitates the activation of numerous brain regions associated with long-term memory (Baddeley, 2012).

Working memory capacity differs from person to person. Scholars devised many assessment methods to find out how much data can be processed and retained at the same time. Reading span is one of the most popular measures assessing Working Memory, which has been adapted to the Listening Span Test afterwards. However, Working Memory capacity is not always stable, but affected by emotions. For instance, Eysenck et al. (2007) found that Working Memory capacity is diminished when someone is apprehensive or agitated. In addition, Working Memory has aroused the interest of specialists in interpreting industry over years. Focusing on the



literature examining whether Working Memory advantages for interpreters, most studies concluded there is a significant difference between interpreters and non-interpreters in Working Memory (Altarriba & Isurin, 2012; Wen & Dong, 2019). A recent study conducted by Wen and Dong (2019) found evidence supporting an interpreter advantage in both Working Memory and short-term memory spans through meta-analysis (a statistical analysis that incorporates the findings of multiple scientific studies). In recent years, Working Memory training has been regarded as a promising field, since the prospect of Working Memory training can extend to other cognitive abilities such as attentional training and reasoning (Hicks & Engle, 2020).

## **Abilities in the Domain of Attention**

Attention is another crucial cognitive element in our daily life. We rely on it consciously or unconsciously. For example, attention helps us to avoid being hit by cars when we cross the road, to search for useful information and to complete two or more tasks at the same time. According to William James (1890, pp.403-404), attention is 'the taking possession by the mind of one out of what seem multiple concurrently possible objects or trains of thought in distinct and vivid form'. Attention can be distinguished into different pairs of categories, such as active and passive attention, internal and external attention, as well as focused and divided attention (Eysenck & Keane, 2020). More precisely, active attention is controlled by individual's subjective goals or expectations in a top-down way; while passive attention by external stimuli like loud noise in a bottom-up way. Another pair concept is internal and external attention. External attention is concerned with sensory input selection and modulation, whereas internal attention is concerned with internally created information such as rules and memory (Chun et al., 2011). Focused attention and divided attention are another important distinction. Focused attention means an individual would respond to one stimulus when faced with two or more stimuli at the same time. In contrast, divided attention implies individuals

are capable of dealing with at least two stimulus inputs simultaneously, which is also known as Multi-tasking (Eysenck & Keane, 2020). Interpreting is a typical multi-tasking job since interpreters, simultaneous interpreters in particular, constantly switch attention from one task to another (listening, interpreting, speaking, etc.; Yagura et al., 2021). Thus, interpreters must inhibit superfluous stimuli input so that attention can focus on target tasks efficiently (ibid).

With the refining of focused attention studies, it can be further classified into focused auditory attention and focused visual attention. Cherry (1953) studied the 'cocktail party problem' many years ago. In a noisy circumstance such as a cocktail party, various sources of sound are conveyed as acoustic waves in the air at the same time, including music, people's conversation, the impact sound of tableware and so on. Under such a situation, the listener can still recognize and focus on a specific target sentence. Cherry (1953) believed that this phenomenon relates to the physical characteristics of auditory inputs such as voice intensity or speaker location or may depend on the context of a second auditory source, such as someone's name being spoken. Furthermore, listeners can only extract information from attended sound, and unattended information receives no particular processing. To explain this mechanism, many psychologists posed the idea of a processing bottleneck (Broadbent, 1958; Eysenck & Keane, 2020). Just as the function of a filter, a processing bottleneck can limit our capacity to deal with simultaneous tasks. Thus, in the cocktail party, listeners can only pay attention to desired information. Despite reaching a consensus on the existence of a processing bottleneck, the location of it has aroused intense discussion. Broadbent (1958) believed that the bottleneck exists in the early selection stage, right behind the sensory register. Treisman (1964) argued that the position of bottleneck should be more flexible. She suggested that processing starts as listeners hear specific words, physical cues and syllable patterns, then move on to process it based on grammar and semantics. On the other hand, Deutsch and Deutsch (1963) supposed that the processing bottleneck is situated near the end of processing system, hence all inputs are fully analyzed.

The research on focused visual attention is much more than that of auditory attention because vision is an important sense modality for humans with more cortex than other sensory modalities (Eysenck & Keane, 2020). Currently, there are general three analogies that scholars use to resemble visual attention: spotlight, zoom lens, and multiple spotlights. Posner (1980b) assimilated focused visual attention with spotlight, which illuminate a relatively small area and can be redirected to other objects. However, some psychologists argued that visual attention should be more flexible, and they resemble it as a zoom lens (Eriksen & St. James, 1986). They suggest that we can regulate the area of focal attention, increasing or decreasing it according to goals. A third theoretical approach is even more flexible, since it believes that people can split their attention and focalize on two or more space regions that are not adjacent (Awh & Pashler, 2000). In this case, focused visual attention is comparable to multiple spotlights. Though holding different views on the mechanism of visual attention, these methods all imply the notion of space-based attention (we selectively pay attention to a specific area or space region.). Alternatively, we may also draw our attention to given objects. Object-based attention is also supported by many scholars (Egley et al., 1994; Hou & Liu, 2012). It is more likely to infer that visual attention is both space-based and object-based. Besides, feature-based attention is also supported by evidence. For example, supposing the situation when we are looking for an object in a bunch of sundries, we might find it out quickly according to its shape, color and other features in our impression. Kravitz and Behrmamn (2011) believe that space-based, object-based and feature-based attention interact with each other to enhance information processing.

In modern daily life, people increasingly tend to do two or more things at once (e.g., text message while crossing the road) instead of focusing attention on a single task (Howard et al., 2020). There is abundant evidence to suggest that multi-tasking causes a general increase in cognitive workload (also known as (over)utilization of cognitive resources; *ibid*). The reason for this is rooted in the fact that human

capacity of processing information is congenitally limited, thus a diminished performance would show in all concurrent tasks (Kahneman, 1973; Townsend & Eidels, 2011). For example, when talking on the phone while driving, drivers not only exhibit decrease speech complexity (Drews et al., 2008), but also react slower to hazards (Strayer et al., 2003). Reduced performance in concurrent tasks suggests that multi-tasking does not follow a trade-off effect, but a general decline of limited available cognitive resources (Howard et al., 2020). In the context of the interpreting workplace, interpreters can also be regarded as multi-taskers according to Gile (1995). They should divide efforts on different tasks (e.g., listen to and comprehend the speech, memorize the speech, take notes, etc.) simultaneously. Therefore, interpreting is a cognitively demanding job, taking years to master to deliver qualified target speech against multi-tasking interference (Altarriba & Isurin, 2012).

There are a range of theories within the Multi-tasking domain. However, the most relevant theories will be focused upon multiple-resource theory, and a unified theory of cognition. Wickens (1984, 2008) proposed multiple-resource theory, in which several independent processing mechanisms or resources in the processing system work together. The theory consists of four major dimensions. The first is processing stages including sequential stages of perception, cognition and responding. Secondly, processing codes such as spatial and verbal codes are used to deal with the previous processing stages. The third dimension is modalities, which involve visual or auditory resources. Lastly, response type can be various forms such as manual, spatial, vocal and verbal. Many people have judged that multiple-resource theory is oversimplified, and another Multi-tasking theory which unified several other theories of cognition must be mentioned (Eysenck & Keane, 2020). A unified theory of cognition integrates several cognitive theories including threaded cognition theory and ACT-R cognitive architecture (Anderson et al., 1997; Byrne, 2012). Specifically, Salvucci and Taatgen (2011) brought forward threaded cognition theory. The major substance of it is that people's cognitive resources (such as memory, task management, and visual perception) can be employed simultaneously, but each

resource can only operate on one task at a time. In other words, multiple goal threads can be active at the same time, and there is no multi-tasking interference as long as the cognitive resources required by these threads do not overlap. When multiple threads request the same resource at the same time, one must wait, and performance may be adversely affected (Salvucci & Taatgen, 2011). In terms of ACT-R cognitive architecture, it is a hybrid theory that consists of a group of programmable information processing systems that can be employed to forecast and clarify human behavior, including cognition and interactions with the environment (Anderson et al., 1997; Ritter et al., 2018). Empirical research observing participants' response in multi-tasks (answering e-mail and message chatting) found that when facing a delay in the e-mail task, they are more likely to switch to chat task instead of waiting for email response, which means the temporal limit and sub-task structure influence people multi-tasking behavior (Katidioti & Taatgen, 2013; Salvucci & Kujala, 2016). The result accords with threaded cognition theory that there is no multi-tasking interference as long as the available cognitive threads do not overlap. Threaded cognition theory contributes to the notion that all resources have limited capacity, which is extremely similar with the Effort Model in the interpreting field. According to Gile's Effort Model, people's attentional resources and cognitive capacity is limited (Gile, 1995). Therefore, interpreters need to allocate efforts (e.g., listening effort, memory effort, etc.) properly (Koshkin et al., 2018). The more detailed mechanism of Gile's Effort Model will be discussed in interpreting performance in later section.

## **Abilities in the Domain of Thinking**

Thinking processes involving problem solving, judgment, decision making, and reasoning are some of the most evident standards that distinguish human beings from animals. Thinking refers to conscious cognitive process that can happen independent of sensory organs (Nida-rumelin, 2010). Broadly speaking, thinking includes all mental events consciously or unconsciously. In this section, cognitive abilities of thinking will be discussed relating to the following primary aspects:

problem solving, judgment and decision making, and reasoning.

People face many problems, trivial or significant, in everyday life. To solve them, there are three aspects people should consider, namely goal, method and knowledge (Goel, 2010). A well-defined problem is one where all aspects are specified, including the purpose of solving it and the method available to do so, whereas ill-defined problems are more unclear in aforementioned aspects (Goel, 2010; Goel & Grafman, 2000). Another taxonomy of problems is based on the knowledge required. Problems that can only be solved by relying upon specific knowledge are called knowledge-rich problems. In contrast, knowledge-lean problems can be figured out in the absence of relevant prior knowledge. Newell and Simon (1972) focused on well-defined and knowledge-lean problems and proposed an important heuristic method, means-ends analysis. According to means-ends analysis, problems can be solved by following steps: a) note the distinction between the current problem state and the target state; b) form a sub-goal to narrow the gap; c) select a mental operator that permits attainment of the sub-goal. This method is typically suitable when problem solver lacks professional background, since little specialized knowledge is demanded in the process of solving problem via means-ends analysis. However, analogical problems (demand for using previous knowledge and experience) and expertise problems (demand for professional knowledge in a given area such as medicine or law) are also commonly seen in ordinary living. Under novel situations, analogical problem solving helps people compare the current problem with the previous one, which reduces unknown risk and improves the success rate. Minds could encode, map, infer and respond to the problem after detecting superficial, structural and procedural similarities (Eysenck & Keane, 2020). As for expertise, it is common for people to spend years acquiring knowledge or practicing skills in a given area. Expertise assembles high-level cognitive abilities of thinking. For example, expert chess players need to activate cognitive abilities such as pattern recognition and selective search in training and competition processes (Gobet et al., 2004). Evidence has found that deliberate practice helps development of expertise skills, because it can change the

trainees' brain structure (Herholz & Zatorre, 2012; Zatorre, 2013). In a study conducted by Hyde et al. (2009), children who received musical training for fifteen months showed significant changes in voxel size (a cube of brain tissue), since musical-related brain regions were driven by musical-relevant behavioral tests. Such changes in brain structure are not only limited in child age, but all ages (Herholz & Zatorre, 2012; Zatorre, 2013).

With regards to judgement and decision making, these two factors are closely interrelated (Dhami et al., 2011). According to Cambridge dictionary, 'judgment' refers to the process of evidence evaluation required to make a decision. It aims to evaluate the possibility of various events on account to existing information. Decision making means choosing one option from the possibilities assessed before. There are several theories in terms of judgement. Tversky and Koehler (1994) put forth the support theory, which hypothesized that an event appears more or less relating to how it is described. The more explicit and detailed an event is described, the larger possibility of differentiating event from description. Another influential theory is Kahneman's (2003) dual-process theory. The theory supposed that judgment processing depends on two systems: system one is fast, effortless and often emotionally-controlled, generating intuitive answers to judgement; whereas system two is slower, effortful and rule-governed, used to monitor or assess the answers made in the previous system (Kahneman, 2003). After people judge options in an all-round way, decisions should be made to minimize loss and maximize benefits. Confronting intricate reality, decision makers should go through many stages: identify attributes related to the decision; decide how to weight those attributes; list all alternatives under consideration; rate each choice on each attribute; obtain a total utility and pick the option with highest weighted total (Wright, 1984). The idea proposed by Wright is rational and conscious since it analyses potential elements as much as possible. However, Dijksterhuis and Nordgren (2006) argued that the preceding theory overemphasizes conscious thinking and ignores unconscious thinking, hence they opposed it with their unconscious thought theory. They argued

that unconscious thinking is better at absorbing vast volumes of data than conscious thinking. Both theories make sense in some circumstances, therefore people who blend conscious and unconscious cognition can make better decisions (Nordgren et al., 2011). Their study compared the result of decision made by integration of conscious and unconscious thought and conscious or unconscious thought alone. Participants were asked to select the best among 12 apartments as if they were a real estate agent. The success rate of choosing the best apartment was highest for participants using both conscious and unconscious thought (57%, assessed by making the choice followed by two minutes deliberation and a two minute distracted anagram task), followed by 28% for participants using only unconscious thought (assessed by making the choice followed by a four minute distracted anagram task), and 26% using only conscious thought (assessed by making the choice followed by four minutes of deliberation; *ibid*).

Reasoning is another major thinking process for human beings, and there are two types of reasoning partitioned by philosophers. One is inductive reasoning, another is deductive reasoning. Inductive reasoning means reasoning from individual to general. Inversely, deductive reasoning is from general to particular, which is associated with problem solving. Johnson-Laird (1983, 2010, 2013) brought forward the mental model of deductive reasoning. People form mental models reflecting what is common to a collection of alternatives, and reasoners frequently reduce the pressure on Working Memory by creating mental models representing explicitly only what is true (Eysenck & Keane, 2020). Furthermore, Evans (2006) put forward a heuristic-analytic theory of reasoning. Different from Johnson-Laird's mental model which argues that people initially use deductive reasoning and then are influenced by real-world knowledge, the sequence in heuristic-analytic theory is that people use real-world knowledge at the first place, and this is then followed by deductive reasoning in the analytic system (Eysenck & Keane, 2020). Admittedly, human reasoning is not always unassailable, and its deficiencies generate from limited awareness of cognitive incompetence. Hence, error-tolerance rates are unavoidable



in some professions including interpreting. According to the standard released by Translators Association of China, the error-tolerant rate can be regarded as an indicator to evaluate the difficulty degree of an interpreting task (Translators Association of China, 2020). The interpretation scenario allowing higher error-tolerant rate is relatively less difficult (ibid). After reviewing the domain of thinking, the following cognitive domain is emotion.

## **Abilities in the Domain of Emotion**

The analogy between human cognition and computer systems has stuck in many people's minds, especially on information-processing model (Eysenck & Keane, 2020). Similitude does exist in many fields, but the key discrepancy between them is that computers fail to boast emotional states. It is therefore possible that it is emotional factors that distinguish human cognition from others.

Emotions are mental states that are triggered by neurophysiological changes and are linked to thoughts, sentiments, behavioral responses, and a degree of pleasure or discontent, which are cognitive processes based on appraisal component (Ekman & Davidson, 1994; Triberti et al., 2017). Different from mood (an affective state), emotions are usually more intense with shorter duration (Beedie et al., 2005). They are often caused by a specific event, whereas the reason behind mood is unclear (ibid). There are various kinds of emotion people can experience, including happiness, sadness, anger, and fear (Izard, 2007). Evidence has shown that cognition is an essential resource for effective emotional regulation, and emotions are associated with cognition in many fields such as language, attention, and memory (Growney & English, 2022). More precisely, the breadth of attention can be impacted by emotion intensity; high-intensity motivations such as anxiety or fear may lead to attentional narrowing, whereas low-intensity emotion is linked with attentional broadening (Easterbrook, 1959; Harmon-Jones et al., 2011). Further speaking, changes in attentional breadth is related to the information in long-term memory. The terms mood congruity and mood-state-dependent memory can embody the

direct impact emotion poses on memory (Hills et al., 2011; Kenealy, 1997). Mood congruity means learning and memory performance is improved when the learner's mood state corresponds to the emotive value of the material; and mood-state-dependent memory means that memory performance is improved when the person's mood state is the same at learning and retrieval than when it differs (ibid). Not only are attention and memory deeply affected by emotions, but also decision making and judgement, which have been mentioned in the previous section. Angie et al. (2011) have found that major emotion such as happiness, sadness, anxiety, fear, or anger have significant effects on decision making and judgement. For instance, someone who is anxious about the outcome of a dangerous decision could pick for a safer option rather than one that could be financially advantageous (Lerner et al., 2015). Readers of negative tales provided more pessimistic judgements of fatalities than counterparts of positive stories (Johnson & Tversky, 1983).

The relationship between emotions and workplace performance has aroused people's interests over years (Mishra, 2012). According to the work-related stress theory proposed by Spector (1998), people who face job stressors continually are prone to feel negative emotions such as anxiety or anger, which can lead to negative behavior (e.g., decreased work quality, work avoidance, etc.) in the workplace. Therefore, it is comprehensible to understand why emotion management, knowing how to control negative emotion, is one of four components of emotional intelligence (Mishra, 2012; Ryback, 1998). In the field of interpreting, emotional stability is also of great significance and can be regarded as a predictor of interpreter competence and aptitude for interpreting (Bontempo & Napier, 2011). Numerous studies have acknowledged that emotional management is a cause of interpreter's stress and burnout experiences (Guntiène, 2014; Hsieh, 2016; Hsieh & Nicodemus, 2015; Rojo Lopez et al., 2021). It suggests that emotion is a non-negligible cognitive domain for interpreters. Another inseparable cognitive domain in interpreting industry is language, which will be mentioned in the following section.

## Abilities in the Domain of Language

Beyond all doubt, language is an extremely important element in social interaction. People who communicate, work and study all heavily rely on language, which is also strongly related to cognitive control ability (Beatty-Martinez et al., 2020). Harley (2013) defined language as a set of symbols and rules that allow us to communicate with one another. Almost all people possess language skills, strong or weak, and these language skills can be traditionally split into listening, speaking, reading, and writing. This section will integrate these four skills into three major language processes, language perception (reading and listening), language comprehension, and language production (speaking and writing).

Starting with language perception, we are exposed to an environment full of written and verbal information. However, language perception in reading and speaking are disparate. Different from words input from printed text, speech provides a more ambiguous signal (Lieberman, 1963). For example, when words present individually and de-contextualize spoken sentences, it only takes half the time to recognize them (ibid). The interactive activation model is an effective tool to understand how people comprehend written words. McClelland and Rumelhart (1981) proposed this bottom-up and top-down interaction model. The model consists of three levels of recognition: the feature level at the bottom; the letter level in the middle; and the word level on the top. Recognizing a written word first need to detect the feature of its letter, then activation goes to all letter units containing the feature and inhibition of other letter units. In a similar way, letters are identified at the second level as the second step, and a word finally can be recognized at the word level based on the activation of letter-level units (ibid). Word recognition can be facilitated within this context. Meyer and Schvaneveldt (1971) observed that a word is identified more rapidly if preceded by a semantically related word, a phenomenon called semantic priming. For instance, the word “doctor” is recognized faster when it followed the word “nurse” than following a non-related word such as “library” (ibid).

With regards to the listening part, speech perception is of great significance in auditory perception. In the listening to speech process, initially people select the speech signal from the acoustic background, then decode the extracted phonemes or syllables. The third step goes to word identification. One of the biggest problems at this stage is that it is hard to distinguish words at phonemic layer, because only roughly 11 vowel phonemes and 35 consonant phonemes make up most English words (Damian, 2020). Only when words in speech are identified can people comprehend the speech meaning based on syntactic analysis and thematic processing (Eysenck & Keane, 2020).

Followed by language perception, language comprehension is the next focus point, which is related to the higher-level processing and understanding of language. On the one hand, for sentence comprehension, the contribution of syntax and grammar cannot be ignored. Syntax refers to a study of the principles for the formation of grammatical sentences, with a particular focus on word order (Erkki, 2015). Grammar has a somewhat broader meaning, forming by a set of rules that explains the productivity and regularity of language, which includes sentence structure, pronunciation, parts of speech and so on (Chomsky, 1986). In fact, many sentences we utter or read are ambiguous, but people can still understand the correct meaning in most cases. For listeners, they can work out the syntactic and grammatical structure of ambiguous language by prosodic cues such as intonation, stress, pause and rhythm. If all syllables are spoken by equal tone, it is more difficult for listeners to understand the speaker (Duffy & Pisoni, 1992). As with readers, listeners can comprehend equivocal sentences' intended meaning by context. However, for discourse comprehension various inferences such as logical inferences, bridging inferences and elaborative inferences are needed. Logical inferences depend on words' meaning. For instance, readers can deduce that cake is a kind of dessert. Bridging inferences function as a bridge to connect the current part and preceding one. Elaborative inferences can expand the information of original text via world knowledge (Eysenck & Keane, 2020). According to McKoon and Ratcliff (1992),

inferences can be categorized into either automatic or goal-directed (strategic). Automatic inferences establish local coherence with individual memory or explicit information in the text, and goal-directed inferences are formed to pursue reader's goals. Hence, seemingly simple language comprehension is comparably complex in cognition processing.

Finally it comes to language production, which is a purposeful activity that people speak and write to reach a certain goal (Do et al., 2020). Speech production includes several stages. In line with spreading-activation theory (processing occurs in parallel at different levels; Dell, 1986), speech production comprises of four levels. The first is the semantic level, which can also be regarded as the planning level, programming the main idea and content of the speech (ibid). Generally speaking, people plan at the level of clause or phrase before speaking. Syntactic level is the second layer that is linked with the grammatical structure of the planned words. The last two levels are morphological level and phonological level, which relate to the morphemes (the basic units of meaning) and phonemes (the basic units of sound; Dell, 1986). These four levels are interactive, meaning processes at one level can influence those at other levels. When it comes to writing production, Chenoweth and Hayes (2003) put forward four writing production processes based on previous studies. The first process is 'proposer' which is responsible for proposing ideas. The next process is 'translator', and it converts the message formed by the proposer into word strings like sentences. The third process, 'transcriber', further transforms the word strings into written text. 'Evaluator' or 'reviser' is the last process of writing production, taking charge of monitoring the text and modifying it. In sum, both speaking and writing production is complicated in cognition though seem effortless in daily life. The following section comes to consecutive interpreting, a cognitively demanding field closely linked to language.

## Consecutive Interpreting

Language interpreting is a translation activity in which the interpreter converts the source language into the target language in a verbal way. Originating from the Paris Peace Conference after World War I, modern interpreting became a recognized profession (Gaiba, 1998). Over the course of history, interpreting has undergone profound development and has become a momentous cross-cultural communication activity that helps people from different language backgrounds communicate with each other. Generally speaking, interpreting can be divided into two categories: simultaneous interpreting and consecutive interpreting. In simultaneous interpreting the speaker does not pause, so the interpreter needs to continuously convey the information to the audience without disturbing the natural flow of the speaker. Thus, time-saving is one of the most obvious advantages of simultaneous interpreting. However, the economic cost of it is relatively higher than that of consecutive interpreting, since simultaneous interpretation equipment (such as a sound-proof booth, microphone and earphone) is required to be used. In an ideal setting, the simultaneous interpreter should sit in a sound-proofed booth where they can clearly observe the meeting circumstance and hear the speakers' presentation via earphones, and then interpret it into a microphone (Gaiba, 1998).

Different from simultaneous interpreting, the speaker will pause after a short speech section during consecutive interpreting, and it is at this time when the interpreter starts to interpret (Conference Interpreters | On-Site & Online Events, 2016). Hence, more time is needed in a consecutive interpreting conference. By far, consecutive interpreting remains the preferred choice in many bilingual situations especially in occasions where budget and flexibility are of special focus, even with the reducing demand of consecutive conference interpreting in some regions (Chen, 2022). Customarily, the consecutive interpreter will sit or stand near the speaker, holding a pen and note-taking book in their hand (*ibid.*). Whether or not to take notes is largely dependent upon the duration of speech segment. In short speech output,

the interpreter may mostly rely on memory, whereas in longer outputs most interpreters will draw support from note-taking (Pochhacker, 2016; Russell & Takeda, 2015). Preferably a note should be legible and logical in order to avoid wasting time whilst reading it, which is also a benefit for interpreters in delivering a message in whole thoughts instead of small pieces (Mazzei, 2017; Szabo, 2021). Therefore, note-taking is considered as a vitally important skill for consecutive interpreting. Interpreting beginners need to spend a prolonged period of time to integrate note-taking skill into interpreting practice until they can apply this technique with high proficiency (Setton & Dawrant, 2016).

The basic process of consecutive interpreting can be understood as involving comprehension-deverbalization-reformulation as described by Seleskovitch's Interpretive Theory of Translation (Baxter, 2012; Seleskovitch, 1975). Comprehension provides a solid foundation for the whole interpreting process. As professional interpreters, they should comprehend the source speech not only based on linguistic level, but more importantly, extra-linguistic level (Gile, 1995; Seleskovitch, 1975). In terms of deverbalization, it is assumed a vital role between comprehension and reformulation, and refers to the process that forgetting linguistic signs consciously in order to memorize the content of thoughts, which is the cognitive and emotional meaning generated by the linguistic signs (Li, 2014; Seleskovitch, 1975). Regarding the reformulation stage, it means making new sentences with symbols in another language. These new sentences should meet two following requirements: first, they should express the whole content of the original speech; and second, they should be easy to understand for target audience (Li, 2014; Seleskovitch, 1975). Therefore, interpreting can be regarded as a highly complicated bilingual activity that not only demands proficient linguistic expertise, but also non-linguistic factors such as extra-linguistic knowledge and cognitive competences (Macnamara, 2012; Riesbeck et al., 1978; Wang, 2004).

In terms of cognitive loads, previous theoretical studies have associated simultaneous interpreting with a complex cognitive task in extreme condition (De

Groot, 2000; Obler, 2012), whilst consecutive interpreting are less demanding in cognitive control as consecutive interpreters can reformulate the speech at their own pace (Gile, 2009). However, a recent quantitative study indicated that the cognitive load of consecutive interpreting, if not higher, at least as high as that of simultaneous interpreting (Lv & Liang, 2019). There are several reasons leading to this counter-stereotype result. Firstly, unlike interpreting sentence-by-sentence in simultaneous context, consecutive interpreting formulates the targeted speech collectively during a short interval of time. Hence, the volume of information to be stored in consecutive interpreting is larger than that of simultaneous interpreting, which generates high working memory burden (ibid). Secondly, the total cognitive load on consecutive interpreting may keep accumulating with more chunks of information input. Consecutive interpreters should keep focusing their attention and integrate individual information chunks into a coherent target speech (Liang et al., 2017). Last but not least, note-taking can also be considered as the source of cognitive overload. Consecutive interpreters need to reallocate their attention on taking systematic note with clear structure as a reminder. Cognitive saturation may also be aroused during note-taking especially when recording and memorizing discourses with significant length and complicated sentence structure in consecutive interpreting (Lv & Liang, 2019). Thus, consecutive interpreting is a complicated bilingual activity with high demands on cognitive abilities.

Confronting the specific characteristic of the interpreting profession, consecutive interpreters have wondered about the “ideal” personality of being successful over years (Nicholson, 2005). Taking the Big Five for example, Openness has found to be a predictive personality trait for interpreting performance, which rates higher among interpreters than people of other professions globally (Bontempo et al., 2014). It is potentially because aptitude for interpreting is not confined to linguistic factors, but also be affected by open attitude to acquiring new knowledge and learning new skills (ibid). Another personality trait, conscientiousness, also scores higher among interpreters in Australia, which is understandable that



conscientious individuals are generally more systematic, hard-working and dependable (Bontempo et al., 2014; Thompson, 2008). In terms of Extraversion, it is the personality trait employed most when people speak of interpreters (Carroll, 1978; Cattell, 1971; Henderson, 1980, 1987; Seleskovitch, 1978; Szuki, 1988). According to Henderson's portrait about "typical" interpreter, "articulate extravert" is pointed out as one of the key words (Henderson, 1980). However, different results show in two more recent studies that: (1) the number of interpreters in extraversion and introversion categories is basically the same (Nicholson, 2005); (2) extraverted interpreters are merely slightly more than their introverted counterparts (Bontempo et al., 2014). One possible explanation is that interpreting is not solely linked to oral expression, but listening comprehension as well, at which introverts outperform extraverts (Bostrom, 1990). Furthermore, for Agreeableness, previous study found that interpreters do not score significantly different on it (Bontempo et al., 2014). Nevertheless, unlike Agreeableness, Neuroticism is an influential factor for interpreters especially when coping with pressure, in that individuals with a low Neuroticism score are more emotionally stable (Jeronimus et al., 2014). Empirical study validates this assumption that interpreters' emotion are more stable (Bontempo et al., 2014). Therefore, there are innumerable links between personality traits and interpreting. The following sub-sections will elaborate several interpreting theories that embody the close-knit interrelation between consecutive interpreting and cognitive abilities.

## **The Effort Model**

The Effort Model is a widespread theory proposed by Gile (1995) in his book *Basic Concepts and Models for Interpreter and Translator Training*. The main feature of the Effort Model is that it presents the interpreting process in the form of mathematical formulas, which helps interpreters to allocate their limited resources to different parts more effectively. The basic principle of the Effort Model is that the interpreter's cognitive capacity is limited no matter whether carrying out a

consecutive or simultaneous interpreting process. According to Gile, all interpreters, regardless of being a student or a professional, would encounter barriers not only in fast, densely informational and highly technical presentations, but also in articulate, leisurely ones. Taking notice of this phenomenon, Gile deduced two ideas: a) Interpretation requires some kind of mental “energy” which could be provided by the brains of the interpreters to a limited extent; and b) when an interpreter demands more mental “energy” than is available, their performance will deteriorate (Gile, 1995). Based on practice and observation, Gile proposed two specific and separate models, one for simultaneous interpreting and the other for consecutive interpreting. The Effort Model of consecutive interpreting was later developed based on the former simultaneous model. Based on the features of consecutive interpreting, its Effort Model can be generally divided into two phases.

The first phase of consecutive interpreting refers to the time when the interpreter listens to the speech section delivered by the speaker (Gile, 1995). During this phase, the interpreter should allocate their efforts into four segments. According to Gile (1995), the formula could be written as “Interpreting = L (Listening and Analysis) + N (Note-taking) + M (Short-term Memory operations) + C (Coordination)”. To be more exact, the Listening and Analysis Effort encompasses all comprehension-focused activities, from the analysis of sound waves, through the recognition of words, to the final decisions concerning the meanings of utterance (Gile, 1995). The degree of analyzing source language during the time the interpreter listens to the speech has basically reached consensus among scholars. Scholars including Chernov (1973) and Gile (1995) believe that such comprehension goes much beyond the simple recognition of words, but as far as at least understanding the logic underlying the speech.

The second effort in the first phase of Effort Model is note-taking effort (Gile, 1995). When interpreters take notes they should bear in mind that understanding the speech is fundamental; putting the incidental before the fundamental cannot be allowed. Furthermore, interpreters need to design their own set of note symbols,

largely accomplished through extensive practice (Szabo, 2021). These symbols are not necessarily the standard symbols used by professional stenographers, but interpreters must be able to respond to them as soon as they read these symbols whilst interpreting. The function of symbols is as a reminder, hinting to the interpreter what the speaker has delivered. The symbol can be self-designed or may be an existing symbol. For example, some mathematical symbols “>”, “<”, “≈” can be used to represent the meaning of “more than”, “less than”, and “close to” respectively. Abbreviation is also a good choice for interpreters to take notes, writing “E” for economy, “G” for globalization, “WTO” for World Trade Organization for instance. Besides these, graphic symbols can also be put into usage, such as an upward arrow representing increase, a downward arrow decrease, a rectangle implicating conference, and a pentagram for important matters. No matter how the interpreter designs their note system, the overall principle is that it should be short and simple (Szabo, 2021).

Thirdly, consecutive interpreters should also distribute attention to Short-term Memory effort, the third effort in the first phase of Effort Model (Gile, 1995). During interpretation, short-term memory operations occur continuously. The load on short-term memory is closely associated with the time of every speech section. When the interpreter hears the speaker’s voice, each phonetic segment has to be stored in short-term memory and analyzed until the whole word or phoneme is recognized (ibid). For instance, when the speaker utters the sentence “D stands for Denmark”, the phonetic element “D” should be held in short-term memory until the word “Denmark” is identified. Interpreters’ short-term memory would load more information and face a trickier situation when the speech is unclear resulting from fuzzy logic line (such as inversion of causality), high density storage of information (such as high rate of delivery), uncommon linguistic structure or even unfamiliar accents (ibid). In such cases, interpreters may need more time to take notes or comprehend the speech. Thus, memory capacity, short-term memory capacity in particular, plays an essential role in interpreting performance.

The last effort in the first consecutive interpreting phase is coordination effort. The function of this effort is responsible for coordinating all other efforts required in the interpreting process. According to Gile's perspective, every individual's energy or effort is limited (Gile, 1995). Therefore, it is necessary to harmonize the effort during the time between the moment the information is heard and the moment it is taken note of, or between the moment the information is heard and the moment the interpreter determines whether or not to record it, or again between the moment it is heard and the moment it vanishes from short-term memory (Gile, 1995). The effort model in the first phase shows that a qualified consecutive interpreter should give consideration to multiple tasks, including listening, analysis, note-taking and short-term memory.

The second phase of Effort Model in consecutive interpreting involves the time included when the speaker pauses and the interpreter starts interpreting. Similar to the multi-efforts in the first phase, consecutive interpreters must also divide their efforts to several proportions. In the second phase, the formula is shown as "Interpretation = Rem (Remembering) + Read (Note-reading) + P (Production)". In this process, remembering is different from short-term memory in the previous phase, but it refers to recalling the sequential parts of the source speech. Thus, long-term memory operations would also be mobilized in this phase (Gile, 1995). Note-reading requires visual memory and is the key to interpreting performance, since a clear and logical note layout could reduce interpreters' cognitive load. As for production effort, this refers to the output part of interpretation. In consecutive interpreting, production is twofold; one for producing notes and another for producing target-language speech (ibid). Due to the different linguistic structures and lexicons between source and target language, the interpreter may run the risk of getting stuck (ibid). For professional consecutive interpreters, they should interpret the original speech in a relatively stable flow of speech, making lexical and syntactic choices as appropriately as possible. In this second phase, the interpreter does not need to follow the pace of the speaker as in the first phase or simultaneous

interpreting, but can perform these three efforts at their own pace (ibid).

In order to better understand the mechanism of the Effort Model, Gile (1995) has suggested some other formulas. The following conditions must be met to ensure that consecutive interpreting proceeds smoothly:

$$(1) LR+NR+MR<TA$$

Where LR is the shortened form of processing capacity requirements for L (Listening and Analysis); NR is the shortened form of processing capacity requirements for N (Notetaking); MR is the shortened form of processing capacity requirements for M (Short-terms memory operations); and TA is the shortened form of total available processing capacity.

$$(2) LR<LA$$

Where LA is the shortened form of available listening capacity.

$$(3) NR<NA$$

Where NA is the shortened form of available note-taking capacity.

$$(4) MR<MA$$

Where MA is the shortened form of available short-term memory capacity.

$$(5) CR<CA$$

Where CR is the shortened form of processing capacity requirements for C (Coordination); CA is the shortened form of available coordination capacity.

When formula (1) is untrue, interpreters' effort may saturate; and when formula (2), (3) or (4) is untrue, failure may still occur in spite of the likelihood of the overall of available capacity being larger than total requirements (Gile, 1995). All of these formulas point to the principle that the actual capacity allocated to a certain effort should be smaller than the corresponding available capacity. Only by following the rule can the consecutive interpreter guarantee performing the task well. Otherwise, interpreters are highly likely to make mistakes (ibid).

It is not difficult to find that the common ground of these two phases is multi-tasking (Gile, 1995; Yagura et al., 2021). The Effort Model is the most obvious one to reflect multi-tasking among the three models mentioned above. The task for

the consecutive interpreter is great, including listening and analysis, note-taking, short-term memory use, coordination, remembering, note-reading as well as production. Hence, facing these multiple tasks, interpreter is a cognitive demanding job indeed (Altarriba & Isurin, 2012).

## **The Interactant Model**

The Interactant Model is pointed out by Pochhacker as suitable for conference settings (Pochhacker, 2016). Broadly speaking, interpreting is a type of communicative event, which is not only affected by but also can shape a particular situation (ibid). According to Pochhacker (2022), the intrinsic interrelation between interpreting and the interpreter is similar to that of the task and the agent. The task or activity that serves as the main point of reference for this discussion is inextricably linked to the agent that carries it out. The agent is also embedded in a specific context in which the activity of interpreting occurs, which in turn shapes both the characteristics of the task and the identity and role of the agent in different ways (Pochhacker, 2022). The context of the interpreting task involves two layers: a sociocultural layer and a linguistic (communicative) layer (ibid). The former emphasizes interpreting in a given institutional context such as the educational or healthcare systems; whilst the later linguistic layer links to expression in interactive communication, which unfolds with interpreting takes place in real time (ibid).

The Interactant Model emphasizes the role of interpreter in the interaction, which is modulated by psycho-physical factors such as perception and disposition (Pochhacker, 2016). It suggests that the perspective of the interactant is primarily shaped by the individual's social-cultural background, composed of diverse cognitive abilities and past experience (ibid). The individual's orientation of and assessment towards the outer situation is determined by factors such as emotional attitude, motivation, intentions and expectations (ibid). Therefore, the Interactant Model highlights the interpreter's "activity role" in a "situated activity" context in which individuals interact to perform a joint activity (ibid).

Thus, the Interactant Model also attaches great importance to non-linguistic factors, since the reaction of the interpreter is closely linked to his socio-cultural horizon in many aspects, including contextual, specialized, personal and general background (Pochhacker, 2016). From a more cognitive perspective, the interpreting situation exists only “in the eyes of” the interactant (ibid).

