A LONGITUDINAL CORPUS STUDY OF SYNTACTIC COMPLEXITY DEVELOPMENT IN L2 WRITING

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ABSTRACT

This research explores syntactic complexity differences of L2 writing in the Longitudinal Corpus of Languaculturer Narrative Texts (Chau, 2015). This research aims to study syntactic complexity development in L2 writing based on the idea that learner language should be described in its own right. This study uses the L2 Complexity Analyzer (Lu, 2010) to process the written English sample by the participants and provides 14 indices as a measure of syntactic complexity. The scores from L2 Syntactic Complexity Analyzer were analyzed using repeated measures ANOVA, establishing statistical differences of 14 indices between the four different points in time.

Penyelidikan ini meneroka perbezaan kompleksiti sintaks penulisan L2 dalam *Longitudinal Corpus of Languaculturer Texts Narrative* (Chau, 2015). Kajian ini bertujuan untuk mengkaji perkembangan kompleksiti sintaks dalam penulisan L2 berdasarkan idea bahawa bahasa pelajar harus diterangkan dengan hak ia sendiri. Kajian ini menggunakan *L2 Complexity Analyzer* (Lu, 2010) untuk memproses sampel Bahasa Inggeris yang ditulis oleh para peserta dan memberikan 14 indeks sebagai ukuran kompleksiti sintaks. Skor dari *L2 Syntactic Complexity Analyzer* dianalisis menggunakan *ANOVA* berulang-ulang, mewujudkan perbezaan statistik 14 indeks antara empat masa yang berbeza.

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LIST OF SYMBOLS AND ABBREVIATIONS

χ^2	=	Chi-squared
η^2	=	Eta-squared
ANOVA	=	Analysis of variance
C/S	=	Clauses per sentences
C/T	=	Clauses per t-units
CN/C	=	Complex nominal per clauses
CN/T	=	Complex nominal per t-units
CP/C	=	Coordinate phrases per clauses
CP/T	=	Coordinate phrases per t-units
CT/T	=	Complex t-units per t-units
DC/C	=	Dependent clauses per clauses
DC/T	=	Dependent clauses per t-units
E.g.	=	*Exempli gratia*
I.e.	=	*Id est*
L2SCA	=	L2 syntactic complexity analyzer
M	=	Mean
MLC	=	Mean length of clauses
MLS	=	Mean length of sentences
MLT	=	Mean length of t-units
p	=	Probability value
SD	=	Standard deviation
T/S	=	T-units per sentences
VP/T	=	Verb phrases per t-units
Z	=	*Z*-score / Standard score

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CHAPTER 1: INTRODUCTION

1.1 Background of the study

Syntactic complexity is widely discussed in various areas of linguistics ranging from its effect on spoken language, such as amongst Alzheimer patients (see, e.g., Tomoeda, Bayles, Boone, Kaszniak & Slauson, 1990; Ferreira, Henderson, Anes, Weeks & McFarlane, 1996), to the neuropsychological study of patterns of syntactic complexity (see, e.g., Friederici, Hahne & Saddy, 2002).

In the area of second language, syntactic complexity is important as it has been recognized as a reliable device in assessing a learner's writing quality as well as their proficiency (Housen & Kuiken, 2009; Housen, Kuiken, & Vedder, 2012; Lu & Ai, 2015). The study of syntactic complexity is crucial in providing insights into L2 development as L2 learners are said to produce less complex syntactic features (Crossley & McNamara, 2014), a claim that warrants further investigation.

Prior studies on syntactic complexity focused on the development of computational tools in measuring syntactic complexity, syntactic complexity was used as a predictor of writing quality, as well as how the notion of syntactic complexity manifests in the production of second language using both cross-sectional and longitudinal methods (e.g., Crossley & McNamara, 2009; Lu, 2010; Wood & Struc, 2013; Kim, 2014; Scontras, Badecker, Shank, Lim & Fedorenko, 2014; MacDonald, Montag & Gennari, 2015).

However, most studies resort to using only a few indices in measuring syntactic complexity, capturing only fragments of the bigger picture (Lu & Ai, 2015). In order to obtain a comprehensive view, it is necessary to use multiple indices to measure the various constructs of learners' syntactic complexity (Ortega, 2003). Therefore, this

study attempts to analyze syntactic complexity development using several indices to measure different constructs of complexity.

1.2 General aim of the study

This research aims to study syntactic complexity development in L2 writing based on the idea that learner language should be described in their own right (Selinker, 1972). The concept of interlanguage posits that L2 learner language is an independent linguistic system (Selinker, 1972). This is because learner language should be described "in their own right, to look at their grammar, their phonology and their vocabulary as things of their own" (Cook, 2005, p. 49).

1.3 Key Term in the study (Development)

1.3.1 Development.

The term *development* is used throughout the study to understand changes in learner language, specifically syntactic complexity. The term is used to project the dynamic nature of learner language, to capture both increasing and decreasing complexification values of syntactic complexity. In this context, it is simply used to capture the dynamic system of learner language: when something is developed, it means it is either growing or shrinking. Growing and shrinking are not always classified with negative or positive attributes. Instead, it changes throughout time, submerging into its dynamic nature (Larsen-Freeman, 2006 & Chau, 2015).

1.4 Research Questions

The focus of this study is to look at the development of L2 speakers without reference to native speakers. The study seeks to answer these questions:

I. What changes in syntactic complexity are observable over a 24-month period in L2 writing development?

II. What do changes observed in syntactic complexity contribute to our understanding of L2 writing development?

The first research question is asked to provide a general idea of how syntactic complexity changes over time through fourteen constructs, showing how much and to what extent each construct has changed (if there is any) from time to time in the period of two years. It is asked to understand what actually changed in the syntactic complexity of the learners within the period of two years; which of the fourteen constructs of syntactic complexity have significantly increase or decrease over time This is demonstrated through graphs to illustrate the patterns of changes from Time 1 to Time 2 to Time 3 and to Time 4 and the summary is presented in Chapter 5.

The findings of the second research question are used to understand what do changes in syntactic complexity constructs mean through the fourteen measures as observed in this study. These are all discussed in Chapter 5.

1.5 Significance of the Study

The study adds to the current literature using a unique approach; studying L2 syntactic complexity development on its own without reference to native speakers, enriching the existing literature in language acquisition.

Additionally, this study discusses syntactic complexity longitudinally, exploring how the notion of complexity by a group of young L2 learners changes over time using 14 measures based on five categories as summarized in Lu (2010). This provides insights into learners' syntactic complexity, what changed within the two years, giving an overview of how learners change from Time 1 to Time 2 to Time 3 and to Time 4 and how long it takes for each measure to change. Changes in the measures are an increase or decrease in the use of syntactic complexity as observed through specific measures (e.g. dependent clauses, number of words etc.).

This research studied a group of young secondary school writers, which according to Chau (2015), is a population understudied. Therefore, this study will directly contribute to the mentioned gap while helping scholars in the field to explore one important linguistic structure, specifically syntactic complexity produced by the L2 learners. The results of this study will contribute towards our understanding of L2 learners' syntactic complexity and pave the way for future research in the linguistic structure of language learners.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter discusses the general notion of syntactic complexity and reviews past studies of syntactic complexity. The subtopic 2.2.2 discusses which measures were carefully selected to be used in the study. Additionally, this chapter includes discussions of how this research is different from previous studies that have been conducted in the syntactic complexity area. This section also discusses how monolinguals and bilinguals and multi-linguals differ from one another and why they are not comparable.

2.2 Syntactic Complexity

Syntactic complexity that is also known as 'syntactic maturity' or 'linguistic complexity' (Ortega, 2003; Qi, 2014), is defined as "the range and degree of sophistication of syntactic structures that surface in language production" (Ai & Lu, 2013, p. 249). Previous studies of syntactic features were built on this conceptual framework focusing on the sophistication and variation of clauses and phrases constructed by L2 learners (Crossley & McNamara, 2014). Although numerous studies have been conducted, a glaring problem persists. The conceptual definition is too vague, too general; barely scratching the surface of our understanding of syntactic complexity. In the words of Szmrecsanyi (2004, p.1031):

> there is a dearth of precise definitions and convincing approaches to operationalize these concepts in a straightforward, objective, and non-intuitional way in empirical research designs.

Nevertheless, the study of syntactic complexity has come a long way since then. Various studies were designed to operationalize syntactic complexity (see e.g. Ortega, 2003; Lu, 2010; Crossley & McNamara, 2014) in order to understand how it surfaces in the production of language. Researchers seemed to agree upon on a set of criteria that can measure syntactic complexity. So they agree on the definition of Lu's; five areas, which would capture the notion of complexity.

This resulted in the development of computational tools to measure syntactic complexity. For instances, the L2 Complexity Analyzer by Lu (2010) and Coh Metrix (Graesser, McNamara, Louwerse, & Cai, 2004; McNamara, Graesser, McCarthy & Cai, 2014) in an effort to empirically and objectively capture how language learners employ syntactic complexity and how it changes over time; ushering in a new phase of studies in syntactic complexity using computational tools.

2.2.1 Past Studies of Syntactic Complexity

Research in syntactic complexity can be categorized into three: the development of computational tools in measuring syntactic complexity, the use of syntactic as a predictor of writing quality, and syntactic complexity in the production of second language using both cross-sectional and longitudinal methods (see e.g., Crossley & McNamara, 2009; Lu, 2010; Wood & Struc, 2013; Kim, 2014; Scontras, Badecker, Shank, Lim & Fedorenko, 2014; MacDonald, Montag & Gennari, 2015). This study belongs to the last group that approaches the study longitudinally.

Computational tools in measuring syntactic complexity are continuously being developed, e.g Coh Metrix and The L2 Syntactic Complexity Analyzer (Graesser, McNamara & Louweres, 2003; Ortega, 2003 & Lu, 2010). Computational tools are useful to studies that require analysis of large amount of data. The analysis can be done by looking at the multidimensional measures provided by such tools (e.g., Ai & Lu, 2013; Crossley & McNamara, 2014 and Lu & Ai, 2015)

The second category is studies that predict writing quality through the use of syntactic complexity by using selected essays from corpora (Stewart, 1978; Kim, 2014; Scontras et al., 2014; MacDonald et al., 2015). Stewart (1978) found that "when students in senior high school rewrite a passage presented in extremely short sentences, those in higher grades and those in upper levels of the various grades tend to produce significantly longer clauses, T-units containing a greater number of clauses, and longer

T-units themselves" (p.45). However, students in the first three years of university did not show any significant change in their average scores from the last two years of high school (Stewart, 1978).

Scontras et al. (2014) revealed that participants took a longer time to come out with sentences when showed syntactically complex object-extracted structures. In another study, semantic interference and the way participants retrieved lexical information can influence the production of syntactic complexity (MacDonald et al., 2015). MLT, CT/T and CN/T of syntactic complexity according to Kim (2014) were the strongest predictors of writing proficiency.

The third category of research uses both cross-sectional and longitudinal methods. Cross-sectional studies allow large quantity of data to be collected at a single point in time by researches. This is different from longitudinal studies that require collection of data to be made at different points in time. Cross-sectional design is no longer foreign in the study of SLA or Corpus Linguistics itself (e.g., Wood & Struc, 2013 & Chau, 2015). A cross-sectional study by Wood and Struc (2013) that consists of a corpus of 62 238 words from students of an English writing program revealed the mean values for five measures, i.e. clauses per orthographic sentence, depth of clauses, two measures of subordination (DC/T and DC/C) and T-units per reconstructed sentence, consistently increased.

Larsen-Freeman (1983), Arnaud (1992), Kern and Schultz (1992), Casanave (1994), and Ishikawa (1995) have all conducted longitudinal studies of syntactic complexity. Larsen-Freeman (1983) used five measures of t-units to examine writing compositions of 25 students. The measures were total number of error-free, average number of words and words per error free as well as percent of error-free. Significant changes were noticed in all of the mentioned five measures from the 25 students'

writing compositions when they were asked to describe the chain of events from the four series picture of Donn Byrne's book.

In another longitudinal study by Arnaud (1992), new students from the English department at the Universite Lumiere- Lyon 2 were required to write essays at the beginning of academic year. They were then again tested to write another compositions six to eight weeks later (Arnaud, 1992). The findings revealed that the scores were significant in the three measures of grammar (0.01) whereas, mean length of T-unit only scored 0.05. The results differ from Kern and Schultz's (1992) findings in which they concluded that students' texts are syntactically more complex when there were more words per T-unit (Kern & Schultz, 1992).