## **Meaning-based Model of Interpreting**

The Meaning-based Model is developed by Russell and has application to consecutive interpreting, identifying the need for the interpreter to consider contextual elements through mobilizing background bilingual and cultural knowledge within a given interaction (Russell & Takeda, 2015). It believes a well-pleasing interpretation product is created throughout the interaction and meaning co-construction where the interpreter acts as an active participant (ibid). This model underlines the demand of meaning-based work in the interpreting process, as it acknowledges differences between the source and target language in linguistic and cultural meanings (ibid). The Meaning-based Model of Interpreting can be divided into five steps.

The first step of the model is assessing contextual factors and monitoring process (Russell, 2005). Throughout the interpreting interaction, the interpreter need to assess contextual factors such as the background similarity and difference between different parties and the emotional atmosphere of the interaction, since context helps the interpreter extract the specific meaning in the speaker’s speech (Russell & Takeda, 2015). Furthermore, the interpreter should also consistently monitor the whole interaction process, because the participants are producing new context during their communications (ibid). Therefore, assessing contextual factors and monitoring process is not only the first step in the Meaning-based Model, but overlays all phases behind.

Analyzing and comprehending source language message is the second step in the Meaning-based Model (Russell, 2005). To comprehend the source speech, the

interpreter should analyze discourses based on linguistic skills and cultural consciousness, including syntactic, semantic, contextual and associated knowledge, background experience and cultural awareness (Russell & Takeda, 2015). At this stage, the interpreter is required to deal with the speaker's information at multiple levels, deepening from lexical and phrasal layer to sentential and discourse layer (ibid). On the basis of understanding the source speech, the interpreter can further identify the style feature of the discourse through details such as the use of politeness marker to produce the target speech accordingly (ibid). For consecutive interpreters, they can negotiate with the speaker to verify uncertainties and seek clarification when needed at this phase (ibid). Thus, sufficient contextual knowledge is vitally important for interpreters to avoid misunderstanding.

The third stage in the model is applying contextual and linguistic schemas (Russell & Takeda, 2015). It involves the on-going assessment of contextual and linguistic factors such as bilingual competence and participants' cross-cultural and cross-linguistic experience (ibid). These factors influence the interpreting interaction to a large extent.

Fourthly, the interpreter should formulate effective message (Russell & Takeda, 2015). After dealing with the source information at lexical, phrasal, sentential and discourse level and applying contextual and linguistic schemas, the interpreter should plan, formulate and review the expressions to be uttered in the target language to deliver an equivalent message (ibid). In other words, the interpreter should make choices combining linguistic and cultural elements (ibid). At this phase, expressions in the target language may be silently rehearsed (ibid). However, the consecutive interpreter is not allowed to stagnate at this stage for too long, as all target speech audiences are waiting for the translated speech.

The last step of the model is producing target language interpretation (Russell, 2005). When the speaker pauses, the consecutive interpreter produces the target information based on all efforts made in the preceding stages. Nevertheless, the interpreter keeps on assessing contextual factors and monitoring process, in that the



speaker will soon start a new speech segment once the consecutive interpreter finishes the target speech. To sum up, the Meaning-based Model of interpreting shows the complexity of the interpreting process. Interpreters should not only develop the linguistic and cognitive skills such as language organization, comprehension and decision-making, but recognizing their role as an interpreter in the meaning co-construction (Russell & Takeda, 2015).

## **Foundational Cognitive Aptitude Model**

The Foundational Cognitive Aptitude Model is proposed by Macnamara (2012) to serve as an under-structure to guide interpreting training. A series of underlying cognitive abilities that must be possessed by a successful interpreter have been mentioned in this model. As with many other scholars such as Lambert (1991), Mackintosh (1999) and Moser-Mercer (1994), Macnamara (2012) also believes that non-linguistic factors are vital for interpreters and has systematically enumerated aptitudes needed in interpreting processes in his Foundational Cognitive Aptitude Model. There are four sets of aptitudes or ability mentioned in the model, namely social-cognitive aptitudes, intellectual aptitudes, processing ability and second language acquisition aptitudes.

First and foremost, social-cognitive aptitudes consist of interpersonal and intrapersonal skills, which are essential to interpreters as interpreting is a social activity in essence (Macnamara, 2012). Confronting a dynamic setting with multifarious people and content, the social-cognitive aptitudes an interpreter needs can be divided into two categories: self-awareness and other-awareness (ibid). Interpreting is extremely challenging and requires a tremendous amount of self-awareness, since interpreters should be able to analyze the situation and choose the best expression within a time limit. Negative emotions such as anxiety, stress and fear reduce the efficiency of information processing, leading to a battery of issues including inaccurate encoding and poor multitasking (Goleman, 2005). However, positive emotions such as belief in the potential of self (self-efficacy) enhance task

performance (ibid). Individuals with a higher level of self-efficacy are more willing to make thoughtful decisions and solve complex problems, thus they are more likely to achieve interpreting career success. Apart from being conscious of self-awareness, interpreters should also pay attention to other-awareness as their practical workplaces require high interpersonal and intrapersonal skills (ibid). The better an interpreter comprehends the thoughts and implications of the speaker, the better the interpreter can deliver an accurate and logical targeted speech. Empathic inference is conducive to employing memory and previous knowledge and conjecture to the feelings of others (Ickes, 1997). Therefore, social-cognitive aptitudes including self-awareness and other-awareness play an important role in the performance of interpretation.

Secondly, intellectual aptitudes are also vital factors related to interpreting career success, which can be generally divided into fluid intelligence and crystallized intelligence (Macnamara, 2012). Fluid intelligence refers to the natural ability that a person is born with to carry out intellectual tasks such as making inferences, learning and solving problems, which is highly correlated to working memory (Cattell, 1963; Conway et al., 2003). Crystallized intelligence is the ability to apply what we have learned from society and culture, such as problem-solving methods, into practice (study, life and work), which is closely associated with long-term memory (Cattell, 1963, 1987). Both fluid and crystallized intellectual aptitudes are of the essence to a qualified interpreter. The pivotal and challenging part of interpreting process is deconstructing the form of source language and producing a rearranged target language with faithful message but without source language intrusions. In the process of interpretation, fluid and crystallized intelligence are interlacedly mobilized when interpreters comprehend, analyse and reason source language, predict message content and speaker targets, and produce coherent and logical target language (Macnamara, 2012). Thus, interpreters' intellectual aptitudes are constantly called upon for sound performance.

Processing ability is the third primary component of Foundational Cognitive

Aptitude Model (Macnamara, 2012). Numerous cognitive skills and capacities are mentioned in this sub-section, namely performance monitoring and regulation, attentional control, memory, chunking, multitasking, decision-making, set shifting, and speed and depth of processing (ibid). Specifically, performance monitoring and regulation can be regarded as a meta-cognitive capacity or skill, which is responsible for properly allocating cognitive resources based on feedback from cognitive components (ibid). A professional interpreter must monitor the process and regulate coping mechanisms at their own pace (ibid). Attentional control is also an important aptitude for interpreters, since it is required throughout the whole interpreting process (ibid). One of the common mistakes made by many novice interpreters is that they devote too much attention on target speech production, thus causing them to only deliver the content on the lexical level instead of implications behind (Moser, 1977). Similarly, memory is employed throughout the whole interpreting process as well, from storing information in the source language to searching for equivalent expression in the target language (ibid). Chunking, referring to inducing similar information together, can be considered as a sub-process of working memory. It helps interpreters expand their mental capacity to be more available for other cognitive assignments (Macnamara, 2012). In addition, multitasking is another indispensable aptitude required (ibid). To some extent, interpreters are multitaskers, as their attention is divided to accommodate many tasks such as listening, comprehending, note-taking, remembering and so on. Decision-making and set shifting are the other two cognitive abilities interpreters should be equipped with (ibid). Interpreters need to make decisions among various options in the target language and set shifting flexibly when confronting emergencies or challenges (ibid). Speed and depth of processing is the last aptitude in processing ability based on cognitive skills and capacities (ibid). It is one of the determining factors of interpreting career success, as interpreters must be able to process incoming information at various depth under time pressure (ibid).

Last but not least, second language acquisition aptitude is also the prerequisite

of an ideal interpreting performance (Macnamara, 2012). As interpreters, they should not only possess advanced linguistic abilities (both source and target language), but also play a joint role between two cultures. According to the second language learning theoretical framework, aptitudes such as language analysis, willingness to communicate, mimicking abilities and cross-cultural analysis are all closely linked to language competence (ibid).

To sum up, Foundational Cognitive Aptitude Model systematically enumerates cognitive aptitudes and abilities that are essential for interpreters. It indicates that not merely language factors, but non-linguistic factors such as cognitive capacities are of great significance to interpreting performance.

## **Attentional Control Model**

Compared with the above interpreting model, the Attentional Control Model in interpreting is a relatively young one, as it is proposed by Yanping Dong and Ping Li (2019) in 2019. There are two control mechanisms included in Attentional Control Model in interpreting: language control and processing control (Dong & Li, 2019).

When interpreting, language control is performed through a dual mechanism that includes both (a) a task schema, which is a structural framework of links between language and modalities, and (b) focused attention, which aids in the initial development of the task schema. Yanping Dong and Ping Li suggest that language control in interpreting is primarily accomplished through the language-modality linkages formed during interpreting practice (Dong & Li, 2019). In a particular interpreting task, one of the two languages is tied to a specific input modality, typically the auditory modality (as the source language), whereas the other is related to a specific output mode, typically the vocal modality (as the target language). The language-modality connections necessary for a particular mode of interpretation are established by training or experience, and the connection pattern is subsequently saved as a task schema (Green, 1998). Regarding focused attention, it is the mechanism with which interpreters can create the language-modality connections in

the initial stage (Dong & Li, 2019). Given the context of the interpreting task, it is proposed that focused attention is the process that aids in developing, strengthening, and adapting the language-modality connections, and that focused attention in interpreting operates through the cognitive processes of monitoring, working memory, target disengagement, task enhancement and shifting (ibid).

Processing control is another indispensable sub-component of the Attentional Control Model (Dong & Li, 2019). Divided attention and language processing efficiency are two crucial ingredients of processing control in interpreting. However, they are not entirely independent of one another and may interact to maintain the coordination of component activities (ibid). On the one hand, one's competence in cognitive abilities such as verbal working memory and coordination may be related to better language processing efficiency (i.e., language proficiency and interpreting methods). On the other hand, after unceasing interpreting training and practices, divided attention and coordination skills can be improved in turn. In short, the Attentional Control Model in interpreting also indicates that there are innumerable links between cognitive abilities and interpreting performance.

Based on the three sections above in this chapter, the basic concept and literature reviews of personality traits, cognitive abilities and consecutive interpreting have been introduced. However, it is important to understand how the relationship between these three factors may play a role in interpreting performance. These inter-relationships will be discussed in the following section.

## **The Relationship Between Personality, Cognitive Ability, and Interpreting**

The primary speculative knowledge and theory in terms of personality traits, cognitive abilities and consecutive interpreting are illustrated in the above section. However, it is far from enough to explore the effect of personality and cognitive ability exerted on interpreting. It is important to understand these relationships before conducting the empirical study for this thesis. The relationship between personality, cognitive ability and interpreting is quite complicated. Both personality and cognitive ability are a collection of multiple elements and are influenced by both nature and nurture factors. Interpreting is an extremely intricate cognitive and linguistic activity, and many variables may affect its performance. In this section, I will discuss the relationship between personality and cognitive ability, personality and interpreting.

### **Personality and Cognitive Ability**

In the early studies of individual differences, personality and cognitive ability were generally regarded as two independent systems (Rammstedt et al., 2018). As further studies were conducted, a growing number of researchers such as Thorndike found a significant correlation between the two (Rammstedt et al., 2018; Thorndike, 1940). Amongst this research, a large part has applied the Big Five framework as a guidepost (Rammstedt et al., 2018). In this section, I will also mainly focus on the Big Five personality traits, namely Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism (Costa & McCrae, 1992). As for cognitive abilities, factors such as intelligence, memory, information processing will be taken into account.

Starting with the relationship between Openness and cognitive ability, numerous studies have found that associations exist between Openness and general intelligence, fluid intelligence (the capacity to address novel reasoning challenges; Unsworth et al., 2014), crystal intelligence (the capacity to deduce secondary

relational abstractions by utilizing formerly learned primary relational abstractions; Cattell, 1987), processing speed, memory and executive function, and Openness has shown to be a positive predictor of all these cognitive abilities (Moutafi et al., 2006; Simon et al., 2020; Soubelet & Salthouse, 2010; Sutin et al., 2011). Taking a brief look at Openness, it represents the preference for novel ideas and experiences. The definition of intelligence is controversial and has been defined in many ways: the ability of abstraction, logic, reasoning, problem solving and so on (Legg & Hutter, 2007). A general concept of intelligence can be understood as “the mental ability to think abstractly, comprehend complicated ideas, learn efficiently, and learn from experience”(Gottfredson, 1997, pp.17-20). It is not merely about academic skills or test-taking smarts, but a broader and more in-depth ability for comprehending surroundings (Gottfredson, 1997). Human intelligence is an intellectual power exclusive to human beings, which is marked by complicated cognitive feats and high degrees of motivation and self-consciousness (Tirri, 2011). Intelligence can be classified into two categories, fluid intelligence and crystallized intelligence, which were introduced by the psychologist Raymond Cattell (1963). Fluid intelligence refers to the natural ability that a person is born with to carry out intellectual tasks, involving learning and solving problems. It relies on innate endowments, which are improved with the development of the nervous system (such as perceptual quickness, mechanical memory, and identification of pictorial relationship) and is unaffected by education or culture. In other words, fluid intelligence is part of inherent basic ability of human beings and is easier to be influenced by congenital genetic factors than by education and culture (Cattell, 1963). The development of fluid intelligence is closely associated with age: fluid intelligence peaks after the age of 20, and then gradually declines (Cacioppo & Freberg, 2019). On the other hand, crystallized intelligence is the ability to apply what we have learned from society and culture, such as problem-solving methods, into practice (study, life and work; Cattell, 1963, 1987). It increases gradually and maintains relatively stable throughout a person's adulthood, and decline shows until the age of 65 (Cavanaugh & Blanchard-Fields, 2006). In

comparison to fluid intelligence, crystallized intelligence is heavily influenced by acquired experience, which manifests itself primarily as the capacity to apply current knowledge and skills to absorb new information and solve novel challenges. These abilities are not prone to decrease before the age of 65, but the exact peak age of cognitive skills is somewhat elusive (Cavanaugh & Blanchard-Fields, 2006; Desjardins & Warnke, 2012). In addition, intelligence and cognition are closely interrelated with each other (Sternberg & Pretz, 2004). To put it simply, cognition is a psychological process, and intelligence is the ability reflected in the cognitive process.

People who score higher on the openness to experience scale appear to have a higher level of intelligence and greater cognitive abilities (Graham & Lachman, 2012). One possible explanation for the relationship between general intelligence and openness score is that individuals with lower intelligence levels become less creative and curious. It is primarily because they lack the ability to cope with brand-new environments, making them less likely to benefit from outer environments. Individuals with higher intelligence, on the other hand, may seek stimulation and be willing to challenge themselves with novel experiences, thus becoming more intellectually curious and creative, which in turn become more open to experience (Moutafi et al., 2003). At the same time, openness is highly correlated with both crystallized intelligence and fluid intelligence (Furnham et al., 2005; Moutafi et al., 2003). The relationship between Openness and crystallized intelligence may be due to individuals with higher levels of Openness pursuing more cognitive experience in daily life, and thus enriching their cognitive reserve; and the correlation between Openness and fluid intelligence may come from the strong correlation between fluid and crystallized intelligence themselves. With regard to cognitive ability, especially Attentional Control, Working Memory and Multi-tasking, research has found an explicit correlation with Openness. According to Paula et al. (2017), Openness to experience is positively related to Attentional Control. However, not all findings support the positive relationship between them. The relationship between Openness and Working Memory is equivocal; some studies find positive



correlations, whilst others find negative correlations (Waris et al., 2018). Openness is the only pertinent personality trait demonstrated to play a moderate role on the relationship between Multi-tasking ability and task performance (Kurapati et al., 2017), but a direct significant correlation between Multi-tasking and Openness has not been found in previous study (Conte & Jacobs, 2003). Although most studies have shown that Openness is an important personality element affecting intelligence and cognition (e.g., Baker & Bichsel, 2006; Schaie et al., 2004), Pearman (2009) did not find a correlation between Openness and various cognitive variables. For example, no significant correlation is found between Openness and Speed of Information Processing (Bates & Shieles, 2003). This may be due to controlling the variables of age and education, both of which are strongly correlated with Openness (Ashton et al., 2000). For its relationship to emotional stress, Openness was negatively linked to perceived pressure, fear, shame and passive endurance, hence positively associated with Psychological Endurance (the bearing and adjusting ability when individual feels negative emotion triggered by adversity; Penley & Tomaka 2002; Wang et al., 2019).

With regard to Conscientiousness, differently from Openness to Experience, many studies have found that Conscientiousness is negatively correlated with general intelligence, crystal intelligence, fluid intelligence, processing speed, memory ability and executive function, and higher scores negatively predict a number of cognitive abilities (Moutafi et al., 2006; Pearman, 2009; Soubelet, 2011; Sutin et al., 2011). Conscientiousness is related to effectiveness, determination, responsibility and persistence. Moutafi et al. (2003) suggested that the observed negative correlation between Conscientiousness and crystallized intelligence may be the result of an equalization effect, which means individuals constantly improve their conscientiousness to compensate for their lower intelligence. This suggests a causal relationship between Conscientiousness and crystallized intelligence, in which certain characteristics of conscientiousness (such as being more organized, conscientious, and persistent) make individuals become harder-working students during school time

and thus increase their crystallized intelligence. In this way, it balances the negative effects of fluid intelligence on Conscientiousness (Zhao & Yu, 2014). Similar results have also been found in the correlation between Conscientiousness and cognitive abilities such as Working Memory and Attentional Control. The relationship between Conscientiousness and Working Memory is negative, which means lower Conscientiousness is associated with better Working Memory performance (Waris et al., 2018). Nevertheless, Conscientiousness appears to be significantly positively associated with Attentional Control (Williams et al., 2017). Conscientiousness has also been found to be negatively related to perceived pressure and fear (Penley & Tomaka, 2002), thus can be deduced to be positively correlated with Psychological Endurance. Not only negatively correlated with Working Memory and perceiving pressure and fear, Conscientiousness is also negatively correlated with Multi-tasking (Conte & Jacobs, 2003). For Speed of Information Processing, nonsignificance has been found between its correlation with Conscientiousness (Zebec et al., 2011).

The relationship between Extraversion and cognitive ability is relatively more controversial. Extraversion refers to high levels of vitality, self-confidence, and a tendency toward social behavior. Some studies have found that Extraversion is significantly negative correlated with both general intelligence and fluid intelligence, and has a negative predictive effect on them (Moutafi et al., 2006). Similar results have been obtained by Graham and Lachman (2012), and those scoring high on measures of extroversion have been found to perform poorly on tasks requiring high demands in information processing such as reasoning (Baker & Bichsel, 2006; Wolf & Ackerman, 2005). On the other hand, some studies have found that Extraversion is significantly positively correlated with executive function (e.g., Sutin et al., 2011). The most influential factor correlating with Extraversion appears to be positive emotion, followed by gregariousness and warmth (Herringer, 1998). This is consistent with the findings of Phillips et al., (2002) that positive emotions can improve executive function, especially verbal fluency. In addition to this, many studies have shown that Extraversion is a positive predictor of a number of cognitive abilities, involving

Working Memory, speed of information process and Attentional Control. Waris et al. (2018) found out that Extraversion relates to better Working Memory. Hancevich et al. (2022) conducted an experiment relating to personality traits and Working Memory, and found that two facets of Extraversion, assertiveness and warmth, are significantly correlated with Working Memory. According to Lieberman (2000), extraverts are faster at making responses in empirical experiments. Findings from Zebec et al. (2011) also show that Extraversion is a personality dimension which embodies the most stable and highest positive correlations with Speed of Information Processing among adolescents. In a similar manner, people who score higher on measures of Extraversion also perform better in Attentional Control and Multi-tasking, showing a positive correlation between them (Conte & Jacobs, 2003; Williams et al., 2017). Studies have also showed that Extraversion is negatively correlated with perceived stress, fear, and self-disgust, and perform significant positively correlated with stress response (Penley & Tomaka, 2002).

When it comes to Agreeableness, amid the existing studies on the relationship between personality and cognition, there is little attention paid to Agreeableness, and few studies have discovered a significant correlation between Agreeableness and cognitive ability (Zhao & Yu, 2014). Agreeableness includes friendly, considerate and humble behavior. Moutafi et al. (2005) have found that Agreeableness is a positive predictor of general intelligence. Analysis of the factors that make up Agreeableness shows that trust and honesty have a positive predictive effect on general intelligence (Moutafi et al., 2003), and that empathy is positively correlated with executive function (Sutin et al., 2011), whereas humility and altruism appear to be negatively correlated with general intelligence (Moutafi et al., 2003). As for the relationship between Agreeableness and cognitive abilities, positive correlations have been found with both Working Memory and Speed of Information Processing (Waris et al., 2018; Zebec et al., 2011). However, Agreeableness does not show its correlation with Attentional Control, Multi-tasking and appraisal variables of stress (Conte & Jacobs, 2003; Penley & Tomaka, 2002; Williams et al., 2017).

Neuroticism is the last personality trait to be discussed in this section. Neuroticism appears to be significantly negatively correlated with general intelligence, fluid intelligence, executive function and many cognitive abilities (Graham & Lachman, 2014; Moutafi et al., 2005; Moutafi et al., 2006; Sutin et al., 2011). Neuroticism refers to the tendency to experience negative emotions such as worry, despair and rage. The analysis of neurotic factors shows that anxiety in neuroticism negatively predicts general intelligence and fluid intelligence (Moutafi et al., 2003). Anxious emotion shown by individuals with lower intelligence may be due to their inability to encounter the environment as efficiently as those with higher intelligence (ibid). The results of Sutin et al.'s (2011) study showed that neurotic negative emotions such as anxiety, anger-hostility, depression, self-awareness and vulnerability were negatively correlated with executive functions such as verbal fluency. In terms of cognitive abilities, Graham and Lachman (2014) also discovered that individuals with higher degrees of depression had poorer ability to reason. Beyond that, Neuroticism has been found to have negative correlations with Working Memory and Attentional Control (Waris et al., 2018; Williams et al., 2017). However, the correlation between Neuroticism and Speed of Information and between Neuroticism and Multi-tasking appear to be controversial. SoCan and Bucik (1998) found that Neuroticism correlated negatively with speed of response; however, more recent research by Wettstein et al. (2017) found that the negative correlation between Neuroticism and information processing speed only showed significance in one's later years instead of most of the life time. It can possibly be explained by the anguished experience of cognitive decline with age. In terms of the correlation between Neuroticism and Multi-tasking, a significant correlation between Neuroticism and Multi-tasking has not been found in Conte and Jacobs' (2003) cognitive psychology study. Nevertheless, a later study found that Neuroticism negatively affects multi-tasking performance from the neuroscience perspective (Szameitat et al., 2016). Neuroticism is also an important factor relating to Psychological Endurance. Although the literature about Psychological Endurance and

personality traits is not abundant, there do exist some connections between Psychological Endurance and anxiety, which is an important sub-trait of Neuroticism. Research has found that lack of Psychological Endurance may be an important correlate of anxiety (Wang et al., 2019). Other research also suggests that Neuroticism is positively correlated with the distinct unpleasant emotions of anxiety, dread, remorse, self-disgust, and humiliation (Penley & Tomaka, 2002), and thus negatively related to Psychological Endurance.

To sum up, the relationship between personality traits and cognitive abilities is interweaved complicatedly. To show these interrelations clearly, Table 2.1 shows the relationships. In the Table 2.1, “positive” means the two factors are positively correlated; “negative” means the two factors are negatively correlated; “undefined” means the research results are mixed and controversial within the literature; “uncorrelated” means the two factors appear to be unrelated.

**Table 2.1**

*The Relationship between Personality Traits and Cognitive Abilities*

	Openness	Consciousness	Extraversion	Agreeableness	Neuroticism
Working Memory	Undefined	Negative	Positive	Positive	Negative
Attentional Control	Positive	Positive	Positive	Uncorrelated	Negative
Multi-tasking	Uncorrelated	Negative	Positive	Uncorrelated	Undefined
Speed of Information Processing	Uncorrelated	Uncorrelated	Positive	Positive	Undefined
Psychological Endurance	Positive	Positive	Positive	Uncorrelated	Negative

## Personality and Interpreting

The relationship between personality and occupational performance has attracted scholars’ attention for many decades. Scholars have found that the

personality trait effects on job performance are not onefold, but multiple. Personality traits such as Emotional Stability, Extraversion, Openness to Experience and Conscientiousness are all related to task performance and creativity. Among them, three personality dimensions, namely Emotional Stability, Openness to Experience and Agreeableness, can explain 28% of the variance in participants' management performance (Rothmann & Coetze, 2003). In addition, different personality traits link with disparate occupations. For example, Openness to Experience is linked to consulting success (Hamilton, 1988) and training (Barrick & Mount, 1991; Vinchur et al., 1998), as people who score high on Openness tend to be more curious towards both the inner and outer world, and live experientially richer than their counterparts. Conscientiousness is also reported to be a strong relevant factor related to job performance, because the conscientious individual is purposeful, strong-willed and resolute. Conscientiousness is demonstrated in achievement orientation (being hardworking and insistent), reliability (being responsible and meticulous) and orderliness (being planful and organized; Barrick & Mount, 1991; Barrick et al., 1993; Rothmann & Coetzer, 2003). Extraversion predicts achievement in positions that need interpersonal connection, such as salespeople and managers (Barrick & Mount, 1991; Bing & Lounsbury, 2000; Vinchur et al., 1998), because extraverts are characterized as being sociable, energetic and talkative. Agreeableness is also a valid job performance predictor. Due to its co-operative feature, individuals who are agreeable may succeed in jobs that require teamwork and customer service (Judge et al., 1999). Neuroticism is another significant element for choosing candidate beyond all doubt, since the second most important factor that influences employability in numerous occupations is emotional stability (the polar opposite of neuroticism; Dunn et al., 1995). Neuroticism is commonly associated with low job performance because it is featured with anxiety and worriedness (Barrick & Mount, 1991; Judge & Ilies, 2002; Uppal, 2017). Therefore, at present, personality tests have been widely applied in job interviews, becoming one of the most important predictors for employers to judge the degree of match between occupations and applicants.

Not limited to job performance, personality studies have also come into notice in the field of academic study. Over the past decades, many scholars have found that personality traits may be a factor that influences individual academic performances (e.g., Busato et al., 2000; Chamorro-Premuzic & Furnham, 2003). The relationship between personality trait scores and academic performance is highly consistent to its relationship with job performance. To elaborate, studies have revealed that high scores on Openness to Experiences is linked to academic success (Blickle, 1996; De Raad & Schouwenburg, 1996). Blickle (1996) argued that people scoring high on Openness may apply learning strategies and techniques in a more in-depth way, which exerts a positive effect on academic settings. Similarly Conscientiousness is a personality trait that is consistently associated with academic performance (Blickle, 1996; Costa & McCrae, 1992; Goff & Ackerman, 1992), and this appears to be the case in all academic settings, including at school, undergraduate and postgraduate level (Andersen et al., 2020; Busato et al., 2000; Hirschberg & Itkin, 1978; Wolfe & Johnson, 1995). One possible explanation for this is suggested to be that sub-facets of Conscientiousness, such as achievement striving, are closely related to motivation, a critical variable in many types of academic performance (Andersson & Keith, 1997; Boekaerts, 1996; Chamorro-Premuzic, 2003). Other sub-facets of Conscientiousness such as order, responsibility, self-discipline, and deliberation are also found to be predictors of examination grades at university-level study (De Raad & Schouwenburg, 1996). With regards to Extraversion, it seems to be negatively correlated with academic performance, since introverts may have an advantage in being more concentrated on study, more systematic in study habits and better at consolidating knowledge (Entwistle & Entwistle, 1970; Sanchez-Marin et al., 2001). Though introverts show an upper hand in academic performance in most cases, the type of academic measurement suggested to be the variable that may even lead to a different result (Anthony, 1973; Chamorro-Premuzic, 2003; Eysenck & Eysenck, 1985; Furnham & Medhurst, 1995). Owing to their different arousal level based on Eysenck's theory, extraverts have an advantage when the test time is short (two to

five minutes) or timed; whereas introverts perform better in long-time tests (e.g., forty minutes) or tests without time limit (Chamorro-Premuzic, 2003). In terms of the relationship between Agreeableness and academic performance, it generally fails to find any significant relationship between the two (Ackerman & Heggestad, 1997; De Fruyt & Mervielde, 1996; Rothstein et al., 1994). Farsides and Woodfield (2003) found that Agreeableness appears to be more related with academic behavior than exam performance. Last but not least, Neuroticism has also been found to be strongly linked with academic performance, but negatively (Cattell & Kline, 1977; De Barbenza & Montoya, 1974). It could be that pressure, impulsiveness and anxiety under test or exam context may lead to negative outcomes which produce this negative correlation (Chamorro-Premuzic, 2003).

Narrowing down to the scope of English learning, Erfani and Mardan (2017) probed the relationship between the big-five personality traits and English language proficiency based on IELTS exam, one of the most authoritative English tests worldwide. Their findings suggest that all big-five personality traits have association with English proficiency, with Extraversion, Agreeableness, Conscientiousness and Openness showing high and positive correlation with IELTS scores whilst Neuroticism was negatively correlated with English proficiency. This result is accordant with the studies focusing on personality trait and job and academic performance mentioned above. For example, Conscientiousness is also reported to be a strong relevant factor related to both job performance and academic performance (Andersen et al., 2020; Barrick & Mount, 1991; Barrick et al., 1993; Wolfe & Johnson, 1995). Neuroticism is commonly associated with low job and academic performance (Barrick & Mount, 1991; Cattell & Kline, 1977; De Barbenza & Montoya, 1974; Uppal, 2017). However, some research has found no significant relationship between personality and language study. For example, in a study of 75 Indonesian university students, Carrell et al. (1996) discovered little association between personality characteristics and language learning. Kao and Craigie (2014) have suggested that this negative finding may be attributed to the use of various frameworks and instruments to assess



personality within the study and have argued that Extraversion and Neuroticism account for a statistically significant amount of variance in English as a Foreign Language (EFL). Focusing on branched aspects, Moody (1988) found that introverted students preferred working alone and outperformed in written exams, whereas extraverted students favored communication and performed better in spoken tasks.

Since interpreting is the study background of the research in this thesis, we should pay more attention to bilingual speaking and listening competence, which is the most important essential technique for student interpreters. Berry (2004) conducted a study on the interaction between individual personality differences and oral performance, and concluded that those scoring high on extraversion were superior on oral presentation performance than those low on the measure. This makes sense as there is general consensus that extraverts are more sociable and talkative. However, some scholars believe they may not be good listeners (Tubbs & Moss, 2000). Bostrom (1990) found that extraverts do more poorly on lecture listening tasks and suggested that this situation may seem boring to them. What does appear to influence learners' listening skills are Openness and Conscientiousness according to Fayyazb and Kamal (2011).

Despite much research being conducted examining the relationship between personality and language learning, research specific to the interpreting field has barely drawn scholar's attention. Henderson (1980) drew a portrait about "typical" interpreter based on his data, and concluded the following key words: a 'jack of all trades', 'self-sufficient', 'articulate extravert', 'quick and intelligent'. When it comes to interpreters, extraversion is the most frequently mentioned quality (Carroll, 1978; Cattell 1971; Henderson 1980, 1987; Seleskovitch, 1978; Szuki, 1988), seemingly because people naturally connect the concept of interpreter with the image of eloquence. Only a few scholars hold the opinion that introverts may actually become better interpreters due to greater attention to their "inner world" (Myers, 1987). Apart from Extraversion, "nerves of steel" is also commonly referred to because interpreting is regarded as a highly stressful job and anti-pressure ability is requisite

(Henderson 1980; Keiser 1978; Seleskovitch 1978). Additional characteristics such as concentration, curiosity, cooperativeness and being “happy-go-lucky” are also considered as interpreters’ typical characteristics. For instance, interpreters show significantly higher cooperativeness than non-linguistic experts (Hiltunen et al., 2019). Nicholson (2005) has measured personality characteristics of interpreter trainees based on the Myers-Briggs Type Indicator (MBTI), a four-dimensional personality test, judging whether a person is extravert or introvert, sensing or intuitive, thinking or feeling and judging or perceiving. Results showed that the interpreter samples were evenly divided in the following three bipolar dimensions: Extravert-Introvert; Sensing-Intuitive; and Judging-Perceiving. It is somewhat surprising to find that the number of interpreters in extraversion and introversion categories is basically the same, as interpreters earn their living by communicating with others. One explanation might be that interpreting is not simply related to oral expression, but listening comprehension as well, at which introverts outperform extraverts (Bostrom, 1990). The main difference in the Nicholson research was found to be in the Thinking-Feeling domain, with Thinking types outnumbering Feeling types by nearly two to one. This is argued to be primarily because Thinkers are adept at both organizing and synthesizing information (Nicholson, 2005). Another reason may be that Thinkers and Feelers would respond to stress differently; Thinkers want to confront stress and tackle difficulties head on and get it back on track, whilst Feelers desire to avoid it at all costs in the hopes that it will simply disappear (ibid).

The Big Five personality model has also been applied in the exploration of importance of personality in sign language interpreter disposition in many different countries, including Australia, New Zealand (NZ), the United Kingdom (UK), Canada and the United States of America (USA) (Bontempo et al., 2014). Results indicate that competent interpreters boast the following characteristics: 1) have higher self-esteem globally; 2) are higher in Conscientiousness in Australia; 3) have better emotional stability; 4) are slightly more extraverted (limited to the USA sample); 5) score higher in Openness to Experience globally; 6) do not score highly in

Agreeableness; 7) have a moderate proclivity for perfectionism (Bontempo et al., 2014).

The relationship between personality and cognitive ability as well as personality and interpreting have been illustrated above, and so the following examines the relationship between cognitive ability and interpreting.

## **Cognitive Ability and Interpreting**

Language mastery is not often the outcome of linguistic practice, because non-linguistic factors such as cognitive abilities are also explanations for differential success among second language learners. In Second Language Acquisition (SLA), common non-linguistic factors related to Second Language (L2) learning are included but not limited to cognitive style, aptitude, personality, motivation attitude, hemispheric specialization and learning methodologies (Larsen-Freeman & Long, 1992). Similar to SLA teachers, interpreter trainers have long debated the phenomenon of individual variances in students' apparent ability to thrive in the field (Macnamara, 2012). According to the interpreting Foundational Cognitive Model pointed out by Macnamara (2012), many non-linguistic factors are listed, involving working memory, fluid intelligence, processing speed, multi-tasking, emotion/stress control, attentional control, analysis and reasoning ability, and prediction ability. In this section, I focus on five major cognitive abilities: Working Memory; Attentional Control; Multi-tasking; Speed of Information Processing; and Psychological Endurance, exploring their relationship with interpreting in previous literature. The reasons for choosing these five cognitive abilities as representative are explained more fully in Chapter Three.

Over the past several decades, Working Memory has been increasingly widely used not only in the cognitive psychology field but also in many areas such as neuroscience and education (Baddeley, 2010). At the same time, the meaning of Working Memory has also undergone ceaseless changes. As early as 1968, the term “Working Memory” was applied to describe the short-term store of Atkinson and

Shiffrin's (1968) multi-store model of memory. Through earnest efforts of past decades, Working Memory is now commonly defined as the system or systems that are thought to be required for keeping things in mind while carrying out intricate tasks like learning, reasoning, thinking and comprehending (Baddeley, 2010). Working Memory engages in many complex intellectual activities (Waris et al., 2018), and is related to academic achievement (Gathercole & Pickering, 2000) and fluid intelligence (Kane et al., 2005), while impairments in Working Memory have been connected with learning disability (Alloway & Gathercole, 2006), neuropsychiatric disorders such as schizophrenia (Lee & Park, 2005) and Attention Deficit Hyperactivity Disorder (ADHD; Martinussen et al., 2005). Furthermore, Working Memory is not an isolated cognitive ability, but closely intertwines with other cognitive functions such as emotions and intellect (Kaufman & Kaufman, 2001), including linguistic abilities. The three components of Working Memory, the phonological loop, visuo-spatial scratchpad, and episodic buffer, perform their own functions to maintain individual mental operation. For instance, Ishkhanyan et al., (2018) found that Working Memory is involved in language production at the phonological encoding level. The visuo-spatial scratchpad of Working Memory is described as a "source of domain general vulnerability in arithmetic cognition", and a positive influence of visuo-spatial scratchpad on mathematics attainment has been argued for (Allen, 2019). Having a basic overview about Working Memory, it is not difficult to understand that Working Memory is one of the most common cognitive abilities attracting interpreting specialists' attention. Scrutinizing the Working Memory Model closely, it shares similar mechanism with that of consecutive interpreting. To be specific, the phonological loop corresponds with listening comprehension, the visuospatial scratchpad with taking and decoding notes (as the note should be taken or decoded based on logic, which is the sister-discipline of mathematics that closely linked with visuospatial scratchpad), and the episodic buffer with interpreting version output. Numerous studies have been conducted to explore the explicit correlation between Working Memory and interpreters with different

backgrounds, including experienced interpreters, novice interpreters, and student interpreters. Findings reach a substantial agreement. Scholars have measured participants' Working memory via reading span tasks, listening span tasks, non-word repetition or cued recall, and found that interpreters or interpreting students outperform non-interpreters; the last-year interpreting students performed better than the first-year students; and experienced interpreters were able to transfer a larger percentage of both idea units (also known as meaning units or meaning segments) and essential idea units than the beginner group (Antonova, 2018; Lee, 2011; Signorelli et al., 2011). Stavroula Stavrakaki et al. (2012) investigated simultaneous interpreters' Working Memory and verbal fluency and discovered that interpreters performed better than control samples in semantic fluency and most sub-measures of Working Memory. They explained that proficiency in a foreign language may improve verbal fluency and Working Memory skills, hence bilingual simultaneous interpreters' linguistic processing and Working Memory ability was greater than for those who were merely proficient in one language (Stavroula et al., 2012). A recent study drew similar conclusions that memory recall tests could foretell overall interpreting performance in both language directions (Shang & Xie, 2020).

There are far fewer empirical studies examining the relationship between interpreting and other cognitive abilities than with Working Memory. Attentional Control refers to a person's capacity to select what they concentrate on and what they overlook (Astle & Scerif, 2009). Attentional control is an important ability that interpreters should possess because they must divide their attention to many subtasks such as listening to a speaker, taking notes, comprehending information and so on, whilst switching between two languages on a regular basis. According to Dong Yanping and Li Ping (2019), interpreting is a complicated bilingual task, demanding both language control (i.e., the source language must not interfere with target language production) and processing control (i.e., multiple tasks carried out at the same time under time constraints). Cowan (1999, 2000) published a psychological model during simultaneous interpreting, which is explained based on the foundation

of selective attention processing during multi-tasking. Studies have showed the existence of a bilingual advantage (the capacity to shift attention between native and non-native languages) and interpreter advantage (more frequent language shifting than bilingual) in attention processing (Abutalebi et al., 2012; Ardila, 2003; Dong & Xie, 2014; Morales et al., 2015). Yagura et al., (2021) further conducted an empirical experiment, and demonstrated that the number of years of simultaneous experience affects selective attention during interpretation. In other words, as the number of years of simultaneous interpreting expertise grows, an interpreter's ability to pay attention improves (Yagura et al., 2021). Morales et al., (2015) drew similar conclusions, that that experience in simultaneous interpreting would transfer to other cognitive domains closely involved in the interpreting tasks. Some researchers have also found cognitive benefits from interpreting tasks not exposed in Attentional Control, but cognitive control as well (Becker et al., 2016).

The essence of Multi-tasking somewhat overlaps with Attentional Control, because it is actually a sub-field of attention control called attention division (Eysenck & Keane, 2020). It refers to splitting attention on more than one task or activity at the same time. Multi-tasking can appear nearly effortless in some situations (e.g., walking and talking); in others, it can appear exceedingly difficult, if not impossible (e.g., reading and listening to two distinct sentences); and in still others, multi-tasking performance may be highly dependent on the person and/or the surroundings (e.g., singing while playing an instrument or making a phone call while driving; Salvucci & Taatgen, 2008). Many scholars believe that multi-tasking behavior incurs a performance cost, because human's effort and attention capacity is limited (Howard et al., 2020; Kahneman, 1973; Townsend & Eidels, 2011). Despite its negative effects, multi-tasking can also be regarded as an ability in complex tasks, or even a strategy that can be consciously applied to facilitate one's performance. For instance, the job of interpreters suggest that multi-tasking can be an effective skill improving their performance (Stachowiak, 2015). Simultaneous interpreters' concurrent tasks include, but are not limited to, language listening, analyzing, oral translation, self-monitoring,

self-correction and many others; while consecutive interpreters require speech listening, comprehension, production, and taking and decoding notes. To master interpreting performance, interpreters must learn how to become a multi-tasker, and divide their attention properly. Researchers who aim to find out the relationship between multi-tasking and interpreting have found that simultaneous interpreters are better at coordinating multiple tasks in lab-based dual-task scenarios (e.g., Strobach et al., 2015).

The next element that needs to be discussed is Speed of Information Processing. Language processing can be roughly divided into auditory and visual information processing. The procedure of auditory information processing should experience several steps: first transforming the sound wave pattern into acoustic characteristics in the pre-perceptual auditory storage; then synthesizing it into unit or gestalt based on primary recognition; next generating abstract memory after secondary recognition; finally completing speech processing assisting by semantic rules, situational context and knowledge (Massaro, 1975). The course of visual information is assumed to be exactly similar to the processing of speech (ibid). The first step is transmitting visual features into pre-perceptual visual storage in the form of a pre-perceptual visual image. Next, transforming the pre-perceptual visual image into letter strings and spaces in synthesized visual memory after primary recognition. Then the secondary recognition process operates to the information in synthetic memory to convert the letter strings into a series of words that people can read and understand (Massaro, 1975). A large scale of literature concentrates the relationship between information processing speed and intelligence, but few studies pay close attention to the relationship between information processing speed and language (Sheppard & Vernon, 2008; Willinger et al., 2019). A recent study tends to fulfill this research gap and finds that information speed processing can significantly predict language metaphor comprehension (Willinger et al., 2019). Consecutive interpreting requires a high level of language information processing, on both auditory and visual information. During the time they hear a speech delivered in source language, the

interpreter must process the auditory information, including understanding, analyzing, and memorizing. When the speaker chooses to pause, consecutive interpreters should process the visual information based on their notes with time requirement. Although the notes are very likely not taken in normal text but symbols or digits, it still requires them to process it deeply to help them recall the original text. Nevertheless, the literature related to interpreting and Speed of Information Processing is also quite insufficient. Research suggests that consecutive interpreting represents a deeper form of information processing (Lambert, 1988), but there is still limited research focusing on processing speed relating to interpreting.

The last factor focusing on its relationship with interpreting is Psychological Endurance, which means the degree to which information is processed rationally when people encounter setbacks or sufferings (Wang et al., 2019). Again, the research combining Psychological Endurance and interpreting is not abundant. However, scholars seem to be interested in the ties between stress and interpreting, because interpreting is regarded as a highly stress-provoking task (Hong, 2003). The sources of pressure are multi-dimensional. Interpreting not only requires a superb command of target and source language, but favorable memory retention, effective risk management skills and so forth (Chiang, 2006). Therefore, interpreters need to be ready at any moment to cope with potential challenges throughout the whole interpreting process, and work under extreme time constraints at all times (Riccardi et al., 1998). Confronting the stress stimulated by linguistic, cognitive, and psychomotor operations, interpreters use strategies of reducing reliance on avoidance coping, seeking social-support coping and problem-solving coping to reduce stress (Kao & Craigie, 2013). An individual with tenacious Psychological Endurance is more able to withstand pressure. The specific relevance between interpreting and Psychological Endurance will be studied in this empirical study.

To conclude, this chapter recounts the principle literature in terms of personality, cognitive abilities, interpreting, and their inter-relationships. It is worth mentioning that the literature related to the relationship among personality traits, cognitive



abilities and interpreting training is seldom seen. Therefore, the current research will explore into this field in more detail, attempting to fill one of the many gaps in this research area. The next chapter will further illustrate the methodology of the current research, including reasons for choosing specific personality model measures and cognitive ability measures. Ethical considerations, the epistemological position of the researcher and research studies will also be indicated in the next chapter.

## **Chapter Three: Methodology**

This chapter illustrates the methodological issues relating to the choices made for carrying out the research for this thesis in detail. I will first explain the reason for choosing the specific personality scale, cognitive abilities, and measures for this study. The number and type of personality theoretical models is diverse. There are various inventories that can be applied to assess personality traits including, but not limited to, the California Psychological Inventory (Gough & Bradley, 1996); the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975); the Sixteen Personality Factor Questionnaire (Cattell, 2007); the Myers-Briggs Type Indicator (Myers & Myers, 1995); and the Big Five Inventory (Goldberg, 1992; John & Srivastava, 1999). Similarly, there are multitudinous cognitive ability tasks used to measure everyday cognitive activities, involving Working Memory (Atkinson & Shiffrin, 1968), Attentional Control (Derryberry & Reed, 2002), Multi-tasking (Salvucci & Taatgen, 2008), Speed of Information Processing (Posner, 1978) and Psychological Endurance (Masten, 2001). The chapter sets out why the measures of these cognitive abilities are chosen to examine the cognitive abilities of interpreting trainees and sets out the measurement of variables in terms of personality traits, cognitive abilities, and interpreting. In addition, the choice of analyses, ethics processes that were considered and implemented, and consideration of the epistemological position of the researcher within the research framework are also set out in this chapter to construct a general methodology section before addressing the specific methodology of the study itself in the next chapter.

### **Choice of Personality Theoretical Model**

As set out in Chapter Two, multiple schools of thought have developed throughout the history of psychological research. The trait tradition lies at the root of this thesis's exploration of personality theory, since personality traits can be

measured and assessed by personality scales (Cattell & Mead, 2008). The questionnaire data can be collected in the empirical research method and used to test hypotheses. In this section, multidimensional personality instruments will be expatiated, as well as explaining the reason for choosing the Big Five (Goldberg, 1992) as the measurement scale of this paper.

## **The California Psychological Inventory**

The California Psychological Inventory (CPI) was first established in 1951, designed to assess personality traits of people with different cultural backgrounds (Cattell & Mead, 2008). Unlike other personality tests, the CPI was not developed from previous personality frameworks or psychometric properties, but through a combination of rational method and practice. Thus, many lay terms such as *self-control* and *tolerance* still exist even in the revised inventory. There are two principal CPI editions, namely the CPI 434-item version and the CPI 260-item version. The CPI 434-item version consists of 434 questions providing scores for 13 special purpose or research scales, 20 standard (folk) scales and three vectors (Gough & Bradley, 1996). Gough and Bradley (1996) reported a five-factor process consisting of ascendance, dependability, conventionality, originality, and femininity/masculinity. Afterwards, a shorter version of the CPI, the CPI 260-item version, was devised comprising of 29 scales, arranged as 20 folk scales, six special purpose scales and three structural scales (Cattell & Mead, 2008).

Both the pros and cons of the CPI are quite distinct. Due to the non-academic expression in the inventory, it has been widespread and translated into many different languages, enhancing its cross-cultural function. However, criticisms never fade away. Firstly, much of the research still applies old versions instead of the latest CPI, which may limit the validity of its findings (Cattell & Mead, 2008). Critics have also pointed out that the data related to the validity and reliability is limited, especially for the latest edition (ibid). Although many studies utilized CPI to examine participants' personality traits, few of these studies publish internal reliability data,

which may be caused by the confidentiality of scoring (ibid). Lastly, factor-analytic work is limited on the CPI, and there are no reference books for interpreting these multiple scales (Groth-Marnat, 2003).

## **The Eysenck Personality Questionnaire**

The Eysenck Personality Questionnaire (EPQ) is the most commonly used scale in the Eysenckian measurement system (Cattell & Mead, 2008). There are four sub-facets included in the final EPQ: Extraversion (E), Neuroticism (N), Lie (L) and Psychoticism (P) scales (Eysenck & Eysenck, 1975). To be specific, extraversion is built upon Eysenck's cortical arousal theory of extraversion, which holds that introverts are more aroused than extraverts. Neuroticism can reflect people's emotional stability and performance under stress. Psychoticism is significantly relevant to human factors such as drug addiction, sexual behavior and stimulus and response. The lie scale is not intended to reflect a stable personality factor but, importantly, is used to assess the accuracy of the self-report descriptions of Extraversion, Neuroticism and Psychoticism (Boyle et al., 2008). The items included in the revised EPQ are fewer than the CPI, with only 100 items, 32 measuring Psychoticism, 23 Extraversion, 24 Neuroticism and 21 Lie.

Compared to the CPI, the reliability and validity data of the EPQ are considered to be much more robust, which is one of the most apparent advantages of it (Cattell & Mead, 2008). Furthermore, not being restricted to research in one country, Eysenck expanded his research to 24 countries at first and then further extended to 34 countries in 1988 (Barrett et al., 1998; Eysenck et al., 1985). As the population sample surged across different nations, Eysenck creatively published a book detailing specific findings in different countries with different age groups such as children, adolescents and adults (Saklofske & Eysenck, 1988, 1998). Another breakthrough in the EPQ was the involvement of a lie scale. It shows participants' degree of response desirability, to filter reluctant and perfunctory subjects. The EPQ is available in versions designed for both children and adults, since it boasts two targeted formats.

However, a criticism of the EPQ has been that it mainly concentrates on the psychoticism scale despite psychoticism as a trait being less fully described and insufficient in empirical support (Boyle et al., 2008).

## **The Sixteen Personality Factor Questionnaire**

The Sixteen Personality Factor Questionnaire (16PF Questionnaire) is proposed by Cattell et al. (1993), who simplified the long list of human traits based on factor analysis. As the instrument is named, the 16PF Questionnaire assesses individual's personality traits from sixteen elements: warmth, emotional steadiness, rule-awareness, dominance, reasoning, vitality, social fearlessness, sensitivity, abstractedness, privateness, alertness, apprehension, openness to novelty, perfectionism, self-reliance and stress (Conn & Rieke, 1994). The 16PF Questionnaire was a multi-level measurement, formed from primary factors and global factors (Cattell & Mead, 2008). Primary factors are traits that distinguish individual personality differences and are argued to explain and predict individual's behaviors (ibid). The sixteen personality traits mentioned above are primary factors in the 16PF Questionnaire. Scholars then factor-analyzed these primary traits into five global factors (the original Big Five) in an attempt to investigate personality frameworks at a higher level. These five global factors help analyze personality from a higher and conceptual level (ibid). The five global factors of the 16PF Questionnaire are extraversion, independence, inquietude, strong-minded and self-regulation. The primary and global factors are interrelated and provide an in-depth understanding of personality. The latest edition of the 16PF Questionnaire contains 185 multiple-choice items (generally taking 35 to 50 minutes to complete in a paper-and-pencil format), providing scores based on the sixteen primary scales, five global scales and three response bias scales (Cattell et al., 1993). It has been innovated into several versions to meet different participants' needs, such as the 16PF Select (approximately needs 20 minutes to complete) and The 16PF Express (approximately needs 15 minutes to complete; Boyle et al., 2008).

The 16PF Questionnaire is one of the most popular personality inventories and can be utilized in a far-ranging setting. The reasons behind this are not only its high levels of validity, or several adaptations for different age groups, but also that it considers cultural factors. Firstly, from factorial validity level, the confirmation of factors in the 16PF has undergone empirical testing with diverse samples of people (Boyle, 1989), so the number and identity of every factor is well-designed and scientific (Cattell & Mead, 2008; Conn & Rieke, 1994). In addition, the 16PF performs well in construct validity which means it shows strong relationships with other instruments such as the PRF and the Locus of Control Inventory (Schneewind & Graf, 1998). Secondly, unlike many other personality questionnaires, the translations of 16PF are adapted according to cultural context. Regional norms and corresponding reliability and validity information are available in reference books (Cattell & Mead, 2008). To sum up, the 16PF is extensively used in different regions and cultures, and the mindset of setting five upper-level global factors sowed the thoughts for later the Big Five (Boyle et al., 2008).

## **The Myers-Briggs Type Indicator**

The Myers-Briggs Type Indicator (MBTI) is another widespread personality instrument, taking Carl Jung's personality theory as its base. The mechanism of MBTI is based on four dichotomies: introversion vs. extraversion, sensing vs. intuition, thinking vs. feeling, and judging vs. perceiving (Myers & Myers, 1995). The first scale (Extraversion/Introversion dimension) defines one's preferences in gathering energy. Extraverts gain energy from the outer world and through interaction with others. In contrast, introverts energize themselves via their inner world (Zeisset & Center, 2006). The second dimension (Sensing/Intuition dimension) deals with how people prefer to collect information. Sensing-type people pay more attention to sensory data such as visual sense and auditory sense, while intuition-type people would focus on things that are more abstract such as concepts (Myers & Myers, 1995). The third bipolar scale (Thinking/Feeling dimension) reflects how people prefer to make decisions.

Thinking types solve problems objectively and logically. Conversely, feeling types are more subjective and place emphasis on social relationship (Nicholson, 2005). The last scale (Judging/Perceiving dimension) deals with control. Judging-type people tend to attempt to control the environment. They are more decisive and prefer to make plans to reach their goals. Conversely, perceiving-type people control their participation in the environment. They are more flexible and prefer to “go with the flow” (ibid). Participants will gain their own personality type, a set of combination from four either-or dimensions, after completing the MBTI.

The MBTI is a useful assessment tool and widely applied in job employment, with recruiters believing the type of people will influence their favorite ways of acting and thinking, so as to associate with job performance. However, in the psychology field, it has been criticized as pseudoscience and thus is not well accepted by academic researchers (Bailey et al., 2018; Thyer & Pignotti, 2015). Generally speaking, the MBTI is denounced for the following four aspects. Firstly, the validity of this measurement is not credible, because it fails to assess what it purports to assess and is short of predictive power (Boyle, 1995; Gardner & Martinko, 2016; Grant, 2013). Secondly, the reliability of the MBTI is also not considered to be robust; it sometimes even generates different result for the same person on different occasions (ibid). Thirdly, criticism also centres on the dichotomy method, since this model directly restricts people into 16 categories instead of admitting that everyone is unique. Most studies have found that scores on each individual scale are shaped as a normal distribution, with about 15% of people at the low and high end, and the majority of people range in the middle. However, the cut-off line of the MBTI is at the middle of scale, which violates the general rule of normal distribution (Bess & Harvey, 2002; McCrae & Costa, 1989). Last but not least, the MBTI is not comprehensive because the dimension of neuroticism is not included in the measurement (Boyle, 1995; Gardner & Martinko, 2016; Grant, 2013).

## The Big Five Inventory

The Big Five Personality Model is a widely acknowledged theory and the derived self-report inventories have been extensively used in psychology and clinics. The Big Five Inventory is a 44-item scale that adapted from earlier version NEO-PI-R (NEO Personality Inventory, a longer inventory, with 240 items that consists of 30 scales; John & Srivastava, 1999). It measures individuals on five dimensions, namely Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. These five elements are selected from thousands of words describing personality traits by scholars based on decades of research assessment. The following paragraphs will make a detailed introduction of these five personality dimensions, as the Big Five Model is the chosen personality measurement for this thesis.

Openness (the O in the OCEAN acronym) represents Openness to Experience, incorporating the six facets of fantasy, aesthetics, feelings, actions, ideas and values. People scoring high in Openness are prone to be more unconventional and curious to both inner and outer world, compared to their conservative counterparts with low scores in Openness (McRae & Tobert, 2004). They are receptive to emotion, perceptive to beauty and open to new experiences. Because of that, individuals who score highly in Openness can be perceived as being uncontrollable or lacking concentration, so that they are more likely to engage in high-risk behavior such as taking drugs (Ambridge, 2014). The source stimulating them to pursue self-actualization is through intense and euphoric experiences. On the contrary, people with low Openness tend to chase a sense of fulfillment through down-to-earth practice, so to some extent they may be regarded as dogmatic or close-minded. They are prone to be conventional and conservative, and prefer familiar to novel (Rothmann & Coetzer, 2003). The relationship between job performance and Openness to experience varies across different professions. Some research shows that high Openness is relevant to success in consulting (Hamilton, 1988), training (Barrick & Mount, 1991; Vinchur et al., 1998) and acclimatizing to



change (Raudsepp, 1990). In contrast, Johnson (1997) found that accomplished employees scored significantly lower on Openness to Experience than unsuccessful counterparts. Tett et al. (1991) reported that Openness dimension is not a reliable indicator of job performance. The possible reason for this is that the demands of different vocations is varying (Rothmann & Coetzer, 2003).

Conscientiousness (the C of OCEAN) refers to self-regulation and the active process of planning, arranging and completing tasks (Barrick & Mount, 1993). It can be subdivided into six facets, competence, order, dutifulness, achievement, self-discipline, and deliberation. It is believed that conscientious people are more reliable, strong-willed and determined. High conscientiousness scorers prefer to make plans instead of carrying out spontaneous behavior (Costa & McCrae, 1992). However, on the negative side, extreme high scores on Conscientiousness may indicate perfectionism or workaholism. Conversely, low scorers on conscientiousness are prone to be associated with flexibility and spontaneity, and this may be viewed as sloppiness or lacking in reliability (Toegel & Barsoux, 2012). Many studies have shown that the correlation between Conscientiousness and job performance is significant, and some factors such as self-control and target setting may affect the relationship between them (Barrick & Mount, 1993; Barrick et al., 1993).

Extroversion (the E in OCEAN) is the most high-frequency topic that people usually discuss when considering personality traits. It is characterized by the breadth of activities, rather than depth, and energy creation from external means (Laney, 2002). Extravert people are often labeled as sociable, energetic, forceful, adventurous, enthusiastic and outgoing. They enjoy interacting with people from all walks of life and tend to be enthusiastic and energetic. Conversely, introverts tend to be quiet, prudent, and reluctant to set up connections with the outer world (Rothmann & Coetzer, 2003). They would not be dominant in social settings like extraverts, but this should not necessarily be explained as shyness or being antisocial; instead they may need less stimulation and more time to stay alone (Rothmann & Coetzer, 2003). Research has found that extroversion is a strong predictor in job

performance, especially for occupations that feature social intercourse as a primary skill such as sales personnel and managers (Barrick & Mount, 1991; Bing & Lounsbury, 2000).

When it comes to Agreeableness (the A of OCEAN), this incorporates trust, straightforwardness, altruism, compliance, modesty and tender-mindedness. Agreeable people are altruistic and sympathetic, and they value getting along with others, since they are always optimistic to human nature (Hogan, 1998; Jensen-Campbell & Graziano, 2001; Sutin & Widiger, 2017). Nevertheless, people who score low on agreeableness are egocentric and skeptical. They place self-interest above others' and are less prone to be considerate of others. Low agreeableness people tend to be uncooperative, competitive, and challenging to others, so they may be considered as argumentative or untrustworthy (Toegel & Barsoux, 2012). Since Agreeableness is a social trait, it is a significant predictor of job performance relevant to group work and customer service (Judge et al., 1999).

As for the last element, Neuroticism (the N in OCEAN), it indicates individual's responses of regulating emotion, negative emotion in particular. It can be divided into anxiety, anger hostility, depression, self-consciousness, impulsiveness, and vulnerability (Conner et al., 2004). Neuroticism can sometimes be called emotional instability, as it is associated with low tolerance for stress or stimuli (Norris et al., 2007). People with high score on Neuroticism are more likely to suffer from psychological stress, excessive demands and impulses, and experience unfavorable emotions such as rage, anxiety, and dismay (Jeronimus et al., 2014). Low Neuroticism scores indicate high emotional stability (ibid). They are more likely to stay calm and be capable to confront stressed situations without being upset (Hough et al., 1990). Neuroticism is also a significant predictor of job performance. Much research shows that Neuroticism is negatively correlated to job performance, because it is featured with anxiety and worriedness (Barrick & Mount, 1991; Higgins et al., 1999; Judge & Ilies, 2002; Uppal, 2017).

The above description shows that the Big Five Model is a systematic personality

framework. The Big Five Inventory is the measurement chosen to assess participants' personality traits in this thesis. The reasons are listed as follows. Firstly, it has been applied by researchers all over the world and well received. The reliability and validity of the model have undergone repeated examinations with samples from different regions and cultures, showing consistent performance in an overwhelming majority cases. The reliability and validity level are not influenced by different language adaptations for the current study, since the original version has been translated into many kinds of languages across the world and receives favorable reviews. Chinese scholars have also applied the Chinese version of the Big Five scale into research in many fields. Reviewing the literature over the past several decades in China, it shows that Cronbach's alpha is above 0.7 on average in all five personality dimensions, despite differences existing in North-South geographical elements (Luo et al, 2016). In addition, the Big Five Inventory shows sufficient reliability in adult non-clinical participants and yielded favorable validity evidence based on considerable convergent and divergent relations with other Big Five assessments and of peer evaluations (John & Srivastava, 1999). Hence, with a solid empirical foundation, the Big Five Model has been chosen as the personality trait measure for this thesis.

Secondly, unlike the CPI 260-item or CPI 434-item, the 44-item Big Five Inventory is more concise and less time-consuming, which is beneficial for response quality. Research has shown significant correlations between the length of questionnaire and response rates in mailed questionnaires (Bogen 1996). Helped by meta-analyses, it indicates that lengthy questionnaires are linked with lower response rates (Heberlein & Baumgartner 1978; Yammarino et al, 1991). Empirical studies show that questionnaires lasting approximately twenty minutes led to higher non-response rate than questionnaire needing eight to ten minutes to complete (Crawford et al, 2001). In addition, from the perspective of psychology, participants are very likely to be impatient, and complete the questionnaires halfheartedly if they spend more time on a questionnaire than they expected. Admittedly, more test items

will generally bring higher reliability if participants complete them in the same attitude, but the reliability of the 44-item Big Five Inventory is also within the acceptable range of reliability. Therefore, the length of questionnaire is one of the most considered factors when choosing an appropriate questionnaire. In the current research, the personality scale is not the only questionnaire participants must complete but is coupled with the Attentional Control Scale and Psychological Endurance Scale. Therefore, the total three questionnaires are hoped to be completed within ten minutes, since the non-response rate is relatively low for this questionnaire length (Crawford et al, 2001). The 44-item Big Five Inventory is estimated to be accomplished within around six to seven minutes, giving enough time for participants to complete the 20-item Attentional Control Scale and six-item Psychological Endurance Scale within an expected three to four minutes. Therefore, the 44-item Big Five Inventory is considered the optimal choice in present study.

Thirdly, the five-factor model is adapted from a four-factor model (the EPQ) and the embryonic five-factor model (the 16PF Questionnaire). Therefore, the five factors of the Big Five Inventory are relatively robust and comprehensive. The initial model was modified by Tupes and Christal in 1961, but failed to meet the standard until the 1980s (Tupes & Christal, 1961). Later in 1990, Digman developed his five-factor model of personality (Goldberg, 1993). These five principal personality domains have been formed and are assumed to represent the fundamental framework underlying all personality traits (O'Connor, 2002). At least four groups of researchers have conducted studies independently on the five factors. Therefore, the Big Five Model has gradually become mature based on the joint efforts of numerous researchers. The relatively sophisticated personality framework also provides support for making this choice.

Last but not least, the scoring method of the Big Five Inventory is more scientific than many others, since it measures on specific scoring criteria instead of assessing dichotomized personality traits such as with the MBTI. In other words, it is somewhat inappropriate to measure individual traits in a black-or-white option; instead a

continuity interval is much more rational. Taking the questionnaire MBTI for example, the result of it is nothing else than 16 personality types (two to the fourth, four personality dimensions with two results in each dimension). Nevertheless, it is by no means reasonable to categorize several billion people on the earth into 16 classifications. Focusing on the Big Five Inventory, every participant receives their own score ranging from one to five in each personality dimension. The results of this is much more plentiful, and every participant would feel themselves as a unique individual to a larger extent. Hence, the Big Five Inventory is chosen as the measurement to assess participants' personality traits in this research combining all the aforementioned reasons. More detailed information about the Big Five Inventory scoring will be illustrated in the measurement of variable section of this chapter.

## **Choice of Cognitive Abilities**

As set out in the cognitive abilities section in chapter two of this thesis, cognitive abilities refer to a wide range of domains, including memory, attention, thinking, emotion and language. Over the past decades, cognitive abilities are often discussed with job performance (e.g., Nye et al., 2022), and the question of interpreter cognitive aptitude, or non-linguistic factors has also been widely discussed in Interpreting research (e.g., Lambert 1991; Mackintosh, 1999; Moser-Mercer, 1994). Macnamara (2012) published a paper called *Interpreter Cognitive Aptitudes*, aiming to examine the fundamental cognitive characteristics and abilities that help an individual increase the likelihood of becoming a successful interpreter. Macnamara (2012) divided these potential aptitudes and abilities into several categories: social-cognitive aptitudes; intellectual aptitudes; and processing ability. There are further subdivisions in each category and a working model of cognitive substrates was developed to serve as the under-structure for interpreting aptitude, called the Foundational Cognitive Aptitude Model. The model sets out a systematic structure of cognitive abilities, including but not limited to memory, comprehension, decision-making, emotion and stress. It would be impractical and

beyond the scope of the current research to measure all cognitive abilities in the Foundational Cognitive Aptitude Model at once. Therefore, among these cognitive aptitudes, I chose several of them as the non-linguistic factors included in this research, namely Working Memory, Speed of Information Processing, Multi-tasking, Attentional Control, and Psychological Endurance. These cognitive abilities are also mentioned in other research talking about the non-linguistic factors in interpreting process (Wang, 2004). The reasons for choosing these factors are listed as follows.

## **Working Memory**

Memory ability is of great significance in the domain of cognition. Scholars have divided memory into various types such as sensory memory, short-term memory, and long-term memory (e.g., Atkinson & Shiffrin, 1968). With further development, Working Memory has drawn people's attention in many complicated cognitive activities. It is also widely mentioned in the study related to interpreting, because interpreter is regarded as a highly cognitive demanding job (Altarriba & Isurin, 2012). Baddeley and Hitch first put forward the original Working Memory Model in 1974, and continuously modified it over the next twenty years. The finalized Working Memory Model contains three basic components: the central executive; the phonological loop; and the visual-spatial sketch-pad (Baddeley, 1992). In brief, the central executive plays a principal role in this system, taking charge of the connection subsystems and Attentional Control in higher-level cognitive processes. The phonological loop oversees storing and controlling of voice-based information, including speech storage and pronunciation control. The visual-spatial sketch-pad is in charge of visual and spatial elements such as color, shape and location (ibid).

Working memory is a popular cognitive ability that is frequently integrated into interpreting studies (e.g., Cowan, 2000; Kopke & Nespoulous, 2006; Liu et al., 2004). The reason behind this can be traced back to the process of consecutive interpreting, which can be segmented into two sections according to Gile (1995). In the first input

stage, the interpreter listens to the source speech and takes note while listening. This requires abilities including listening and analysis, note-taking, short-term memory, and coordination efforts. During the next output stage, the interpreter should translate the information in the target language, mobilizing their remembering, note-reading, and production efforts (Gile, 1995). Considering the indispensable efforts taken in the consecutive interpreting process, Working Memory plays a part directly or indirectly. For instance, listening to source speech from speaker would activate the phonological loop, and note-reading activate the visual-spatial sketch-pad. The central executive role here comes down to analysis, coordination and other efforts. Among the interdisciplinary research exploring the relationship between Working Memory and interpreting, interpreters' advantage in Working Memory has been reported in much research, though the testing methods are all different, included but not limited to word span with written presentation, word list recall and listening span tasks (Signorelli et al., 2011). However, some scholars come out with some different findings. For instance, the advantage may only be for novices, not advanced or professional interpreters (Kopke & Nespoulous, 2006; Liu et al., 2004).

## **Attentional Control**

Attention is another age-old and eternal element in the field of cognition, since Simon (1947) first focused on attention aspects such as channeling, structuring, and allocation. According to William James (1890), attention is 'the taking possession by the mind of one out of what seem multiple concurrently possible objects or trains of thought in distinct and vivid form', and regulates many cognitive functions such as memory and language (Petersen & Posner, 2012). It is absolutely important for people who are immersed in brain activities to grasp the ability of Attentional Control, knowing when they should focus or shift their attention. Attentional control refers to an individual's capacity to select what they focus on and what to neglect (Astle & Scerif, 2009). In other words, Attentional Control includes the abilities of focusing and

shifting attention (Derryberry & Reed, 2002).

For interpreting, it is an intense bilingual task, since interpreters should transform from source language to target language under time limits (Gile, 1995). One of the most evidenced findings that sets interpreting apart from general bilingual processes is that the frequency and regularity of switching between source and target language during interpreting process is much higher (Nour et al., 2019). More often than not, bilingual speakers would insist on one language as the base and code-switch occasionally to meet the needs of their audience (ibid). In the situation of interpreting, however, interpreters switch between listening to one language and expressing in another language within a limited amount of time (Hervais-Adelman et al., 2014). This time limitation and high frequency of language switching is challenging in attention level (Nour et al., 2019). Thus, the demand for interpreters to allocate their attention properly is enormous. Scholars (e.g., Nour et al., 2019) have conducted many empirical studies to explore the attention network of interpreters. Results show that when compared to other multilingual groups, such as translation participants, interpreters and interpreter trainees perform differently in their attentional networks. This distinction was more evident in the alerting network both for the reaction time and response correctness (Nour et al., 2019). Yanping Dong and Ping Li (2019) proposed an Attentional Control model based on empirical evidence in the literature. They pointed out that interpreting Attentional Control consists of two control system, language control and processing control. Concretely, language control in interpreting is accomplished through the dual mechanism of language-modality links (formed during interpreting training and stored as a task schema), and focused attention (operated through particular functions of monitoring, task disengagement, goal enhancement, switching and Working Memory). Another control system in interpreting tasks, processing control, is accomplished by divided attention that operates through particular functions of coordination and Working Memory, and language processing efficiency that is accomplished by the proficiency of both languages and the intelligent application of interpreting techniques and



strategies (Dong & Li, 2019).

## **Multi-tasking**

Like Attentional Control, Multi-tasking is also closely associated with attention in cognition. As mentioned in chapter two of this thesis, focused attention and divided attention are two crucial concepts in attention, in which divided attention can also be understood as multi-tasking (Eysenck & Keane, 2020). Human multi-tasking refers to splitting attention on more than one task or activity at the same time, such as making phone calls while driving a car. Research has shown that multi-tasking behavior incurs a performance cost (Kahneman, 1973; Townsend & Eidels, 2011). It is principally because the component processes involved in Multi-tasking are largely isolated and independent, therefore consuming the mental resources or attentional capacity quickly. For many years the relationship between multi-tasking and attention has been of great interest to scholars. For example, according to Ophir et al. (2009), high multi-taskers were more prone to distraction than low multi-taskers. However, Alzahabi and Becker (2013) investigated task switching, and their results indicated that high multi-taskers perform more efficiently on task switching and can control their attention better. In fact, one important factor that determines two task performance is the degree of similarity of the two tasks. Treisman and Davies (1973) discovered that two tasks interfered with one another substantially more when the stimuli on both tasks were categorized in the same modality (visual or auditory). Another decisive factor is practice. As the saying goes: “practice makes perfect”, many empirical studies have also supported this statement (Spelke et al., 1976). For example, Bherer et al. (2006) found that older adults improve their dual task performance after receiving appropriate training, and similar results are also found in younger adults (Oberauer & Kliegl, 2004).

Comparing interpreters and other professions, it requires higher demand in multi-tasking. The multi-tasking feature can be fully reflected in the Effort Models of Gile (2002). Interpreters should re-allocate their attention into several aspects. For

example, simultaneous interpreters should listen to the speaker, memorize the speech and produce a version at the same time; consecutive interpreters would face another mission, note-taking, besides the tasks facing simultaneous interpreters (Gile, 1995). A professional interpreter should allocate their attention to even detailed tasks such as analyzing the goal of speakers, choosing the most appropriate productive words as well as considering cultural difference between speaker and audience. Although interpreters are tolerated to make some errors such as marginal information omission, the overall version should still be accurate and complete. Thus, interpreters are trained to minimize the performance cost that may result from multi-tasking. Practice can help interpreters perform better in Multi-tasking due to the enhancement in automatic processes. Shiffrin and Schneider (1977) indicated that automatic processes suffer no capacity constraints and do not demand attention, which is totally different from controlled processes that are of restricted capacity and demand attention. A large amount of practice can promote automatic processes that tend to be fast and eliminate some cognitive bottlenecks (Shiffrin & Schneider, 1977). Thus, there is a cornerstone standpoint in interpreting: interpreters are not born but made (Mackintosh, 1999).

## **Speed of Information Processing**

In day to day life everyone must often process a great deal of information within a limited amount of time, with important information needing to be paid attention to and remembered before it is lost to forgetting or a failure to store; thus the speed of dealing with information is of vital importance. Speed of information processing is commonly analyzed in disciplines such as psychophysiology, behavioral neuroscience, and cognitive neuroscience since it is highly related to the thinking domain of cognition. Many studies focus on the time course of information processing in the nervous system by measuring the elapsed time between the onset of sensory stimulus and ensuing behavioral reactions (e.g., Posner, 1978). Reaction time is a parameter that can usually be measured as an important predictor of information

processing speed, which refers to the time difference between the emergence of stimulus and response. Nevertheless, quick response does not necessarily represent fast Speed of Information Processing, because whether the information has been processed correctly should also be taken into account. Hence, Speed of Information Processing implicates two aspects of performance: first, whether the task is completed correctly or meets the demands of a given standard, and second, the time taken to fulfill the task (Socan & Bucik, 1998). Narrowing the scope to the language domain, Speed of Information Processing is particularly relevant to reading speed and the rate of work in performing verbal tasks. Specifically, reading speed is a characteristic that assesses an individual's pace of silently reading various types of content for various purposes (Carver, 1990). Similarly, the rate of work in performing verbal tasks is a parameter that reflects the speed in completing verbal sentence completion tasks or multiple-choice vocabulary tests (Raskin, 1937).

In terms of technical interpreters, the time of processing information is extremely pressing. Consecutive interpreters should start interpreting within three seconds as soon as the speaker finishes their speech section. A long time interval between source language and target language is regarded as an unprofessional behavior. The response time for simultaneous interpreters is even more urgent. They should adjust their ear-voice span (the time lag between comprehension and reformulation) during the interpreting process (Gile, 1995). If prolonging the ear-voice span over time, it would necessarily increase the load for processing information. Thus, processing speed is a critical indicator when comparing interpreters' competency and expertise. Not only should interpreters transcode speakers' speech in a very short time, they should also guarantee the quality of the translated version. A list of interpreting criteria has been formulated for AIIC (International Association of Conference Interpreters) members by Zwischenberger and Pochhacker (2010). According to the list, evaluation criteria could be divided into two aspects, namely the linguistic parameters and non-linguistic parameters. For linguistic parameters, it consists of information completeness, fluency of delivery,

accurate terminology, proper syntax, sense consistency with the original, logic cohesiveness and appropriate style. Non-linguistic parameters refer to lively intonation, native accent, pleasant voice and graceful behavior (Pochhacker & Zwischenberger, 2010). These high-standard linguistic parameters show that interpreters must be capable to process input information at varying depths and with various levels of understanding. Therefore, Speed of Information Processing is an indispensable factor in this research.