Ishikawa's (1995) longitudinal study looked at the writing of two freshmen groups of Japanese women's college. The data were collected during class sessions every week (Ishikawa, 1995). The study discovered that there was a significant change in nine measures in which seven of them are related to clauses (Ishikawa, 1995). The conventional measure of length of T-unit however, did not pick up any significant change (Casanave, 1994; Ishikawa, 1995). Longitudinally, Ishikawa's (1995) study is the closest to this study. However, this study is different in a sense that it uses multiple measures to measure syntactic complexity.

Even though past studies have approached the notion of syntactic complexity through the longitudinal method (see e.g., Larsen-Freeman, 1983; Arnaud, 1992; Casanave, 1994; Ishikawa, 1995), these studies had only used a few constructs. On the other hand, Lu and Ai's (2015) study examined syntactic complexity through multiple constructs, but approached the subject through a native-centric view. The study discovered that non-native speakers from Germany, Bulgaria, French, Russia, Tswana, Japan and China performed differently from 'native speakers' of English in terms of their length of production of units, amount of subordination, coordination, degree of

phrasal sophistication and overall sentence complexity (Lu & Ai, 2015). Similarly, Ai and Lu (2013), discovered the mean values of non-native speakers are lower than native speakers based on 9 out of 10 measures of syntactic complexity. This study uses an approach towards understanding L2 learners' complexity without comparing them to native speakers.

2.2.2 Syntactic Complexity Measures

Since syntactic complexity is a multidimensional construct, it is impossible to obtain a comprehensive understanding using only one measure (Lu & Ai, 2015). From the idea of standardizing the measurements of proficiency proposed by Larsen-Freeman (1978), a study was conducted to look at the relationship between metrics and proficiency levels by Wolfe-Quintero, Inagaki and Kim (1998). The study found that clauses per unit, dependent clauses per clause, mean length of T-unit as well as mean length of clauses (Wolfe-Quintero et al., 1998).

More than a hundred indices was used across 39 studies on second language writing's syntactic complexity to measure accuracy, fluency and complexity (Wolfe-Quintero et al., 1998). From the synthesis, the hundred indices were simplified into fourteen measures. This is due to the fact that many of the hundred measures correlated with each other; eliminating redundancies resulted in just fourteen unique constructs. These fourteen constructs are further classified into five categories: 'length of production unit', 'sentence complexity', 'subordination', 'coordination' as well as 'degree of phrasal sophistication' (Ai & Lu, 2013).

Length of production unit has been found to be positively correlated with learners' proficiencies (e.g., Wolfe- Quintero et al., 1998; Grant & Ginther, 2000; Lu, 2011). Length of production units are measured by calculating average number of words per sentence, clause and T-unit. These measures are used to gauge length of production (Lu, 2010) at the three levels of language production.

Sentence complexity measures the average number of 'clauses per sentence' (C/S). Sentence complexity is used to look at overall production at a sentential level.

Subordination is viewed as a clausal-level sophistication that should be used to measure spoken language (Biber et al., 2011). However, it is extensively used in measuring syntactic complexity for the advanced learners (Bardovi-Harlig, 1992; Norris & Ortega, 2009). Subordination accesses the number of 'clauses per T-unit' (C/T), 'complex t-units per T-unit' (CT/T), 'dependent clauses per clause' (DC/C) and 'dependent clauses per T-unit' (DC/T) (Lu, 2010). Subordination is measures that are used to look at all types of clauses.

Coordination, claimed to be a phrasal level of syntactic feature, is said to appear more in spoken language than written language (Biber, Gray & Ponpoon, 2011). Over time, L2 writers began to produce fewer coordinate clauses (Crossley & McNamara, 2014). Coordination is said to appear more in essays by lower levels of L2 proficiency (e.g., Bardovi- Harlig, 1992; Norris & Ortega, 2009). This is contrary to what Lu and Ai (2011) found in their study: advanced students produced significant coordinate sentences while the lower students used low coordinate sentences. Further researches are needed to understand the use of the measure better. Coordination measures 'coordinate phrases per clause' (CP/C), 'coordinate phrases per T-unit' (CP/T) as well as 'T-units per sentence' (T/S) (Lu, 2010).

The last category of syntactic complexity is particular structures that looks at 'complex nominals per clause' (CN/C), 'complex nominals per t-unit' (CN/T) and 'verb phrases per T-unit' (VP/T) (Lu, 2010). Particular structures are measures that inspect deeper into phrases; units that built up clauses. Writing relies on nouns and nominalizations (Biber et al., 2011). The longitudinal analysis by Crossley & McNamara (2014) showed that over time, L2 writers began to develop more phrasal components. The multilevel analysis of syntactic complexity is measured through these

five categories from the smallest (complex nominals) to the biggest production unit; clauses to form sentences.

Wolfe-Quintero et al. (1998) and Ortega (2003) identified six of the measures from the fourteen constructs. These measures 'mean length of sentence' (MLS), 'mean length of clause' (MLC), 'mean length of t-units' (MLTU), 't-units per sentences' (T/S), 'clauses per t-units' (C/T) and 'dependent clauses per clauses' (DC/C). Five measures were shown to correlate with proficiency; 'clauses per sentences' (C/S), 'coordinate phrases per clauses' (CP/C), 'coordinate phrases per t-units' (CP/T), 'complex nominal per clauses' (CN/C) and 'complex nominal per t-units' (CN/T) (Lu, 2010). Another three measures: 'complex t-units per t-units' (CT/T), 'dependent clauses per t-units' (DC/T) and 'verb phrases per t-units' (VP/T) were suggested by Wolfe-Quintero et al. (1998). The table of fourteen syntactic complexity measures by Lu (2010) can be referred as below along with their definitions and codes:

Table 2.1: The Fourteen Syntactic Complexity Measures by Lu (2010)

Measure	**Code**	**Definition**
Type 1: Length of production unit		
Mean length of clause	MLC	# of words / # of clauses
Mean length of sentence	MLS	# of words / # of sentences
Mean length of T-unit	MLT	# of words / # of T-units
Type 2: Sentence Complexity		
Sentence complexity ratio	C/S	# of clauses / # of sentences
Type 3: Subordination		
T-unit complexity ratio	C/T	# of clauses / # of T-units
Complex T-unit ratio	CT/T	# of complex T-units / # of T-units
Dependent clauses per clause	DC/C	# of dependent clauses / # of clauses
Dependent clauses per T-unit	DC/T	# of dependent clauses / # of T-units
Type 4: Coordination		
Coordinate phrases per clause	CP/C	# of coordinate phrases / # of clauses
Coordinate phrases per T-unit	CP/T	# of coordinate phrases / # of T-units
Sentence coordination ratio	T/S	# of T-units / # of sentences
Type 5: Particular structures		
Complex nominals per clause	CN/C	# of complex nominals / # of clauses
Complex nominal per T-unit	CN/T	# of complex nominals / # of T-units

Verb phrases per T-unit	VP/T	# of verb phrases / # of T-units

In the calculation of syntactic measures, consistent and explicit definitions of each of the construct must be well grounded to validate each calculation (Lu, 2010; Lu & Ai, 2013). Both conceptual and operational definitions are needed to understand how the systems operationalize each construct. The conceptual and operational definitions of each production unit by Lu (2010) are illustrated and described as follows:

Sentence as defined by Lu (2010) is a set of words that ends with any punctuation marks: exclamation mark, a period, question mark, quotation as well as elliptical marks. Operational definition of sentence by Lu (2010, p.9) and an example of sentence from an essay:

"ROOT"

Example*:* 'Ariffin and Saiful went to call ambulance'.

Clause can be described as a structure that contains a subject as well as a finite verb (Lu, 2010). Clause measures nominal clauses, adverbial clauses, independent clauses, and adjective clauses (Lu, 2010, p.10). Operational definition of clause by Lu (2010) and an example of clause from an essay:

"S|SINV|SQ < (VP <# MD|VBD|VBP|VBZ)"

"FRAG > ROOT !<< VP"

Example*:* 'went to the garden'.

A dependent or also known as a subordinate clause is a clause that cannot stand on its own as a complete sentence which includes nominal clause, adjective and finite adverbial (Lu, 2010). Operational definition of dependent clause by Lu (2010, p.10) and an example of dependent clause (the italicized words represent one dependent clause) from an essay:

"SBAR < (S|SINV|SQ < (VP <# MD|VBD|VBP|VBZ))"

Example*:* 'Hamizah and Shafira are my friends *who lives next to my house'*

T unit entails "one main clause plus any subordinate clause or nonclausal structure that is attached to or embedded in it" (Hunt, 1974, p. 4 as cited in Lu, 2010). Operational definition of t-units by Lu (2010, p.11) and an example of t-units (the italicized words represent one t-unit taken from a sentence) from an essay:

"S|SBARQ|SINV|SQ > ROOT | [$-- S|SBARQ|SINV|SQ !>> SBAR|VP]"

"FRAG > ROOT"

Example*: 'Azman ran quickly,* as fast as he can to safe that girl in the water'.

A complex t-unit comprises of dependent clause (Lu, 2010). Operational definition of complex t-units by Lu (2010, p.11) and an example of complex t-units from an essay:

"S|SBARQ|SINV|SQ [> ROOT | [$-- S|SBARQ|SINV|SQ !>> SBAR|VP]] << (SBAR < (S|SQ|SINV < (VP <# MD|VBP|VBZ|VBD)))"

Example*:* 'They collected some beautiful flowers beside the river'

Coordinate phrases are phrases that are coordinated in a sentence that normally coordinates adjective, nouns, adverbs and verbs phrases together (Lu, 2010). Operational definition of coordinate phrase by Lu (2010, p.12) and an example of coordinate phrase from an essay:

"ADJP|ADVP|NP|VP < CC"

Example*:* 'Hamizah and Shafira'.

Complex nominal denotes noun with an addition of one of the followings: "(i) nouns plus adjective, possessive, prepositional phrase, relative clause, participle, or appositive, (ii) nominal clauses, and (iii) gerunds and infinitives in subject position" (Cooper, 1976, as cited in Lu, 2010). Operational definition of complex nominal by Lu (2010, p.12) and an example of complex nominal from an essay:

"NP !> NP [<< JJ|POS|PP|S|VBG |<< (NP $++ NP !$+ CC)]"

"SBAR [$+ VP | > VP] & [<# WHNP |<# (IN < That|that|For|for) |<, S]"

"S < (VP <# VBG|TO) $+ VP"

Example*:* 'a delicious meal'.

Verb phrases comprise of both non-finites as well as finite verbs (Lu, 2010) Operational definition of a verb phrase by Lu (2010,p.13) and an example of verb phrase from an essay:

"VP > S|SQ|SINV"

Example: 'Enjoy themselves'.

2.3 Learner Corpus Research

Learner corpus research is "a collection of texts produced by learners of a language" (Hunston, 2002, p.15). Learner corpora are empirical means that are used to show what learners know and do not know about their L2 (Cobb, 2003). Conventionally, learner corpus is usually compared between learners and native speakers of language. 'International Corpus of Learner English' (ICLE) is an example of a learner corpus, and the comparable corpus of it, is the 'Louvain Corpus of Native English Essays' (LOCNESS) (Hunston, 2002). However, such thing is not desirable in this corpus. To achieve a better understanding of L2 development and use, related disciplines such as SLA, bilingualism and multilingualism should be incorporated into corpus-based L2 research (Chau, 2012). Learner corpus research is known for bridging two fields: SLA and corpus linguistics (Chau, 2015).

Learner corpus research is useful in a sense that it provides a valuable description of student language (Chau, 2015) but not without limitations. One of them is that most of these studies tend to compare learner language with the native language (see e.g., Granger & Tyson, 1996; Granger, 1997; Altenberg & Granger, 2001; Cobb, 2003; Shirato & Stapleton, 2008, Gilquin & Granger, 2011). This is a problem in many

ways with one of them being that a learner's native language has been shown to interfere in the production of second language (e.g., Edelsky, 1982; Kobayashi & Rinnert, 2008; Uysal, 2008; van Weijen, van den, Rijlaarsdam & Sanders, 2009; Lally, 2010; Rankin, 2011). L1, rather than L2 features, tend to be produced in L2 activity (van Weijen, et al., 2009; Lally, 2010). For example, L1 inversions were transferred into L2 writing (Rankin, 2011; Uysal, 2008). Apart from that, verbs patterns, e.g. subject-initial clauses and interrogatives, were also transferred into L2 writing (Rankin, 2011), e.g. participants resorted to using 'be' inversion when participial and infinitival phrases were supposed to be used (Rankin, 2011).

Native speakers on the other hand do not experience interference from any language. Thus, the comparisons between a learner's language with a native language are obsolete as comparisons were not made on the same platform. Gilquin and Granger's (2011) study for example showed the closest to the reference corpus is Dutch learners, followed by the French and Spanish. Such study should take into consideration the degree of distinctions that these three different languages have, for example, their syntactic systems. One of these languages might be syntactically similar to the reference language. Learners whose L1 is Dutch should be studied with the same L1 Dutch learners. Through this approach, it will be easier to establish and observe changes in learners' language.

Another limitation of the previous learner corpus studies is that they are limited to observation in errors (e.g., Milton & Tsang, 1993; Granger & Rayson, 1998; Altenberg & Granger, 2001; Cobb, 2003). Take Milton and Tsang (1993) for example that discovered that connectors were misused and redundantly used in Chinese students' writings. Granger and Rayson (1998) on the other hand found out that in French learner corpus, *the* as the definite article was underused and the indefinite article *a* is vice versa. In another study, it has been found that the verb *make* was underused by the French

while the Swedish learners on the other hand used the verb a bit more than native speakers (Altenberg & Granger, 2001). In a study of advanced Quebec learner corpus, it was found out that "almost 90% of vocabulary items used in writing by these advanced learners are common words from the 0-1000 frequency range" (Cobb, 2003, p. 403). This simply means that learners made use of basic lexical items over and over again in their writing confirming an overuse hypothesis (Cobb, 2003).

The emphasis on language performance errors by learners, that has always been the focus SLA (Larsen-Freeman, 1978) just like the studies above, can limit the interpretation of data. In summary, their approach reduces language development to descriptions of right and wrong of the so-called native language.

2.4 Language Learner: Monolinguals vs Bilinguals

Language users who know more than one language are different from language users who use only one language. This argument is captured by Basetti and Cook (2011): "If differences in linguistic representation lead to differences in cognition among speakers of different languages, what happens to people who know more than one language?" (p.143). They further argued that bilinguals look at the world differently than the monolinguals (Bassetti & Cook, 2011). Biologically, it has been proven that "the grey-matter density in bilinguals' brain was greater as compared to monolinguals" (Mechelli et al.,2004, p.757). There should be no reason to compare bilinguals and monolinguals if they are biologically different.

The issue of conceptualization of meanings between different types of language users should also be taken into account. A native speaker according to the definition given by Cook (2005) is someone who speaks the language that was "first learned in his or her childhood" (p.50). Based on this definition, an L2 learner will never be a native speaker unless the L2 is acquired during childhood, which is paradoxically impossible (Cook, 2005).

2.5 Second Language Writing Research

The study of the second language writing area can be traced back to 1960s, exploring the writing of L2 learners as well as writing instruction that was later developed into its own field of language with its own structures (Matsuda, Canagarajah, Harklau, Hyland & Warschauer, 2003).

The field of second language writing has garnered various theoretical discussions from scholars in the field in an attempt to deliver teachings that fit L2 learners' needs in the study of English (Leki, Cumming & Silva, 2010). While this field has been explored in the past decades, and is still being expanded, most studies in the area of second language writing are still tied to native-centric perspective (Chau, 2015). Hinkel's (2011) synthesis of L2 writing research based on decades of research for example, shows L2 writers performed 'lower' as compared to L1 writers. For instance,

> L2 writers often neglect to account for counterarguments and to anticipate audience reactions, significantly more often leave their argumentation unsupported, construct less fluent and less detailed/explanatory prose produce shorter and less elaborated texts, exhibit less lexical variety and sophistication, contain significantly fewer idiomatic and collocational expressions, have smaller lexical density and lexical specificity, more frequent vocabulary misuses, use shorter words (fewer words with two or more syllables, more conversational and high frequency words (e.g., good, bad, ask, talk) and Incorrect or omitted prepositions, e.g., *from my opinion, *At some time there is this young businessman who just about takes a taxi of the airport (Hinkel, 2011 as cited in Chau, 2015, pp. 26-27).

The problem with this comparison is that, linguistic repertoires of L1 and L2 writers are different because L2 writers may not have the same oral knowledge to transfer into written language unlike L1 speakers (Leki et al., 2010). This is due to the fact that writing in first language is an automatic process as the structures of language may be easily accessible just like in speaking (Schoonen et al., 2003), indicating that the readily available knowledge of the language that L1 writers have may not be easily accessible to L2 writers. Scnoonen et al., (2003) further argued that the writing process involves linguistic resources that are needed by writers to produce written texts. This

brings out the question: how does an L2 writer perform in conditions whereby his linguistic resources are different from L1 writers as different exposures to L2 can also influence the linguistic knowledge of L2 writers (Schoonen et al., 2003).

Apart from that, L2 writers have more than one language to access unlike L1 writers (Woodall, 2002). Woodall (2002) further argued that during writing process, L2 writers occasionally change to their first language, which is something that is not experienced by speakers who use only one language. Switching happens in the production of second language speech "between a stronger first language (L1) and a relatively weaker second language (L2), the cost of switching languages should be larger for a switch to L1 than for a switch to L2" (Meuter & Allport, 1999, p. 26). Switching by L2 writers in the writing process occurs due to difficulties in operating in second language (Woodall, 2002), especially when the semantic elements of the languages are different from one another (Navarro & Nicoladis, 2005). This is contrary to speech production switching that occurs to get the messages through for communicative purpose (Odlin, 1989 & Woodall, 2002).

Additionally, L2 speakers are exposed to different situations while they are acquiring and operating second language in both spoken and written forms. These learners that come from different backgrounds for example in North America where some students have little literacy, other students have never been to school until the age of 17, some students are already equipped with the knowledge in language prior to coming to the country, whereas other students have learned in private schools, and others who were educated in refugee camps, are all expected to be in the same group and learn English together (Leki et al., 2010). This begs the question, how effective are the pedagogical approaches used in educating these learners when the approaches are measured based on comparison to other speakers of different background that are not the of same background as these learners?

Based on the arguments presented above, the field of second language writing research should refocus from comparing L1 with L2 writers to understanding how L2 writers develop their second language by themselves. This should be done to ensure pedagogical approaches in teaching are suitable to the context of learning a second language. Therefore, instead of approaching the lessons through the lens that L2 learners are copycats of L1 learners, the focus should shift to an understanding of what actually works for L2 learners in acquiring a second language. Consequently, what works for L1 learners might not work for L2 learners and vice versa.

2.6 Conclusion

Overall, this chapter presents the notion of syntactic complexity, past studies of syntactic complexity, syntactic complexity measures, learner corpus research, language learners and the field of second language writing research. The next chapter discusses how the corpus selection was made and how the data were analyzed step by step.

CHAPTER 3: METHODS

3.1 Introduction

This chapter begins by discussing the selection of corpus for the study and tools that were used to analyze syntactic complexity of the participants. The chapter then discusses the number of participants and how long the data collection took place. The three tools that are introduced in this chapter (refer to 3.3) were used to measure the fourteen measures of syntactic complexity by the participants. This chapter also discusses how each construct was selected as a measure of complexity based on previous studies that were conducted.

3.2 Corpus Collection

This study uses an existing Longitudinal Corpus of Languaculturer Narrative Texts by Chau (2015). The corpus was collected over a 24-month period at four different points of time (May 2007, November 2007, November 2008, June 2009) using the same group of 124 students. When data collection began in May 2007, these participants were 13-year-old students (secondary-one) from the same L1 background: Malay (Chau, 2015). The corpus developer has granted the access to these data.

The participants were required to write texts within an hour without reference to external materials (Chau, 2015). A repeated picture-narrating task as follows was used by the participants. The picture shows a female character that has fell down into river and the process involved to show how she is saved from drowning (Chau, 2015).

Figure 3.1: A repeated picture narrating-task that was used by the participants in the study. (Source: Chau, 2015)

3.3 Methods

The L2 Complexity Analyzer was used to process the written English samples of the participants and provided 14 indices as a measure of syntactic complexity through two processes: the preprocessing stage and syntactic complexity analysis stage (Lu, 2010). In the preprocessing stage, the syntactic structure was analyzed using a syntactic parser. The syntactic parser produced parse trees; each tree indicating an analysis of a sentence's syntactic structure (Lu, 2010). In the syntactic complexity stage, the system produced 14 syntactic complexity measures after analyzing each text by counting the occurrences of all the production of the indices (if there was) and calculated total production. Three tools that were used to carry out the two stages mentioned above:

1. Standford Parser. Standford parser was developed by Klein and Manning in 2003 (Lu, 2010). It categorized each constituent in sentences into groups. For example, the sentence "I am fat". 'I' will be catalogued into noun or pronoun group while 'am' is a verb and 'fat' will be parsed as adjective.

2. Tregex by Lewy and Andrew was introduced in 2006 (Lu, 2010). Tregex was used to retrieve and count the number of occurrences of each production unit (Lu, 2010).
3. The syntactic complexity analyzer. The sentences that have been parsed were inserted into this program to produce fourteen codes as well as their measures (Lu, 2010).

3.4 What Each Construct Measures

As noted earlier in 2.1.2, there are five areas of focus of complexity: 'length of production', 'sentence complexity', 'subordination', 'coordination' and 'particular structures' (Lu, 2010). From these five categories, fourteen measures of syntactic complexity are constructed. This section analyses each construct of syntactic complexity to understand how changes in each of the production unit realizes in the writing production of L2 learners when is increases/ decreases. Furthermore, each construct is analyzed to understand why each of the construct was chosen as a measure of syntactic complexity and from where the constructs are derived.

Changes within each measure in the corpus were analyzed. For each measure, examples of essays are showed to observe changes in the production unit. These examples were taken from students at different times at their highest and lowest scores The purpose of these analyses is to look at how changes manifest themselves in L2 students' writing. While the changes that happened in each of the writing of students are not the same to one another, they are treated as examples of different choices. As pointed out by Chau (2015, p.125):

> Rather than being compared with an external norm of reference, earlier and later texts by the same narrators are treated as examples of different, changing choices and strategies on the part of the narrators, with, as will be seen, complexity as a distinctive feature emerging from such an analysis

What follows is a series of examples chosen from the language learners that went through the most significant change in each construct. This is done for the purpose of highlighting the changes of each of construct of narrative writings produced over time. For instance, the use of MLS went through the most significant change from Time 1 to Time 4 while CP/C went through significant change at Time 2 and Time 3. Therefore, essays at Time 1 and 4 were selected from the same student that scored highest significant change at Time 1 and Time 4 for MLS and essays at Time 2 and 3 were selected from the same student that has significantly change at Time 2 and Time 3. The symbol *a* is used for Time 1, *b* for Time 2, *c* for Time 3, and *d* for Time 4. In the following subsections for each construct, examples are taken from excerpts from students' texts (see Appendix A- M for full texts).

3.4.1 MLS

MLS denotes the average number of words per sentence in a text that ends with any punctuation mark, covering all the parts of speech (see 2.1.2 for example). This measure is calculated by counting the total number of words divided by the total number of sentences. The difference between low MLS structures and high MLS structures is the number of each of part of speech as well as the number of words produced in a sentence. Given that high MLS structures have more words, it can be said that more information can be extracted from higher MLS essays. The types of information retrievable through MLS are: places, persons, things, ideas (nouns), words that describe actions or processes (verbs), words that are used to replace nouns (pronouns), words that modify nouns or pronouns (adjectives), the spatial, temporal or

directional relationships between a noun and other words (prepositions), words that link other words or parts of sentences together (conjunction) and emotions (interjections). Subsequently, the increase in the use of MLS indicates a heavy use of one or more of such information: heavy use of words to describe places, things and words used to describe actions and so on and vice versa.

In a cross-sectional study by Monroe (1975), it has been found that there was a steady increase of words per sentence from five groups of students from freshmen, sophomores, juniors and seniors, graduate students and native speakers sophomores. The same finding can be found in Cooper (1976) that analyzed sophomores, juniors, seniors, graduate students and German native speakers. Consider the following example taken from a student's essays at the highest and lowest mean of words per sentence (see Appendix A for full texts):

Table 3.1: Sentences at Time 1 and Time 4 by Learner 034

	Sentence	Number of words per sentence
034-a	They wanted to get some flowers to give her teacher.	10
034-d	They went to the river because public holiday and there are very happy to go there.	16

Both of the above sentences are the continuation of events from the previous sentences that talk about why 'they' went to the river. The first sentence from learner 034 at time 1 has 10 words while at time 4, the number of words has increased to 16. Two information can be extracted from the first sentence: first, *'they'* in the sentence wanted to get some flowers. Second, the flowers are for their teacher. At time 4, extra information is observed: first, *'they'* went to the river. Second, the reason for going to the river was because it was a public holiday. Finally, *'they'* are feeling very happy having managed to go there. Unlike sentence at time 4, sentence at time 1 did not discuss the feeling of *'they'*.