## **Psychological Endurance**

Apart from the domain of memory, attention and thinking, emotion has been specially mentioned in the domain of cognitive ability. Negative emotions such as fear, stress, and anxiety could lead to irrational judgment, paralyzed thinking, erroneous encoding, and poor organizing, multi-tasking and problem solving (Goleman, 2005). According to the National Institute for Occupational Safety and Health (NIOSH), working conditions are a major contributor to occupational stress. Stress, including stress from the workplace, consists of the psycho-physiological processes caused by a perceived threat or danger. The phenomenon has two components from a psychological standpoint: (1) the experience of a hazardous and stressful circumstance, and (2) the uncertainty about one's ability to cope with this circumstance (Kurz, 2003). Consequently, the capacity of bearing pressure plays a strong part, especially in workplace. Psychological endurance refers to the bearing and adjusting ability when an individual feels psychological pressure and negative induced emotion triggered by adversity, including the adaptability, tolerance, stamina and strength to overcome stress (Wang et al., 2019). Generally speaking, Psychological Endurance can be understood from two perspectives. In a narrow sense, it is related to innate neurological characteristics, which means that people can suffer from different degrees of stress due to their diverse cerebral nervous system. Whereas from broad perspective, Psychological Endurance means the degree to which information is processed rationally when people encounter

setbacks or sufferings (Sar et al., 2018). People with strong Psychological Endurance are more likely to tackle emergencies or unexpected events composedly (Wang et al., 2019). Thus, Psychological Endurance is an important index that evaluates the working ability of workers under high-pressure environment such as journalists (ibid).

It is widely acknowledged that interpreting is indeed a high-stress occupation due to diverse stress triggers (Kurz, 2003). From the perspective of intuitive perception, interpreters must deal with a wide range of topics and accents from speakers from all over the world. They should be able to withstand long periods of stress, as they never know whether the speaker will say something difficult to interpret, which increases the possibility of failure. In addition, interpreters also confront a huge amount of psychological stress from the ongoing information input, the time issue, the intense focus required, and other factors (Kurz, 2003). Stressors impacting upon interpreting may even originate from the physical environment such as air quality, humidity, and temperature. Considering the particularity of booths, where simultaneous interpreters usually work, the average in-booth temperature often exceeds the temperature comfort zone recommended by the International Organization for Standardization (ISO). The humidity and CO<sup>2</sup> levels in many booths are also often inadequate (Kurz, 2003). Novice or student interpreters may also experience more stress during interpreting than experts because a novice cannot count on previous experience (Kurz, 2003). They continue to face several challenges (keeping up with the speaker, background information, comprehension, concentration, discovering equivalents, etc.; Moser-Mercer, 2000). Hence, Psychological Endurance is a practical indicator to measure whether the interpreter is potentially capable of dealing with stress or not.

In sum, I chose five cognitive abilities as the representatives of abilities in the field of interpreting, namely Working Memory, Attentional Control, Multi-tasking, Speed of Information Processing and Psychological Endurance. It is worth mentioning that all these five factors are interdependent of each other. For example, research has shown that multi-tasking performance could be improved by training in Speed of

Information Processing (Dux et al., 2009). Attentional control is modulated by the capacity to regulate stress and emotions, as tension and negative emotions disrupt one's capacity to pay attention (Goleman, 2005), and attending is also modulated by metacognitive management and Working Memory (Macnamara, 2012). The specific measurement of these factors will be further discussed in the following section.

## **Measurement of variables**

Variables are the basic component forming a model or system. Independent and dependent variables are normally studied in experimental sciences, mathematical analysis, and statistical modeling. Independent variables, as the name implies, are not dependent upon other variables of the research such as time and space. They refer to the attributes or conditions that lead to the change of the dependent variable owing to the manipulation by the researcher. Dependent variables refer to the variables that could change depending upon independent variables (Alligood et al., 2000; Aris, 1995; Boyce et al., 2022). Therefore, to put it in another way, independent variable can be considered as the cause of dependent variable, and dependent variable the result of independent variable. According to different context, independent variables can sometimes be called as “predictor variables”, “explanatory variables” or “input variables”, and dependent variables as “criterion variables”, “explained variables” and “output variables” (Dodge, 2006). Since some research questions in this thesis mainly focus on exploring differences, the terms independent and dependent variables will be used; whereas terms predictor and criterion variables will be utilized in other research questions focusing on correlations.

Apart from experimental variables that researchers aim to observe mentioned above, there are many other variables that would potentially strongly affect experimental results, called control variables. These variables are not of primary interest to the experimenter but can also be understood as non-experimental factors or irrelevant factors. In order to obtain objective results, control variables should be held constant throughout the experiment (Stylianou, 2008). Any change in control

variables would invalidate the relationship of independent variables and dependent variables. Taking the case as an example, of a researcher wanting to find out the effect of caloric intake exerted on the correlation of exercise to weight loss. Participants' prior weight should be controlled the same, as different prior weights may skew the result. Hence, irrelevant factors should be controlled in the study to ensure the validity and reliability of the results.

In the current study, the independent variable of this research is participant's interpreting performance, and the dependent variables are cognitive abilities (Working Memory, Attentional Control, Speed of Information Processing and Psychological Endurance) and personality traits. The measuring mean of these variables can be roughly divided into two types: self-report and behavioral task. In addition, these general cognitive abilities are measured to represent the corresponding cognitive ability mobilized in the interpreting process, since many previous studies have showed general cognitive ability is a credible predictor of domain-specific academic achievement (Karch et al., 2013). Besides this, there are many variables that must be controlled in the study including participants' age, educational level, linguistic level, experimental environment and so forth.

## **Measurement of personality**

Personality traits are investigated as variables in this study. There are two mainstream methods to test an individual's personality, namely self-report inventory and projective test. Self-report inventory is a personality questionnaire, offering numerous declarative questions to participants, so that they could choose the option that best fits them. The self-report inventory is widely applied for testing people's personality because it is easy-to-operate and standardized, whereas personality projective testing often lacks objective criterion and the results of it are hard to explain (Goldberg et al., 2006; Thompson, 2008). In this study, I chose the Big Five Inventory as the scale to measure participants' personality, and the rationale of the selection has been explained in the choice of personality theoretical model. The Big

Five Inventory is a 44-item inventory that adapted from earlier version NEO-PI-R (NEO Personality Inventory, a lengthy inventory, with 240 items that are organized into 30 scales; John & Srivastava, 1999). The advantage of this version is that it is more concise and less time-consuming. Beyond that, the Big Five Personality Model is a widely acknowledged theory and the derived self-report inventories have been extensively used in psychology and in clinics. It demonstrated sufficient reliability in adult non-clinical participants and provided strong validity evidence on the basis of significant convergent and divergent relationships with other Big Five instruments as well as peer judgments (John & Srivastava, 1999).

## **Measurement of Cognitive Ability**

### **The Listening Span Test (Assessing Working Memory)**

To assess participants' Working Memory, the Listening Span Test (Daneman & Carpenter, 1980; Liu et al, 2004) was adopted. Working memory can usually be measured by Span Tests, such as listening, reading and digit span test. Due to the occupational requirement of an interpreter, the Listening Span Test is widely used to test interpreters' or interpreting trainees' Working Memory instead of the Reading or Digit Span Test (Liu et al., 2004; Kopke & Nespoulous, 2006). The original Listening Span Test was designed by Daneman and Carpenter in 1980, taking sentences from knowledge quiz books as listening material. Considering Chinese participants' insufficient English encyclopedia knowledge, I adopted a Chinese scholar Liu et al.'s (2004) test version, which is revised based on the original version. The specific materials will be described in Chapter Four of this thesis.

### **Attentional Control Scale (Assessing Attentional Control)**

According to previous studies, there are many measurements that could be applied to assess the attention-related ability, including the Sustained Attention to Response Task (SART; Robertson et al., 1997), Mackworth Clock test (Mackworth, 1948), and Conners Continuous Performance Test (CPT; Conners, 2000) for testing



sustained attention and vigilance; Attention Network Test (ANT; Fan et al., 2002) and Attentional Control Scale (Derryberry & Reed, 2002) for measuring Attentional Control. Focusing on Attentional Control ability highlighted in this study, the Attention Network Test (ANT) developed by Fan et al. (2002) combines Posner's cued reaction time task and Eriksen's flanker task to measure three types of attentional control: alerting, orienting and executive (or decision making). In addition to the standard Posner task, the test involves presentation of the cue arrow presentation flanked by either congruent (same direction) or incongruent arrows (opposite direction) which requires the participant to use more sophisticated (executive) decision making to determine which way the arrow is pointing (Eriksen & Eriksen, 1974; Posner, 1980a). However, the current study does not intend to measure Attentional Control by behavioral task such as ANT, but plans to utilize a self-report questionnaire, the Attentional Control Scale (Derryberry & Reed, 2002). Although both measurements (behavioral task and self-report questionnaire) are widely used, they have different advantages and disadvantages. Two distinct strengths of the self-report approach are rooted in its clear question design and effective cost (Cyders & Coskunpinar, 2011). Nevertheless, this method requires high levels of participants' honesty in their responses (ibid). In terms of behavioral tasks, it reflects individuals' actual behaviors and response, but lacks specificity and only records a "snapshot" of behavior (Cyders & Coskunpinar, 2011; Dougherty et al., 2002). Considering that time-on-task is closely related to experiencing fatigue in completing cognitively demanding tasks (Matuz et al., 2021), the present study attempts to design the self-report and behavioral task in balance.

The Attentional Control Scale is a twenty-item self-report questionnaire that has been designed to assess individual dissimilarities in Attentional Control (Olafsson et al, 2011). The scale was designed by Derryberry and Reed (2002), focusing on one's capacity to focus perceptive attention, shift attention between tasks, and manage thoughts flexibly (Derryberry, 2002). According to Derryberry and Reed (2002), the Attentional Control Scale evaluates individual's attention coordination competence

from three aspects: a) focusing attention (e.g., 'When I need to concentrate and solve a problem, I have trouble focusing my attention'); b) shifting attention between tasks (e.g., 'It is easy for me to alternate between two different tasks'); and c) Controlling thought flexibly (e.g., 'I can quickly switch from one task to another'). Many studies have found that the Attentional Control Scale is a reliable tool to measure individual's focusing and shifting attention. The scale's overall score is internally accordant, with estimates of reliability ranging from  $\alpha = 0.71$  (Gyurak & Ayduk, 2007; Verwoerd et al., 2008) to  $\alpha = .88$  (Derryberry & Reed, 2002). Studies also show that scores on the scale predict response control across diverse behavior domains and relate to prefrontal cortex activation, supporting the validity of the ACS as a broad measure of effortful Attentional Control (Olafsson et al, 2011).

### **The Linguistic Dual Task (Assessing Multi-tasking)**

Dual-tasking experiments and task-switching experiments are two common methods to assess participants' Multi-tasking ability (Worringer et al., 2019). Dual-tasking is the capacity to perform two tasks simultaneously (MacPherson, 2018), whilst task-switching refers to the process of switching attention from one task to another (Collette & Van der Linden, 2002; Dreisbach, 2012). Therefore, the major difference between dual-tasking and task-switching experiments is the time sequence of two tasks: the two tasks in dual-tasking experiments are presented simultaneously, but alternatingly in close succession in the context of task-switching experiments (Worringer et al., 2019). Considering that interpreters should perform multiple tasks simultaneously instead of alternatingly, dual-tasking is selected in this research.

The dual task is a popular way to assess the utilization and distribution of attentional resources, particularly applied to examining the consequences of dividing attention between multiple tasks (Meyer & Kieras, 1997; Ward et al, 2019). When completing the task, participants are asked to perform two distinct tasks concurrently. Performance decrements (i.e., dual-task costs) would typically occur in the dual task,

as participants' attentional resources are not large enough to handle both tasks. In the research for this thesis, the Linguistic Dual Task is chosen as the measurement of Multi-tasking considering the linguistic study background. It is a reliable methodology for measuring Multi-tasking ability and has been used previously in interpreting research contexts (Stachowiak, 2015).

### **The Digits Symbol Substitution Test (Assessing Speed of Information Processing)**

Reaction time tasks, computer-based reaction time tasks in particular are typically applied to evaluate Speed of Information Processing (Burke et al., 2016; Senden et al., 2014). Nevertheless, given that consecutive interpreting trainees should process information based on taking and reading notes on paper instead of a computer-based environment, the current research plans to assess participants' Speed of Information Processing via a paper-pencil test, the Digits Symbol Substitution Test (Kaufman & Lichtenberger, 2006; Wechsler, 1939).

The Digits Symbol Substitution Test is a portion of the Wechsler Adult Intelligence Scale, one of the most widely used measures of intelligence (Kaufman & Lichtenberger, 2006; Wechsler, 1939). The test is user-friendly since it only requires an answer sheet and a pencil. Participants are required to write down the corresponding symbol to Arabic numerals from one to nine within the allowed time (usually 90 or 120 sec) according to the digit-symbol pairs exemplified on the top of the answer sheet. It can reflect participants' Speed of Information Processing, since the transcription of digit-symbol code is time-limited. In addition, from the perspective of transcription, it shares high degree of similarity with consecutive interpreting notes. In the process of taking notes, consecutive interpreters usually use symbols such as ">", "<", "≈" to represent meanings. Hence, the Digits Symbol Substitution Test is chosen for this study.

### **The Psychological Endurance Scale (Assessing Psychological Endurance)**

Similar to the measurement of Attentional Control, Psychological Endurance is

also designed to be assessed by a self-report questionnaire. It is primarily because Psychological Endurance is an unstable property, which is not appropriate to be assessed by behavioral tasks that only record a “snapshot” of behavior (Cyders & Coskunpinar, 2011; Dougherty et al., 2002; Sar et al., 2018). Thus, a targeted self-report questionnaire, the Psychological Endurance Scale, is selected in this research. Compared to the Big Five Inventory and the Attentional Control Scale, the Psychological Endurance Scale is relatively brief. It only has six items, all of which are intended to measure an individual's ability to be a source of strength to others in hard time and to persevere when confronted challenges (Hamby et al, 2015). Five of the six items used in the current study for this thesis were modified from Hamby et al.'s (2013) Endurance Scale, and one was rearranged based on Zimbardo and Boyd's (1999) Time Perspective Inventory. Hamby et al. (2013) have tested the reliability and validity of the Psychological Endurance Scale through both pilot and formal study, recruiting 104 and 2005 participants respectively. The pilot and main samples had internal consistency (coefficient alphas) of 0.81 and 0.86 respectively. Strong correlations with other regulatory strength measures, such as Anger Management ( $r = .64$ ) and Coping ( $r = .63$ ), as well as well-being measures, such as Subjective Well-being ( $r = .64$ ) and the Awe Index ( $r = .52$ ), were used to establish validity in the main sample (Hamby et al, 2015).

## **Measurement of Interpreting**

Whether the participants have received training in interpreting is the independent variable of the current study. Since the assessment criteria of interpreting is subjective and may vary from person to person, the interpreting exam CATTI (China Accreditation Test for Translators and Interpreters) is chosen as the measurement to ensure that every participant in the experimental group has adequate professional interpreting skills. CATTI is a grade examination, consisting of level I, II and III. CATTI III is the entry level and basic threshold of becoming a professional interpreter, and CATTI I represents mastery level (CATTI Center, 2019).

People who have passed the CATTI Ⅲ Consecutive Interpreting Test can be regarded as a group with relatively similar bilingual competence. In other words, their second language acquisition is essentially native-like. Based on the examination criteria displayed on the official website of China Accreditation Test for Translators and Interpreters, the equivalent competence requirement for CATTI Ⅲ Consecutive Interpreting Test certificate holders is: (a) able to accomplish general interpreting work; (b) expressing the basic original intention of both sides in a relatively standard pronunciation and intonation (CATTI Center, 2019). In addition, for CATTI Ⅱ Consecutive Interpreting Test certificate holders, they are demanded to possess a relatively systematic theoretical knowledge and could complete relatively difficult interpreting tasks independently with accurate and fluent versions (ibid). For individuals who obtain the CATTI Ⅰ Consecutive Interpreting Test certificate, they are experienced and can handle interpreting tasks with high proficiency (ibid). In the current research, participants who possess any level of CATTI certificate are regarded as having received training in the interpreting field.

## **Choice of Analysis**

The strategy of empirical study is based on quantitative analysis. Quantitative research is widely applied in many disciplines such as psychology, economics, demography, sociology and so forth. It is a method of research that focuses on quantifying data collecting and analysis (Bryman, 2012). The data for a quantitative study is in numerical form, such as statistics, percentages, and so on. It is hoped that these data can provide an objective support or denial of the hypothesis. Quantitative research is often contrasted with qualitative research. The approach of building a mathematical model based on statistical data is known as quantitative analysis, which can be used utilized to discover associations (Gilbert, 2009). Qualitative analysis, on the other hand, is a method for exploring the essential property of a research question through empirical materials such as case study, life story, interview and personal experience, which is an iterative process to understand the scientific

community (Aspers & Corte, 2019; Denzin & Lincoln, 2011). These two broad types of analysis method are complementary with each other, thus neither is superior nor subordinate. The researcher should choose the most appropriate method to collect and analyze the required data or combine the two methods together if necessary.

In this thesis I collected quantitative numerical data from mainly two aspects: questionnaires and physical experiments. Questionnaires were used for collecting participants' personality traits, Attentional Control, and Psychological Endurance abilities, whilst physical experiments were used for collecting data relating to Working Memory, Multi-tasking, and Speed of Information Processing. The responses from 80 participants (40 in the experimental group; 40 in the control group) were all gathered as numerical values, reflecting their own personality traits and performance in cognitive abilities.

## **Ethics**

Ethical issues are indispensable and must be taken into consideration in every research related to human morality. During the process of empirical studies, participants often carry out different tasks and complete diverse questionnaires, some of which may refer to their private information and thoughts. Therefore, it is researchers' responsibility to act responsibly, and to protect their participants' and the information that they provide in any such study, so that so that participants can authentically take part in the empirical study in the knowledge that they and their data will be treated appropriately. Inappropriate behavior by researchers may not only influence the performance of participants, but also the reputation of the institution they work for and the field of research in general.

The empirical study conducted in this research followed the guidelines provided by the University of Wales Trinity Saint David (UWTSD) Research Ethics & Integrity Code of Practice, the UWTSD Research Data Management Policy, the British Psychological Society (BPS) Code of Ethics and Conduct (2017) and the BPS Code of Human Research Ethics (2014). In addition, since the research activity took place

outside of the United Kingdom in China, it also had to comply with Chinese ethical considerations and relevant permissions. Abiding by the rules and principles mentioned above, I have made clear written statements to all participants in an attempt to gain their valid consent before pragmatic research; shown respect for the dignity of individuals and groups; ensured respect for the self-governance, confidentiality, and dignity of individuals and communities; acted with integrity including being honest, factual, precise, and coherent in behavior, utterances, choices, methods, and outcomes; and considered all research from the perspective of the research participants, as well as any other people, organizations, or communities who may be influenced by the study. In addition, participants have been informed about the full nature of the study in debriefs at the end of the empirical study. Participants have also been made aware of their right to quit the study at any point, and their right to withdraw their data after full debriefing. In practice, no participants asked to withdraw their data.

Considering the time of data collection happened after the outbreak of COVID-19, it was also necessary for me to anticipate potential risks posed by the pandemic. COVID-19 posed issues as many of the quantitative elements of this study originally required the participant to carry out physical tasks. I had prepared a plan B just in case; all physical tasks could also be completed online under technical support. Participants were therefore able to accomplish all of the questionnaires and physical tasks by using their own phones and computers without coming into physical contact with the researcher or going to public places.

As for data storage, each participant was assigned a unique ID code and this code was added to each of their task responses to enable them to be matched up to the same participant; the participant name was not associated with the ID code and so there was no way to link data back to any individual after the study has been completed and the data stored with other participants' data. After getting an ID code, participants were invited to complete online questionnaire data that was stored in a cloud storage system (Qualtrics, the online questionnaire platform used within

UWTSD). Access to the data in the cloud system was limited to the researcher and supervisory team, who had password access to the study data. All raw data downloaded from the cloud storage system was encrypted and stored on the University Office 365 system in password-protected cloud storage. Password protection was applied to all USB sticks used to store or transfer data. To preserve secrecy, all data transfers were encrypted and password protected.

## **Epistemological Position of the Researcher**

As the researcher of this study, a relatively objective experiment was carried out to the greatest extent possible through using a positivist theoretical perspective (Crotty, 1998). Research questions and hypotheses were generated from the prior literature and model. However, it is a must to admitted that every coin has two sides. Strengths and weaknesses coexist in the chosen measurement and study design. Whilst I tried to choose the way that best captures the data that answers the research questions, inconsideration still hide in the study. For instance, I am attempting to quantify and standardize results, and avoid bias by limiting interaction with the participants, etc., but this can lead to potentially missing out on some forms of data by not interacting with them. In addition, I have used an objective approach (emphasizing the logical construction of theories on the basis of discrete empirical facts; Biggs & Buchler 2007; Friedman 2003; Owen 1998) such as sampling and handing out questionnaire throughout the whole research, hence the questions and tasks that participants are invited to respond are influenced by my choice as a researcher. This epistemological position will be addressed further in the conclusion chapter when considering the limitations of the paper.

Based upon the above, I am going to examine the research questions below:

1. Is there a significant difference in cognitive abilities between experimental (interpreter) and control (non-interpreter) group?
2. Is there a significant relationship between personality traits and cognitive abilities?



3. Is there a significant difference in personality traits between experimental and control group?

4. Is there a significant relationship between interpreting training, personality traits and cognitive abilities?

Furthermore, some hypotheses are put forward based on aforementioned literature review:

1. There is a significant difference between interpreting and control group in Working Memory.

2. There is a significant difference between interpreting and control group in Attentional Control.

3. There is a significant difference between interpreting and control group in Multi-tasking.

4. There is a significant difference between interpreting and control group in Speed of Information Processing.

5. There is a significant difference between interpreting and control group in Psychological Endurance.

6. Openness to Experience is positively correlated to cognitive abilities.

7. Conscientiousness is correlated to cognitive abilities.

8. Extraversion is positively correlated to cognitive abilities.

9. Agreeableness is positively correlated to cognitive abilities.

10. Neuroticism is negatively correlated to cognitive abilities.

11. There is a significant difference between experimental and control samples on Openness.

12. There is a significant difference between experimental and control samples on Conscientiousness.

13. There is a significant difference between experimental and control samples on Extraversion.

14. There is a significant difference between experimental and control samples on Agreeableness.

15. There is a significant difference between experimental and control samples on Neuroticism.

16. Personality traits plays a moderating effect on the relationship between interpreting training and cognitive abilities.

17. Interpreting training plays a mediating role on the relationship between personality traits and cognitive abilities.

18. There is an interaction effect between personality traits, interpreting training, and cognitive abilities.

## Chapter Four: Experimental Study

This chapter mainly focuses on the experimental study of this paper, aiming to record the whole process of this empirical study. I first illustrate participants information of this study, including their age and general backgrounds. In addition, the study design is stated, and assessment materials are introduced and explained. The procedure of the study, including the process before, during, and after data collection is then set out. This method section should then provide a replicable instruction of the study for researchers who are interested in related study fields.

### Participants

The research sample comprised of 80 participants, with 40 participants in the experimental group and 40 in the control group. Of 40 experimental participants, 35 were female and 5 male adults who had achieved the certificate of CATTI II Consecutive Interpreting Test or CATTI III Consecutive Interpreting Test. Their average age was 24.68 years, ranging from 20 to 29 years of age. The gender and age distribution of the control group was similar to the experimental group, with 35 female and 5 male participants, aged from 20 to 29 years and an average age of 24.33 years (see Table 4.1). The professional backgrounds of participants in the control group varied, including but not limited to economy, computer science and education degrees. Whilst all control group participants possessed a certain degree of bilingual competence, due to English being a compulsory course in China, none of them had received interpreting training or had taken an interpreting test.

**Table 4.1**

*Demographic Characteristics of Participants*

	Number	Mean Age	Male-female Ratio
Experimental Group	40	24.68	5: 35

Control Group	40	24.33	5: 35
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## Design

In general, the study can be divided into two parts, online questionnaires and physical experiment. To be specific, three online questionnaires incorporating the Big Five, Attentional Control Scale and Psychological Endurance Scale are set to test participants' personality, Attentional Control and Psychological Endurance respectively, and the physical experiments are designed to measure their Working Memory, Multi-tasking ability, and Speed of Information Processing by the Listening Span Test, Digits Symbol Substitution Test, and Linguistic Dual Task on a one-to-one basis. Thus, there are a number of variables involved in this study (See Table 4.2)

**Table 4.2**

*Variables of Present Study*

Continuous Variables	Possible Range	Valid N
Age	18-70	80
Openness to Experience	1-5	80
Conscientiousness	1-5	80
Extraversion	1-5	80
Agreeableness	1-5	80
Neuroticism	1-5	80
Working Memory	2-7	80
Attentional Control	1-4	80
Multi-tasking	0-40	80
Speed of Information Processing	0-100	80
Psychological Endurance	1-4	80
Binary Variables	Option	Valid N
Interpreting Background	Yes/No	80

For Research Question One, the independent variable was whether the participants have received training in interpreting, and the dependent variable was scores on the cognitive task (Working Memory; Attentional Control; Multi-tasking; Speed of Information Processing; Psychological Endurance). This was measured using an independent samples t-test as the independent variable conditions are between-subjects.

For Research Question Two, a bivariate correlation test was used to verify the correlation between Big-Five personality traits (Openness to Experience; Conscientiousness; Extraversion; Agreeableness; Neuroticism) and cognitive abilities (Working Memory; Attentional Control; Multi-tasking; Speed of Information Processing; Psychological Endurance).

For Research Question Three, the independent variable was whether the participants have received training in interpreting, and the dependent variable was scores on the personality traits. An independent sample t-test was used again to examine differences in personality traits (Openness to Experience; Conscientiousness; Extraversion; Agreeableness; Neuroticism) between experimental and control groups.

For Research Question Four, different computerized analyses were used to examine several hypotheses. Firstly, the cognitive ability of the two groups (experimental and control group) was set as predictor variables, personality trait as moderator variables, and scores on the cognitive ability as criterion variables. A hierarchical regression analysis was used to ascertain whether personality traits play a moderating role on the relationship between interpreting and cognitive ability. Then, to examine whether receiving interpreting training acted as a mediating variable on the relationship between personality traits and cognitive abilities, a linear regression analysis was applied to test. Finally, to examine whether there is an interacting effect between interpreting training and personality traits to cognitive

abilities, whether receiving interpreting training and participant's personality traits were both independent variables, and the scores on the cognitive task were dependent variables, a uni-variant analysis was used to analyse data for this research question.

## Materials

**The Big Five Inventory** is the measurement chosen to assess participants' personality traits in this thesis (Goldberg, 1992; John & Srivastava, 1999). It is a 44-item inventory adapted from an earlier version NEO-PI-R. It measures the individual on five dimensions: Openness to Experience (e.g., I see myself as someone who is original, comes up with new ideas); Conscientiousness (e.g., I see myself as someone who does a thorough job); Extraversion (e.g., I see myself as someone who is talkative); Agreeableness (e.g., I see myself as someone who is helpful and unselfish with others); and Neuroticism (e.g., I see myself as someone who is depressed, blue). The scoring system of the Big Five Inventory is easy-to-operate. Forty-four items are partitioned into five categories according to the five personality dimensions. Participants make a choice from five options (from 'disagree strongly' to 'agree strongly'), indicating the degree of their agreement to the statement. The specific scoring rule is detailed in the attached Appendix A, with theoretical scores ranging from one to five points per item. The number of items assessing each personality dimension is different, with ten items relating to Openness to Experience; nine to Conscientiousness; eight to Extraversion; nine to Agreeableness; and eight to Neuroticism. Therefore, participants' scores on each dimension are calculated by taking the average rather than calculating as a sum total. Taking Openness (ten items included) as an example, the valid range of it is from ten (10x1) to fifty (10x5). Score on Openness is the average of the total added by these ten questions, ranging from one to five. The other four personality dimensions are calculated in the same method. An individual who scores higher on Openness, Consciousness, Extraversion,

Agreeableness and Neuroticism tends to be more open to experience, conscious, extravert, agreeable but with lower emotional stability.

**The Listening Span Test** was used to test participants' Working Memory (Daneman & Carpenter, 1980; Liu et al, 2004). Six sets of unrelated sentences were required to be completed by all participants. The number of sentences in each set increased from two to seven and each set contains five groups of sentences. While listening to every sentence, participants were required to judge whether the sentence made sense or not. Thus, their Working Memory capacity was measured according to the accuracy of judging true-or-false and last-word recall. Although participants in the experimental group are proficient English language learners, their counterparts in the control group have different educational backgrounds and have achieved varying degrees of English proficiency, so Chinese materials were selected to guarantee that all participants could understand the material without a language barrier. The content of these Chinese sentences was all about common sense and rudimentary knowledge that every adult could comprehend without specific professional knowledge (e.g., 'it is common sense that the sun rises in the east and sets in the west'). The length of these sentence was from 11 to 30 Chinese characters, with an average of 20 Chinese characters. Out of these 100 sentences, 26 of them do not make sense but are grammatically correct (e.g., 'The Eiffel Tower is a landmark of New York'). These 26 incorrect sentences are evenly distributed among the whole 100 sentences. Since the task becomes progressively more difficult, not all 100 sentences were necessary heard by all participants. If the participant felt their memory was being overburdened on a sentence set, they could ignore the next set of sentences (which would be classed as incorrect) and move on to the next physical task. The evaluation standard of the Listening Span Test is as follows: only when each sentence in each set was correctly judged and memorized could this be counted as the whole set correct; if there was one fault in a set, then the whole set was classed as a fail. The Working Memory span was defined as the greatest number of sentences for which the participants could

correctly remember all of the final words for at least three out of five sets. If the participants were correct on two out of five sets, they received half credit. Participants with a Working Memory span of three were defined as recalling three out of five three-sentence sets well. A Working Memory span of 2.5 was assigned if they were correct on two of the five three-sentence sets, in accordance with Liu (2004). Therefore, an individual who scored higher on this measure is considered to have a better Working Memory than someone scoring low on the measure.

**The Attentional Control Scale** was completed by participants to measure their Attentional Control ability (Derryberry, 2002). This self-report questionnaire is made up of 20 items. The Attentional Control Scale measures participants' focusing attention and shifting and controlling attention using items such as 'My concentration is good even if there is music in the room around me' and 'It is easy for me to alternate between two different tasks'. It contains four options, allowing participants to choose the most appropriate response (from always to almost never). The scoring rule is also attached in Appendix B, with the highest possible score four (always) and lowest one (almost never) per item. Participants' score on Attentional Control was calculated by taking the average of whole items, which ranges from one to four. Higher scores predict lower Attentional Control ability.

**The Linguistic Dual Task** is the assessment to appraise participants' Multi-tasking ability in this research (Meyer & Kieras, 1997; Ward et al, 2019). During the task, the participants completed the following two tasks simultaneously: first, listening to math multiplications (such as five times eight) and speaking the answer as soon as possible; second, judging whether Chinese four-character idiom pairs were synonyms, and ticking a box next to the answer if correct or a cross if incorrect. There were 20 math multiplications and 20 idiom pairs in total. Each correct response on a sub-task was awarded one point, so the range of this task was from 0 - 40 with 40 equating to better Multi-tasking ability.

**The Digits Symbol Substitution Test** was a paper and pencil test that assessed participants' Speed of Information Processing (Kaufman & Lichtenberger, 2006;



Wechsler, 1939). On the answer sheet, participants were shown a demonstration table at the upper end, displaying the corresponding symbol from number 1 to number 9 (e.g., 1/-, 2/ $\perp$  ... 7/ $\Delta$ , 8/X, 9/=). They were required to complete a table (see Appendix F), filling in the 100 blanks with the symbols corresponding to the digits (0-9) within 120 seconds. The mark range of the Digits Symbol Substitution Test was from 0 to 100, and participants' scores were the total number of completed clear substitutions. The higher score stands for quicker Speed of Information Processing.

**The Psychological Endurance Scale** was the last questionnaire that participants completed to measure their Psychological Endurance; in other words, whether their emotion could remain stable even under high-pressure circumstance (Hamby et al, 2015). It is a concise scale and contains six items (e.g., 'I believe that what doesn't kill you makes you stronger'). Participants chose their answer from four options ('mostly true about me', 'somewhat true about me', 'a little true about me' and 'not true about me'). The final score range is one to four, which can be calculated as the average of all the components that range from six to twenty-four. Higher scores indicate lower level of Psychological Endurance.

## **Procedure**

### **Pre-data Collection**

Preparatory work is necessary before data collection from participants, including testing material preparation, carrying out a pilot study of the materials and adjusting experiment details according to feedback. Since all original questionnaires were written in English, it was essential to translate them into Chinese versions to avoid misunderstanding caused by linguistic elements. The author invited two people who have passed CATI II Translator Test to translate these three scales, and a bilingual tutor (native in English and with expertise in Chinese) to check for ambiguity and give feasible amending advice. None of the people who helped to translate the questionnaires subsequently took part in the formal experimental study. After

repeated deliberation, the finalized version was agreed upon and entered into Qualtrics, an online data collection programme, in bilingual form. Apart from translating questionnaires, other materials such as the sentences used for Working Memory, digit symbol substitution table for Speed of Information Processing and word pairs for Multi-tasking were also prepared thoroughly.

A pilot study was carried out to ensure that problems that the author might not have recognized could be identified by participants. Six participants were invited to complete the measures as a pilot study. During their test completion I calculated the time they took for each task and observed their behavior, checking whether they felt impatient or passive. After finishing the process, pilot participants were encouraged to express their own feelings and give opinions. Many questions were asked actively by the author to collect useful feedback; for example, whether the literal expression of questionnaires caused ambiguity; how participants felt about the speech rate of listening material; whether participants felt that they had enough time to recall and write down the final word of all sentences in the Listening Span Test; and whether they thought anything could be improved in the experiment.

According to the overall feedback, the author further improved the experimental scheme. The biggest adjustment concentrated on the Linguistic Dual Task. In the pilot study, the author first designed 20 pairs of Chinese words (10 pairs of synonyms and 10 pairs of unrelated words) and asked participants to orally repeat “blah, blah, blah” while judging whether two words are synonyms. Almost all pilot participants completed the task correctly, suggesting that the task failed to differentiate and reflect individual’s Multi-tasking ability. According to their feedback, the task was excessively easy and deficiencies mainly occur from two aspects: firstly, mechanically repeating “blah, blah, blah” does not consume mental energy, so they felt they were actually fulfilling a single-task instead of multiple tasks; secondly, the word pairs were so simple that they did not even need time to respond. In order to solve these problems, the author revised the two tasks separately. Rather than asking participants to repeat “blah, blah, blah”, the author required them to answer simple

math multiplications (e.g., five times eight) immediately as soon as they heard it. In addition, word pairs were substituted with Chinese four-character idiom pairs, which boast more complicated meaning and take a longer time to process literal information. After the modification was completed, participants were no longer able to get full marks so as to separate their capabilities. In addition to this, a demonstration section was added to the physical tasks. For instance, the author set a brief example to participants, showing them how to accomplish the Listening Span Task instead of merely explaining the instructions for the test. After completing a series of preparatory work, formal testing was ready to commence.

## Data Collection

Participant recruitment was the first step before completing formal questionnaires and the physical experiments. A snowball sampling approach was used to recruit interpreting and non-interpreting participants. People who attended the CATTI I were the origin of interpreting sample snowball, since it is required that all CATTI I examinees should be qualified with CATTI II beforehand; whilst the initial of non-interpreting sample snowball was graduate students with other educational backgrounds. In addition, to ensure ethical processes, gaining consent from participants was vitally important. The author set out what participation would involve, the time it would take, how data would be collected and stored, participant rights to withdraw, and their rights regarding their data. To do this the author handed out written information about the study to potential participants and elucidated several points. First, their decision to participate must be their own, instead of being influenced by pressure from other people. Second, potential participants must be given all the information about empirical scales or tests, including the time it might take in the test. Third, all personal and private data of potential participants would be protected and stored properly. Fourthly, potential participants had the right to withdraw their consent to participation at any time before the data has been made anonymous. Fifthly, potential participants had the right to know the progress of

research and what their data are contributing to. Finally, potential participants had to be capable of giving consent, which meant that they could understand the information given to them. To protect data confidentiality and participants' private information the author promised not record the name of participants or organizations, instead using a unique ID code for each participant to match up online questionnaires and physical experiment data. Consent forms with names on them were kept separate from study data collected at all times (shown as Appendix G). Participants who had the willingness to attend this study were requested to leave an email address (promised the private information will be protected properly) for receiving the consent form and experimental materials.

The physical experiments were accomplished before filling in the questionnaires. Due to COVID-19, the author designed all on-the-spot tests into online form in the order of Working Memory, Speed of Information Processing and Multi-tasking. A benefit of the online experiments was that this reduced potential COVID-19 exposure, besides saving commuting time and breaking geographical boundaries. Firstly, participants were required to sign a consent form on an electronic document by email. Then, they were asked to print the materials which had been sent to their emails for preparation. The whole online process was carried out on Zoom or Tencent meeting, a reliable and full-featured online conference platform extensively used in many fields.

The first part of the whole procedure was the Listening Span Test. After explaining the instructions and setting a demonstration for the participant, the test began in earnest. The sentences were input into an APP called Xunfeiyousheng, a text-to-speech software. This read the sentences in an artificial female voice with a moderate speech rate, approximately 150 to 180 Chinese characters per minute. Participants had enough time to recall and write the last word of every sentence during the interval time. At the end of this task participants were offered a short break before continuing testing, as the Listening Span Test was the most time-consuming and energy-consuming task among the total three physical

experiments. Then participants were asked to take out the pre-printed digits symbol substitution table which has been sent to them before the experimental test. It was emphasized in the instructions that they should not continue writing once they heard “time is up”. The last experimental task was the Multi-tasking. The author first showed participants how to fulfill the two tasks simultaneously in an express edition as a demonstration. Then in the formal test, participants were required to speak out the answer of math multiplications and judge whether the Chinese four-character idiom pairs were synonyms simultaneously. All of their responses were recorded by machine after permission was granted.