3.4.2 MLC

MLC denotes the average number of words per clause in a text that contains structures with subjects and finite verbs (see 2.1.2 for example). MLC is calculated by dividing by the total number of clauses with the total number of words. A study by Stewart (1978) showed that upper-level high school students scored higher standard deviations of words per clause as compared to lower-level high school students. Monroe's cross-sectional study (1975) observed an increase of words per clause employment from freshmen to native speakers (see also Cooper, 1976 for similar observation). Clause length is also used to differentiate between poor and good freshmen writings (Gebhard, 1978, Lu, 2011). Consider the following example taken from a student's essays at the highest and lowest mean of clauses per sentence (see Appendix B for full texts):

Table 3.2: Clauses at Time 1 and Time 4 by Learner 028

	Sentence	Clause	Number of words per clause
028-a	Last Saturday, Azriff and his friends went to fishing at the river in Kampung Semberong.	Last Saturday, Azriff and his friends went to fishing at the river in Kampung Semberong.	15
028-d	Last Saturday, Ah Chong and his friends went to a Kampung Baru in Kluang.	Last Saturday, Ah Chong and his friends went to a Kampung Baru in Kluang.	14

The difference between the first clause and the second clause is only one word. Though in both clauses, *Azriff/Ah Chong* went back to *kampung*, one event is missing from the second clause at time 4, which is *fishing*.

3.4.3 MLT

Since t-unit is the shortest grammatically allowable sentence (Hunt, 1965) higher MLT essays therefore have more words in these 'short sentences'. MLT looks at the average number of words per t-unit (see 2.1.2 for example). This is calculated by dividing the total number of t-units with the total number of words in an essay. Hunt (1965) discovered that children write longer as they grow older: grade 4, 8, 12 and adults have an average length of t-units of 8.6, 11.5, 14.4 and 20.3 words respectively. On the other hand, longitudinal studies by Casanave (1994) and Ishikawa (1995) show no significant change in the MLT in their studies. ESL students were seen to employ more words in their t-units as compared to the FL students (see Cooper, 1976, Henry, 1996; Homburg, 1984; Kern & Schultz, 1992 Larsen-Freeman, 1978; Larsen-Freeman, 1983 & Monroe, 1975 for further details). Consider the following examples taken from a student's essays at the highest and lowest mean of words per T-unit (see Appendix C for full texts):

Table 3.3: Sentences and T-units at Time 1 and Time 4 by Learner 054

	Sentence	T-unit	Number of words per t-unit
054-a	And, me jumping to the river to safe the girl.	*And, me jumping to the river to safe the girl*	10
054-d	Without good thinking, Ali jump into the river after we knew that was happening there and I went to the nearest public phone to call the ambulance and her parents.	*Without good thingking, Ali jump into the river after we knew that was happening there*	15
		and I went to the nearest public phone to call the ambulance and her parents.	15

Two observable differences can be seen from the texts: the amount of information in these 'short sentences' (t-units) and the number of words per T-unit. The MLT of text 054-a is 10.1111 while text 054-d is 14.9333. The first sentence is taken from time 1 and the second sentence is taken from time 4. While the second sentence

has two t-units, the first sentence has one t-unit. The t-unit in the first sentence consists of 10 words while both t-units from the second sentence has 15 words. In the t-unit of the first sentence, the information stops after the action of 'jump'. What follows 'jump' is the reason that caused 'jump' to happen in the first place. Meanwhile, in the first t-unit of the second sentence, two additional information are observed. The first one is what the actor of 'jump' did before jumping (which is *'without good thingking'*) which comes before the action of 'jump' and the second information is the cause of the jump *which is after we knew what was happening there,* that exists after the action of 'jump'.

3.4.4 C/S

C/S denotes the total number of clauses per sentence (see 2.1.2 for examples of clauses and sentences and for the definitions of clause and sentence). This measure is calculated by dividing the total number of sentences with the total number of clauses in an essay. A longitudinal study by Ishikawa (1995) showed a significant change in the use of clauses per sentence by one group of freshmen Japanese women's college after taking 'Oral English' and English classes for 90 minutes per week for three months. Consider the following examples taken from a student's essays at the highest and lowest mean of clauses per sentence (see Appendix D for full texts):

Table 3.4: Sentences and Clauses at Time 1 and Time 4 by Learner 010

	Sentence	Clause	Number of clauses per sentence
010-a	Aina and Aika wanted to pluck some flowers for their mother as present in Mother's Day.	Aina and Aika wanted to pluck some flowers for their mother as present in Mother's Day.	1
010-d	Their brothers wanted to fish but Memu and Emu wanted to pluck some beautiful flowers for their room decorations.	Their brothers wanted to fish Memu and Emu wanted to pluck some beautiful flowers for their room	2

decorations.

The first text has 20 clauses with 17 sentences while the second text has 64 clauses with 34 sentences, making the C/S ratios as 1.1765 and 1.8824 respectively. The first sentence from learner 010 is at time 1 while the second sentence is from time 4. The first sentence has one clause while the second sentence has 2 clauses per sentence. From the examples given, it can be seen that there was only one occurrence in the first sentence, which is *wanted* while in the second sentence, two occurrences are highlighted, which are *wanted* in the first clause and another *wanted* from the second clause. In this context, clause is used as a representation of human experience, to highlight the processes of what happened (Halliday, Matthiessen & Matthiessen, 2014).

3.4.5 C/T

C/T denotes the total number of clauses per t-unit (see 2.1.2 for examples of clause and t-unit and for the definitions of clause and t-unit). This measure is calculated by counting the total number of clauses in an essay and divided by the total number of t-units in an essay. Hunt (1965) observed an increase in clauses per t-unit ratio as grades increased. In narrative essays, writing quality and clauses per T-unit has been found to be positively correlated to one another (Beer & Nagy, 2007). C/T can also be used to differentiate between college-level L2 writing groups (Ortega, 2003) and was found to be highly applied in higher-level learners' as compared to the lower ones (Iwashita, Brown, McNamara & O' Hagan, 2008). Similarly, higher grades of high school students were also seen to use more clauses per t-unit as compared to the lower ones (Stewart, 1978). It is also suggested that advanced writers tend to reduce the use of clausal forms in writings as clauses can be reduced to phrases indirectly reducing C/T (Wolfe-Quintero, 1998). Consider the following example taken from a student's essays at the highest and lowest mean of clauses per T-unit (see Appendix E for full texts):

Table 3.5: T-units and Clauses at Time 1 and Time 4 by Learner 049

	T-unit	Clause	Number of clauses per t-unit
049-a	her friend shouded loud as she can to get help.	Her friend shouded loud she can to get help	2
049-d	As we were arrived, we told to her parents what were happened to their daughter.	As we were arrived we told to her parents what were happened to their daughter.	3

The first t-unit from learner 049 has 2 clauses while at time 4 the number of clauses per t-unit is 3. From the examples given, it can be seen that there were two occurrences in the first t-unit, which are *shouded* and *can* while in the second sentence, three occurrences are highlighted, which are *arrived* in the first clause, *told* from the second clause and *were happened* from the third clause. From the examples given, it can be seen that more human experiences can be expressed in t-unit that has more clause.

3.4.6 CT/T

CT/T denotes the total number of complex t-units per t-unit (see 2.1.2 for examples of complex t-unit and t-unit and for the definitions of complex t-unit and t-unit). This measure is calculated by counting the total number of complex t-units in an essay and divided by the total number of t-units in an essay. Complex t-units per t-unit has been considered as a poor index of development (Lu, 2011). However, this study uses CT/T to test the construct for different demography of learners apart from it being one of the constructs of complexity by Lu (2010). Consider the following example taken from a student's essays at the highest and lowest mean of complex t-units per t-unit (see Appendix F for full texts):

Table 3.6: T-units and Complex T-units at Time 1 and Time 4 by Learner 010

	T-unit	Complex t-unit	Number of complex t-units per t-unit
010-a	Aina and Aika are twins	-	0
010-d	As they are siblings, they love each other very much.	As they are siblings, they love each other very much.	1

In the first t-unit, no complex t-unit was detected. In the second t-unit, one complex t-unit was applied. By Lu's (2010) definition, a complex t-unit contains a dependent clause. However, in the above examples, it can be seen that complex t-unit and t-unit are the same. While t-unit can sometimes be a sentence, from the above example, it appears that complex t-unit=t-unit=sentence.

3.4.7 DC/C

DC/C denotes the total number of dependent clauses per clauses (see 2.1.2 for examples of dependent clauses and clauses and for the definitions of dependent clause and clause). This measure is calculated by counting the total number of dependent clauses in an essay and divided by the total number of clauses in an essay. Pallotti and Ferrari's (2008) study observed a high use of subordination ratio in narrative task (as cited in Pallotti, 2009). Ortega's synthesis of college L2 writings showed ESL learners scored higher mean value of DC/C as compared to the FL learners. In a discriminant analysis by Homburg (1984) related to holistic ratings, five measures accounted to 84% of the variance among the levels; in which DC/C is one of the measures. This means DC/C can be used to predict in which level a learner belongs to. Consider the following example taken from a student's essays at the highest and lowest mean of dependent clauses per clause (see Appendix G for full texts)

Table 3.7: Clauses and Dependent Clauses at Time 1 and Time 4 by Learner 010

	Clause	Dependent Clause	Number of dependent clauses per clause
010-a	Mei Ling so shocked	-	0

	with the accidence		
010-d	Farah cried because she she worried	because she worried	1

The first clause at time 1 has no dependent clause insinuating that there was no connection made to the previous event (occurrence) The second clause at time 4 has one dependent clause which is '*because she worried'* that was made to connect to the previous occurrence which was *'Farah cried'*. The reason for *'Farah cried'* was due to *'because she worried'*.

3.4.8 DC/T

DC/T denotes the total number of dependent clauses per t-unit (see 2.1.2 for examples of dependent clauses and t-unit and for the definitions of dependent clause and t-unit). This measure is calculated by counting the total number of dependent clauses in an essay and divided by the total number of t-units in an essay. While "some measures failed to differentiate between adjacent levels of proficiency, report that the mean length of T-unit (MLTU), mean length of clause (MLC), mean length of error-free T-unit (MLEFTU), C/TU, dependent clauses per clause (DC/C), and DC/TU, "consistently increased in a linear relationship to proficiency level across studies"" (Wolfe Quintero et al., 1998 as cited in Struc & Wood, 2011, p. 53). However, Taguchi, Crawford and Wetzel (2013) found that lower-rated essays utilized more subordinating conjunctions as compared to higher-rated ones. Consider the following example taken from a student's essays at the highest and lowest mean of dependent clauses per t-unit (see Appendix H for full texts):

Table 3.8: T-units and Dependent Clauses at Time 1 and Time 4 by Learner 049

	T-unit	Dependent Clause	Number of dependent clauses per clause
049-a	Mei Ling so shocked with the accidence	-	0
049-d	Farah cried because she she worried	because she worried	1

3.4.9 CP/C

CP/C denotes the total number of coordinate phrases per clauses (see 2.1.2 for examples of coordinate phrase and clause and for the definitions of coordinate phrase and clause). This measure is calculated by counting the total number of coordinate phrases in an essay and divided by the total number of clauses in an essay. In a discriminant analysis carried out by Homburg (1984), coordinating conjunctions per composition was one of the measures that accounted for 84% of the variance among strata 5, 6 and 7. This means coordinating conjunctions per composition is vital in classifying which stratum a learner belongs to. Consider the following example taken from a student's essays at the highest and lowest mean of coordinate phrases per clause (see Appendix I for full texts):

Table 3.9: Clauses and Coordinate Phrases at Time 2 and Time 3 by Learner 067

	Clause	Coordinate phrase	Number of coordinate phrases per clause
067-b	Last Holiday, Maria and Syahira went to the river and plucked the flowers.	Maria and Syahira went to the river and plucked the flowers.	2
067-c	They were walking along the river bank and chated with each other.	walking along the river bank and chated with each other	1

The first clause from learner 067 at time 2 has 2 coordinate phrases while the second clause from time 3 has 1 coordinate phrase per clause. In the first clause, two nouns, '*Maria'* and '*Syahira'* and two verbs phrases were connected *'went to the river and plucked the flowers'*. In the second clause, instead of using two nouns, one pronoun was used; '*they'*. '*They'* was followed by a verb phrase: *'walking along the river bank and chated with each other'*. The function of coordinate conjunctions in writing is to connect two things or phrases together, showing multiple actions in sentences rather than one action at a time.