The whole physical experiment process took between twenty and twenty-five minutes. At the end of the test the researcher informed participants of their unique participant ID number, to be entered into the Qualtrics programme for them to complete the online questionnaire part of the study. Participants then received a link to the Qualtrics programme and completed these measures. Before starting to respond to specific questions participants were shown a page of instruction, telling them which questionnaire would be displayed and informing them that they should select the answer that most corresponded to how they felt, and that there are no right or wrong answers. The order of questionnaire presented on Qualtrics follows the sequence of the Big Five Inventory (Appendix A), Attentional Control Scale (Appendix B) and Psychological Endurance Scale (Appendix C). According to the Qualtrics feedback report, the duration taken to complete questionnaires was eight minutes on average.

## **Post-data Collection**

Data storage is crucial after collecting data of 80 participants. According to the ethical code mentioned in the Chapter Three, all raw data from the cloud storage system was encrypted and stored in a password-protected cloud storage system on the University Office 365 system, which was shared with the study supervisors. Password-protected USB sticks were used to store data for backup. All data

transmissions were password-protected and encrypted. All participants' data was kept securely in password protected folders to ensure confidentiality. The data will be stored until the project is completed, after which it will be stored in accordance with the University's Research Data Management Policy. In addition, all data stored in the University Repository is anonymous and not traceable back to any individual taking part in the research study. At this point, all raw data was collected and readied for subsequent data analysis. The result of data analysis and the discussion about the findings are set out in the next chapter.

# Chapter Five: Results

This chapter presents the results of this study. It starts with the presentation of demographic characteristics and the reliability of the three measurement scales, then results of four research questions are examined. For Research Question One (Is there a significant difference in cognitive abilities between experimental [interpreter] and control [non-interpreter] group?), an independent sample t-test analysis is used to examine differences in cognitive abilities between interpreting and non-interpreting groups, and five hypotheses are tested seriatim. With regard to Research Question Two (Is there a significant relationship between personality traits and cognitive abilities?), bivariate correlation tests are used to examine the correlation between Big-Five personality traits and cognitive abilities. The third research question (Research Question Three; Is there a significant difference in personality traits between experimental and control group?) is also examined by independent sample t-test to examine whether there are significant differences of personality traits between individuals with interpreting backgrounds and their control group counterparts. The method of studying the last research question (Research Question Four; Is there a significant relationship between interpreting training, personality traits and cognitive abilities?) is more complicated than the previous three questions. A hierarchical regression analysis is applied to test the moderating effect that personality traits may play in the relationship between interpreting and cognitive abilities. Furthermore, a linear regression analysis is used to examine the mediating effect of interpreting training on the relationship between Big-Five personality trait and cognitive abilities. To inspect the interactive relationship between personality traits and interpreting training on cognitive abilities, a uni-variant analysis is utilized. It is worth mentioning that the analyses for the different measures is carried out independently of each other to avoid the potential for increasing chance in related statistical tests. Thus, results and hypotheses testing are the principle parts of this chapter.

## Reliability and Validity of Measures

In this empirical study, three scales were used to examine participants' personality traits, Attentional Control and Psychological Endurance. The 44-item Big Five Inventory (John & Srivastava, 1999) contains five sub-scales (Openness to Experience; Conscientiousness; Extraversion; Agreeableness; and Neuroticism). Cronbach's alpha coefficients for each sub-scale was computed to test the reliability of these scales, a measure widely used to test reliability in social science research. The higher the coefficient, the more reliable the scale is, and if the coefficient does not exceed 0.6 the reliability is generally considered inadequate (Nunnally, 1967), with a 0.7 coefficient considered to be 'good'. In the present study, the Cronbach alpha of each dimension is presented in Table 5.1. All sub-scales of the Big Five Inventory showed good levels of internal consistency above .8 apart from Agreeableness which achieved an alpha of .61, which can still be considered acceptable. The data from these scales can therefore be considered reliable for use in the current study.

**Table 5.1**

*Reliability and Validity of the Big Five Inventory, Attentional Control Scale and Psychological Endurance Scale*

Dimension	Number of Items	Cronbach's alpha	KMO
Openness	10	0.81	0.80
Conscientiousness	9	0.83	0.81
Extraversion	8	0.82	0.81
Agreeableness	9	0.61	0.58
Neuroticism	8	0.82	0.77
Attentional Control Scale	20	0.79	0.71.
Psychological Endurance Scale	6	0.66	0.68



Furthermore, regarding its validity, Kaiser-Meyer-Olkin (KMO) and Bartlett's tests were applied to the sub-scales to examine whether the data were suitable for factor analysis. Similar to Cronbach's alpha, the higher the KMO coefficient, the more reliable the scale is, and the numerical boundary of the KMO value is also 0.6 (Kaiser & Rice, 1974). If the coefficient does not exceed 0.6, it indicates that the present statistic is not appropriate for factor analysis. As can be seen in Table 5.1, all sub-scales apart from Agreeableness met the KMO threshold. The relatively low reliability and validity levels of the Agreeableness dimension will be discussed in the later chapter.

The second scale applied in this study is the Attentional Control Scale, reflecting participants' Attentional Control abilities. It contains 20 items that are rated on a four-point Likert-scale system anchored by "always (1)", "often (2)", "sometimes (3)" and "almost never (4)". Computed analysis also shows that the collected data is reliable and valid, as the Cronbach's  $\alpha$  presents as 0.79, and KMO and Bartlett's test 0.71 (shown as Table 5.1).

Finally, the six-item Psychological Endurance Scale was used to assess students' Psychological Endurance, with responses ranging from 1 to 4, representing "mostly true about me", "somewhat true about me", "a little true about me" and "not true about me" respectively. The Cronbach's  $\alpha$  of the scale tests to be 0.66, and KMO and Bartlett's test 0.68 (also shown in Table 5.1). The parameter of reliability and validity is not as high as that in other two inventories, and is also lower than 0.81 and 0.86 tested by Hamby based on other samples. However, the data is considered adequate to subject to further analysis since there is no bias shown between the experimental and control group on these reliability measures. Many factors such as cultural background may lead to the phenomenon that relatively lower Cronbach's  $\alpha$  in one country but higher in another country.

## **Results of Research Question One**

The first research question aims to examine whether there is a significant

difference between interpreting and control group in cognitive ability. A series of independent sample t-test analyses were carried out to address this question, the results of which are presented on the basis of following five hypotheses: there is a significant difference between interpreting and control group in cognitive abilities: (1) Working Memory; (2) Attentional Control; (3) Multi-tasking; (4) Speed of Information Processing; and (5) Psychological Endurance.

**Hypothesis 1: There is a significant difference between interpreting and control group in Working Memory.**

Descriptive statistics of the Listening Span Test from the two groups are displayed in Table 5.2 below. The mark range of the Listening Span Test is from two to seven, with higher scores indicating better Working Memory. The descriptive and inferential statistics show that experimental group ( $M = 4.80$ ,  $SD = .76$ ) performed significantly better than control group ( $M = 3.79$ ,  $SD = .81$ ) on this test ( $t = 5.78$ ,  $df = 78$ ,  $p < .001$ ). Therefore, the first hypothesis, there is a significant difference between interpreting and control group in Working Memory, can be supported.

**Table 5.2**

*Descriptive and Inferential Statistics of the Listening Span Test*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	4.80	0.76	5.78	78	<.001
Control	40	3.79	0.81			

*Note:* Higher score indicating better Working Memory

The result gained from the present study is in line with the findings of previous research that interpreters or interpreting students outperform non-interpreters.

**Hypothesis 2: There is a significant difference between interpreting and control group in Attentional Control.**

Descriptive statistics of the Attentional Control Scale for the two groups are displayed in the Table 5.3 below. The score ranges from one to four, with one indicating higher Attentional Control ability and four being low ability. The descriptive and inferential statistics show that experimental group ( $M = 2.10$ ,  $SD = .56$ ) performed significantly better than control group ( $M = 2.42$ ,  $SD = .50$ ) on this test ( $t = -4.29$ ,  $df = 78$ ,  $p < .001$ ). Therefore, the second hypothesis, that there is a significant difference between interpreting and control group in Attentional Control, can also be supported.

**Table 5.3**

*Descriptive and inferential statistics of the Attentional Control Scale*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	2.10	0.56	-4.29	78	<.001
Control	40	2.42	0.50			

*Note:* Higher score indicating lower Attentional Control ability

Further analyzing the Attentional Control Scale from two sub-dimensions, the descriptive statistics is presented in the Table 5.4 below. The experimental group significantly outperformed the control group both in attentional focusing and shifting. Both groups showed better attentional focusing ability than attentional shifting ability. Among these four average values, the highest comes to the experimental attentional focusing, followed by control attentional focusing, experimental attentional shifting and control attentional shifting. The result indicates that people tended to perform better on concentration instead of attentional diversion. Based on the independent-samples t-tests (Shown as Table 5.4), experimental group ( $M = 1.90/2.27$ ,  $SD = .67/.78$ ) performed significantly better than control group ( $M = 2.23/2.66$ ,  $SD = .68/.68$ ) on both attentional focusing and shifting ( $t = -3.41/-3.78$ ,  $df = 78/78$ ,  $p < .001/<.001$ ). Thus, there is a significant difference between interpreting and control group in Attentional Control, both focusing and shifting aspects.

**Table 5.4***Descriptive and Inferential Statistics of the Attentional Control Scale Sub-dimensions*

Sub-dimension	Group	N	Mean	SD	t-value	df	P-value
Attentional	Experimental	40	1.90	0.67	-3.41	78	<.001
Focusing	Control	40	2.23	0.68			
Attentional	Experimental	40	2.27	0.78	-3.78	78	<.001
Shifting	Control	40	2.66	0.68			

**Hypothesis 3: There is a significant difference between interpreting and control group in Multi-tasking.**

The third hypothesis of this research is that a significant difference existed between interpreting and control group in Multi-tasking. As the descriptive and inferential data shows in Table 5.5 below, a distinct disparity is revealed between the two groups. Similar with above two results, experimental group ( $M = 31.20$ ,  $SD = 3.44$ ) also performed significantly better than control group ( $M = 23.80$ ,  $SD = 4.69$ ) on both attentional focusing and shifting ( $t = 8.05$ ,  $df = 78$ ,  $p < .001$ ). These findings suggest that the interpreting group were significantly more proficient in Multi-tasking than the control group.

**Table 5.5***Descriptive and Inferential Statistics of the Linguistic Dual Task*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	31.20	3.44	8.05	78	<.001
Control	40	23.80	4.69			

*Note:* Higher score indicating better Multi-tasking ability

**Hypothesis 4: There is a significant difference between interpreting and control group in Speed of Information Processing.**

The next hypothesis of Research Question One is examining whether a significant difference existed between interpreting and control group in Speed of Information Processing. The Digits Symbol Substitution Test can reflect the correctness of information processing within time limit. It was hypothesized that participants with an interpreting background would transcode symbols more accurately, since the job nature of interpreting requires to process information sound and rapid. However, there is no discernible difference between the experimental and control groups in the descriptive data (see Table 5.6), with the experimental group displaying a mean score of 93.13 ( $SD = 6.03$ ) and the control group a mean score of 92.63 ( $SD = 7.06$ ), and the independent-samples t-test showed this to be a nonsignificant difference ( $t = .34$ ,  $df = 78$ ,  $p = .73$ ).

**Table 5.6**

*Descriptive and Inferential Statistics of the Digits Symbol Substitution Test*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	93.13	6.03	.34	78	.73
Control	40	92.63	7.06			

*Note:* Higher score indicating better Speed of Information Processing ability

**Hypothesis 5: There is a significant difference between interpreting and control group in Psychological Endurance.**

The last hypothesis to be examined for Research Question one is that there is a significant difference between interpreting and control group in Psychological Endurance. The Psychological Endurance Scale is a six-item Likert scale to assess participants' Psychological Endurance. The score ranges from one to four, with one equaling higher Psychological Endurance and four representing lower endurance. As can be seen in Table 5.7, the experimental group displays significantly better endurance scores on this measure ( $M = 2.12$ ,  $SD = .76$ ) than the control group ( $M = 2.36$ ,  $SD = .67$ ), and the independent-samples t-test showed this to be a significant

difference ( $t = -2.37$ ,  $df = 78$ ,  $p = .02$ ).

**Table 5.7**

*Descriptive and Inferential Statistics of the Psychological Endurance Scale*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	2.12	0.76	-2.37	78	.02
Control	40	2.36	0.67			

*Note:* Higher score indicating worse in Psychological Endurance

In summary, the data relating to Research Question One show there is a significant difference between interpreting and control group for Working Memory, Attentional Control, Multi-tasking, and Psychological Endurance, but not in Speed of Information Processing. The current results agree with previous studies that shows: (1) explicit correlation between Working Memory and interpreting training (e.g., interpreters or interpreting students outperform non-interpreters; the last-year interpreting students performed better than the first-year students; and experienced interpreters was able to transfer a higher percentage of both idea units and essential idea units than the novice group; Antonova & Sagin, 2018; Lee, 2011; Signorelli et al, 2011); (2) the existence of bilingual advantage (the ability to switch attention between native and non-native languages) and interpreter advantage (more frequent language switching than bilingual) in attention processing (Abutalebi et al., 2012; Ardila, 2003; Dong & Xie, 2014; Morales et al., 2015); (3) interpreters possess superior skills in coordination of multiple tasks in lab-based dual-task situations (Strobach et al., 2015). The specific relevance between interpreting and Multi-tasking, and Psychological Endurance has not been examined in empirical study before. The present result provides a reference that participants with interpreting background display significantly better Psychological Endurance, but there is no difference in Speed of Information Processing.

## Results of Research Question Two

Research Question Two aims to examine whether a significant relationship exists between Big-Five personality traits and cognitive abilities. If so, the correlation will be elaborated in this section. To examine this, it is much more complicated than Research Question One, since the sub-factors in both Big Five and cognitive abilities are manifold. A bivariate correlation test is applied to explore this question, and the linear correlation between two sets of data can be reflected by Pearson correlation coefficient from it.

**Table 5.8**

*Correlations between the Big-Five Personality Traits and Cognitive Abilities*

		O	C	E	A	N	WM	AC	MT	SIP	PE
O	Pearson	1									
	Sig.(P)										
	N	80									
C	Pearson	<b>.35**</b>	1								
	Sig.(P)	.001									
	N	80	80								
E	Pearson	<b>.52**</b>	.15	1							
	Sig.(P)	<.001	.19								
	N	80	80	80							
A	Pearson	.03	.13	.19	1						
	Sig.(P)	.79	.25	.09							
	N	80	80	80	80						
N	Pearson	<b>-.42**</b>	<b>-.48**</b>	<b>-.33**</b>	<b>-.37**</b>	1					
	Sig.(P)	<.001	<.001	.003	<.001						
	N	80	80	80	80	80					
WM	Pearson	.19	<b>.29**</b>	.14	.03	.07	1				

	Sig.(P)	.09	.01	.22	.78	.52					
	N	80	80	80	80	80	80				
AC	Pearson	<b>-.48**</b>	<b>-.58**</b>	<b>-.23*</b>	-.05	<b>.44**</b>	<b>-.29**</b>	1			
	Sig.(P)	<.001	<.001	.04	.68	<.001	.01				
	N	80	80	80	80	80	80	80			
MT	Pearson	.14	.19	.09	-.08	-.03	<b>.52**</b>	<b>-.31**</b>	1		
	Sig.(P)	.23	.10	.41	.47	.78	<.001	.01			
	N	80	80	80	80	80	80	80	80		
SIP	Pearson	.05	.04	-.01	-.11	.05	.05	-.03	.14	1	
	Sig.(P)	.69	.70	.95	.32	.67	.67	.82	.21		
	N	80	80	80	80	80	80	80	80	80	
PE	Pearson	<b>-.28*</b>	<b>-.40**</b>	<b>-.40**</b>	-.13	<b>.38**</b>	-.18	<b>.31**</b>	-.02	.20	1
	Sig.(P)	.01	<.001	<.001	.24	<.001	.11	.01	.85	.07	
	N	80	80	80	80	80	80	80	80	80	80

Note: \*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Bold font represents significant correlation.

O stands for Openness to Experience; C for Conscientiousness; E for Extraversion; A for Agreeableness; N for Neuroticism; WM for Working Memory; AT for Attentional Control; MT for Multi-tasking; SIP for Speed of Information Processing; PE for Psychological Endurance. Higher score in Working Memory, Multi-tasking and Speed of Information Processing means better Working Memory, Multi-tasking and Speed of Information Processing capacity; while higher score in the Attentional Control and Psychological Endurance scale represents worse corresponding performance. The positive or negative of Pearson coefficient (r) reflects the positive or negative correlation between two variables. Considering the scoring rule of each variables is different, positive correlation is examined when: (1) r is positive number, and two variables both abide by same scoring rule that higher score means better capacity; (2) r is negative number, and two variables abide by opposite scoring rule (one higher score means better capacity, the other higher score means worse capacity). Negative correlation is



examined when: (1)  $r$  is negative number, and two variables both abide by same scoring rule that higher score means better capacity; (2)  $r$  is positive number, and two variables abide by opposite scoring rule (one higher score means better capacity, the other higher score means worse capacity).

Table 5.8 presented above show the correlation between the Big-Five personality traits and cognitive abilities. The Pearson correlation coefficient measures the linear correlation between two variables. If the coefficient is equal to 0 there is no linear correlation between them, not that there is no correlation. The stronger the association, the larger the absolute value of the correlation coefficient: the stronger the correlation, the closer the correlation coefficient approaches 1 or -1; the weaker the correlation, the closer the correlation coefficient approaches 0. The two variables show positive correlation when the coefficient is greater than 0 and less than 1, and negative correlation when the coefficient is in the interval from minus 1 to 0. The standard of effect size is as follows: if the absolute value of Pearson  $r$  correlation ( $r$ ) is 0.1, it is considered a small effect; if  $r$  is 0.3, a moderate effect;  $r$  is 0.5, a large effect (Cohen, 1992). In advance of observing correlation between the Big-Five personality and cognitive abilities, the internal relationship among the five Big-Five trait and five cognitive abilities are worth examining closer.

There was a significant positive correlation with a moderate effect between Openness to Experience and Conscientiousness, ( $r = .35$ ,  $N = 80$ ,  $p = .001$ ), and a significant large positive effect between Openness to Experience and Extroversion, ( $r = .52$ ,  $N = 80$ ,  $p < .001$ ), and a significant negative correlation between Openness to Experience and Neuroticism with a moderate effect, ( $r = -.42$ ,  $N = 80$ ,  $p < .001$ ). This suggests that participants in the sample with higher score on Openness were prone to be more conscious, extravert and emotionally stable. With regards to Conscientiousness, apart from moderately and positively relating to Openness, ( $r = .35$ ,  $N = 80$ ,  $p = .001$ ), it is negatively associated with Neuroticism with a moderate effect, ( $r = -.48$ ,  $N = 80$ ,  $p < .001$ ). It suggests that individual who scored higher on

Conscientiousness are more open to experience and can better adjust themselves in steady emotion. Similarly, Extraversion was significantly positively related to Openness with a strong effect, ( $r = .52$ ,  $N = 80$ ,  $p < .001$ ) and negatively related to Neuroticism with a moderate effect, ( $r = -.33$ ,  $N = 80$ ,  $p = .003$ ). Therefore, an extravert is also more likely to experience innovations and better at emotional control.

Agreeableness is the personality trait that related to the least number of other traits, only significantly negatively linked with Neuroticism with a moderate effect, ( $r = -.37$ ,  $N = 80$ ,  $p < .001$ ). It means that an individual who tends to adjust their manner to suit others is usually less emotional. Neuroticism is negatively correlated with all other four personality traits, the degree of correlation ranked as Consciousness, ( $r = -.48$ ,  $N = 80$ ,  $p < .001$ ), Openness, ( $r = -.42$ ,  $N = 80$ ,  $p < .001$ ), Agreeableness, ( $r = -.37$ ,  $N = 80$ ,  $p < .001$ ) and Extraversion, ( $r = -.33$ ,  $N = 80$ ,  $p = .003$ ) from high to low. It suggests that a person with high score in Neuroticism dimension is less conscious, open to experience, agreeable and extravert.

On the other hand, the correlation between five cognitive abilities is less than that of Big-Five personality trait. Starting from Working Memory, it is positively correlated with Attentional Control, ( $r = .29$ ,  $N = 80$ ,  $p = .01$ ) and Multi-tasking ability, ( $r = .52$ ,  $N = 80$ ,  $p < .001$ ), with a small and large effect respectively, which means the better Working Memory, the better at focusing and shifting attention and Multi-tasking. Attentional Control competence is positively related with Working Memory with a small effect, ( $r = .29$ ,  $N = 80$ ,  $p = .01$ ), Multi-tasking, ( $r = .31$ ,  $N = 80$ ,  $p = .01$ ) and Psychological Endurance, ( $r = .31$ ,  $N = 80$ ,  $p = .01$ ) with a moderate effect. An individual who can better control their attention can be inferred to possess better Working Memory and resist pressure better. As for Multi-tasking, it is positively associated with Working Memory, ( $r = .52$ ,  $N = 80$ ,  $p < .001$ ), and Attentional Control, ( $r = .31$ ,  $N = 80$ ,  $p = .01$ ), in which the correlation with Working Memory shows a large effect, and a moderate effect between Multi-tasking and Attentional Control. Speed of information processing has not shown any correlation with other four cognitive abilities. Psychological endurance is only moderately correlated with Attentional

Control positively, ( $r = .31$ ,  $N = 80$ ,  $p = .01$ ), which indicates that people with tougher mental state can manage their attention better. The correlations between personality traits and cognitive abilities will be explored based on following hypotheses.

**Hypothesis 6: Openness to Experience is positively correlated to cognitive abilities.**

Shown as the results in Table 5.8, Openness is not bound up with all five of research cognitive abilities, but only positively correlates with Attentional Control, ( $r = .48$ ,  $N = 80$ ,  $p < .001$ ) and Psychological Endurance, ( $r = .28$ ,  $N = 80$ ,  $p = .01$ ) which means that the positive correlation between Openness and Attentional Control is moderate, and with Psychological Endurance being weaker. It should be noted here that the  $r$  value (.28) falls within Cohen's suggestion for a weak strength of relationship (.10 to .30) but the significant probability of the finding (.01) means that this can still be considered a significant finding, but interpretation of it must be considered with care. It means that an individual with higher score in Openness is prone to control his attention and handle stress better. Nevertheless, the linear correlation between Openness and Working Memory, Multi-tasking and Speed of Information Processing do not exist in this study.

**Hypothesis 7: Conscientiousness is correlated to cognitive abilities.**

The statistics from Table 5.8 manifest that there is a slight positive correlation between Conscientiousness and Working Memory, ( $r = .29$ ,  $N = 80$ ,  $p = .01$ ), and a strong positive correlation between Conscientiousness and Attentional Control, ( $r = .58$ ,  $N = 80$ ,  $p < .001$ ) as well as a moderate positive correlation between Conscientiousness and Psychological Endurance, ( $r = .40$ ,  $N = 80$ ,  $p < .001$ ). That is to say, individuals enjoying high level of Conscientiousness are more likely to possess better Working Memory, Attentional Control and Psychological Endurance capacity. For other two cognitive abilities, Multi-tasking and Speed of Information Processing, it does not show its correlation with Conscientiousness in the present study.

**Hypothesis 8: Extraversion is positively correlated to cognitive abilities.**

Shown as Table 5.8, the data from this experiment indicate that Extraversion is only positively correlated with Attentional Control ( $r = .23$ ,  $N = 80$ ,  $p = .04$ ) and Psychological Endurance ( $r = .40$ ,  $N = 80$ ,  $p < .001$ ). The absolute value of Pearson coefficient between Extraversion and Attentional Control is 0.23, showing a weak and positive relationship, and so interpretation of this finding should also be treated with caution. The correlation degree between Extraversion and Psychological Endurance is also positive, but to a moderate degree. It means that the more Extraverted participants, the better Attentional Control and tougher Psychological Endurance they possess.

**Hypothesis 9: Agreeableness is positively correlated to cognitive abilities.**

The result of the study denies the assumption (see Table 5.8). It shows that there is no correlation between Agreeableness and any cognitive abilities of the research. In other words, no matter to what extent is the Agreeableness of the participant, it does not appear to relate to their cognitive abilities.

**Hypothesis 10: Neuroticism is negatively correlated to cognitive abilities.**

Based on Table 5.8, Neuroticism is negatively correlated to Attentional Control, ( $r = -.44$ ,  $N = 80$ ,  $p < .001$ ) and Psychological Endurance, ( $r = -.38$ ,  $N = 80$ ,  $p = .04$ ) both to a moderate effect. It could be stated that when people score high on Neuroticism, they perform worse in Attentional Control and Psychological Endurance tasks. With regards to the other three cognitive abilities (Working Memory; Multi-tasking; and Speed of Information Processing), there is no correlation between them.

To conclude, personality traits are correlated to a number of cognitive abilities, but not all traits are related to every cognitive ability. Table 5.9 below summarizes the correlation between each Big-Five personality trait and cognitive ability. It appears that there is no correlation between Big-Five personality traits and Multi-tasking, as well as Big-Five personality traits and Speed of Information

Processing, so as the correlation between Agreeableness and all these five cognitive abilities. For others, Openness is moderately positively correlated to Attentional Control, and slightly positively to Psychological Endurance. Conscientiousness is positively correlated with Working Memory and Psychological Endurance to a slight degree, and Attentional Control to a moderate degree. As for Extraversion, there is a slight positive correlation between it and Attentional Control, and a moderate positive correlation between it and Psychological Endurance. Last but not least, Neuroticism is negatively correlated to Attentional Control and Psychological Endurance, with the former to moderate level, and the latter slight level.

**Table 5.9**

*The Summarized Correlation between Big-Five Personality Traits and Cognitive Abilities*

	O	C	E	A	N
WM	Uncorrelated	Slight Positive	Uncorrelated	Uncorrelated	Uncorrelated
AC	Moderate Positive	Strong Positive	Slight Positive	Uncorrelated	Moderate Negative
MT	Uncorrelated	Uncorrelated	Uncorrelated	Uncorrelated	Uncorrelated
SIP	Uncorrelated	Uncorrelated	Uncorrelated	Uncorrelated	Uncorrelated
PE	Slight Positive	Moderate Positive	Moderate Positive	Uncorrelated	Moderate Negative

*Note:* O stands for Openness to Experience; C for Conscientiousness; E for Extraversion; A for Agreeableness; N for Neuroticism; WM for Working Memory; AC for Attentional Control; MT for Multi-tasking; SIP for Speed of Information Processing; PE for Psychological Endurance.

## Results of Research Question Three

The third question aims to explore whether there is a significant difference between experimental and control samples on Big-Five personality traits. A trait portrait hopefully can be drawn for the interpreting profession according to the Big

Five Inventory. Five dimensions will be described to make this portrait, namely Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. The total range for each dimension is one to five, and three points can be regarded as the neutral value, since three stands for neither agree or disagree in the questionnaire option. Combining with predecessors' research, five hypotheses are made to examine the personality tendency of interpreting participants. Descriptive data and independent test are assisted to verify these assumptions.

**Hypothesis 11: There is a significant difference between experimental and control samples on Openness.**

Beginning with Openness to Experience, to examine whether there is a significant difference between experimental and control samples on Openness, an independent-sample t-test was put into use. Based on the Table 5.10, a significant difference ( $t = 2.64$ ,  $df = 78$ ,  $p = .01$ ) showed between experimental ( $M = 3.68$ ,  $SD = 0.59$ ) and control group ( $M = 3.34$ ,  $SD = 0.53$ ) on Openness. Therefore, the hypothesis is valid that Openness level is significantly different between individuals with interpreting background and their counterparts. In other words, people who have been trained in interpreting are more likely to be unconventional and curious about the inner and outer world. For others, they are relatively conservative and pragmatic, and prefer to follow routine. The potential reason behind it will be explained in the discussion chapter.

**Table 5.10**

*Descriptive and Inferential Statistics of Openness*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	3.68	0.59	2.64	78	.01
Control	40	3.34	0.53			

*Note:* Higher score indicating higher Openness level

**Hypothesis 12: There is a significant difference between experimental and control samples on Conscientiousness.**

The next hypothesis is that there is a significant difference between experimental and control samples on Conscientiousness. Shown as Table 5.11, the level of Conscientiousness of interpreting subjects ( $M = 3.59$ ,  $SD = 0.61$ ) is higher than for their control counterparts ( $M = 3.17$ ,  $SD = 0.61$ ), thus a significant difference showed between these two groups ( $t = 3.10$ ,  $df = 78$ ,  $p = .003$ ). It shows interpreting group represents a more trustworthy and diligent image, since individuals who enjoy high level of Conscientiousness usually can hold on straight to the end with a clear goal setting. Hence, individuals with interpreting background boast a higher level of Conscientiousness, and Conscientiousness can be regarded as an important dimension for interpreters or interpreting trainees.

**Table 5.11**

*Descriptive and Inferential Statistics of Conscientiousness*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	3.59	0.61	3.10	78	.003
Control	40	3.17	0.61			

*Note:* Higher score indicating higher Conscientiousness level

**Hypothesis 13: There is a significant difference between experimental and control samples on Extraversion.**

To examine whether There is a significant difference between experimental and control samples on Extraversion, an independent sample t-test was applied. According to the descriptive and inferential statistics shown in the Table 5.12 below, the difference of Extraversion between experimental group ( $M = 3.24$ ,  $SD = 0.75$ ) and control group ( $M = 2.83$ ,  $SD = 0.66$ ) is significant ( $t = 2.66$ ,  $df = 78$ ,  $p = .01$ ), with participants with an interpreting background presenting more extraverted, and control group more introverted. Hence, individuals with an interpreting background

appear to be more sociable and energetic, and control samples are a bit more silent and cautious.

**Table 5.12**

*Descriptive and Inferential Statistics of Extraversion*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	3.24	0.75	2.66	78	.01
Control	40	2.83	0.66			

*Note:* Higher score indicating higher Extraversion level

**Hypothesis 14: There is a significant difference between experimental and control samples on Agreeableness.**

The next hypothesis of Research Question Three is that there is a significant difference between experimental and control samples on Agreeableness. In the current experiment (see Table 5.13), no significant difference ( $t = -.78$ ,  $df = 78$ ,  $p = .44$ ) was found between the experimental group ( $M = 3.77$ ,  $SD = 0.37$ ) and control group ( $M = 3.85$ ,  $SD = 0.51$ ). Hence, the assumption is invalid.

**Table 5.13**

*Descriptive and Inferential Statistics of Agreeableness*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	3.77	0.37	-.78	78	.44
Control	40	3.85	0.51			

*Note:* Higher score indicating higher Agreeableness level

**Hypothesis 15: There is a significant difference between experimental and control samples on Neuroticism.**

The last hypothesis of Research Question Three is related to the difference between the experimental and control samples on Neuroticism. Shown as Table 5.14, the



average scores assessed from the Big Five Inventory showed that experimental group ( $M = 2.84$ ,  $SD = 0.37$ ) score lower on Neuroticism than the control group ( $M = 3.08$ ,  $SD = 0.37$ ); however, this difference is not statistically significance ( $t = -1.57$ ,  $df = 78$ ,  $p = .12$ ). Therefore, it does not suggest that there is a significant difference between experimental and control samples on Neuroticism.

**Table 5.14**

*Descriptive and Inferential Statistics of Neuroticism*

Group	N	Mean	SD	t-value	df	P-value
Experimental	40	2.84	0.64	-1.57	78	.12
Control	40	3.08	0.71			

*Note:* Higher score indicating lower emotional stability

To sum up, significant differences have shown in the dimension of Openness, Conscientiousness and Extraversion. Samples with an interpreting background possess a higher level of Openness, Conscientiousness and Extraversion. However, data fails to verify that significant difference exists in the other two dimensions, Agreeableness and Neuroticism. These findings are in line with the previous study that high conscientiousness can be regarded as one of the best predictors of academic and career success (Andersen et al., 2020; Barrick & Mount, 1991; Costa & McCrae, 1992; Goff & Ackerman, 1992). Nevertheless, it argues against the finding that Neuroticism is another significant negative element in workplace and academic performance (Cattell & Kline, 1977). The other data can provide empirical evidence to show the relationship between interpreting training and Big-Five personality traits. The above data analysis reflects the relationship between interpreting training and cognitive abilities, personality traits and cognitive abilities as well as interpreting training and personality traits. The relationship between Big-Five personality traits, interpreting training and cognitive abilities will be further explored in the next section.

## Results of Research Question Four

The fourth question of this research aims to explore the relationship between interpreting training, Big-Five personality traits and cognitive abilities. Reviewing the previous literature, there is much research with respect to the relationship between any two of the three; however, research combining all three together is rarely seen. The inter-relationship between three elements is more complicated than the relation between two, including potential mediating, moderating and interaction effects. In many statistical studies, the relationship between dependent and independent variables may depend upon a third variable, mediator variable or moderator variable. A mediation model seeks to identify that independent variables act on dependent variables via mediator variables to some extent. It contributes to better understanding the relationship between independent and dependent variables especially when these variables are not directly connected. As for moderator variables, it affects the direction (positive or negative) and strength of the association between dependent and independent variables. The moderator variables can be qualitative (e.g., gender, race, type of school, etc.) or quantitative (e.g., age, number of stimuli, years of education, etc.). A rigid set of criteria to distinguish mediator from moderator variables is: mediator variables must be a casual result of the independent variables and a casual antecedent of the dependent variables; moderator variables must not be the causal result of the independent variables (Baron & Kenny, 1986). For example, in a study examining the relationship between exercise and weight loss in which exercise is independent variable and weight loss is dependent variable, among five hypothetical variables: caloric intake; well-being; gender; age; and prior weight, the first two are mediator variables and the last three are moderator variables. The reason is that caloric intake and well-being change is the result of changes in exercise and the cause of weight loss to a certain extent. On the other hand, the other three variables, gender, age and prior weight cannot generate weight loss, but may affect the strength of impact on weight loss caused by exercise. With

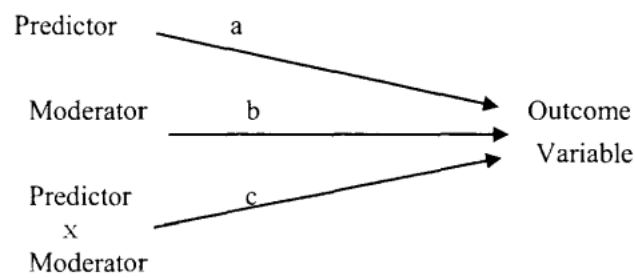
regard to interaction effect, it usually hides when the dependent variables are influenced by two or more interacted independent variables. It means the different level of one independent variable would affect the levels of another or several independent variables. Based on the above research, significant correlations have shown between interpreting and cognitive abilities, as well as personality trait and cognitive abilities. Therefore, two hypotheses are made based on it. The mediating effect is excluded as being an assumption because personality traits are relatively stable throughout lifetime and by no means can be influenced by interpreting training or cognitive abilities.

**Hypothesis 16: Personality traits plays a moderating effect on the relationship between interpreting training and cognitive abilities.**

Based on the findings of research question one, interpreting training could exert an impact on four cognitive abilities in the research, namely Working Memory, Attentional Control, Multi-tasking and Psychological Endurance. In this section, the goal is to find out whether Big-Five personality traits would strengthen or weaken the correlation between the interpreting and cognitive abilities. A hierarchical regression analysis is applied to test the moderator hypothesis. The common mechanism of moderate effect is diagrammed in the Figure 5.1 below (Baron & Kenny, 1986). There are three casual paths that feed into outcome variables: the impact of a predictor (path a), the impact of a moderator (path b), and the interaction between these two (path c). The hypothesis of a moderating effect is supported when the interaction (path c) is significant. In this section, the author assumes that personality traits play a moderating effect on the correlation between interpreting training and cognitive abilities. The diagram of hypothesized model thus displayed as Figure 5.2 below.

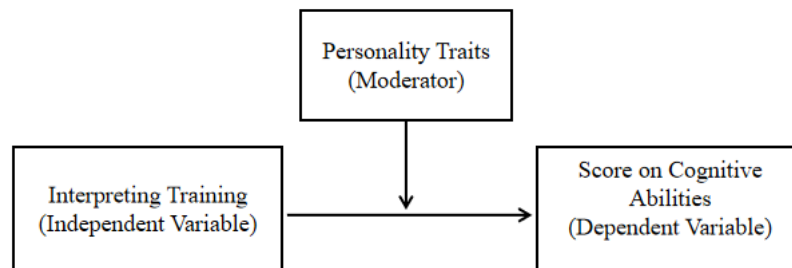
**Figure 5.1**

*Diagram of Moderating Effect (Baron & Kenny, 1986)*



**Figure 5.2**

*Hypothesized Diagram of Moderating Effect of Personality Traits on the Correlation between Interpreting Training and Cognitive Abilities.*



Putting Big-Five personality trait as moderator, Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism are tested in sequence. Starting with Openness as moderator, the independent variable as a dichotomous variable, (interpreting training or control), and dependent variables are Working Memory, Attentional Control, Multi-tasking and Psychological Endurance, which are also put into the regression model one after another. Table 5.15 summarizes the result of this hierarchical regression analysis:

**Table 5.15**

*Moderating Effect Test of Openness to Interpreting Training and Cognitive Abilities*

Dependent	Independent	R <sup>2</sup>	R <sup>2</sup>	F	t	Sig.
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	Variables	Variables		Change	Change		
Step 1	WM	Interpreting	.30	.30	16.61	-5.40	<.001
		Openness				.39	.70
Step 2	WM	Interpreting	.31	.003	.37	-5.35	<.001
		Openness				-.45	.66
		Interpreting*Openness				.61	<b>.55</b>
Step 1	AC	Interpreting	.33	.33	18.89	3.35	.001
		Openness				-3.98	<.001
Step 2	AC	Interpreting	.34	.01	1.25	3.39	.001
		Openness				-2.35	.02
		Interpreting*Openness				1.12	<b>.27</b>
Step 1	MT	Interpreting	.46	.46	32.49	-7.90	<.001
		Openness				-.72	.48
Step 2	MT	Interpreting	.46	.004	.58	-7.85	<.001
		Openness				-.95	.34
		Interpreting*Openness				.76	<b>.45</b>
Step 1	PE	Interpreting	.11	.11	4.90	1.74	.09
		Openness				-1.99	.50
Step 2	PE	Interpreting	.11	.001	.04	1.73	.09
		Openness				-.44	.66
		Interpreting*Openness				-.21	<b>.83</b>

*Note:* WM for Working Memory; AC for Attentional Control; MT for Multi-tasking; PE for Psychological Endurance.