3.4.10 CP/T

CP/T denotes the total number of coordinate phrases per t-unit (see 2.1.2 for examples of coordinate phrase and t-unit and for the definitions of coordinate phrase and t-unit). This measure is calculated by counting the total number of coordinate phrases in an essay and divided by the total number of t-units in an essay. As proficiency increases, leaners were found to use less coordinating conjunctions. The percentage of coordination index has decreased from 39.9% to 10.3% from level 1 to level 7 learners (Bardovi-Harlig, 1992). Coordination constructs are useful in measuring beginner level of L2 competence to capture syntactic complexification (Norris & Ortega, 2009). This means, higher proficient learners rely less on coordination in combining sentences. Consider the following example taken from a student's essays at the highest and lowest mean of coordinate phrases per t-unit (see Appendix J for full texts):

Table 3.10: T-units and Coordinate Phrases at Time 1 and Time 4 by Learner 025

	T-unit	Coordinate phrase	Number of coordinate phrases per t-unit
025-a	My friends and I went to the river bank	My friends and I	1
025-d	Ali and his friends heard that yell and shocked	Ali and his friends yell and shocked	2

The first clause from learner 025 at time 1 has 1 coordinate phrase while the second clause from time 4 has 2 coordinate phrases per t-unit. In the first clause, two nouns, '*my friends'* and '*I* were connected. In the second clause, two nouns were still applied: '*Ali*' and '*his friends*' that followed by an adjective phrase: *'yell and schocked'*. The function of coordinate conjunctions in writing is to connect two things or phrases together, showing multiple actions in sentences rather than one action at a time.

3.4.11 T/S

T/S denotes the total number of t-units per sentence (see 2.1.2 for examples of t-unit and sentence and for the definitions of t-unit and sentence). This measure is calculated by counting the total number of t-units in an essay and divided by the total number of sentences in an essay. T-units per sentence has been shown to decrease with L1 school students' levels except for professional writers (e.g Hunt, 1970). Cooper's (1976) study showed a monotonous use of T/S across all L2 levels except for native German learners who scored 1.3 mean value of T/S as compared to a 1.2 of the rest of the learners (sophomores, juniors, seniors and graduate students). Consider the following example taken from a student's essays at the highest and lowest mean of t-units per sentence (see Appendix K for full texts):

Table 3.11: Sentences and T-units at Time 1 and Time 4 by Learner 021

	Sentence	T-unit	Number of t-units per sentence
021-a	She thanked for their quick act	She thanked for their quick act	1
021-d	They went back home and I was totally thankful that they had came at the right time to save Qila.	They went back home I was totally thankful that they had came at the right time to save Qila.	2

The first sentence from learner 021 at time one has one t-unit while the sentence at time 4 from the same learner has two t-units. Both of the above sentences reported events that occurred after the previous sentence. The sentence with two t-units talks about two new events that are crammed into one sentence whereas in the first sentence, only one event is observed. After '*they went back home*' (first event), the writer felt thankful because her friend was saved (second event).

3.4.12 CN/C

CN/C denotes the total number of complex nominals per clauses (see 2.1.2 for examples of complex nominal and clause and for the definitions of complex nominal and clause). This measure is calculated by counting the total number of complex nominal in an essay and divided by the total number of clauses in an essay. Yau (1991) found a moderate correlation between words in complex nominal per clause and clause length (r=.77) (as cited in Wolfe-Quintero et al.,, 1998). This means the number of words per t-unit is moderately influenced by the number of words in complex nominal indicating that complex nominals play an important role in writing. Since the number of words in complex nominals only shows their lengths in writing, Wolfe- Quintero et al., suggested to change them to CN/N and CN/T to show their frequency of appearance. Lu (2010) argues that advanced writers produce longer clauses and T-units due to an increase in the use of complex nominals and complex phrases and not because of the

increase in the use of dependent clauses (as cited in Wood & Struc, 2011). Consider the following example taken from a student's essays at the highest and lowest complex nominal per clause (see Appendix L for full texts):

Table 3.12: Clauses and Complex Nominals at Time 1 and Time 4 by Learner 028

	Clause	Complex nominal	Number of complex nominals per clause
028-a	A girls thanked him for his good deed	his good deed	1
028-d	they walked a long the long and deep river to find a good place for fishing.	a long the long and deep river a good place for fishing	2

The increase in the use of CN per C shows a better narrative of things. Things/ objects are described in a more elaborate way through the use of CN. From the examples above, it can be seen that the use of complex nominals makes narrative writing more descriptive. Instead of just plainly 'river', the river is described graphically: *long* and *deep*.

3.4.13 CN/T

CN/T denotes the total number of complex nominals per t-unit (see 2.1.2 for examples of complex nominal and t-unit and for the definitions of complex nominal and t-unit). This measure is calculated by counting the total number of complex nominal in an essay and divided by the total number of t-units in an essay. Yau (1991) had also found a moderate correlation between words in complex nominal per T-unit with words per T-unit (r=.82) (as cited in Wolfe-Quintero et al., 1998). The use of nominals increased across students' levels (Cooper, 1976). A proficient group of graduate students has been shown to use a higher number of nouns, possessive nouns, participle and appositive noun phrases (complex nominal) as compared to a lower proficient group that used a lot of noun modifiers (Parkinson & Musgrave, 2014). Complex

nominals, relative clauses and articles are indicative of certain development (Wolfe-Quintero et al.,1998) and writing proficiency (e.g Lu, 2011). Consider the following example taken from a student's essays at the highest and lowest complex nominal per clause (see Appendix L for full texts):

Table 3.13: T-units and Complex Nominals at Time 1 and Time 4 by Learner 028

	T-unit	Complex nominal	Number of complex nominals per t-unit
028-a	He is kind and good person	Kind and good person	1
028-d	They brought a old rusty fishing rod and a medium red old pail with them.	a old rusty fishing rod and a medium red old pail	1

Both of the above examples have one complex nominal per t-unit. As previously mentioned, the presence of complex nominals makes describing things become more expressive.

3.4.14 VP/T

VP/T denotes the total number of verb phrases per t-unit (see 2.1.2 for examples of verb phrase and t-unit and for the definitions of verb phrase and t-unit). This measure is calculated by counting the total number of verb phrases in an essay and divided by the total number of t-units in an essay. Since clauses that are included in the C/T construct are finite clauses and DC/T only includes three non-independent clauses, VP/T was proposed to measure all seven types of finite and non-finite verbs (Wolfe-Quintero et al., 1998). Significant differences were found in the use of verb phrases with mean values of 0.40, 0.44, 0.39, 0.44, 0.54 for level 1, 2, 3, 4, and 5 students respectively (Iwashita et al., 2008). Consider the following example taken from a student's essays at the highest and lowest complex nominal per clause (see Appendix M for full texts):

Table 3.14: Verb Phrases and T-units at Time 1 and Time 4 by Learner 048

	T-unit	Verb phrase	Number of verb phrases per t-unit
048-a	she just can shouted searching for help.	can shouted searching for help	2
048-d	The girl can not swim	can not swim	1

A verbal group functions as an expansion of a verb that ends with events (Halliday t al., 2014). In the first t-unit at time 1, two verb phrases are used: *can shouted* and *searching* for *help*. In the second t-unit, only one verb phrase is used: *can not swim*. In the first –unit, the expansion of verb to describe event is more prominent as compared to the second t-unit. No new information has been added after the verb phrase *can not swim* whereas in the first t-unit, a new event occurred (*searching for help*) as the result of the first verb phrase (*can shouted*).

While some of the measures were originally used in measuring the complexity of L1 learners (e.g Hunt, 1965; Hunt, 1970), these measures have been adopted into the field of second language acquisition to capture learners' complexity. Though measures like CT/T, VP/T and C/T did not differentiate learners' levels in school (see Lu, 2011 for further details), these measures were included in this study to examine a different demography of learners with different L1 backgrounds to see whether these measures are capable of differentiating learners' development.

3.5 Data Analysis

The scores from L2 Syntactic Complexity Analyzer were analyzed using repeated measures ANOVA. ANOVA established the statistical differences of 14 indices between four different points in time of 124 students. Statistical analysis of various measures show how students significantly change over time.

Of the 14 measures, only DC/C was normally distributed and without outliers as assessed by Shapiro-Wilk test ($p > .05$) and boxplot. Outliers are "an observation which

deviates so much from other observations as to arouse suspicions that it was generated by different mechanism" (Hawkins, 1980).

All other measures were positively skewed, requiring the data to be transformed according to severity of skewedness as follows: square root transformation for DC/T, CP/T, CP/C and CN/C, Log 10 transformation for MLT, and C/S, and finally, inverse transformations on MLS, MLC, VP/T and C/T. Transformations were unsuccessful in normalizing T/S, CT/T and CN/T, therefore a Friedman test was used for analysis.

Following transformations, the remaining 13 measures were normally distributed as assessed by Shapiro-Wilk test ($p > .05$). However, all measures had outliers except for MLS. Outliers were removed and the analysis was conducted on both data, with and without outliers, in order to observe if their presence affects the analysis. The data were then observed if it passed Mauchly's test of sphericity, as it is a requirement for analysis using ANOVA. If it transgressed the assumption of sphericity, then we would refer to the Greenhouse-Geisser adjusted results. All results were adjusted according to Bonferroni as multiple comparisons were performed, i.e. T1 and T2, T1 and T3, T1 and T4, and etc. C/S, VP/T and C/T were not normally distributed when outliers were removed. Analysis was continued as the data were similarly skewed.

3.6 Conclusion

Overall, all the above fourteen measures as discussed in 3.4 were carefully chosen based on the past studies that used these measures as indices of development and maturity. The next chapter (Chapter 4) discusses the findings of the study.

CHAPTER 4: FINDINGS

4.1 Introduction

The findings reported in this chapter are the changes in constructs at four different points in time used by leaners. The chapter begins by reviewing the results of each of the measure at different points in time by the same 124 students. The results are reported in both with and without outliers (see 3.5 for the definition of outlier). Next, this chapter illustrates changes in constructs by showing the graphs for each measure. This chapter concludes by highlighting at which point in time the changes in each construct became significant.

4.1 Results

Even though the data were skewed (as discussed in 3.5), ANOVA was used because it is a parametric test. Therefore, it is more sensitive. Only when it was no longer possible to transform the data, Friedman, a non-parametric test was used. The following table shows the results of repeated measures ANOVA with and without outliers for all measures except T/S, CT/T and CN/T.

Table 4.1 Repeated measures ANOVA with and without outliers

		With outliers					**Without outliers**				
	Source	SS	df	MS	*F*		SS	df	MS	*F*	
Type 1: Length of Production Unit											
MLC	Time	0.000	3	6.116	0.236		0.000	3	8.462	0.342	
	Error	0.096	369	0.000			0.087	351	0.000		
MLS	Time						0.002	3	0.001	4.231	*
	Error						0.063	369	0.000		
MLT	Time	0.028	3	0.009	2.776	*	0.032	3	0.011	3.400	*
	Error	1.220	369	0.003			1.092	351	0.003		

Type 2: Sentence Complexity											
C/S	Time	0.041	3	0.014	3.801	*	0.580	3	0.019	6.104	*
	Error	1.340	369	0.004			1.112	351	0.003		
Type 3: Subordination											
C/T	Time	0.079	3	0.026	2.519		0.080	3	0.027	2.864	*
	Error	3.843	369	0.010			3.282	351	0.009		
DC/C							0.069	3	0.023	3.706	*
							2.298	369	0.006		
DC/T	Time	0.168	3	0.056	3.913	*	0.176	3	0.059	4.225	*
	Error	5.296	369	0.014			5.006	360	0.014		
Type 4: Coordination											
CP/C	Time	0.059	3	0.020	1.609		0.100	3	0.036	3.098	*
	Error	4.530	369	0.012			3.695	317	0.012		
CP/T	Time	0.065	3	0.022	1.572		0.075	3	0.025	1.953	
	Error	5.061	369	0.014			4.499	351	0.013		
Type 5: Particular Structures											
CN/C	Time	0.106	3	0.035	3.416	*	0.122	3	0.041	4.189	*
	Error	3.812	369	0.010			3.345	345	0.010		
VP/T	Time	0.097	3	0.032	5.822	*	0.109	3	0.036	6.630	*
	Error	2.044	369	0.006			1.963	357	0.005		

*Significance level at $p < .05$

This study reported both with and without outliers results for several reasons. First, it is vital in showing the true 'nature' of what the data are showing: the language

production of 124 students. To remove the outliers altogether would just be 'enhancing' the data to make it look better and easier to analyze. Therefore, the idea to understand them the way they are is no longer applicable if this was applied to the data. Therefore, the data 'with outliers' were reported.

Additionally, it is also important to look at how the 'general' learners performed, the ones that are within the normal curve because most learners are within this category. In order to analyze the changes in syntactic complexity at these learners, outliers were removed, highlighting the performance of the general group of learners. To understand the general syntactic complexity performance spectrum of learners, discussion without outliers is reported.

4.2 Learner Language at Four Different Points in Time

The analysis of this study has revealed that, over time, the syntactic complexity of L2 learners' writings has significantly changed in 10 out of 14 measures of complexity from Time 1 to Time 4. From Time 1 to Time, L2 writers in this study employed more DC/C and DC/T, CN/C, MLT, C/S and CN/T. The use of CP/C, MLS, VP/T and C/T-unit on the other hand have significantly decreased over time.

The use of syntactic complexity at four different points in time can be observed in the graphs below to show at which points significant changes happened and to illustrate the dynamic development of learner language:

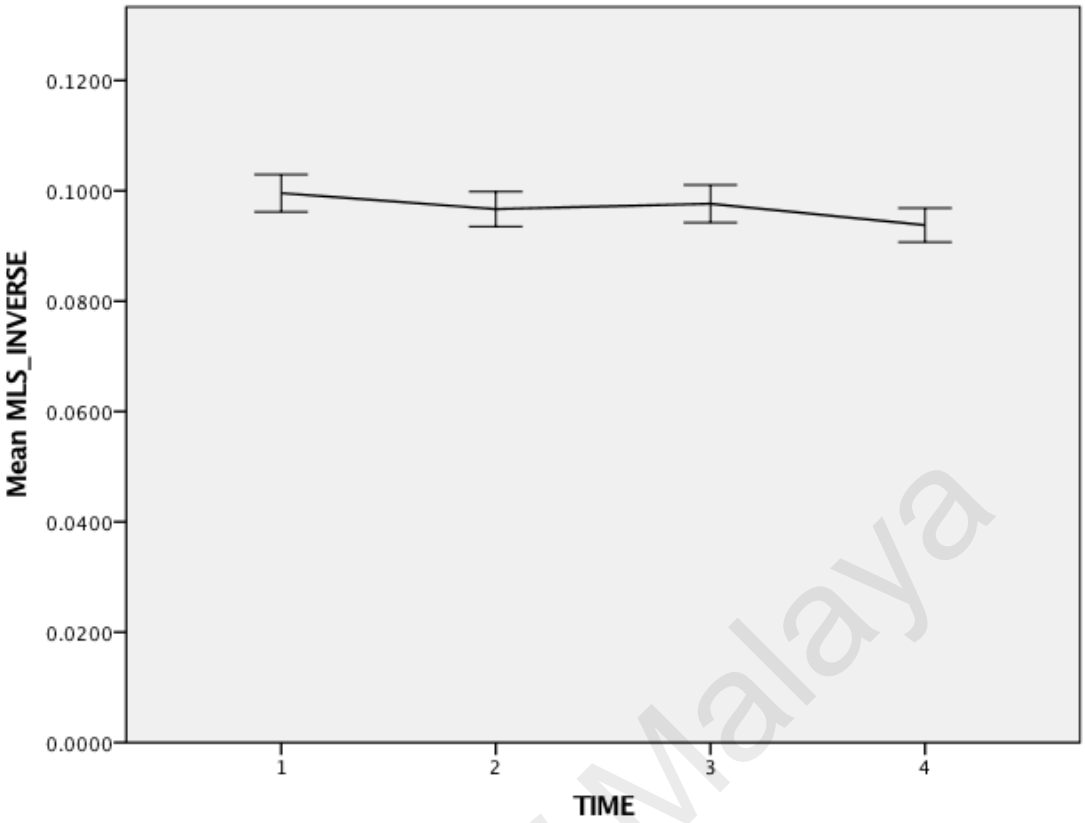

Figure 4.1: MLS graph without outliers.

The assumption of sphericity was met for MLS without outliers, as assessed by Mauchly's test of sphericity, χ^2 (5) = 6.731, p = 0.241. The analysis report a statistically significant change in MLS over time, F(3, 369) = 4.231, p = 0.006, η^2 = 0.033, with MLS decreasing from T1 (M = 0.0996, SD = 0.01909) to T2 (M = 0.0967, SD = 0.01778) increasing to T3 (M = 0.0977, SD = 0.01926) decreasing to T4 (M = 0.0938, SD = 0.01737). Post hoc analysis with a Bonferroni adjustment revealed that without outliers MLS statistically significantly decreased from T1 to T4 (M = -.006, 95% CI [-.011, -.001], p = .008) but not from T1 to T2 (M = -.003, 95% CI [-.008, .002], p = .588), T1 to T3 (M = -.002, 95% CI [-.007, .003], p = 1.000), T2 to T3 (M = .001, 95% CI [-.003, .005], p = 1.000), T2 to T4 (M = -.003, 95% CI [-.007, .001], p = .434) and T3 to T4 (M = -.004, 95% CI [-.008, -.000], p = .061).

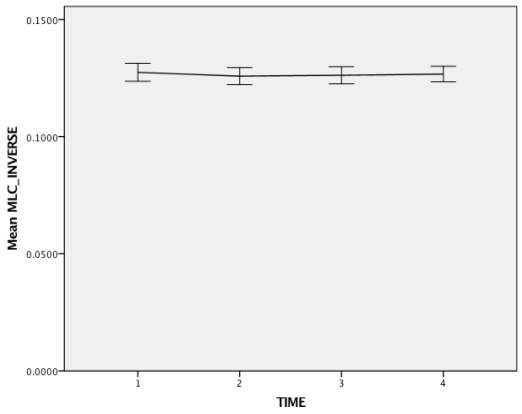

Figure 4.2: MLC graph with outliers

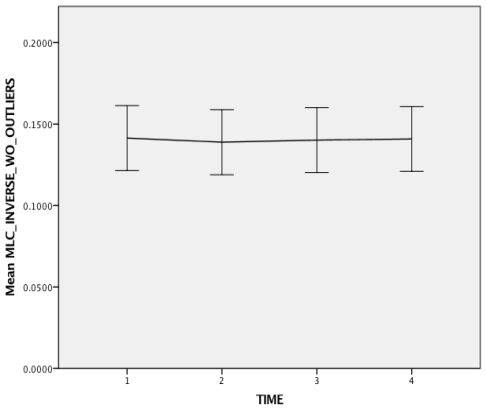

Figure 4.3: MLC graph without outliers

The assumption of sphericity was met for MLC with outliers, as assessed by Mauchly's test of sphericity, χ^2 (5) = 2.922, p = 0.712, and without outliers, χ^2 (5) = 1.88, p = 0.866. However, the analysis reveals no statistically significant changes in MLC over time for both with, F(3, 369) = 0.236, p = 0.872, η^2 = 0.002, and without outliers, F(3, 351) = 0.342, p = 0.795, η^2 = 0.003.

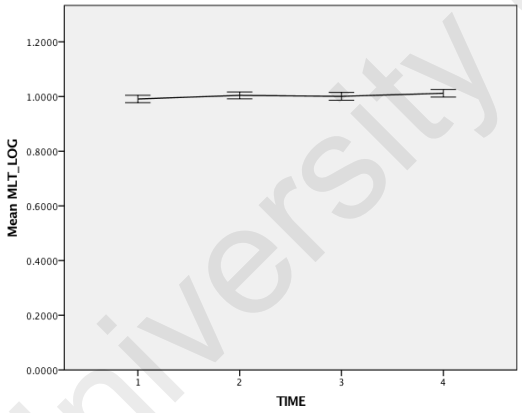

Figure 4.3: MLT graph with outliers

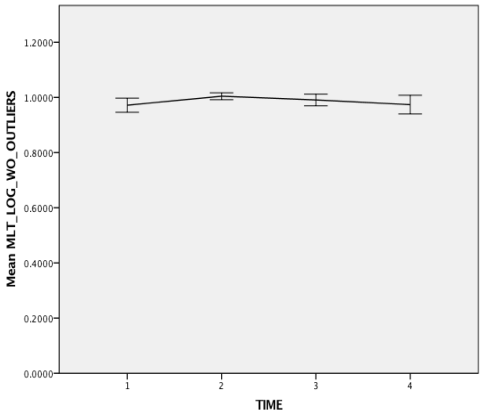

Figure 4.4: MLT graph without outliers

Both MLT with outliers and without outliers met the assumption of sphericity, χ^2 (5) = 1.669, p = 0.893 and χ^2 (5) = 2.081, p = 0.838 respectively. The analysis report a statistically significant change in MLT over time, F(3, 369) = 2.776, p = 0.041, η^2 = 0.022, with MLT increasing from T1 (M = 0.9912, SD = 0.07569) to T2 (M = 1.0043, SD = 0.07077), decreasing to T3 (M = 1.0007, SD = 0.0814) and increasing to T4 (M = 1.0119, SD = 0.07657). However, post hoc analysis with a Bonferroni adjustment

revealed that with outliers MLT statistically significantly increased only from T1 to T4 (M = .021, 95% CI [.001, .041], p = .035) but not from T1 to T2 (M = .013, 95% CI [-.007, .033], p = .46), T1 to T3 (M = .01, 95% CI [-.011, .03], p = 1.000), T2 to T3 (M = -.004, 95% CI [-.023, .016], p = 1.000), T2 to T4 (M = .008, 95% CI [-.011, .027], p = 1.000) and T3 to T4 (M = .011, 95% CI [-.008, .03], p = .678).

Similarly, MLT without outliers shows a statistically significant change in MLT over time, F(3, 351) = 3.4, p = 0.018, η^2 = 0.028, with MLT increasing from T1 (M = 0.984, SD = 0.069) to T2 (M = 1.0017, SD = 0.06911), decreasing to T3 (M = 0.9976, SD = 0.07983) increasing to T4 (M = 1.0058, SD = 0.06834). Again, post hoc analysis shows a statistically significantly increased only from T1 to T4 (M = .022, 95% CI [.002, .041], p = .018) but not from T1 to T2 (M = .018, 95% CI [-.002, .037], p = .096), T1 to T3 (M = .014, 95% CI [-.007, .034], p = .460), T2 to T3 (M = -.004, 95% CI [-.024, .016], p = 1.000), T2 to T4 (M = .004, 95% CI [-.015, .023], p = 1.000) and T3 to T4 (M = .008, 95% CI [-.01, -.027], p = 1.000).

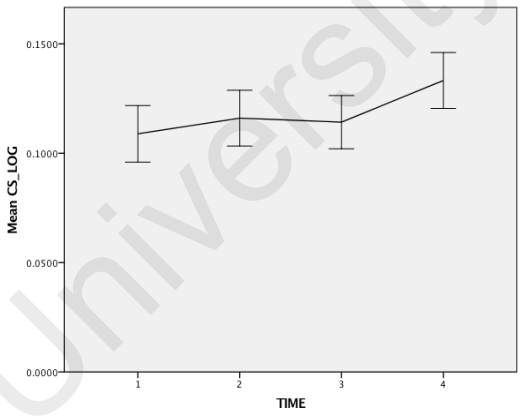

Figure 4.5: C/S graph with outliers

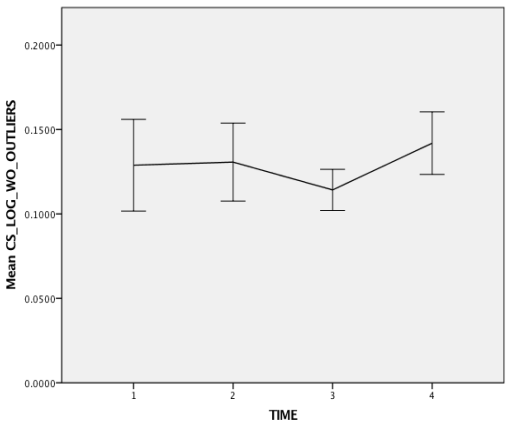

Figure 4.6: C/S graph without outliers

The assumption of sphericity was met for C/S with, χ^2 (5) = 9.809, p = 0.081, and without outliers, χ^2 (5) = 5.105, p = 0.403as assessed by Mauchly's test of sphericity. The analysis report a statistically significant change in C/S over time, F(3, 369) = 3.801, p = 0.01, η^2 = 0.03, with C/S increasing from T1 (M = 0.1089, SD = 0.07271), T2 (M = 0.116, SD = 0.0717), decreasing to T3 (M = 0.1142, SD = 0.06853) and increasing to T4 (M = 0.1333, SD = 0.07194). Post hoc analysis revealed that with outliers, C/S statistically significantly increased only from T1 to T4 (M = .024, 95% CI [.001, .047], p = .032) but not from T1 to T2 (M = .007, 95% CI [-.012, .027], p = 1.000), T1 to T3 (M = .005, 95% CI [-.015, .026], p = 1.000), T2 to T3 (M = -.002, 95% CI [-.02, .017], p = 1.000), T2 to T4 (M = .017, 95% CI [-.004, .039], p = .202) and T3 to T4 (M = .019, 95% CI [-.000, .039], p = .059).