Seen from Table 5.15, standardized regression coefficient of Openness and interpreting interaction (Interpreting\*Openness) in step two is 0.55, 0.27, 0.45 and 0.83 corresponding to Working Memory, Attentional Control, Multi-tasking and Psychological Endurance (highlighted in Table 5.15). All of the coefficients are greater than  $p=0.05$ , indicating that the Openness trait fails to moderate the relationship

between interpreting training and cognitive abilities. In the similar way, hierarchical regressions analysis has then been adopted to test the moderating effect of Conscientiousness on the relationship between interpreting training and cognitive abilities. Specific values are demonstrated in Table 5.16 below:

**Table 5.16**

*Moderating Effect Test of Conscientiousness to Interpreting Training and Cognitive Abilities*

	Dependent Variables	Independent Variables	R2	R2 Change	F Change	t	Sig.
Step 1	WM	Interpreting	.31	.31	17.53	-5.07	<.001
		Conscientiousness				1.20	.23
Step 2	WM	Interpreting	.31	.00	.01	-5.04	<.001
		Conscientiousness				.48	.63
		Interpreting*Conscientiousness				-.11	<b>.92</b>
Step 1	AC	Interpreting	.40	.40	26.13	2.95	.004
		Conscientiousness				-5.25	<.001
Step 2	AC	Interpreting	.41	.01	.70	2.94	.004
		Conscientiousness				-2.45	.02
		Interpreting*Conscientiousness				.84	<b>.41</b>
Step 1	MT	Interpreting	.46	.46	32.20	-7.71	<.001
		Conscientiousness				-.44	.66
	MT	Interpreting	.46	.002	.28	-7.67	<.001
		Conscientiousness				-.64	.52
		Interpreting*Conscientiousness				.53	<b>.60</b>
Step 1	PE	Interpreting	.18	.18	8.21	1.31	.19
		Conscientiousness				-3.18	.002
Step 2	PE	Interpreting	.18	.004	.35	1.31	.20
		Conscientiousness				-.45	.66
		Interpreting*Conscientiousness				-.59	<b>.56</b>

Note: WM for Working Memory; AC for Attentional Control; MT for Multi-tasking; PE for Psychological Endurance.

It can be seen that all standardized regression coefficients of Interpreting\*Conscientiousness are nonsignificant with  $p>0.05$  (highlighted in Table 5.16), indicating that Conscientiousness does not play a moderating role in the relationship between interpreting and cognitive abilities. The result is the same as that of Openness. Extraversion is the next personality trait that need to be examined to see whether it plays a moderating role.

**Table 5.17**

*Moderating Effect Test of Extraversion to Interpreting Training and Cognitive Abilities*

	Dependent Variables	Independent Variables	R <sup>2</sup>	R <sup>2</sup> Change	F Change	t	Sig.
Step 1	WM	Interpreting	.30	.30	16.53	-5.56	<.001
		Extraversion				-.21	.83
Step 2	WM	Interpreting	.32	.02	1.90	-5.63	<.001
		Extraversion				1.24	.22
		Interpreting*Extraversion				-1.38	<b>.17</b>
Step 1	AC	Interpreting	.20	.20	9.81	3.81	<.001
		Extraversion				-1.07	.29
Step 2	AC	Interpreting	.23	.03	3.09	3.91	<.001
		Extraversion				-2.01	.05
		Interpreting*Extraversion				1.76	<b>.08</b>
Step 1	MT	Interpreting	.47	.47	33.46	-8.10	<.001
		Extraversion				-1.25	.21
	MT	Interpreting	.47	.01	.66	-8.10	<.001
		Conscientiousness				.36	.72
		Interpreting*Extraversion				-.81	<b>.42</b>

Step 1	PE	Interpreting	.18	.18	8.66	1.47	.15
		Extraversion				-3.32	.001
Step 2	PE	Interpreting	.21	.03	2.37	1.51	.14
		Conscientiousness				-2.54	.01
		Interpreting*Extraversion				1.54	<b>.13</b>

*Note:* WM stands for Working Memory; AC for Attentional Control; MT for Multi-tasking; PE for Psychological Endurance.

The results of Extraversion moderating effect are shown as the Table 5.17 above. Bolded in the form, all significance value of regression coefficients are above  $p=0.05$  again, which indicates that Extraversion is not a moderator of the relationship between interpreting training and cognitive abilities. Agreeableness is then tested to check whether it is a moderator in interpreting-cognitive abilities' relationship.

**Table 5.18**

*Moderating Effect Test of Agreeableness to Interpreting Training and Cognitive Abilities*

	Dependent Variables	Independent Variables	R <sup>2</sup>	R <sup>2</sup> Change	F Change	t	Sig.
Step 1	WM	Interpreting	.31	.31	17.02	-5.82	<.001
		Agreeableness				.85	.40
Step 2	WM	Interpreting	.31	.001	.16	-1.77	.08
		Extraversion				.61	.54
		Interpreting*Agreeableness				-.40	<b>.69</b>
Step 1	AC	Interpreting	.20	.20	9.53	4.34	<.001
		Agreeableness				-.84	.41
Step 2	AC	Interpreting	.20	.001	.06	1.27	.21
		Agreeableness				-.47	.64
		Interpreting*Agreeableness				.25	<b>.80</b>
Step 1	MT	Interpreting	.46	.46	32.09	-7.95	<.001



		Agreeableness				-.28	.78
	MT	Interpreting	.46	.002	.29	-1.37	.18
		Agreeableness				-.59	.56
		Interpreting*Agreeableness				.54	<b>.59</b>
Step 1	PE	Interpreting	.09	.09	3.88	2.50	.01
		Agreeableness				-1.44	.16
Step 2	PE	Interpreting	.09	.00	.02	.48	.64
		Conscientiousness				-.28	.78
		Interpreting*Agreeableness				-.12	<b>.90</b>

*Note:* WM stands for Working Memory; AC for Attentional Control; MT for Multi-tasking; PE for Psychological Endurance.

Shown as the Table 5.18, the standardized regression coefficients of Interpreting\*Agreeableness are printed in bold font, 0.69, 0.80, 0.59 and 0.90 respectively. It also manifests that Agreeableness fails to play a moderating effect between interpreting training and each cognitive abilities in this research. Last but not least, Neuroticism is the last trait to verify its role in the hypothesis.

**Table 5.19**

*Moderating Effect Test of Neuroticism to Interpreting Training and Cognitive Abilities*

	Dependent	Independent	R2	R2	F	t	Sig.
	Variables	Variables		Change	Change		
Step 1	WM	Interpreting	.30	.30	16.54	-5.70	<.001
		Neuroticism				.24	.81
Step 2	WM	Interpreting	.31	.005	.51	-5.69	<.001
		Neuroticism				.75	.45
		Interpreting*Neuroticism				-.72	<b>.48</b>
Step 1	AC	Interpreting	.33	.33	18.83	3.92	<.001
		Neuroticism				3.97	<.001

Step 2	AC	Interpreting	.36	.03	3.70	3.96	<.001
		Neuroticism				3.06	.003
		Interpreting*Neuroticism				-1.92	<b>.06</b>
Step 1	MT	Interpreting	.46	.46	33.03	-8.12	<.001
		Neuroticism				1.05	.30
	MT	Interpreting	.47	.01	.86	-8.12	<.001
		Neuroticism				1.20	.23
		Interpreting*Neuroticism				-.93	<b>.36</b>
Step 1	PE	Interpreting	.18	.18	8.56	1.90	.06
		Neuroticism				3.29	.002
Step 2	PE	Interpreting	.19	.01	.67	1.89	.06
		Conscientiousness				1.78	.08
		Interpreting*Neuroticism				-.82	<b>.42</b>

*Note:* WM stands for Working Memory; AC for Attentional Control; MT for Multi-tasking; PE for Psychological Endurance.

According to the Table 5.19 above, Neuroticism, like other four personality traits, fails to moderate the relationship between interpreting training and cognitive abilities, since all interaction coefficients are above  $p=0.05$  (highlighted in the Table 5.19). To sum up, no Big-Five personality traits appear to moderate the relationship between interpreting training and cognitive abilities. In other words, different degrees of Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism would not strengthen or weaken the influence of interpreting training posed on cognitive abilities like Working Memory, Attentional Control, Multi-tasking and Psychological Endurance.

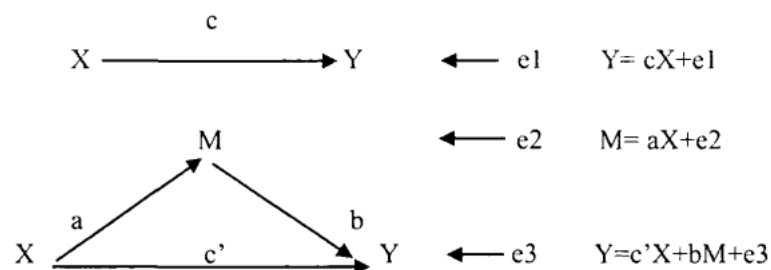
#### **Hypothesis 17: Interpreting training plays a mediating role on the relationship between personality traits and cognitive abilities.**

Mediators, like moderators, can be regarded as a third variable to the

relationship between independent variable and dependent variable. The difference is that the mediating variable explains why or how an effect or relationship between variables occurs, while moderating variables explain when the relationship of effect emerge or disappear. Mediating variable, as its name implies, means instead of affecting the independent variable itself, the dependent variable can also be influenced by independent variable through a mediator. The diagram of mediator model could be revealed as the Figure 5.3 below.

**Figure 5.3**

*Mediator Model*



*Note:* X stands for independent variable, Y for dependent available and M for mediator

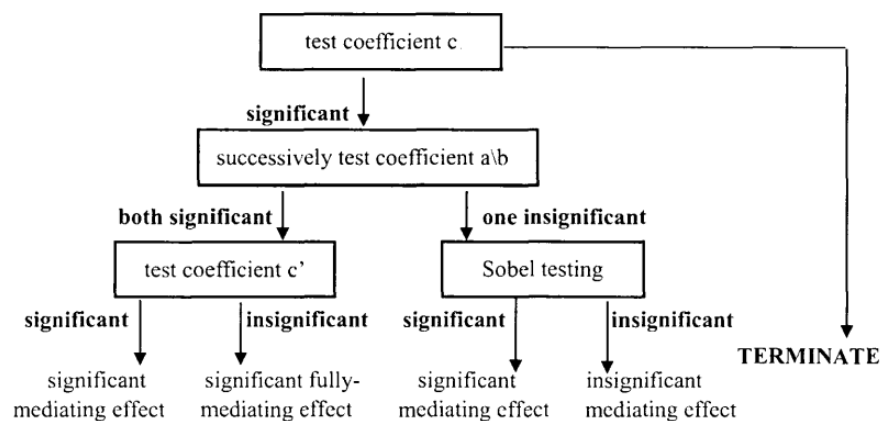
The coefficient c represents the overall effect of independent variable X to dependent variable Y; a and b is the mediating effect of mediator M, and c' is the direct effect of variable X on Y. To judge whether a variable is the mediator of X-Y relationship should satisfy all three following conditions simultaneously: firstly, the independent variable must have an effect on the dependent variable; secondly, the independent variable must influence the mediator; thirdly, the mediator must influence the dependent variable. If all these three conditions are satisfied, then it can be deduced that the mediating effect is valid. Based on the effect of independent variable to dependent variable before and after adding a mediator, whether the mediating effect is complete or partial can be judged. If the influence becomes not significant after the mediating variable is presented, the effect of the independent variable can be considered to be “completely” or “fully” mediated by the mediator.

On the other hand, if the influence is still significant after the mediating variable is added, the effect of the independent variable can be considered to be “partially” mediated. If any of these conditions are not met, then the mediation effect does not exist (Baron & Kenny, 1986).

Based on the theory proposed by Baron and Kenny (1986), Wen et al (2004) pointed out a three-step regression analysis. The flow diagram is shown in the Figure 5.4 below. Linear regression analysis should be firstly applied to the independent and dependent variable. If the independent variable fails to influence the dependent variable, the mediator testing can be terminated. After confirming the effect of independent variable to dependent variable is significant, the linear regression analysis can be further put into use to test the coefficient a, b and c' successively. The three-stepped regression analysis is the method to test whether interpreting training plays a mediating role between personality trait and cognitive abilities in this paper.

**Figure 5.4**

*Three-stepped Regression Analysis (Wen et al, 2004)*



To examine whether interpreting training could mediate the effect of personality traits on cognitive abilities, screening out the influencing relationship between personality trait and cognitive abilities is the first necessary step. The correlation between Big-Five personality trait and cognitive abilities has been analyzed previously in Research Question Two and it was found that not all five personality

traits are associated with all five cognitive abilities in the research. The relationship with significant correlations are listed as follows:

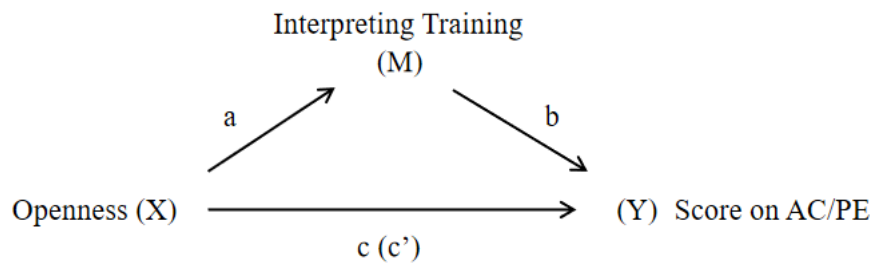
- Openness - Attentional Control
- Openness - Psychological Endurance
- Conscientiousness - Working Memory
- Conscientiousness - Attentional Control
- Conscientiousness - Psychological Endurance
- Extraversion - Attentional Control
- Extraversion - Psychological Endurance
- Neuroticism - Attentional Control
- Neuroticism - Psychological Endurance.

The second step is checking whether the four personality traits mentioned above is correlated with interpreting training. According to the findings in the research question three above, interpreting training is significantly correlated with three personality traits, namely Openness, Conscientiousness and Extraversion. Comprehensively speaking, the hypothesis mainly focuses on whether interpreting training acts as a mediator in the relationship between Openness and Attentional Control, Openness and Psychological Endurance; Conscientiousness and Working Memory, Conscientiousness and Attentional Control, Conscientiousness and Psychological Endurance, Extraversion and Attentional Control as well as Extraversion and Psychological Endurance.

Starting with Openness, a triangulated hypothesized model is shown in Figure 5.5 below. In the mediating model, the independent variable (X) is Openness; Attentional Control or Psychological Endurance is dependent variable (Y); and mediating variable (M) is interpreting training.

### **Figure 5.5**

*Hypothetical Relations between Openness, AC/PE and Interpreting Training*



Note: AC stands for Attentional Control; PE for Psychological Endurance

The three-stepped regression analysis was used to examine the mediating effect and calculate coefficients. Table 5.20 enumerates the coefficients of each step in the mediating effect test of interpreting training on Openness and Attentional Control. It reveals that the coefficient of a, b, c and c' are significant with significant value all below less than or equal to 0.001. The Beta column in each step represents the coefficient of c, a, c' and b accordingly. The mediating effect of interpreting training on Openness and Attentional Control is  $ab/c = 0.25 \times 0.24 / 0.31 = 19.35\%$  (the reason for calculating its absolute value is that the scoring mode of Openness and Attentional Control questionnaire is reversed. The higher score represents higher level of openness and lower level of Attentional Control). It means interpreting training partially mediates the effect of Openness on Attentional Control, accounting for 19.35%. of the total effect. The mediation diagram of it is displayed as the Figure 5.6.

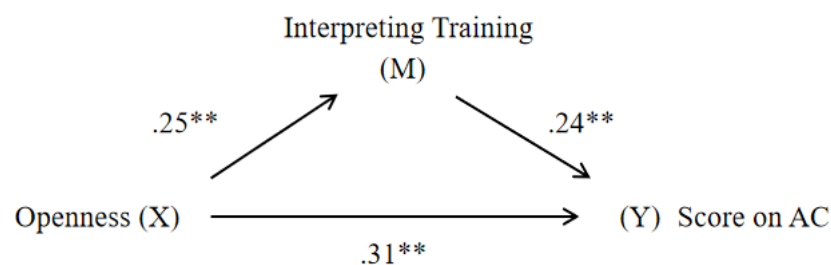
**Table 5.20**

*Mediating Effect Test of Interpreting Training on Openness and Attentional Control*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Openness	-.31	.06	-4.85	<.001	-.25	.09	-2.64	.01	-.25	.06	-3.98	<.001
Interpreting Training									.24	.07	3.35	.001

**Figure 5.6**

*Mediation Diagram of Interpreting Training on Openness and Attentional Control*



*Note:* AC stands for Attentional Control

In a similar way, a mediating effect of interpreting training on Openness and Psychological Endurance is inspected through three-stepped regression analysis. According to the data in the Table 5.21, the coefficient of a, c and c' is significant with the number of 0.01, 0.12 and less than  $p=0.05$  respectively. However, the coefficient of b is non-significant, as the significance value of it is  $p=.85$ , higher than the  $p=0.05$  threshold. Thus, based on the theory of three-stepped regression analysis put forward by Wen et al (2004), a Sobel test should be used to further test the relationship between interpreting training, Openness and Psychological Endurance. The purpose of Sobel testing is to test whether a mediator carries the influence of an independent variable to a dependent variable. It can be calculated directly on the website of [quantpsy.org](http://quantpsy.org) by inputting the numerical value of path coefficient a and b, and the standard error (SE) of a and b. Shown as the Table 5.22, Sobel testing shows that z is 0.26 and p is 0.79, which is greater than  $p=0.05$ . Therefore, there is no statistical significance of the mediating effect of interpreting training on Openness and Psychological Endurance.

**Table 5.21**

*Mediating Effect Test of Interpreting Training on Openness and Psychological Endurance*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Openness	-.22	.09	-2.56	.01	-.25	.09	-2.64	.01	-.18	.18	-1.99	.05
Interpreting									.18	.07	1.74	.09
Training												

**Table 5.22**

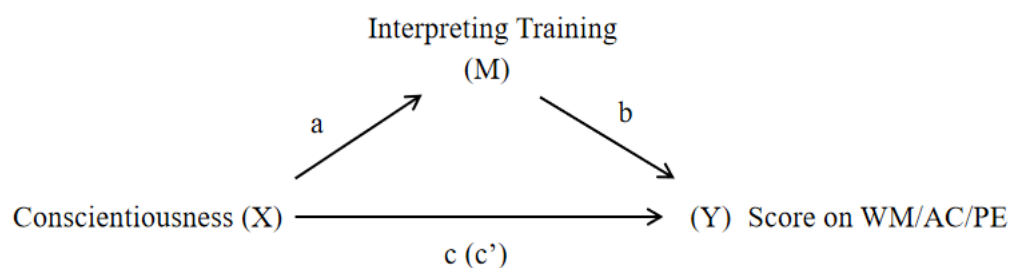
*Sobel Testing of Interpreting Training on Openness and Psychological Endurance*

Test Statistics	SE	p-value
0.26	0.17	0.79

The next independent variable turns to the second personality trait Conscientiousness. The hypothesis mediating model is represented in the Figure 5.7. The independent variable (X) is Conscientiousness; Working Memory, Attentional Control or Psychological Endurance is dependent variable (Y); and interpreting training is the mediating variable. Three-stepped regression analysis is utilized to examine the model.

**Figure 5.7**

*Hypothetical Relations between Conscientiousness, WM/AC/PE and Interpreting Training*



*Note:* WM stands for Working Memory; AC for Attentional Control; PE for Psychological Endurance

The mediating effect test of interpreting training on Conscientiousness and



Working Memory is reflected in the Table 5.23. Referring to the coefficient of a, b, c and c', the coefficient of a, b and c are all significant with the quantitative value less than  $p=0.05$ . Nevertheless, the influence of Conscientiousness on Working Memory becomes non-significant after interpreting training has been added as moderator, since the coefficient of c' is 0.23 (greater than  $p=0.05$ ). This indicates that the mediating effect of interpreting training on Conscientiousness and Working Memory is complete. Complete mediating effect means that the effect of the independent variable exerted on the dependent variable is completely realized through the mediator. Hence, the diagram of the mediating effect of interpreting training on Conscientiousness and Working Memory shapes in a line, instead of a triangle (Figure 5.8).

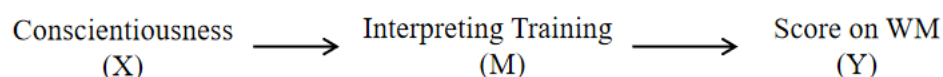
**Table 5.23**

*Mediating Effect Test of Interpreting Training on Conscientiousness and Working Memory*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Conscientiousness	.42	.16	2.66	.01	-.26	.08	-.33	.003	.17	.15	1.20	.23
Interpreting Training									-.94	.19	-5.07	<.001

**Figure 5.8**

*Mediation Diagram of Interpreting Training on Conscientiousness and Working Memory*



*Note:* WM stands for Working Memory

The mediating effect of interpreting on Conscientiousness and Attentional

Control is further analyzed in a similar stepwise regression. The result of it is shown in the Table 5.24 below, which indicates that the coefficient of a, b, c and c' are significant. Since the independent variable still exerts an impact on the dependent variable after the mediating variable taking part, the mediating effect can be considered as partial mediating effect. The mediating effect of interpreting training takes up  $ab/c=0.26*0.20/0.34=15.29\%$  of the total effect (the reason for calculating its absolute value is that the scoring mode of Conscientiousness and Attentional Control questionnaire is reverse. The higher score represents higher level of Conscientiousness and lower level of Attentional Control). The mediation diagram could thus be demonstrated in Figure 5.9.

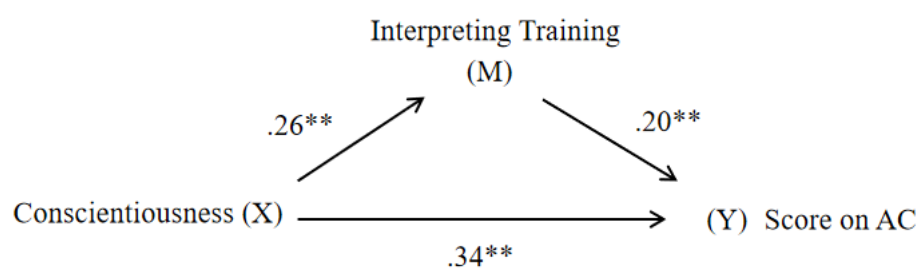
**Table 5.24**

*Mediating Effect Test of Interpreting Training on Conscientiousness and Attentional Control*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Conscientiousness	-.34	.05	-6.30	<.001	-.26	.08	-.33	.003	-.28	.05	-5.25	<.001
Interpreting Training									.20	.07	2.95	.004

**Figure 5.9**

*Mediation Diagram of Interpreting Training on Conscientiousness and Attentional Control*



Note: AC stands for Attentional Control

Another mediation effect to be tested in the Conscientiousness dimension is the relationship between Conscientiousness and Psychological Endurance. In line with the statistics computed by stepwise regression in Table 5.25, the coefficient of b is not significant ( $>0.05$ ), and the remaining coefficients are all significant. Similar to the situation with interpreting training, Openness and Psychological Endurance, a Sobel test is required to further test whether the mediation effect is valid in this relationship. The Sobel test shows that  $z$  is 1.21 with a  $p$ -value of 0.23 ( $>0.05$ ), suggesting that the mediating effect is not significant (see Table 5.26). Therefore, this suggests that interpreting training does not mediate the relationship between Conscientiousness and Psychological Endurance.

**Table 5.25**

*Mediating Effect Test of Interpreting Training on Conscientiousness and Psychological Endurance*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Conscientiousness	-.29	.08	-.40	<.001	-.26	.08	-.33	.003	-.26	.08	-3.18	.002
Interpreting Training									.13	.10	1.31	.19

**Table 5.26**

*Sobel Testing of Interpreting Training on Conscientiousness and Psychological Endurance*

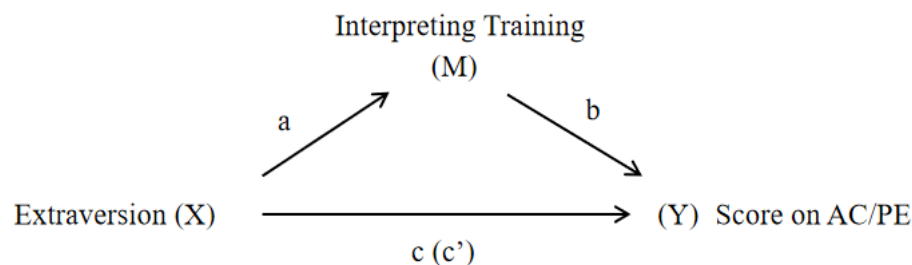
Test Statistics	SE	P-value
1.21	0.03	0.23

The last personality dimension needing to be analyzed in this section is

Extraversion. According to the findings in the research question two and three, the hypothesis model is built up as the diagram in Figure 5.10. Extraversion acts as the independent variable (X); Attentional Control and Psychological Endurance are the dependent variables (Y); and interpreting training is the mediating variable (M). The mediating effect of interpreting training on Extraversion and Attentional Control will be tested first, followed by Psychological Endurance.

**Figure 5.10**

*Hypothetical Relations between Extraversion, AC/PE and Interpreting Training*

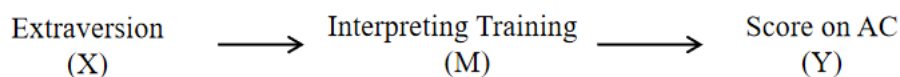


*Note:* AC stands for Attentional Control; PE for Psychological Endurance

Three-stepped regression analysis reveals that the coefficient of a, b and c is significant with significance values equal to 0.01, 0.04 and less than 0.001 respectively (See Table 5.27). Focusing on the coefficient of path c', it becomes non-significant with a p-value of 0.29 (>0.05). This phenomenon signifies that the mediating effect can be categorized into a complete mediating effect, as the direct influence of Extraversion to Attentional Control disappears with the presence of interpreting training. Therefore, as with the complete mediating effect of interpreting training on Conscientiousness and Working Memory, the diagram of the mediation effect of interpreting is shown in Figure 5.11 below. Extraversion appears to not have an effect on Attentional Control directly, but through the mediator of interpreting training for these participants.

**Table 5.27***Mediating Effect Test of Interpreting Training on Extraversion and Attentional Control*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Extraversion	-.12	.06	-2.09	.04	-.20	.08	-2.66	.01	-.06	.05	-1.07	.29
Interpreting Training									.30	.08	3.81	<.001

**Figure 5.11***Mediation Diagram of Interpreting Training on Extraversion and Attentional Control*

Note: AC stands for Attentional Control

The last regression analysis to be examined for a mediating effect of interpreting training is between Extraversion and Psychological Endurance. The computerized data is presented in Table 5.28 below. The coefficients of a, c and c' are all significant with the p-values less than 0.01. Nevertheless, due to the non-significance of the coefficient path b ( $0.15 > 0.05$ ), a Sobel test is again needed for further examination. Shown as Table 5.29, by inputting the Beta and SE of path a and b into the Sobel calculator, the number of z is 1.28, and p-value is 0.20 ( $> 0.05$ ). Thus, the mediating effect of Interpreting Training on Extraversion and Psychological Endurance is not significant. In other words, interpreting training does not appear to mediate the relationship between Extraversion and Psychological Endurance.

**Table 5.28**

*Mediating Effect Test of Interpreting Training on Extraversion and Psychological Endurance*

	Step One (path c)				Step two (path a)				Step Three (path c' and b)			
	Beta	SE	t	Sig.	Beta	SE	t	Sig.	Beta	SE	t	Sig.
Extraversion	-.26	.07	-3.87	<.001	-.20	.08	-2.66	.01	-.23	.07	-3.32	.001
Interpreting Training									.15	.10	1.46	.15

**Table 5.29**

*Sobel Testing of Interpreting Training on Extraversion and Psychological Endurance*

Test Statistics	SE	P-value
1.28	0.02	0.20

To summarise, interpreting training does appear to play a mediating role in the relationship between certain personality traits and cognitive abilities. More precisely, interpreting training plays a partial mediating role on the relationship between Openness and Attentional Control as well as between Conscientiousness and Attentional Control; and plays a complete mediating role on the relationship between Conscientiousness and Working Memory as well as between Extraversion and Attentional Control.

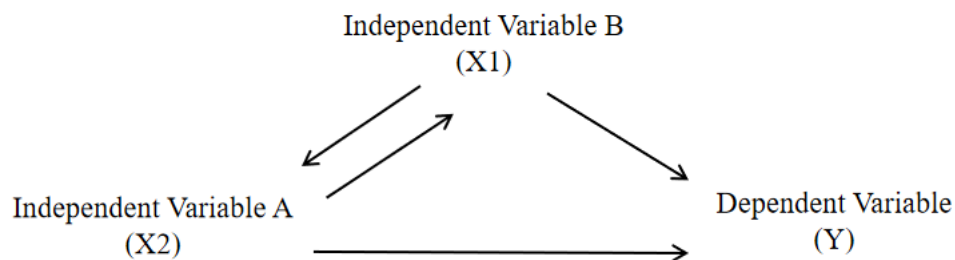
**Hypothesis 18: There is an interaction effect between personality traits, interpreting training, and cognitive abilities.**

An interaction effect is often tested when the number of independent variables is not single. The aim of interaction effect tests is to find out whether these two or more independent variables are interacted with one another, thus playing a combining effect on the dependent variable. If the influence of independent variable A on the dependent variable is different at different degrees of independent variable B (or vice versa), then A and B are said to interact (Mize, 2019). Independent variable A and B are not only solely influencing dependent variables, but also interacting with each other (See Figure 5.12). Exploring the interacting relationship between

independent variables may find a different test score from the results of each independent variable to dependent variable separately. Reviewing the results of the previous research questions, interpreting training and personality traits appear to be related to cognitive abilities. That is to say, both interpreting training and personality traits are independent variables of dependent variables. Therefore, it is required to test whether there is an interaction effect between personality traits and interpreting training to cognitive abilities. The assumed model is presented in Figure 5.13.

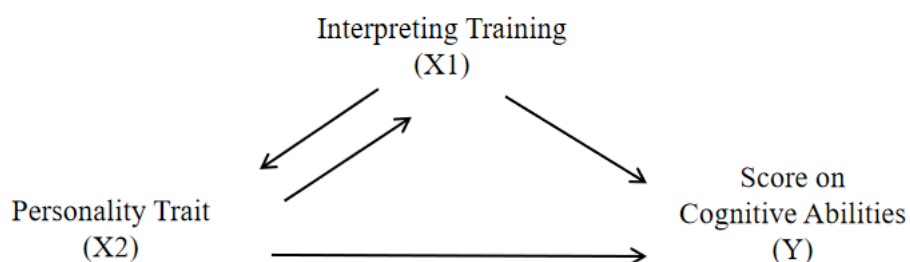
**Figure 5.12**

*Diagram of Interacting Effect*



**Figure 5.13**

*Hypothetical Diagram of Interacting Effect between Interpreting Training and Personality Trait on Cognitive Abilities*



The core step of checking whether the interacting effect is valid is to verify the significance of interaction item of independent variables, namely independent variable A\* independent variable B on dependent variable. If the significance value of the interaction item is less than  $p = .05$ , it can be inferred that the interacting effect between independent variables exists. If not, then each independent variable is impacting upon the dependent variable individually. The testing sequence of cognitive abilities is Working Memory, Attentional Control, Multi-tasking, Speed of Information Processing and Psychological Endurance.

Starting with Working Memory, uni-variant analysis is used to compute the interacting effect between Big-Five personality traits and cognitive abilities. Shown as the data in Table 5.30, the significance value of interaction items between interpreting training and the five personality traits are all greater than 0.05, meaning that there are no statistically significant interacting effects between personality traits and interpreting training relating to Working Memory.

**Table 5.30**

*Interacting Effect between Personality Trait and Interpreting Training on Working Memory*

	Mean Square	F	Sig.
Interpreting Training*Openness	.72	1.07	.41
Interpreting Training*Conscientiousness	.66	1.10	.32
Interpreting Training*Extraversion	.71	1.36	.23
Interpreting Training*Agreeableness	.75	1.25	.28
Interpreting Training*Neuroticism	.70	1.15	.35

For the next test, the interacting effect between personality traits and interpreting training on Attentional Control was examined. Similarly, uni-variant analysis was applied to find any interactions. Represented as Table 5.31, the



significance values of each interaction item are also greater than 0.05, which indicates that the interacting effect between personality traits and interpreting training relating to Attentional Control are non-significant. Therefore, personality trait and interpreting training exert an impact on Attentional Control separately. The different level of Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism could not interact with whether the subject has received interpreting training or not.

**Table 5.31**

*Interacting Effect between Personality Trait and Interpreting Training on Attentional Control*

	Mean Square	F	Sig.
Interpreting Training*Openness	.12	1.42	.19
Interpreting Training*Conscientiousness	.03	.56	.84
Interpreting Training*Extraversion	.05	.45	.91
Interpreting Training*Agreeableness	.11	.86	.58
Interpreting Training*Neuroticism	.12	1.16	.34

The third dependent variable of cognitive ability is Multi-tasking. As Table 5.32 shows, the significance values of Interpreting Training\*Openness, Interpreting Training\*Conscientiousness, Interpreting Training\*Extraversion, Interpreting Training\*Agreeableness and Interpreting Training\*Neuroticism are 0.34, 0.71, 0.09, 0.39 and 0.67 respectively. All these data are greater than 0.05, manifesting that like the previous two results, the interacting effect between personality traits and interpreting training on Multi-tasking also does not exist. None of the five personality traits appear to exert an interacting role on the relationship between interpreting training and Multi-tasking ability.

**Table 5.32**

*Interacting Effect between Personality Trait and Interpreting Training on Multi-tasking*

	Mean Square	F	Sig.
Interpreting Training*Openness	17.41	1.16	.34
Interpreting Training*Conscientiousness	13.82	.71	.71
Interpreting Training*Extraversion	27.97	1.79	.09
Interpreting Training*Agreeableness	17.81	1.08	.39
Interpreting Training*Neuroticism	12.39	.77	.67

Speed of Information Processing is the fourth dependent variable in the hypothesized model. Displayed in the Table 5.33 below, results show that the significance value of these five interaction items are all greater than  $p=0.05$  likewise. Therefore, the two independent variables, interpreting training and personality traits, are not interacted with each other in their relationship with Speed of Information Processing.

**Table 5.33**

*Interacting Effect between Personality Trait and Interpreting Training on Speed of Information Processing*

	Mean Square	F	Sig.
Interpreting Training*Openness	37.71	.75	.72
Interpreting Training*Conscientiousness	46.61	1.13	.36
Interpreting Training*Extraversion	19.15	.45	.91
Interpreting Training*Agreeableness	16.76	.32	.98
Interpreting Training*Neuroticism	43.11	.95	.51

The last dependent variable of the hypothesized model is Psychological Endurance. The result of interacting effects between personality traits and interpreting training and the relationship with Psychological Endurance is presented in Table 5.34. The significance values of interaction items of Interpreting

Training\*Openness, Interpreting Training\*Conscientiousness, Interpreting Training\*Extraversion, Interpreting Training\*Agreeableness and Interpreting Training\*Neuroticism is 0.24, 0.03, 0.57, 0.11 and 0.85 respectively. The significance value of Interpreting Training\*Conscientiousness is less than 0.05 ( $p=.03$ , printed in bold font in Table 5.34), suggests that interpreting training and conscientiousness interact with each other and create a combining effect on Psychological Endurance. Figure 5.14 diagrams the relationship between interpreting training, conscientiousness and Psychological Endurance.

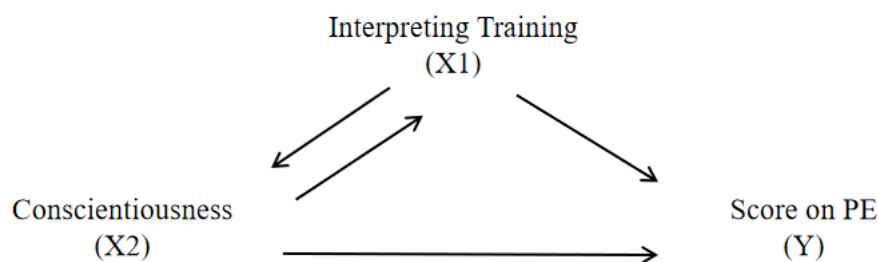
**Table 5.34**

*Interacting Effect between Personality Trait and Interpreting Training on Psychological Endurance*

	Mean Square	F	Sig.
Interpreting Training*Openness	.26	1.31	.24
Interpreting Training*Conscientiousness	.32	2.35	<b>.03</b>
Interpreting Training*Extraversion	.18	.87	.57
Interpreting Training*Agreeableness	.31	1.65	.11
Interpreting Training*Neuroticism	.12	.57	.85

**Figure 5.14**

*Interacting Effect of Interpreting Training and Conscientiousness on Psychological Endurance*



*Note:* PE stands for Psychological Endurance

In summary, the majority of interacting effects fail to be found between most Big-Five personality traits and interpreting training for most cognitive abilities. Among 25 hypothesized interacting model (five personality traits multiplied by five cognitive abilities), only one personality trait interacts with interpreting training on a specific cognitive ability. More concretely, there is an interacting effect between Conscientiousness and interpreting training on Psychological Endurance. In regard to the comprehensive relationship among the three major elements in this research, personality traits do not appear to play a moderating role in the correlation between interpreting training and cognitive abilities. However, interpreting training appears to play a mediating role in the relationships between some personality traits and cognitive abilities. For example, interpreting training plays a partial mediating role in the relationship between Openness and Attentional Control as well as between Conscientiousness and Attentional Control; and plays a complete mediating role in the relationship between Conscientiousness and Working Memory as well as between Extraversion and Attentional Control. In addition, the two independent variables, Conscientiousness and interpreting training, interact with each other and pose a conjoint effect on the dependent variable Psychology Endurance. After analyzing the data and producing these results for the four research questions in this chapter, a general discussion will be reported in the next chapter.

## Chapter Six: General Discussion

In this chapter, I will first summarize the key findings generated in Chapter Five regarding the research questions. Then a discussion will revolve around the possible explanation of these outcomes, combining it with discussion of how these findings relate to prior literature. Finally, enlightenment will be enumerated in light of findings and explanation, hoping to inspire individuals in the field of interpreting training, personality trait and cognitive ability.

### Summary of Key Findings

As an interdisciplinary research method of study, the research carried out for this thesis aimed to carry out an empirical experiment around three major aspects: interpreting training, personality traits, and cognitive ability, using quantitative analysis. In total, 80 individuals participated in this study, in which 40 participants who had received interpreting training and obtained an interpreting certificate of CATTI II or III were measured against 40 participants from diverse professional backgrounds with no interpreting training but with similar age and gender distribution to the experimental group. The experimental process included two main parts; online questionnaires and physical tasks. Through online questionnaires, data of Big-Five personality traits, Attentional Control and Psychological Endurance were collected through the Big-Five Inventory, Attentional Control Scale and Psychological Endurance Scale. Physical tasks were arranged to test participants' three cognitive abilities: Working Memory, Multi-tasking, and Speed of Information Processing. Below is a summary of the major findings presented in accordance with the research questions posed.

Firstly, the research question aimed to examine whether significant differences in cognitive abilities between the experimental and control groups could be found. I had hypothesized that individuals with an interpreting training background would outperform others in all five cognitive abilities (Working Memory, Attentional Control,

Multi-tasking, Speed of Information Processing and Psychological Endurance) in this research. This was largely supported in that the experimental (interpreting) group performed better than the control group in all these five cognitive abilities, with significant differences between groups on four of the tasks; only on the difference in Speed of Information Processing between the two groups was there no significant finding.

The second research question focused on the relationship between Big-Five personality traits and cognitive abilities. Through bivariate correlation tests, Pearson coefficients help to reveal the answers to this question. The findings show that personality traits are correlated to cognitive abilities, but not all traits are related to every cognitive ability. To be specific, Openness to Experience is moderately positively related to Attentional Control, and slightly positively related to Psychological Endurance. Conscientiousness is positively correlated to Working Memory to a slight extent, Attentional Control to a strong extent, and Psychological Endurance to a moderate degree. As for Extraversion, it is slightly positively correlated to Attentional Control, and positively correlated to Psychological Endurance to a medium level. Agreeableness was not found to correlate with any cognitive abilities in this research. The last personality trait, Neuroticism, is moderately negatively correlated to both Attentional Control and Psychological Endurance.

To answer the third research question of the difference in Big-Five personality traits between the two groups, Independent Samples t-tests were once again applied as in the operation of Research Question One. The results show that the mean score of the experimental group for Openness, Conscientiousness and Extraversion dimensions of the Big Five were significantly higher than that of control group; however, Agreeableness and Neuroticism did not show significant differences.

Last but not least, according to Research Question Four, a whole picture of these three elements combined can be considered. Although no moderating effect of personality traits was found on the relationship between interpreting training and cognitive abilities, mediating and interacting effect were discovered in the research.

More precisely, interpreting training plays a partial mediating role on the relationship between Openness and Attentional Control as well as between Conscientiousness and Attentional Control; and plays a complete mediating role on the relationship between Conscientiousness and Working Memory as well as between Extraversion and Attentional Control. Besides this, there is also an interacting effect between Conscientiousness and interpreting training on Psychological Endurance.

Summing up the above, the findings from four research questions are multitudinous. The next section concentrates on comparing the results between the current study and previous similar studies. Based on it, the next section further gives possible explanations of these findings, reanalyzing the whole research from covered perspectives.

## **Possible Explanations of Findings**

The greatest strength of quantitative analysis is objectivity, since statistics do not change with researchers' subjective willingness. The researchers' responsibility is to identify the relationships within the data and explain the findings accordingly. This section first compares the findings drawn from the current study with the results of other similar research to distinguish those findings that are inconsistent. Then I aim to explore possible explanations behind these discrepant findings in the sequence of research question, since the reasons leading to different conclusions can be various, including but not limited to different measurements or cultural backgrounds of participants.

First and foremost, with regards to the first research question, the results shows that individuals with interpreting background significantly outperform other participants in the cognitive ability of Working Memory, Attentional Control, Multi-tasking and Psychological Endurance. There is no conflict between the current results and preceding studies. To start with, previous studies basically reach a substantial agreement that there is an explicit correlation between Working Memory and interpreting training. Via different measuring tools of Working Memory such as

reading span tasks, listening span tasks, non-word repetition or cued recall, researchers found that interpreters or interpreting students outperform non-interpreters; the last-year interpreting students performed better than the first-year students; and experienced interpreters were able to transfer a larger percentage of both idea units (also known as meaning units or meaning segments) and essential idea units than the beginner group (Antonova, 2018; Lee, 2011; Signorelli et al., 2011). In other words, both previous and current studies manifested that interpreting experience is significantly positively associated with Working Memory. The result is comprehensible, since proficiency in a foreign language may improve verbal fluency and Working Memory skills, which results in the phenomenon that bilingual simultaneous interpreters' linguistic processing and Working Memory ability was greater than for those who were merely proficient in one language (Stavroula et al., 2012). Moving on to the significant correlation between Attentional Control and interpreting training. The current finding is also in line with previous studies that found the existence of a bilingual advantage and interpreter advantage (Abutalebi et al., 2012; Ardila, 2003; Dong & Xie, 2014; Morales et al., 2015). It has also been demonstrated by scholars that the number of years of simultaneous experience affects selective attention during interpretation. In other words, an interpreter's attention ability improves with an increase in the number of years of experience of simultaneous interpreting (Yagura et al, 2021). Reviewing the mechanism of interpreting process pointed out by Gile (1995), interpreting advantage in Attentional Control is not difficult to understand that interpreters should divide their attention to many subtasks such as listening to speaker, taking notes, comprehending information and so on; and switch over two languages on a regular basis. Hence, individuals who have received training in interpreting have exercised their Attentional Control ability unconsciously and can outperform their counterparts. With regard to Multi-tasking, the current result is also in accordance with former literature that interpreters possess superior skills in coordination of multiple tasks in lab-based dual-task situations (Strobach et al, 2015) and multi-tasking can be an effective skill improving interpreting performance



(Stachowiak, 2015). This result is also as in the way that was expected, since the essence of Multi-tasking somewhat overlaps with Attentional Control, actually a sub-field of attention control called attention division (Eysenck & Keane, 2020). Therefore, an interpreting advantage exists in both Attentional Control and Multi-tasking tasks. The last significantly different cognitive ability found between interpreting and control group is Psychological Endurance. Although previous studies focusing on these two elements are mostly theoretical instead of empirical, it is logical to comprehend the current result that interpreting is regarded as a highly stress-provoking task (Hong, 2003). The sources of pressure stem from multiple aspects. Interpreting not only requires a superb command of target and source language, but favorable memory retention, effective risk management skills and so forth (Chiang, 2006). Therefore, interpreters need to be on standby at any moment to deal with potential challenges throughout the whole interpreting process, and handle severe time pressure at all times (Riccardi et al., 1998). Hence, the experimental group scored higher on the Psychological Endurance Scale than their counterparts.

The questionable point of research question one is that Speed of Information Processing fails to show significant difference between the two groups. The previous studies only found that information speed processing can significantly predict language metaphor comprehension (Willinger et al., 2019), and consecutive interpreting represents a deeper form of information processing (Lambert, 1988). However, no former empirical study results have explored the relationship between interpreting training and Speed of Information Processing. Theoretically speaking, consecutive interpreting requires a high level of information processing, on both auditory and visual information. During the time they hear a speech delivered in source language, they should process the auditory information, including understanding, analyzing, memorizing and so on (Gile, 1995). When the speaker chooses to pause, consecutive interpreters should process the visual information based on their notes. Furthermore, unlike written translation without time limit, interpreting requires interpreters to react and respond to the source text as soon as

possible to avoid too much waiting time from audience side. Hence, from my perspective, it is not rational to draw the conclusion that interpreting training is not significantly positively related to Speed of Information Processing. Below is a possible explanation. It may be that the measurement tool of Speed of Information Processing is not appropriate in this research. Admittedly, the Digits Symbol Substitution Test is authoritative that is part of the Wechsler Adult Intelligence Scale, one of the most widely used measures of intelligence (Kaufman & Lichtenberger, 2006; Wechsler, 1939). It can also test the number of information unit subjects processed within limited time. However, I may ignore that it is a pencil-paper test, which means the test is designed to measure the speed of visual information processing. For consecutive interpreters, the visual information they should process in the task of note-reading only account for a limited proportion of the whole process. What they should mainly focus on is the auditory information from the speaker, since comprehending the source language completely is the basic foundation of an accurate version, and as a principle in interpreting said, a consecutive interpreter should allocate 70% effort to memorizing and 30% to notetaking (Li, 2011). Therefore, the Digits Symbol Substitution Test may not be the befitting measurement in this research. Other assessments aiming at auditory information processing such as the Paced Auditory Serial Addition Test (PASAT; Gronwall, 1977) might present a different result.

Secondly, moving on to the second research question, it examines the correlation between Big-Five personality traits and cognitive abilities. Among these 25 sets of relationships (5 personality traits multiply 5 cognitive abilities), only nine of them (Openness - Attentional Control; Openness - Psychological Endurance; Conscientiousness - Working Memory; Conscientiousness - Attentional Control; Conscientiousness - Psychological Endurance; Extraversion - Attentional Control; Extraversion - Psychological Endurance; Neuroticism - Attentional Control; Neuroticism - Psychological Endurance) produce significant correlations. The results of Research Question Two do not all accord with that of the literature review. Many correlations that have been reported in previous studies failed to reproduce in the

current data. Concretely speaking, in terms of the Openness dimension, previous studies have found that Openness is positively correlated to Attentional Control and Psychological Endurance (Paula et al., 2017; Penley & Tomaka 2002; Wang et al., 2019) and uncorrelated to Multi-tasking (Conte & Jacobs, 2003) and Speed of Information Processing (Bates & Shieles, 2003), which is consistent with the current finding. However, Working Memory shows uncorrelated to Openness in the present study, which is in conflict with former research that found significant correlation exists between Openness to Working Memory (despite some studies concluded positive correlations, whilst others find negative correlations; Waris et al., 2018). It is explainable that people who score higher on the openness to experience scale are innate to challenge themselves with novel experiences, hence appear to have greater cognitive abilities (Graham & Lachman, 2012), including Attentional Control and Psychological Endurance. Regarding the uncorrelated result between Openness and Working Memory in this study, it is unexpected, because Working Memory plays a vital role in many complicated cognitive abilities. There are two possible explanations resulting to this result. Firstly, the experiment only used one single task to assess Working Memory, instead of a factor score calculated from several Working Memory tasks. The usage of a single task may potentially restrict the generalizability of the results (Waris, 2018). Secondly, different experimental results may be generated from different domain of Working Memory tasks. The content of Working Memory task is various and focuses on different fields of Working Memory. For instance, a reading span task is a tool to assess people's reading Working Memory; a visuospatial task is commonly used to measure Visuospatial Working Memory. In this research, only listening span task is applied to test participants' Working Memory. The score obtained from this task can only represent subjects' listening Working Memory instead of their overall Working Memory.

Conscientiousness is the next dimension tested in Research Question Two to examine whether it is correlated to cognitive abilities. Most results between Conscientiousness and cognitive abilities found in the current study are in line with previous literature. Both the present and previous research found that

Conscientiousness is positively correlated with Attentional Control (Williams et al., 2017) and Psychological Endurance (Penley & Tomaka, 2002), and uncorrelated with Speed of Information Processing (Zebec et al., 2011). Different from the present results (Conscientiousness is positively correlated to Working Memory and uncorrelated to Multi-tasking), previous literature found Conscientiousness is negatively correlated to both Working Memory and Multi-tasking (Conte & Jacobs, 2003; Waris et al., 2018). Comparing the completely opposite results between current and former study on Conscientiousness and Working Memory, use of a different measurement tool is the potential reason leading to the phenomenon. In a previous study (Waris et al., 2018), n-back, a test made up of individual items, was the tool chosen to assess participants' Working Memory ability, whilst the Listening Span Test, a test consisting of sentences, is the measuring instrument here. As for the different result on Conscientiousness and Multi-tasking, reasons may also hide in different assessment applied. The method for testing Multi-tasking in former research is a six-item Likert scale (Conte & Jacobs, 2003). However, in the present study, participants were asked to engage in a physical Multi-tasking task (the Linguistic Dual Task) instead of completing a questionnaire. Although questionnaire and behavioral tasks are both extensively used measurements, they have some distinct advantages and disadvantages and thus it may lead to different conclusions. Questionnaire or self-report approach is a traditional choice in psychological research for its two prominent strengths: a) it is usually regarded as a valid tool, in that each question is designed clear to both participants and researchers; b) it is a cost-effective method, especially when a large group of individuals attend the study (Cyders & Coskunpinar, 2011). However, there remain several shortages in applying questionnaire assessments: a) it requires a certain level of insight for participants as they should report their own behaviors and feelings; b) some questions might motivate participants to not respond in an honest manner, which is difficult to detect (ibid). In terms of behavioral tasks, it overcomes the weakness of self-report approaches as it reflects individuals' actual behaviors instead of their thoughts (ibid). Nevertheless, behavioral tasks are also accompanied with some drawbacks: a) they

usually lack specificity, since multiple cognitive processes are assessed simultaneously, making it difficult to distinguish which cognitive elements are affecting performance (Dougherty et al., 2002); b) behavioral tasks measure only a “snapshot” of behavior, so the generalizability of this approach to real-life action is unclear (Cyders & Coskunpinar, 2011). Thus, it is understandable that the result in the current study (assessed Multi-tasking by the Linguistic Dual Task) is different from that of the previous one (assessed Multi-tasking by a six-item Likert scale).

In terms of Extraversion, it shows to be significantly positively correlated with Attentional Control and Psychological Endurance in the current study. However, according to previous studies, the positive correlation between Extraversion and cognitive abilities is not limited to Attentional Control and Psychological Endurance (Penley & Tomaka, 2002; Williams et al., 2017), but all other abilities (Working Memory; Multi-tasking; Speed of Information Processing) in this study (Conte & Jacobs, 2003; Hancevich et al., 2022; Waris et al., 2018; Zebec et al., 2011). The possible reason causing different result on Extraversion and Working Memory, and Multi-tasking is the same as the reason explained previously: a different measuring tool. As for the different result on the relationship between Extraversion and Speed of Information Processing, disparate instrument may also be partially responsible for it. A revised Stroop test consisting of words is the tool for scoring Speed of Information Processing in previous research (Zebec et al., 2011). However, the Digits Symbol Substitution Test in this research is composed of symbols and digits. Another possible explanation that lead to the difference is age group. Some scholars drew the conclusion that Speed of Information Processing is positively related to Extraversion based on adolescent test-taker (Zebec et al., 2011). However, the participants in this study were adults around 24 years old. Previous studies have found that there is a significant difference between adolescents and adults in reaction time and accuracy of cognitive tasks. Empirical evidence shows that adults respond quicker and more accurately than adolescents (Bustillo-Casero et al., 2017; Feenstra et al., 2011). Therefore, the age difference may cause the different findings.

The fourth personality dimension tested in Research Question Two is

Agreeableness. None of the cognitive abilities shows significant correlation with Agreeableness in the current study. Only part of the current result accordant to previous study that also found Agreeableness is uncorrelated with Attentional Control, Multi-tasking and Psychological Endurance (Conte & Jacobs, 2003; Penley & Tomaka, 2002; Williams et al., 2017). However, previous studies concluded that Agreeableness is positively correlated with Working Memory and Speed of Information Processing (Waris et al., 2018; Zebec et al., 2011). The possible reason leading to this phenomenon is the same as the explanation analyzed above, namely different measuring tool and participants' age group.

Neuroticism, the last personality dimension examined in Research Question Two, appears to be negatively correlated with Attentional Control and Psychological Endurance, and uncorrelated with Working Memory, Multi-tasking and Psychological Endurance in the present study. Likewise, not all findings are consistent with previous results. Negative correlation with Attentional Control and Psychological Endurance had been found in former studies (Conte & Jacobs, 2003; Penley & Tomaka, 2002; Williams et al., 2017), but the correlation with Working Memory is negative (Waris et al., 2018) and with Speed of Information Processing and Multi-tasking is undefined (Conte & Jacobs, 2003; Szameitat et al., 2016). It has been found that Neuroticism correlated negatively with speed of response (SoCan & Bucik, 1998); however, similar research by Wettstein et al. (2017) did not find a significant correlation between them in one's adolescence and mid-life but only showed significance in one's later years. As mentioned previously, different measurement is the most possible cause of different result. A computer-based Hick reaction time paradigm was the assessment chosen to measure information processing speed in previous studies (SoCan & Bucik, 1998), while the paper-and-pencil-based Digits Symbol Substitution Test is the tool in the present research. Previous studies have found that computer tasks are more complicated, sensitive and require higher attentional demands than paper-and-pencil tasks (Blini et al., 2016; Villarreal et al., 2022). Therefore, the result based on the paper-and-pencil-based Digits Symbol Substitution Test is different from that drawn from computer-based Hick reaction time paradigm.

Thirdly, Research Question Three found that there is a significant difference between interpreting samples and control group in three personality dimensions, Openness, Conscientiousness and Extraversion, and no difference in Agreeableness and Neuroticism, which is mostly not paradoxical with the results of preceding findings. Bontempo et al. (2014) found that interpreters score higher in Openness to Experience across global interpreters, including Australia, New Zealand, the United Kingdom, Canada and the United States of America. It is not difficult to understand why individuals with interpreting background may be a group of people with higher levels of Openness to Experience. According to the Interpretive Theory of Translation (Seleskovitch, 1975), the process of translation can be divided into three stages: comprehension, deverbalization and reformulation, so as interpreting. As interpreters, they should not only just follow the original speech word by word, but also be capable of making intellectual enquiries and reorganizing the information into the target language. Thus, people who are bold in challenging conventional concepts, enjoying the feeling of “disorder” and willing to connect with new things are liable to gain the upper hand in becoming interpreters. These features are also the exact characteristic of high Openness scorers (McRae & Tobert, 2004). In terms of Conscientiousness, previous studies also found that interpreters score higher in Conscientiousness (Bontempo et al., 2014). It is comprehensible that a person who obtains high score in Conscientiousness means they prefer to make preparation before putting their plan into practice. In addition, such people may be more responsible, logical, reliable and self-disciplined (Thompson, 2008). It explains why many researchers find that people with higher scores on Conscientiousness usually perform better in both work and study (Blickle, 1996; Costa & McCrae, 1992; Erfani & Mardan, 2017; Goff & Ackerman, 1992). Interpreters are no exception, because an eligible interpreter should complete sound preparatory work before interpreting and be responsible for his audiences and clients. Regarding Extraversion, most previous studies hold that “typical” interpreters are articulate extraverts (Carroll, 1978; Cattell 1971; Henderson 1980, 1987; Seleskovitch, 1978; Szuki, 1988), but former empirical studies have shown different results: (1) American interpreters are slightly more

extraverted (Bontempo et al., 2014); (2) the number of interpreters in extraversion and introversion categories is basically the same (Nicholson, 2005). The present result conforms to mainstream theoretical opinion and is in line with Bontempo et al.'s (2014) empirical study that interpreting group are more extravert than their counterparts. Considering the working circumstance of interpreters, they should transform the speech facing a large number of people in a conference, thus should not feel antipathy against socializing with people at least. Hence, it is understandable that samples with interpreting background tend to be extravert. It is also worth noting that the interpreting samples cannot be counted as extreme extravert, since only getting 3.24 points (3 points represents neutral status) on average in Extraversion dimension, so they are just mild extraverts. For the fourth personality trait, Agreeableness, there is no significant difference found between the two groups on this dimension. Based on previous studies, scholars sometimes label interpreters by traits such as cooperative and "happy-go-lucky" (Henderson 1980; Keiser 1978; Seleskovitch, 1978). However, in the context of empirical study, both current research and Bontempo et al. (2014) found participants with interpreting background do not score highly in Agreeableness. All the above results related to the first four personality traits is consistent with previous findings, but contradiction shows up as to the dimension of Neuroticism. On the basis of related literature review, "nerves of steel" is commonly referred in typical interpreter portrait, because interpreting is regarded as a highly stressful job and anti-pressure ability is requisite (Henderson 1980; Keiser 1978; Seleskovitch, 1978). However, the collected statistics in this research fail to present a significant difference in Neuroticism between interpreting samples and others. Confronting this result, there is a possible explanation I can think of. Although experimental samples have received interpreting training for a period of time, they are not professional interpreters after all. Their linguistic abilities can be improved under unremitting efforts, but the pressure they face in practice is of a world of difference from that on the spot. Undeniably, the threshold of becoming an occupational interpreter is higher than getting related interpreting certificates. Therefore, this limitation in the research should be considered to improve future



studies in this area.

Last but not least, the results concluded from Research Question Four construct a framework of the relationship between personality traits, interpreting training and cognitive abilities. In general, cognitive abilities can be affected by both interpreting training and personality traits. Besides, interpreting training plays a partial mediator role in the relationship between Openness and Attentional Control as well as Conscientiousness and Attentional Control, and a complete mediator role on the relationship between Conscientiousness and Working Memory as well as Extraversion and Attentional Control. It means that Openness and Conscientiousness positively affect Attentional Control not only in a direct way, but partly through interpreting training. Furthermore, the positive affect of Conscientiousness on Working Memory appears to be fully through interpreting training, as does the relationship between Extraversion and Attentional Control. This indicates that interpreting training is a potential effective method to help an individual with higher score in Openness, Conscientiousness and Extraversion enhance the ability of Working Memory and Attentional Control. Apart from the mediating effects, an interacting effect was also found between Conscientiousness and interpreting training and poses a combining effect to Psychological Endurance. It means Conscientiousness and interpreting training are not independent variables separately, but the effect of Conscientiousness on Psychological Endurance is different at different status of interpreting training (or vice versa). The conclusion drawn from Research Question Four cannot be compared with previous studies since scarcely any former research has focused on all of these three elements simultaneously. Based on the above findings and explanations, some enlightenment are gained and illustrated in the following section.

## **Implications**

In view of above-mentioned findings, some implications can be drawn from them. Firstly, inferred from Research Question One and Four, interpreting training

could potentially be applied as an effective method to improve cognitive abilities. Given that those with interpretive training performed significantly better on some of the cognitive domains tested according to Research Question One and interpretive training was found to be a mediator between certain personality types and cognitive abilities according to Research Question Four, this could suggest that it may be possible to use interpretive training as a potential method to enhance certain cognitive abilities. Shown as the result on Research Question One, participants with interpreting background show significantly better performance in cognitive tasks such as Working Memory, Attentional Control, Multi-tasking and Psychological Endurance than their counterparts. Though no significant difference is found in speed of information process, it does not indicate that interpreting training fails to benefit speed of information process, because the measurement of it might not be appropriate in this study, which has been explained in the previous section. Unlike the relatively stable property of personality traits, cognitive abilities can be changed or improved by targeted intervention (Shatil, 2013). Neville et al. (2013) found that some parent-child interactions could foster children's attention and self-regulation skills while reducing problem behaviors, which would in turn improve children's learning across a broad range of cognitive domains. Not limited to enhance children's cognitive abilities, cognitive training program could also improve cognitive ability in elderly patients with mild cognitive impairment. After receiving six weeks of cognitive function training interventions, including language and expression training, attention and calculation training, orientation training, reinforcement memory training, psychological support and daily living ability training, the cognitive abilities and daily living ability of elderly patients who suffer from mild cognitive impairment have been significantly improved. The performance of cognitive training programmes may help alleviate the brain tissue damage in elderly patients with mild cognitive impairment (Tian et al., 2021). Enhancing cognitive abilities is of great significance not only to children and adolescents, but also adults, since adults' cognitive functions (e.g., Working Memory; dual-tasking; Attentional Control; information processing speed; reasoning) decline with the increase of age (Park et al., 2002; Salthouse, 2004; Schaie,

1996; Verhaeghen & Cerella, 2002). In a wide variety of cognitive training, some are effective to one targeted cognitive domain such as Working Memory, Attentional Control and linguistic processing (Bherer et al., 2008; Horowitz-Kraus & Breznitz, 2009; Smith et al., 2009), whilst others impact upon multiple cognitive abilities concurrently (Shatil et al., 2010; Verghese et al., 2010). Interpreting training thus can be regarded as the latter category according to the present results that it could help people improve linguistic expression, Working Memory, Attentional Control, Multi-tasking and Psychological Endurance at the same time. In addition, interpreting training breaks through the tradition of cognitive intervention that can either be administered by technician's personal instruction or computer machine (Ball et al., 2002; Shatil, 2013; Smith et al., 2009). For those who are eager to promote cognitive abilities, they could practice interpreting all by their own without other people's company or a cumbersome machine, which is more easy-to-use and economical. Therefore, this thesis provides neuropsychologists another potential method to help people improve their cognitive abilities. Having various advantages over other cognitive training methods in versatility and operability, interpreting training could potentially be an innovative and effective method to improve cognitive abilities.

Secondly, Research Question Two implicates that Conscientiousness is the most relevant personality dimension to cognitive abilities, followed by Openness, Extraversion and Neuroticism, and Agreeableness is least related to cognitive abilities. Based on the numerous correlations between personality and cognitive abilities found in both present and previous studies, it appears that an individual's innate personality traits appear to be related to some cognitive abilities. However, the degree of correlation between different personality dimension and cognitive abilities is various. The current study shows that people with relatively high scores on Conscientiousness appear to have an advantage on three cognitive abilities, namely Working Memory, Attentional Control and Psychological Endurance; people who score relatively higher on Openness and Extraversion and relatively lower on Neuroticism are advantaged in two cognitive domains: Attentional Control and Psychological Endurance; no cognitive abilities show a correlation with

Agreeableness (same as above, Multi-tasking and Speed of Information Processing fails to correlate with any personality dimension in current study does not represent the correlation does not exist objectively, considering the measurement of it might not be comprehensive). Thus, the result indicates the varying correlation degree among these five personality dimensions with cognitive abilities. This implication is particularly serviceable for employing units. To screen the most suitable talent for each job position, nearly 8000 occupational-related tests exist nowadays (Furnham, 2008). These tests are oriented toward different type of job including manual and mental work, aiming to predict job seekers' probability of career success. Traditionally, specific ability tests are applied to select candidates who meet job requirements. However, Gaudet and Carli (1957) found that failure caused from lack of professional competence is seven times more than that from personality problems. Taylor and Nevis (1957) explained that isolated specific ability tests may not be sufficient to reach the goal, since many occupations such as executive jobs are highly complex, which requires comprehensive instead of specific capacity. Therefore, personality tests have gradually been given great importance in workplace (Furnham, 2008). Mainstream personality tests that widely applied in occupation are enumerated by Furnham (2008): The Myers-Briggs Type Indicator (MBTI), The Eysenck Personality Questionnaire (EPQ) and Cattell Sixteen Personality Factor Questionnaire (16PF Questionnaire), but the Big Five is not on the list. Considering the deficiency of these personality tests and unique advantage of the Big Five mentioned in Chapter three, I believe the Big Five can also become a universal tool to help employers discover potential high-fliers.

Thirdly, the finding from Research Question Three provides an important guidance to draw the personality portrait of interpreting talents. According to the current results, individuals with relatively higher scores in Openness, Conscientiousness and Extraversion are more likely to be competent for interpreting jobs. It is worth noting that the extent of Extraversion is minor, since extraverts generally show advantages in cognitive tasks like dividing attention and short-term memory, while introverts are better at sustained attention tasks and long-term

memory (Matthews et al., 2003), and interpreters should mobilize both long-term and short-term memory, dividing and sustained attention in an interpreting task. The personality portrait implicates that people who conform to above-mentioned characteristics should be given priority to be chosen as interpreters. However, it does not mean that people who regard interpreting as their dream job but without these personality characteristics should be stopped from becoming interpreters for two reasons. Firstly, there is a cornerstone standpoint in interpreting industry: interpreters are not born but made (Mackintosh, 1999), which indicates that every interpreter must undergo constant practice to improve their comprehensive ability. It is linguistic and non-linguistic factors that directly play a role in interpreting performance, instead of personality traits. In other words, fitting the characteristic of interpreter personality portrait is not the prerequisite of judging whether an individual can become an interpreter. Secondly, both linguistic and non-linguistic competence can be improved through specialized training. Under unremitting efforts, an individual without innate interpreting-advantage personality traits can also become a professional interpreter. From another perspective, for people who have not determine whether to choose interpreting career, completing a Big-Five Personality Inventory before making decision can be a method for reference. If a relative high score obtained in the dimension of Openness, Conscientiousness and Extraversion, it means that they are more likely to become an outstanding interpreting in the future. Although this measurement cannot be counted as the determining factor of career decision, it may play a helping role to the confused.

The last implication extracted from Research Question Four is that individuals with relatively higher scores on Openness, Conscientiousness and Extraversion can benefit more from improving cognitive abilities through deliberate practice such as interpreting training than others. As the results show, interpreting training plays a mediating role on the relationship between Openness and Attentional Control, Conscientiousness and Working Memory, Conscientiousness and Attentional Control, Extraversion and Attentional Control, and interacts with Conscientiousness to Psychological Endurance. It means in addition to the direct correlation with cognitive

abilities, personality influences cognitive abilities via the variable of whether having received interpreting training, and sometimes interpreting training and personality trait can pose an interacting effect to cognitive abilities. In other words, the reason why people with relatively higher score in Openness, Conscientiousness and Extraversion have an advantage of becoming an interpreter is that they can spend less time and effort on professional training. Furthermore, generalizing this implication, individuals with particular personality traits are more likely to achieve success in related careers, because they can perform the same as others with less efforts. It can explain why scholars enjoy in exploring the predictor of certain career success from personality perspective. However, the importance of hard work and practice cannot be ignored. Cognitive abilities are associated with a combination of nature and nurture. Training programs like interpreting training can also help individuals sharpen their cognitive skills. Therefore, as mentioned above, people who regard interpreting as their dream job but without the advantageous personality characteristics can still pursue their goal through sustained practice.

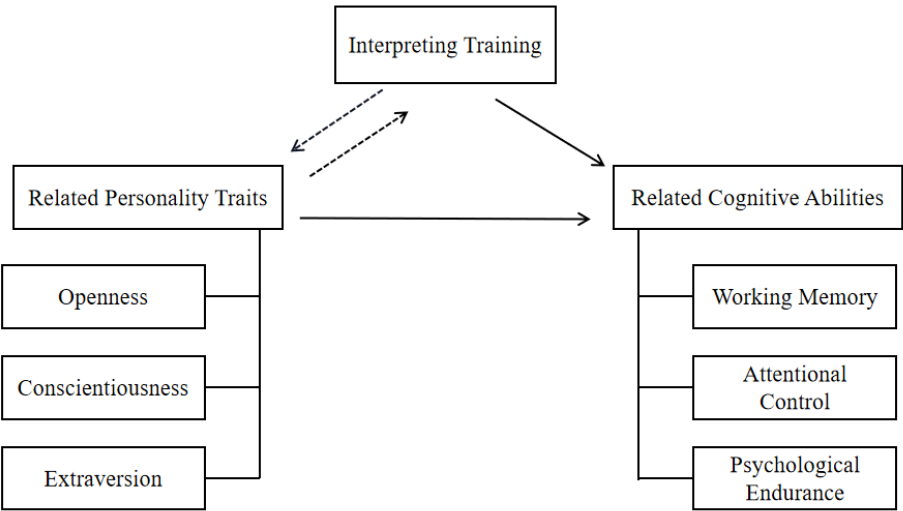
## **A Tentative Model for the Relationship between Three Elements and Interpreting Success**

Based on the present results, it is found that personality traits, cognitive abilities and interpreting training are interrelated with each other. Both inborn personality traits and interpreting training appear to be related to cognitive abilities. Previous studies have shown that cognitive abilities are widely acknowledged as the key to success, especially career success (Converse et al., 2015). Therefore, this section aims to put forward a tentative model to show the relationship between personality traits, cognitive abilities and interpreting training and career success.

Firstly, an inner model between personality traits, cognitive abilities and interpreting training should be built. Based on findings from four research question, it finds that the role of interpreting training is not merely an independent variable, but a mediating variable sometimes when the correlation between personality trait

and cognitive abilities, interpreting training and cognitive abilities are both significant. In this case, the effect that personality traits pose on cognitive control partially or completely through interpreting training. In addition to this, an interacting effect may happen between two independent variables (personality traits and interpreting training) and act together to cognitive abilities. As the mediating and interacting effect in the model do not exist in all cases, the mediating and interacting relationship is drawn as dotted line. A tentative framework between personality traits, cognitive abilities and interpreting training is presented as Figure 6.1 below.

**Figure 6.1**  
*A Tentative Framework between Personality Traits, Cognitive Abilities and Interpreting Training*



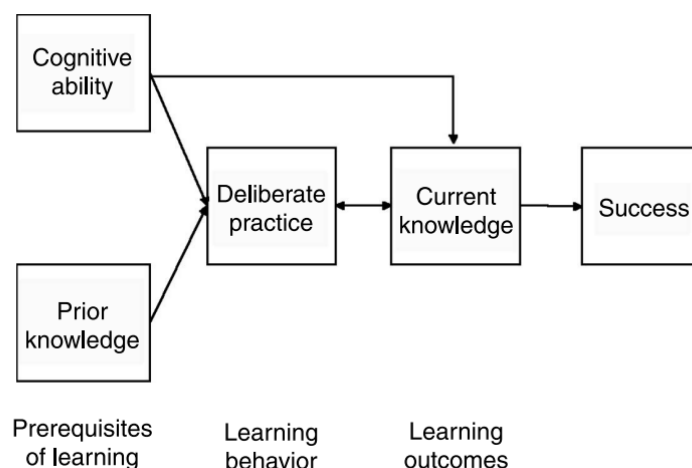
This model should work because the findings in this thesis show interpreting training plays a mediator role on the relationship between Openness and Attentional Control, Conscientiousness and Working Memory, Conscientiousness and Attentional Control, and Extraversion and Attentional Control. Apart from a mediating effect, an interacting effect is also found between Conscientiousness and interpreting training and poses a combining effect to Psychological Endurance. Although only five

personality dimensions and cognitive abilities are mentioned in the research, it does not mean that only those mentioned traits and cognitive abilities are related to interpreting training. Other cognitive abilities such as reasoning may also be related to personality traits or interpreting training, which can be further examined in future study. This inner tentative model between personality traits, cognitive abilities and interpreting training hopes to provide an initial draft for people to understand the role of interpreting and personality traits on cognitive abilities.

Secondly, it is feasible to link this inner tentative model to achieving success in the interpreting industry, since cognitive abilities are widely acknowledged as the key attribute to occupational attainment (Converse et al., 2015). Unger et al. (2009) have proposed a cognitive model of learning, which shows the relationship between cognitive ability, knowledge, deliberate practice and success (see Figure 6.2).

**Figure 6.2**

*The Cognitive Model of Learning (Unger et al., 2009)*



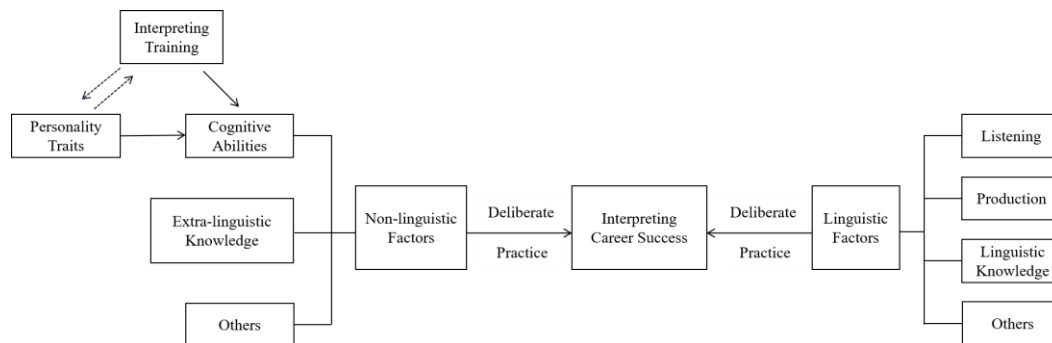
As shown in the above model, cognitive ability, knowledge and deliberate practice are three indispensable prerequisites of achieving success. Putting it in interpreting context and combining it with the thought from previous researchers such as Gile (1995), Macnamara (2012) and Wang (2004), a tentative model between personality traits, cognitive abilities, interpreting training and career success is built



as Figure 6.3.

**Figure 6.3**

*A Tentative Framework between Personality Traits, Cognitive Abilities, Interpreting Training and Career Success*



Shown as Figure 6.3 above, achieving success in interpreting career relies on two major factors: linguistic and non-linguistic competence (Wang, 2004). Linguistic factors are composed of listening, production, linguistic knowledge and other elements such as phonetic appearance (fluent delivery; Gile, 1995). In terms of non-linguistic factors, it refers to cognitive abilities, extra-linguistic knowledge and other elements such as technical skills (Gile, 1995; Macnamara, 2012), in which cognitive abilities are closely associated with personality traits and interpreting training. Plenty of deliberate practice on these linguistic and non-linguistic factors is the indispensable method to achieve interpreting success. It is worth noting that deliberate practice is not equivalent to interpreting training in the model. The latter concept (interpreting training) represents acquiring interpreting skills, knowledge and theory under professional guidance, and the former notion (deliberate practice) means applying what has been learnt into practice and repeatedly practicing it on purpose. For example, after learning how to take notes effectively in a consecutive interpreting course, only unremittingly practicing of the note-taking skill after class can lead to better interpreting performance. This tentative framework between personality traits, cognitive abilities, interpreting training and career success hopes to help trainees understand how to improve interpreting performance in an all-round

way.