As for C/S without outliers, the analysis report a statistically significant change in C/S over time, F(3, 351) = 6.104, p = 0.001, η^2 = 0.05, with C?S increasing from T1 (M = 0.108, SD = 0.06667) to T2 (M = 0.1159, SD = 0.06698), decreasing to T3 (M = 0.113, SD = 0.06774) and increasing to T4 (M = 0.137, SD = 0.06888). Post hoc analysis revealed that with outliers C/S statistically significantly not only increased from T1 to T4 (M = .029, 95% CI [.007, .051], p = .003), but also from T2 to T4 (M = .021, 95% CI [.001, .042], p = .038) and T3 to T4 (M = .024, 95% CI [.005, .043], p = .006). No significant changes were observed between T1 and T2 (M = .008, 95% CI [-.011, .027], p = 1.000), T1 and T3 (M = .005, 95% CI [-.015, .025], p = 1.000) as well as T2 and T3 (M = -.003, 95% CI [-.021, .015], p = 1.000).

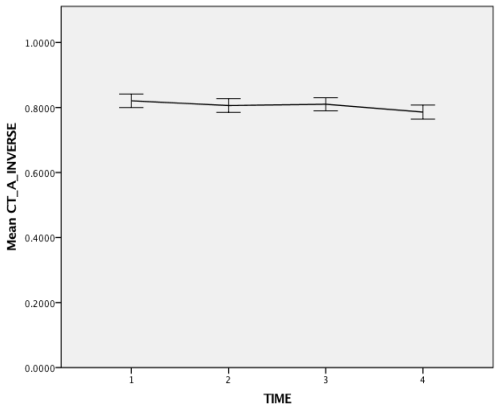

Figure 4.7: C/T graph with outliers

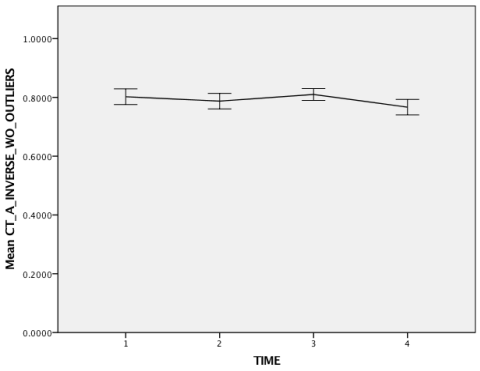

Figure 4.8: C/T graph without outliers

The assumption of sphericity was met for C/T with outliers, as assessed by Mauchly's test of sphericity, χ^2 (5) = 9.706, p = 0.084. There are no statistically significant changes in C/T over time, F(3, 369) = 2.519, p = 0.058, η^2 = 0.02.

The assumption of sphericity was met for C/T without outliers, as assessed by Mauchly's test of sphericity, χ^2 (5) = 9.071, p = 0.106. The analysis report a statistically significant change in C/T over time, F(3, 351) = 2.864, p = 0.037, η^2 = 0.024, with C/T decreasing from T1 (M = 0.8124, SD = 0.11021) to T2 (M = 0.7982, SD = 0.11058), increasing to T3 (M = 0.8082, SD = 0.11161), and decreasing to T4 (M = 0.7786, SD = 0.11135). However, post hoc analysis with a Bonferroni adjustment revealed that without outliers C/T did not statistically significantly change from T1 to T2 (M = -.014, 95% CI [-.045, .017], p = 1.000), T1 to T3 (M = -.004, 95% CI [-.038, .030], p = 1.000), T1 to T4 (M = -.034, 95% CI [-.072, .005], p = .123), T2 to T3 (M = .010, 95% CI [-.021, .041], p = 1.000), T2 to T4 (M = -.020, 95% CI [-.054, .015], p = .757) and T3 to T4 (M = -.030, 95% CI [-.064, .004], p = .124). The difference between the results of ANOVA and post hoc test may be due to different levels of analysis, i.e. it is overall significant a macro level, but the significance disappears at a micro level of analysis.

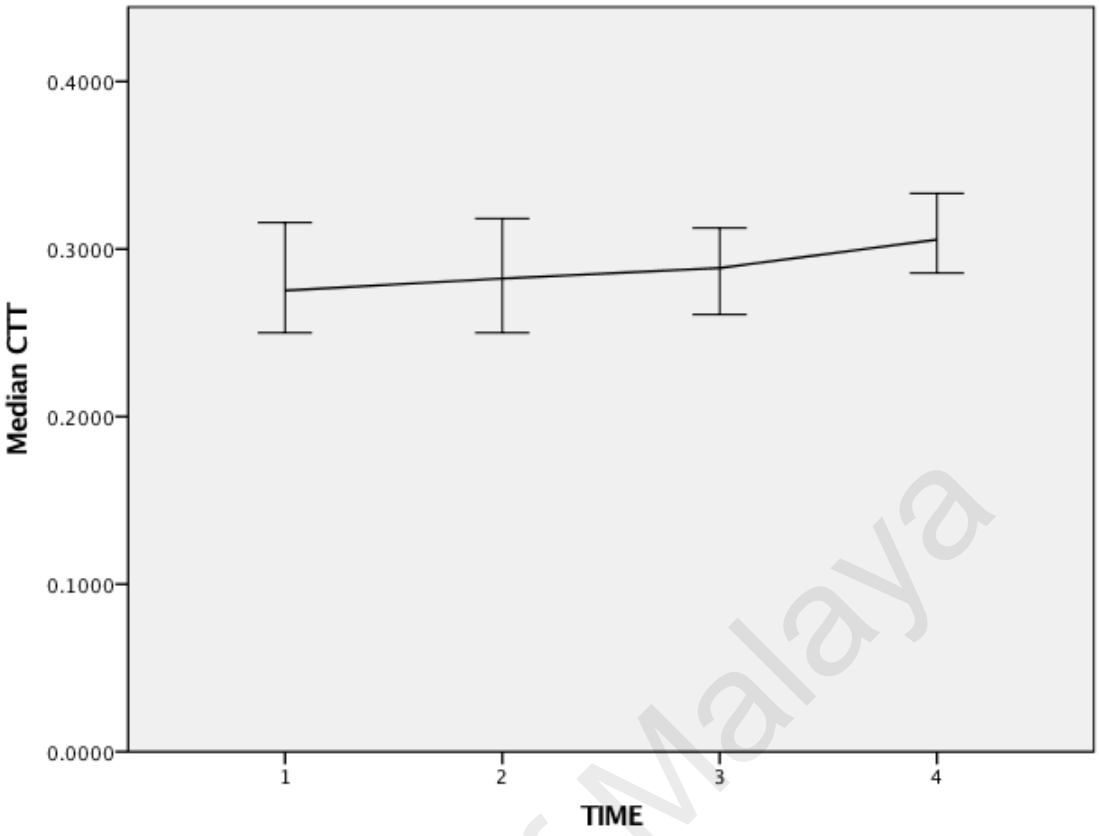

Figure 4.9: CT/T graph with outliers

A Friedman test reported no statistically significant difference in CT/T over time, χ^2 (3) = 5.819, p = .121.

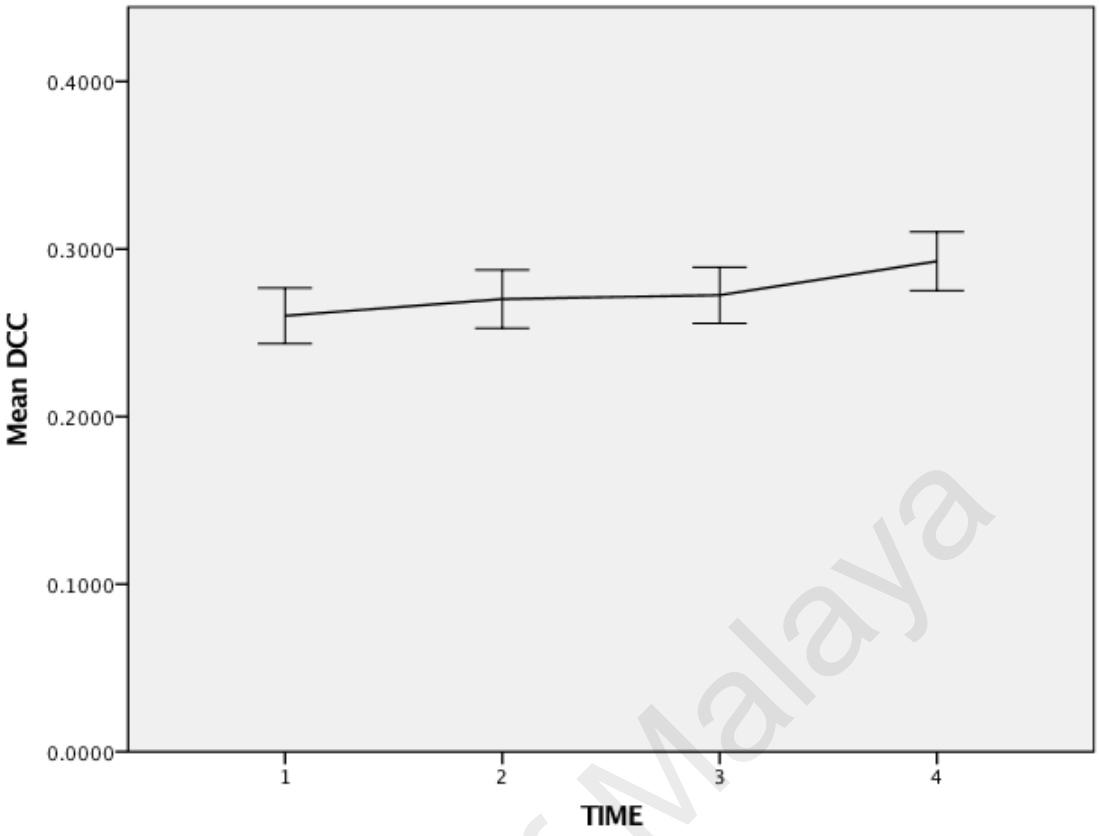

Figure 4.10: DC/C graph with outliers

The assumption of sphericity was met for DC/C, as assessed by Mauchly's test of sphericity, χ^2 (5) = 5.463, p = .362. DC/C statistically significant changed over time, F(3, 369) = 3.706, p = .012, partial η^2 = .029, with DC/C increasing from T1 (M = .2602, SD = .0937) to T2 (M = .2702, SD = .0977) to T3 (M = .2724, SD = .0941) to T4 (M = .2927, SD = .0985). Post hoc indicated a statistically significantly increase from T1 to T4 (M = .033, 95% CI [.005, .060], p = .012), but not from T1 to T2 (M = .010, 95% CI .015, -.035], p = 1.000), T1 to T3 (M = .012, 95% CI .015, -.040], p = 1.000), T2 to T3 (M = .002, 95% CI .023, -.028], p = 1.000), T2 to T4 (M = .023, 95% CI .006, -.051], p = .218), and T3 to T4 (M = .020, 95% CI .006, -.047], p = .261).