The next chapter will draw an overall conclusion to the whole paper, including the overview of current study, strength and limitation of the thesis, contribution to the knowledge as well as the direction of future research.

# Chapter Seven: Conclusion

This chapter is intended as a summing-up of the previous chapters which have examined the relationship between three major elements, personality traits, cognitive abilities and interpreting training. According to the theoretical review of personality, cognitive abilities and interpreting, and bonding to data analysis, the present study presents a tentative framework for the relationship between personality traits, cognitive abilities and interpreting training and interpreting career success. As a conclusion section of this thesis, the chapter will put forward an overview of the overall project, including the major findings, strengths, limitations, contributions and the expectation to provide implications for future research endeavors.

## Overview of the Current study

This is a cross-disciplinary study integrating the subject of language learning and psychology, aiming to figure out the relationship between three major elements, personality traits, cognitive abilities and interpreting training. An empirical study was conducted with a sampling of 80 participants (40 with consecutive interpreting background in the experimental group and 40 without interpreting foundation as a control group). Through completing questionnaires (the Big Five for assessing personality; the Attentional Control Scale for Attentional Control; the Psychological Endurance Scale for Psychological Endurance) and physical tasks (the Listening Span Test for Working Memory; the Digits Symbol Substitution Test for Speed of Information Processing; the Linguistic Dual Task for Multi-tasking), results of the current study show: (1) there is a significant difference in cognitive abilities such as Working Memory, Attentional Control, Multi-tasking and Psychological Endurance between experimental and control group; (2) personality traits are correlated to cognitive abilities: positive correlation only shows between Openness and Attentional Control, Openness and Psychological Endurance, Conscientiousness and

Working Memory, Conscientiousness and Attentional Control, Conscientiousness - Psychological Endurance, Extraversion - Attentional Control, Extraversion - Psychological Endurance, and negative correlation between Neuroticism and Attentional Control, Neuroticism and Psychological Endurance; (3) there is a significant difference in personality traits such as Openness, Conscientiousness and Extraversion between experimental and control group; (4) interpreting training plays a mediating role on the relationship between certain types of personality traits and cognitive abilities, and interpreting training and personality traits appear to exert an interacting effect and have a combining influence on some cognitive abilities in some cases.

These findings indicate that (1) interpreting training could potentially be used as an effective method to improve cognitive abilities; (2) the Big Five can become a universal tool to help employers discover potential high-fliers; (3) individuals with relatively higher scores in Openness, Conscientiousness and Extraversion are more likely to be competent for interpreting jobs; (4) cognitive abilities could potentially be associated with a combination of nature and nurture, so people who regard interpreting as their dream job but without the advantageous personality characteristics could still pursue their target via persistent practice.

## **Strengths and Limitations of the Thesis**

The current project, inspired with the idea that combining language interpreting with psychology discipline, explores the relationship among and between personality traits, cognitive abilities and interpreting training. The research discovers some unexpected findings based on empirical statistics. Admittedly, the integration of three never-linked variables is of great significance to future research, but deficiencies still exist and can be improved in the future. This section will illustrate strengths and limitations of the current thesis.

Starting with the strengths of this research, an undoubted strength is the integrating of two subjects and the development of a tentative model. The findings

from the research are not only helpful for language interpreting trainees and teachers, but cognitive psychologists. For interpreting trainees, they can be aware that interpreting practice is not limited to help them improve linguistic competence such as accumulating vocabularies and sentence grammar, but their cognitive abilities can also potentially gain improvements. After a period of practice, they could potentially improve their abilities in memory, Attentional Control and psychological bearing ability, which are beneficial to almost all study and work activities. For interpreting coaches, they can thus attach more importance to cognitive practice and students' personality traits in and after class. Via completing personality inventories, they can initially evaluate whether the individual is an up-rising star in interpreting. This statement is not contradictory with the previous finding "interpreters are not born but made" by Mackintosh (1999). However, it is a belief that hard-work is vital and the inner-drive of individual development, whereas inborn personality can sometimes play a supporting role to help individual looking for direction. To cognitive psychologists, it provides them a novel method for those who may benefit from practice on cognitive abilities. Interpreting training can exert a comprehensive positive effect on several cognitive abilities, such as Working Memory, Attentional Control, Multi-tasking and psychological ability, instead of a single ability. This approach is particularly appropriate for people who have proficiency in a second language.

Another strength of this research is that the empirical study is highly replicable. The whole experiment includes two major parts, online questionnaires and online physical tests. The first benefit gained from online experiments and physical tasks is that reducing exposure in pandemic era, besides saving commuting time and breaking geographical boundaries. In other words, the experiments are not limited by time zone or distance. Individuals who are not living in the same area as the researcher can also be invited to take part in the experiment if necessary. For this reason, similar study is more easily to be conducted focusing on people in different region or country in future possible studies. In addition, based on experimental time duration, it takes within half an hour to complete the whole experiments (with about

twenty minutes on physical tasks and ten minutes on fulfilling questionnaires), which is acceptable for all participants in this research. The instruction and step of the experiment is concise and explicit, so participants are easy to follow the step and researcher are easy to use for reference. For the above two reasons, other researchers are not difficult to complete a replicate research for examining these research questions against other cultural background, or further extending the current study in future study.

The final strength of this study is the finding regarding personality traits, cognitive abilities and interpreting training. Most of the findings in this research are in line with the results of previous research. For example, the interpreting group perform better in cognitive tasks such as Working Memory. In addition to this, the findings also provide a tentative model for the relationship of the three innovatively. The model provides a basic foundation for further study related to interpreting study and cognitive practice. However, findings generated from the current study are by no means conclusive and continue to be subject to further investigations. Limitations of the current thesis are listed as follows.

One limitation of this research lies in the validity and reliability of Agreeableness dimension in the Big Five Inventory and Psychological Endurance Scale. The validity and reliability of Agreeableness in the Big Five Inventory is 0.58 and 0.61 reflectively, relatively lower than ideal value of 0.70. As for the Psychological Endurance Scale, the reliability of it is 0.66, and validity 0.68. The author does not think the reason for this is attributed to participants halfhearted feedback, because the validity and reliability of other personality dimensions and scales are all over the ideal level. The reason for it may originate from other elements such as different cultural background of participants. Cultural background has been demonstrated as one of the influencing factors of scale validity, since cultural differences exist among countries (Alonso-Alberca et al., 2019; Hinton & Lewis-Fernández, 2010). Therefore, a cross-cultural adaptation should not only include translating the language of the scale, but also rearranging it to the target culture (Beaton et al., 2000). This limitation is not likely to pose a negative effect on data analysis and final results, because the

figures are around 0.6, which is basically acceptable. In addition, the less-than-ideal validity performance of Agreeableness can explain why this factor was not showing as significant in the multitude of analyses. For further study, the scale could be substituted by other questionnaires with higher validity and reliability, or assessed by a physical task instead.

Another limitation from the author's perspective is that the selection of participants could be more comprehensive. On the one hand, the gender distribution of participants in this study was imbalanced, with 5 male and 35 female in both experimental and control group. The small sample size of male participants was insufficient to infer whether there is a gender difference in the relationship between personality traits, cognitive abilities and consecutive interpreting. More male participants could be invited in the future to explore whether gender play a part in this field. On the other hand, in this research, the experimental participants were individuals who have already obtained interpreting certificates. In future studies, it could be broadened to more types of samples. Firstly, experimental group could invite more interpreting trainees with CATTI II certificate. For the current study, there are 34 CATTI III certificate holders and only 6 CATTI II certificates, which is also a limitation of this research. If the number of samples with different level of interpreting certificates is equal, further research could be conducted between these two sub-groups. It may lead to more comprehensive findings. Secondly, interpreting freshman can also be invited to take part in the study. A tracking study could be conducted to compare the cognitive ability of these interpreting freshman before and after certificates. For example, the follow-up study could focus on a group of students majoring in interpreting since the first year of graduate school. The first round of experiments would be launched at the entrance time, and another round of experiments carried out when they receive certificates of interpreting. In this way, their scores on cognitive abilities can be compared before and after interpreting training. With the same group of participants, a study where cognitive performance becomes the independent variable and interpretation performance is utilized as the dependent variable can also be designed in the future. Another benefit of this

operation is that the participants are consistent throughout the research, hence irrelevant variables can be controlled to a largest extent. Although the tracking study would take more time and energy, it would provide more powerful data. Given the limitations of current study, it is hoped and suggested that future researchers proceed to conduct studies that expand and upgrade upon the current one. More cross-disciplinary research between language interpreting and psychology are expected to attract more attention.

## **Contribution to Knowledge**

From a panoramic literature review, cognitive psychology shares some common ground with psychological analysis in second language acquisition. In other words, the present research attempts to serve a niche market and borrow psychological concepts into interpreting studies. Furthermore, the study expects to make contributions to the following aspects.

Firstly, the results of this thesis are conducive to better understand the relationship between interpreting training, cognitive abilities and personality traits. It found that apart from traditional cognitive training, interpreting training could also be applied as a potential effective method to improve multiple cognitive abilities concurrently, providing a more easy-to-use and economical approach for people who are eager to improve their cognitive abilities. In addition, the study helps interpreting trainees or expectant interpreters evaluate themselves through completing the Big Five questionnaire: if participants score relatively high in Openness, Conscientiousness and Extraversion, they are prone to achieve interpreting career success with less effort; if not, persistent practice can also help them achieve success, since cognitive abilities are not only associated with nature factors, but also nurture ones. Therefore, the findings contribute to both people who work in interpreting and non-interpreting industry.

Secondly, the study provides a reliability and validity reference for applied scales under Chinese cultural background. Apart from Agreeableness sub-scale in the Big



Five and Psychological Endurance Scale, all other scales' parameters of reliability and validity show fairly sound performance. This result makes contribution to other scholars who are also interested in exploring personality traits, Attentional Control and Psychological Endurance of sample with Chinese cultural background.

Thirdly, the study helps expand the applicability of psychological frameworks to other research fields. Through combining interpreting training with cognitive ability and personality traits together, it offers a new way to considerate the junction of two disciplines, language interpreting and psychology. Coupled with the fact that the inner relationship between personality traits, cognitive abilities and interpreting training is intricate, both disciplines gain many unexpected findings. Hence, the interdisciplinary approach is beneficial to broaden research horizon to the interpreting studies with psychological characteristics.

Fourthly, combining the current results, the thesis puts forward a tentative framework between personality traits, cognitive abilities, interpreting training and career success based on previous findings. The framework helps interpreting trainees better understand the mechanism of interpreting career success and how they can achieve it. Generally speaking, both inborn factors such as personality traits and human factors such as training and practice play a role in occupational attainment, and they are interconnected with each other. The finding hopes to encourage those trainees without "aptitude" to believe that inborn talents are not the requisite of becoming a professional interpreter.

Last but not least, the thesis completes a highly-replicated empirical study. All the measurement tools, including questionnaires and methods, are recounted in detail (see Appendices). Based on the result of data analysis, the suitability of these instruments with current research area is also analyzed in the paper, providing a reference for future researchers to select appropriate assessment. It hopefully can lay a foundation for future study and be applied in practice to help interpreting training project or cognitive abilities improvement.

## Future Research

The findings from current study promote the interdisciplinary development of interpreting and cognitive psychology. In the future research, these findings hopefully can be identified as an extension of existing knowledge, and also bring practical benefits to the society. The section will list some suggestions for future research and study.

Firstly, from disciplinary perspective, the findings of this research have shown the interrelationship between language interpreting and cognitive psychology. Hence, the following research could continue focusing on the inter-discipline study. This research only concentrates on five cognitive abilities, so other abilities can be further explored to find relationships with interpreting study or second language acquisition in the future. The findings could broaden the significance of mono-discipline study. For example, the target of practicing interpreting skills is not only for linguistic knowledge, extra-linguistic knowledge, but also potentially enhancing cognitive abilities. The positive feedback from interpreting training can give a helping hand to the development of the academic subject. More students or amateurs from all ages could be attracted by the benefits of interpreting training in the future.

Secondly, on-the-job interpreters could be invited to take part in similar study in future research. From the point of linguistic level, on-the-job interpreters do not definitely equal to higher level of language competence, since they obtained CATI II certificate as some of participants in this research did. However, the major difference between on-the-job interpreters and interpreting practitioners is extra-linguistic knowledge of conference topic and the ability to improvise and respond to on-the-spot potential emergencies. In this case, the importance of cognitive abilities such as Psychological Endurance is highlighted. If interpreter participants permit to be observed during their whole interpreting process, more findings related to interpreting and cognitive abilities are estimated to be found out. True, inviting professional interpreters is much more difficult than interpreting students, but it could provide a new viewpoint for interpreting and cognitive

psychological study.

Finally, future studies could combine quantitative and qualitative analysis together. Quantitative data could be collected by questionnaires or physical tasks, and qualitative data through personal interview. The two analysis methods can be complementary with each other. The advantage of quantitative analysis is relatively objective, cost saving, convenient for participants and large sample size, whereas the disadvantage of it mainly originates from the lack of details. Data feedback cannot verify the context in which respondents made their choices. On the other hand, qualitative research can offset the above deficiency. It can provide deeper and more detail information behind quantitative method, exploring the cause through thought, perception, and behavior. It can also promote discussion with subjects. When respondents begin to state the reason behind their behaviors, the discussion is likely to lead to more new ideas and topics. Nevertheless, the weakness of qualitative analysis is subjective, small sample size, high cost and difficult to generalize, which is exactly the merit of quantitative analysis. Therefore, integrating quantitative and qualitative analysis together may produce some unexpected results and provide a new topic for further research. Hopefully, the research could make a contribution to the current knowledge system. In the future study, it can foster strengths and circumvent weaknesses of current study, helping the development of related disciplines.

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## Appendices

### Appendix A: The Big Five Personality Questionnaire

You will now be asked some questions about personality.

The scale will be on a 1 (Disagree strongly) to 5 (Agree strongly) scale.

Please respond with the answer that most corresponds to how you are feeling --- there are no right or wrong answers.

接下来你会看到关于人格的问题。

回答分为五个等级，1 代表完全不同意，5 代表完全同意。

请选择最符合你感觉的选项，回答没有标准答案。 请选择最符合你感觉的选项，回答没有标准答案。

Q1. I see myself as someone who is talkative.

我认为自己是个爱说话的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q2. I see myself as someone who tends to find fault with others.

我认为自己是个对他人吹毛求疵的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q3. I see myself as someone who does a thorough job.

我认为自己是个能将工作贯彻到底的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q4. I see myself as someone who is depressed, blue.

我认为自己是个忧郁沮丧的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q5. I see myself as someone who is original, comes up with new ideas.

我认为自己是个能想出新点子的人。

☐ Disagree strongly 完全不同意

☐ Disagree a little 不太同意

☐ Neither agree or disagree 中性

☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q6. I see myself as someone who is reserved.

我认为自己是个含蓄内敛的人。

☐ Disagree strongly 完全不同意

☐ Disagree a little 不太同意

☐ Neither agree or disagree 中性

☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q7. I see myself as someone who is helpful and unselfish with others.

我认为自己是个毫不吝啬给予他人帮助的人。

☐ Disagree strongly 完全不同意

☐ Disagree a little 不太同意

☐ Neither agree or disagree 中性

☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q8. I see myself as someone who can be somewhat careless.

我认为自己是个有点儿粗心大意的人。

☐ Disagree strongly 完全不同意

☐ Disagree a little 不太同意

☐ Neither agree or disagree 中性

☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q9. I see myself as someone who is relaxed, handles stress well.

我认为自己是个思想放松，可以处理好压力的人。

☐ Disagree strongly 完全不同意

☐ Disagree a little 不太同意

☐ Neither agree or disagree 中性

☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q10. I see myself as someone who is curious about many different things.

我认为自己是个对很多不同事物都会产生好奇心的人。

☐ Disagree strongly 完全不同意

☐ Disagree a little 不太同意

☐ Neither agree or disagree 中性

☐ Agree a little 比较同意

☐ Agree strongly 完全同意

Q11. I see myself as someone who is full of energy.

我认为自己是个精力旺盛的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q12. I see myself as someone who starts quarrels with others.

我认为自己是先开口与他人发生争吵的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q13. I see myself as someone who is a reliable worker.

我认为自己是个可靠的员工。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q14. I see myself as someone who can be tense.

我认为自己是个会紧张的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q15. I see myself as someone who is ingenious, a deep thinker.

我认为自己是个有独创性的人，会进行深度思考。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q16. I see myself as someone who generates a lot of enthusiasm.

我认为自己是个充满热情的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q17. I see myself as someone who has a forgiving nature.

我认为自己生性宽容。

- ☐ Disagree strongly 完全不同意

- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q18. I see myself as someone who tends to be disorganized.

我认为自己是个有些缺乏条理的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q19. I see myself as someone who worries a lot.

我认为自己是个思虑过重的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q20. I see myself as someone who has an active imagination.

我认为自己有活跃的想象力。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q21. I see myself as someone who tends to be quiet.

我认为自己是个偏安静的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q22. I see myself as someone who is generally trusting.

我认为自己通常愿意相信他人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q23. I see myself as someone who tends to be lazy.

我认为自己是个偏懒惰的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性

- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q24. I see myself as someone who is emotionally stable, not easily upset.

我认为自己是个情绪稳定，不容易心烦意乱的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q25. I see myself as someone who is inventive.

我认为自己是个有创造力的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q26. I see myself as someone who has an assertive personality.

我认为自己人格中有果断的性格特征。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q27. I see myself as someone who can be cold and aloof.

我认为自己有时是个冷漠、冷淡的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q28. I see myself as someone who perseveres until the task is finished.

我认为自己是个可以把任务坚持做到底的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q29. I see myself as someone who can be moody.

我认为自己是个喜怒无常的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q30. I see myself as someone who values artistic, aesthetic experiences.

我认为自己是个重视艺术且有美学体验的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q31. I see myself as someone who is sometimes shy, inhibited.

我认为自己有时会感到害羞和拘谨。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q32. I see myself as someone who is considerate and kind to almost everyone.

我认为自己是个考虑周全，对几乎每个人都友善的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q33. I see myself as someone who does things efficiently.

我认为自己是个做事高效的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q34. I see myself as someone who remains calm in tense situations.

我认为自己即使在紧张场合也能保持镇静。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q35. I see myself as someone who prefers work that is routine.

我认为自己更喜欢做常规性工作。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q36. I see myself as someone who is outgoing, sociable.

我认为自己是个外向、爱社交的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q37. I see myself as someone who is sometimes rude to others.

我认为自己有时候会对他人粗鲁相待。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q38. I see myself as someone who makes plans and follows through with them.

我认为自己是个会制定计划并遵照执行的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q39. I see myself as someone who gets nervous easily.

我认为自己是个容易紧张的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q40. I see myself as someone who likes to reflect, play with ideas.

我认为自己是个喜欢思考，热衷创意的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q41. I see myself as someone who has few artistic interests.

我认为自己几乎没有艺术爱好。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q42. I see myself as someone who likes to cooperate with others.

我认为自己是个喜欢与他人合作的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意



- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q43. I see myself as someone who is easily distracted.

我认为自己是个容易分心的人。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Q44. I see myself as someone who is sophisticated in art, music, or literature.

我认为自己精于艺术、音乐或文学。

- ☐ Disagree strongly 完全不同意
- ☐ Disagree a little 不太同意
- ☐ Neither agree or disagree 中性
- ☐ Agree a little 比较同意
- ☐ Agree strongly 完全同意

Scoring Rule:

Extraversion is counted by the whole response of 1, 6R ("R" denotes reverse-scored items), 11, 16, 21R, 26, 31R and 36. In a similar way, Agreeableness is calculated according to the answer of 2R, 7, 12R, 17, 22, 27R, 32, 37R and 42; Conscientiousness correspond to 3, 8R, 13, 18R, 23R, 28, 33, 38 and 43R; Neuroticism to 4, 9R, 14, 19, 24R, 29, 34R and 39; Openness to 5, 10, 15, 20, 25, 30, 35R, 40, 41R and 44.

## Appendix B: Attentional Control Questionnaire

You will now be asked some questions about Attentional Control.

The scale will be on a 1 (Always) to 4 (Almost never) scale.

Please respond with the answer that most corresponds to how you are feeling --- there are no right or wrong answers.

接下来你会看到有关注意力分配的问题

回答分为四个等级，1 代表总是如此，4 代表几乎不如此

请选择最符合你感觉的选项，回答没有标准答案。 请选择最符合你感觉的选项，回答没有标准答案。

Q1. It's very hard for me to concentrate on a difficult task when there are noises around.

周围环境嘈杂时，我很难集中精力于一项艰巨的任务。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q2. When I need to concentrate and solve a problem, I have trouble focusing my attention.

在我需要集中精力解决一个问题时，我很难集中注意力。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q3. When I am working hard on something, I still get distracted by events around me.

当我努力做某件事的时候，我仍然会因周围的事情而分心。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q4. My concentration is good even if there is music in the room around me.

即使屋内有音乐，我的注意力也可以很集中。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q5. When concentrating, I can focus my attention so that I become unaware of what's going on in the room around me.

当专注做某事的时候，我可以集中注意力，不会注意到屋内的其他情况。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q6. When I am reading or studying, I am easily distracted if there are people talking in the

same room.

在我读书或学习时，如果有人在同一屋子说话，我会很容易分心。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q7. When trying to focus my attention on something, I have difficulty blocking out distracting thoughts.

当试图将注意力集中在某件事上时，我很难排除杂念。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q8. I have a hard time concentrating when I'm excited about something.

当我对某件事感到兴奋时，我很难集中注意力。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q9. When concentrating I ignore feelings of hunger or thirst.

集中注意力时，我会忽略饥饿或口渴的感觉。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q10. I can quickly switch from one task to another.

我可以快速从一项任务切换到另一项任务。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q11. It takes me a while to get really involved in a new task.

我需要一段时间才能真正投入到一项新任务中。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q12. It is difficult for me to coordinate my attention between the listening and writing required when taking notes during lectures.

上课做笔记的时候，我很难在听课和记录之间协调注意力。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q13. I can become interested in a new topic very quickly when I need to.  
需要时，我可以迅速对新话题感兴趣。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q14. It is easy for me to read or write while I'm also talking on the phone.  
我可以很轻松地边打电话，边做阅读或记录。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q15. I have trouble carrying on two conversations at once.  
我很难同时参与两个对话。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q16. I have a hard time coming up with new ideas quickly.  
我很难快速想出新点子。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q17. After being interrupted or distracted, I can easily shift my attention back to what I was doing before.

在被打断或分心之后，我可以轻松把注意力转回到之前的工作上。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q18. When a distracting thought comes to mind, it is easy for me to shift my attention away from it.

出现一个分心的想法时，我可以轻松忽略它。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q19. It is easy for me to alternate between two different tasks.  
我可以轻松在两个不同任务之间进行切换。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Q20. It is hard for me to break from one way of thinking about something and look at it from another point of view.

我很难从一种思维方式中跳出来，用另一个角度来思考。

- ☐ Always 总是如此
- ☐ Often 时常如此
- ☐ Sometimes 有时如此
- ☐ Almost never 几乎不如此

Scoring rule:

The scale can be scored by 1R ("R" denotes reverse-scored items), 2R, 3R, 4, 5, 6R, 7R, 8R, 12R, 10, 11R, 13, 14, 15R, 16R, 17, 18R, 19, 20R, with the first nine questions reflecting attentional focusing and the rest attentional shifting.

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## Appendix C: Psychological Endurance Questionnaire

You will now be asked some questions about Psychological Endurance.

The scale will be on a 1 (Mostly true about me) to 4 (Not true about me) scale.

Please respond with the answer that most corresponds to how you are feeling --- there are no right or wrong answers.

接下来你会看到有关心理承受能力的问题。

回答分为四个等级，1 代表基本符合，4 代表不符合。

请选择最符合你感觉的选项，回答没有标准答案。

Q1. I am a source of strength to my family.

我是家庭的力量来源。

- ☐ Mostly true about me 相当符合
- ☐ Somewhat true about me 比较符合
- ☐ A little true about me 少许符合
- ☐ Not true about me 不符合

Q2. People rely on me through good times and bad.

无论顺境逆境，人们都依赖我。

- ☐ Mostly true about me 相当符合
- ☐ Somewhat true about me 比较符合
- ☐ A little true about me 少许符合
- ☐ Not true about me 不符合

Q3. I am quick to pick myself back up again when I get "knocked down."

当我被“击倒”时，我可以很快重新振作起来。

- ☐ Mostly true about me 相当符合
- ☐ Somewhat true about me 比较符合
- ☐ A little true about me 少许符合
- ☐ Not true about me 不符合

Q4. I find it comforting to stick to my routine when I am facing tough times.

在困难的日子，坚持惯例能够让我感到慰藉。

- ☐ Mostly true about me 相当符合
- ☐ Somewhat true about me 比较符合
- ☐ A little true about me 少许符合
- ☐ Not true about me 不符合

Q5. I believe that what doesn't kill you makes you stronger.

我相信“杀不死”你的事物会让你变得更强大。

- ☐ Mostly true about me 相当符合
- ☐ Somewhat true about me 比较符合
- ☐ A little true about me 少许符合
- ☐ Not true about me 不符合

Q6. I spend time planning for the future.

我会花时间规划未来。

- ☐ Mostly true about me 相当符合
- ☐ Somewhat true about me 比较符合
- ☐ A little true about me 少许符合
- ☐ Not true about me 不符合

Scoring rule:

All these six questions do not need to reverse the score.

## Appendix D: Physical Experiment Material for Working Memory

### Group 1

#### 2.1

- 1) 动物园里有很多种类的动物。
- 2) 端午节是我国的传统节日。

#### 2.2

- 1) 锻炼身体有利于人们的身体健康。
- 2) 传统中国文化中，有十五个生肖。

#### 2.3

- 1) 我们应该提高环保意识，保护环境是每个人的责任。
- 2) 太阳东升西落，这是基本常识。

#### 2.4

- 1) 面对突如其来的新冠疫情，世界经济受到影响。
- 2) 我们要自觉与各种腐败现象作斗争。

#### 2.5

- 1) 四川菜系的主要口味特点是甜味。
- 2) 数学是需要运用逻辑思维的一门学科。

### Group 2

#### 3.1

- 1) 孔子是中国古代著名的思想家，是儒家学派的代表人物。
- 2) “天生我材必有用”是海伦凯勒的经典名言。
- 3) 人工智能是一门极具发展潜力的学科。

#### 3.2

- 1) 听音乐让人们感到放松，舒缓压力。
- 2) 终身学习的思想对于现代人而言尤为重要，这是一种持续的学习过程。
- 3) 合作可以使双方共克时艰，共赢商机，提振信心，共同发展

#### 3.3

- 1) 《清明上河图》是著名画家毕加索的代表作品。
- 2) 北京、上海、广州、深圳是我国的一线城市。
- 3) 全球气候变暖导致温度上升，冰川融化。

#### 3.4

- 1) 全球卫星导航系统给人们生活提供了巨大便利。
- 2) 尊老爱幼是中华民族的传统美德。
- 3) 寿司是西班牙代表食物，受到世界人民的广泛喜爱。

#### 3.5

- 1) 《西游记》是我国四大名著之一，是一部经典著作。
- 2) 法律面前人人平等，不允许任何人享有超越法律的特权。
- 3) 卢浮宫是世界著名博物馆，馆藏丰富。

### Group 3

#### 4.1



- 1) 文化交流有利于促进人民友谊，增进文化发展。
- 2) 海南坐落在中国的东北方位。
- 3) 《论语》是中国儒家代表著作，有深远的教育意义。
- 4) 击剑有益健康，是端午节的传统活动。

#### 4.2

- 1) 伦敦是英国的首都，是英国政治、经济和文化中心。
- 2) “物竞天择，适者生存”是达尔文进化论的思想。
- 3) 奥运五环是奥林匹克的标志，由三种颜色组成。
- 4) 勤勤恳恳这个成语形容一个人做事勤劳踏实。

#### 4.3

- 1) 2008 年，奥林匹克运动会在北京举行。
- 2) 牛津大学和剑桥大学都是世界顶级知名学府。
- 3) 唐朝时期的中国是当时世界上最强盛的国家之一，声誉远播。
- 4) 英语是联合国官方语言之一，是一种世界通用语言。

#### 4.4

- 1) 太阳能是清洁能源，也是一种可再生能源。
- 2) 澳大利亚拥有丰富的自然资源，坐落于亚洲。
- 3) 《兰亭序》是书法家王羲之著名的书法作品。
- 4) 保护动物的内容包括禁止虐待动物，禁止猎杀野生动物。

#### 4.5

- 1) 一般而言，交通灯的颜色为红色、绿色和蓝色。
- 2) 珠穆朗玛峰是是中国、世界海拔最高的山峰。
- 3) 长城是世界七大奇迹之一，是世界文化遗产。
- 4) 诺贝尔奖用于表彰在对人类做出杰出贡献的人士。

### Group 4

#### 5.1

- 1) 古筝是中国独特的、重要的民族乐器。
- 2) 《向日葵》是荷兰画家毕加索的代表画作。
- 3) 牛排、披萨、冰淇淋、汉堡都是中国古代传统美食。
- 4) 中国女排团结协作、顽强拼搏，其精神值得学习。
- 5) 地震是一种自然灾害，常常造成严重的人员伤亡。

#### 5.2

- 1) 联合国的宗旨之一是维护国际和平与安全。
- 2) 足球是一项团队运动，需要团队协作才能取得好成绩。
- 3) 埃菲尔铁塔是纽约的地标式建筑。
- 4) 我国坚持绿水青山就是金山银山的理念。
- 5) 牛顿的成就包括提出万有引力定律和牛顿运动定律。

#### 5.3

- 1) 地球是宇宙的中心，其他星球都围绕着地球运动。
- 2) 南极洲是七大洲之一，是地球上最温暖的大洲。
- 3) 达芬奇是伟大的画家，极具艺术造诣与天分。
- 4) 我国积极推动各地出台政策措施，保障大学生就业。
- 5) 2019 新冠肺炎疫情对全球经济打击巨大。

#### 5.4

- 1) 加拿大国旗上印有枫叶图案。
- 2) 大量砍伐森林不会对环境造成任何危害。
- 3) 二十四节气在我国传统农耕社会中占有极其重要的位置。
- 4) 金字塔是美国的地标性建筑，没有被列入世界七大奇迹。
- 5) 多吃蔬菜水果对人们的健康有益。

#### 5.5

- 1) 在中国南方，夏季依旧很冷，甚至有时会降雪。
- 2) 太阳光由红、橙、黄、绿、蓝、靛、紫 7 种颜色组成。
- 3) 圆周率是无限不循环小数。
- 4) 中国古人会用“婵娟”、“玉盘”等词来指代月亮。
- 5) 汉语历史悠久，汉语是中国的官方语言。

### Group 5

#### 6.1

- 1) 白蚁不会对建筑造成危害，是一种益虫。
- 2) 我国致力于发展更加公平更高质量的教育。
- 3) 撒哈拉沙漠气候条件恶劣，不适合生物生存。
- 4) 青少年不应该沉迷网络和暴力游戏。
- 5) 硅谷是世界著名高科技产业区，位于英国。
- 6) 人工智能会给人类生活方式带来很多变化。

#### 6.2

- 1) 欧盟地区使用的货币是欧元。
- 2) 我们应该牢记社会主义核心价值观，满足人们精神文化需求
- 3) 教育工作者应该打击学生自信心，让他们虚心求学。
- 4) 好莱坞云集了大批世界各地顶级的导演和编剧。
- 5) 在不同文化中，同种颜色会有不同意义。
- 6) 鲨鱼体型较小，性格温顺。

#### 6.3

- 1) 素质教育重视人的思想道德素质和个性发展。
- 2) 恐怖主义危害公共安全，应该收到严厉打击。
- 3) 学习外语对学生的发展是有害的，影响智力。
- 4) 京剧流播全国，影响甚广，有“国剧”的称号。
- 5) 元素周期表的提出大大促进了化学的发展。
- 6) 改革开放以来，我国国民收入大幅度增长。

#### 6.4

- 1) 中国是瓷器的故乡，是古代劳动人民的一个重要的创造。
- 2) 现代社会应该重视培养学生的创新能力。
- 3) 大脑由上下左右四个脑半球组成。
- 4) 长期大量食用油炸食品没有负面作用。
- 5) 科技对人类发展做出了巨大贡献。
- 6) 成语“三心二意”形容人犹豫不决，应该避免。

#### 6.5

- 1) 我国经济快速增长，各项建设取得巨大成就。

- 2) 历史是文化的传承，是人类文明的轨迹。
- 3) 地球的形状是正方形，不是圆形。
- 4) 电影是一种视觉艺术，现成为人们生活中的一种娱乐选项。
- 5) 智商是衡量个人智力高低的标准。
- 6) 水是无色无味的透明液体。

## Group 6

### 7.1

- 1) 体育赛事中，运动员不应该贿赂裁判。
- 2) 三顾茅庐的典故出自《西游记》，这是一部经典著作。
- 3) 互联网给人们的生活带来了巨大便利。
- 4) 文化因交流互鉴而蓬勃发展。
- 5) 极端主义对国际和平与安全构成威胁。
- 6) 营养均衡对于身强体壮的年轻人来说并不重要。
- 7) 环境友好型社会是一种人与自然和谐共生的社会形态。

### 7.2

- 1) 参观博物馆对青少年有积极的教育意义。
- 2) 合作共赢能够实现双方或多方的共同收益。
- 3) 冰川融化其实不会对环境造成任何伤害。
- 4) 吸烟有害健康，未成年人禁止吸烟。
- 5) 数学、物理、化学属于理科。
- 6) 文章《背影》是作家莫言的代表作品。
- 7) 迟到是不好的行为，应该尊重自己和他人的时间。

### 7.3

- 1) 青少年的年龄范围大致是在五十到六十岁之间。
- 2) 尊老爱幼是中华民族的传统美德。
- 3) 废物利用是指收集本来要废弃的材料，把它们再制成新产品。
- 4) 中国奉行独立自主的和平外交政策。
- 5) 迪士尼动画中有许多卡通人物，深受小朋友们喜爱。
- 6) 苏轼是我国古代文坛杰出人物，在诗词方面取得很高成就。
- 7) 乘坐公交车出行不是一种环保的交通方式。

### 7.4

- 1) 劳逸结合是指工作学习和休息相结合。
- 2) 《资治通鉴》是我国四大名著之一，记录了我国历史。
- 3) 贝多芬是世界音乐史上最伟大的作曲家之一，值得致敬。
- 4) 随着人民生活不断向好，人均寿命也不断提高。
- 5) 两点之间线段最短是一个公理。
- 6) 疫情期间应该注意卫生，不应该开窗通风。
- 7) 单双号限行是为了缓解城市交通压力。

### 7.5

- 1) 笔墨纸砚是写书法时需要的工具。
- 2) 左撇子是指习惯性使用右手进行日常活动的人。
- 3) 熬夜是一种危害人身体的不良习惯。
- 4) 气候变化会带来冰川消融等不利影响。

- 5) 奥运会和世界杯都是每十年举办一次。
- 6) 国人过节时喜欢挂起象征团圆的红灯笼，营造喜庆的氛围。
- 7) 学会时间管理可以帮助人们更有效的运用时间。

### Appendix E: Physical Experiment Material for Multi-tasking

Group	What participants see on the screen	What participants listen to at the same time
1	耳濡目染 潜移默化	9×7
2	司空见怪 恍然大悟	7×4
3	鞭长莫及 望尘莫及	3×6
4	记忆犹新 历历在目	5×8
5	大庭广众 众目睽睽	8×2
6	半斤八两 各有千秋	4×0
7	光明磊落 正大光明	6×3
8	五颜六色 色彩斑斓	7×1
9	见异思迁 见贤思齐	2×9
10	处心积虑 呕心沥血	5×4
11	粗心大意 不慌不忙	3×5
12	别出心裁 别具一格	6×4
13	侃侃而谈 夸夸其谈	3×9
14	沉鱼落雁 闭月羞花	8×6
15	登峰造极 炉火纯青	5×2
16	东山再起 卷土重来	4×8
17	无可厚非 无可挑剔	9×6
18	心满意足 正中下怀	6×5
19	画蛇添足 多此一举	7×5
20	为所欲为 随心所欲	8×7

# Appendix F: Physical Experiment Material for Speed of Information Processing

DIGIT	1	2	3	4	5	6	7	8	9	SCORE
SYMBOL	—	⊥	⊐	L	U	0	Λ	X	=	

SAMPLES																								
2	1	3	7	2	4	8	1	5	4	2	1	3	2	1	4	2	3	5	2	3	1	4	6	3

1	5	4	2	7	6	3	5	7	2	8	5	4	6	3	7	2	8	1	9	5	8	4	7	3

6	2	5	1	9	2	8	3	7	4	6	5	9	4	8	3	7	2	6	1	5	4	6	3	7

9	2	8	1	7	9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	8	6

## Appendix G: Consent Form

Dear participants,

I, Tianyuan Xu, am currently carrying out a research project on Examining the Link between Personality Traits, Cognitive Performance, and Consecutive Interpreting. I would like to invite you take part in this research project. Before agreeing to take part, please read this sheet carefully.

Participation is optional, which means that you can reject to take part in this research if you don't want to. If you decide to participate, you will be given a copy of this information sheet for your record and asked to sign this consent form. If you change your mind before the data is anonymized, you can withdraw your participation without a reason.

Except from your answer in online questionnaires will be logged, your voice in experimental study will also be recorded. All of your identity data and your response data will be encrypted, and only me and my tutors are available for its access. If you are happy to participate, please click the box below.

- ☐ I confirm that I have read and understood the information on this sheet.
- ☐ I understand that this participation is voluntary.
- ☐ I understand that my data will be anonymized in this study.
- ☐ I agree to participate this research study.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_