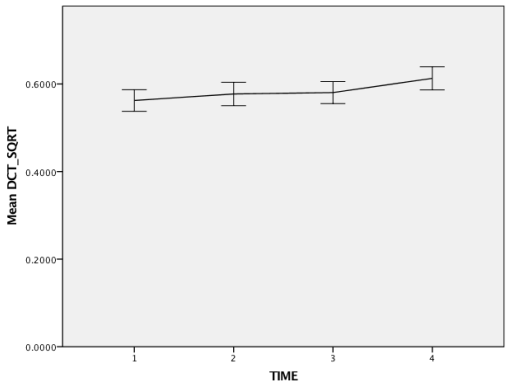

Figure 4.11: DC/T graph with outliers

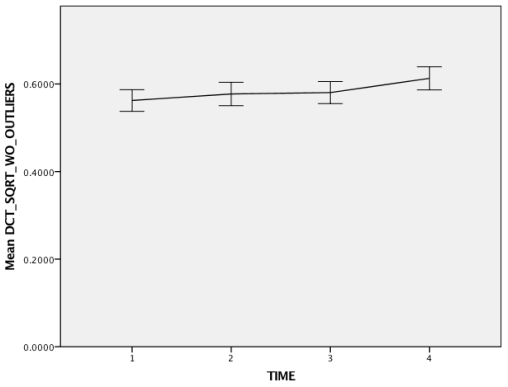

Figure 4.12: DC/T graph without outliers

DC/T with outliers fulfilled the assumption of sphericity, as assessed by Mauchly's test of sphericity, χ^2 (5) = 7.245, p = 0.203 ANOVA revealed a statistically significant change in DC/T over time, F(3, 369) = 3.913, p = 0.009, η^2 = 0.031, with DC/T increasing from T1 (M = 0.5623, SD = 0.13907) to T2 (M = 0.5772, SD = 0.15017) to T3 (M = 0.5804, SD = 0.14149) to T4 (M = 0.6128, SD = 0.14773) Post hoc analysis with a Bonferroni adjustment revealed that DC/T statistically significantly increased from T1 to T4 (M = .051, 95% CI [.008, .093], p = .012), but not from T1 to T2 (M = .015, 95% CI [-.022, .052], p = 1.000), T1 to T3 (M = .018, 95% CI [-.023, .059], p = 1.000), T2 to T3 (M = .003, 95% CI [-.036, .042], p = 1.000), T2 to T4 (M = .036, 95% CI [-.009, .08], p = .199) and T3 to T4 (M = .032, 95% CI [-.007, .072], p = .187).

DC/T without outliers also met the summption of sphericity as assessed by Mauchly's test, χ^2 (5) = 7.508, p = 0.186. DC/T statistically significant changed over time, F(3, 360) = 4.225, p = 0.006, η^2 = 0.034, increasing from T1 (M = 0.563, SD = 0.1364) to T2 (M = 0.5821, SD = 0.14082) decreasing to T3 (M = 0.581, SD = 0.13489) and increasing to T4 (M = 0.6158, SD = 0.14731). Post hoc analysis observes that without outliers DC/T statistically significantly increased from T1 to T4 (M = .053, 95% CI [.010, .096], p = .008) but not from T1 to T2 (M = .019, 95% CI [-.018, .056], p = 1.000), T1 to T3 (M = .018, 95% CI [-.023, .059], p = 1.000), T2 to T3 (M = -.001,

95% CI [-.039, .037], p = 1.000), T2 to T4 (M = .034, 95% CI [-.010, .077], p = .246) and T3 to T4 (M = .035, 95% CI [-.005, .075], p = .128).

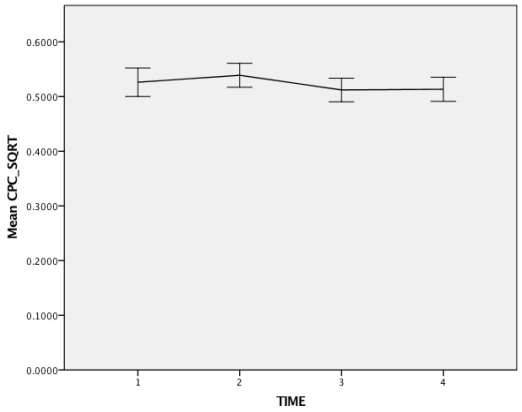

Figure 4.13: CP/C graph with outliers

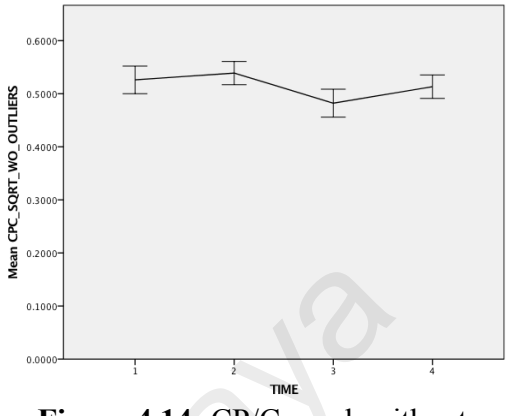

Figure 4.14: CP/C graph without outliers

CP/C also met the assumption of sphericity, as assessed by Mauchly's test of sphericity, χ^2 (5) = 6.152, p = 0.292. The analysis does not report a statistically significant change in CP/C over time, F(3, 369) = 1.609, p = 0.187, η^2 = 0.013.

As for CP/C without outliers, the assumption of sphericity was not met, χ^2 (5) = 12.656, p = 0.027. Therefore, a Greenhouse-Geisser adjustment was used. Interestingly, the analysis report a statistically significant change in CP/C over time, F(2.785, 317.452) = 3.098, p = 0.03, with CP/C increasing fromT1 (M = 0.5257, SD = 0.14079) to T2 (M = 0.5429, SD = 0.11559), decreasing to T3 (M = 0.507, SD = 0.10041) and increasing to T4 (M = 0.5078, SD = 0.12132). Post hoc analysis with a Bonferroni adjustment revealed that without outliers CP/C statistically significantly decreased from T2 to T3 (M = -.036, 95% CI [-.068, -.004], p = .017) but not from T1 to T2 (M = .017, 95% CI [-.024, .058], p = 1.000), T1 to T3 (M = -.019, 95% CI [-.059, .022], p = 1.000), T1 to T4 (M = -.018, 95% CI [-.056, .020], p = 1.000), T2 to T4 (M = -.035, 95% CI [-.071, -.000], p = .055) and T3 to T4 (M = .001, 95% CI [-.032, .034], p = 1.000).

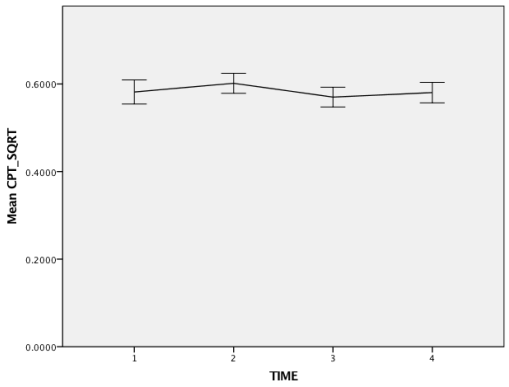

Figure 4.15: CP/T graph with outliers

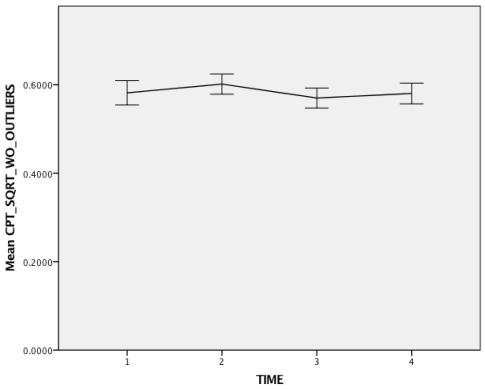

Figure 4.16: CP/T graph without outliers

The assumption of sphericity was met for CP/T with outliers, χ^2 (5) = 8.405, p = 0.135, and without, χ^2 (5) = 8.051, p = 0.153. Both conditions report no statistically significant change in CP/T over time, F(3, 369) = 1.572, p = 0.196, η^2 = 0.013, and F(3, 351) = 1.953, p = 0.121, η^2 = 0.016 respectively.

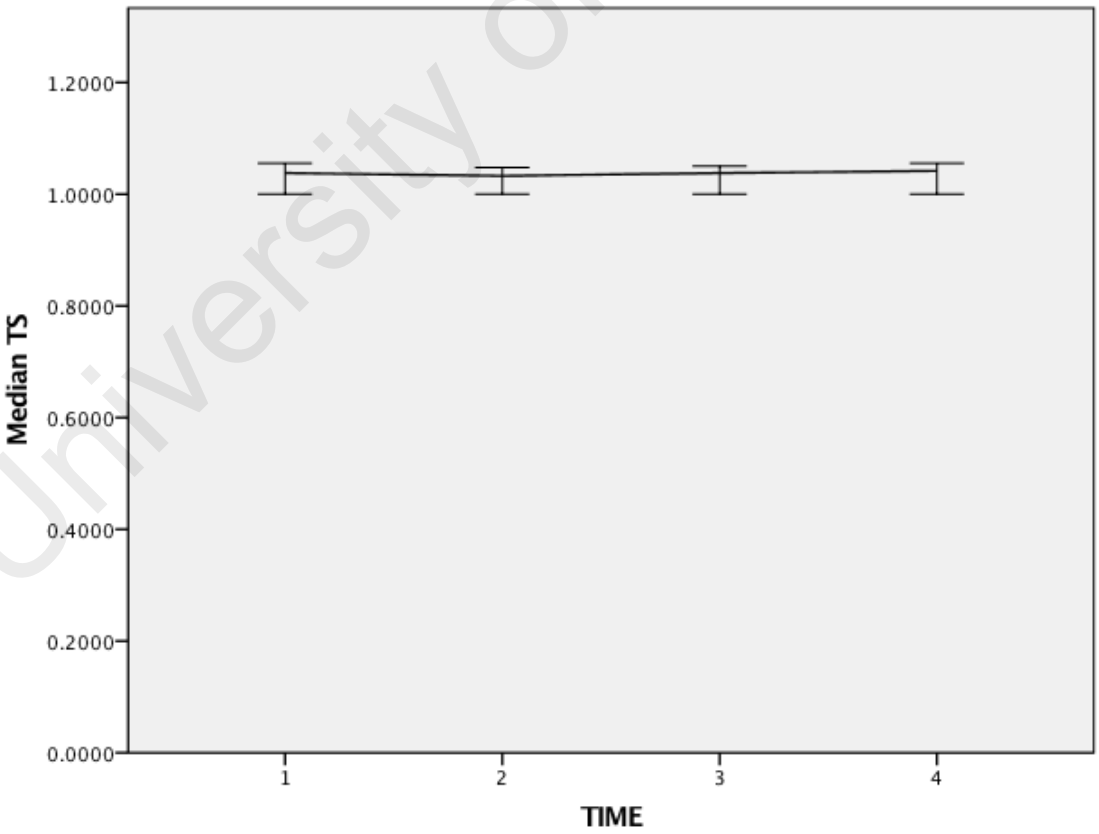

Figure 4.17: T/S Friedman test graph

A Friedman test reported no statistically significant difference in T/S over time, χ^2 (3) = 3.321, p = .345.

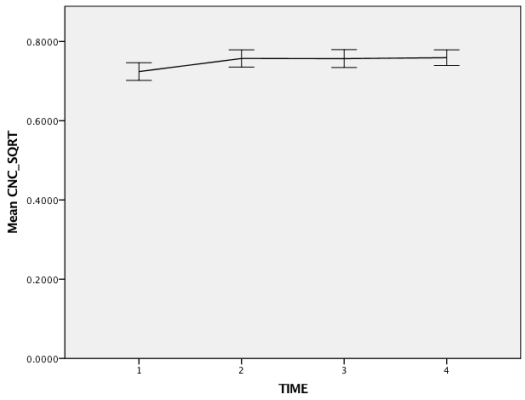

Figure 4.18: CN/C graph with outliers

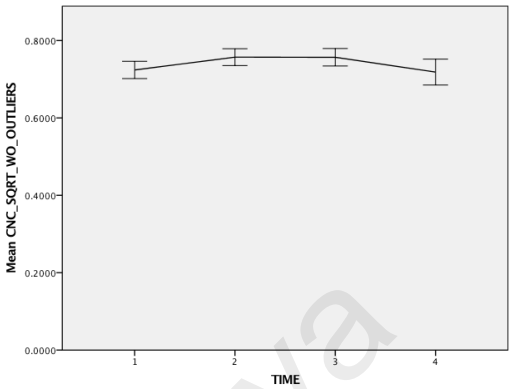

Figure 4.19: CN/C graph without outliers

Mauchly's test indicated that CN/C both with outliers and without outliers met the assumption of sphericity, χ^2 (5) = 5.75, p = 0.331 and χ^2 (5) = 5.697, p = 0.337 respectively. A significant change is observed in CN/C with outliers, F(3, 369) = 3.416, p = 0.018, η^2 = 0.027, with CN/C increasing from T1 (M = 0.724, SD = 0.12534) to T2 (M = 0.7571, SD = 0.12256), decreasing to T3 (M = 0.7567, SD = 0.127) and increasing to T4 (M = 0.7591, SD = 0.11108). Bonferroni adjusted post hoc analysis revealed that with outliers CN/C statistically significantly increased from T1 to T3 (M = .033, 95% CI [.001, .064], p = .039) and T1 to T4 (M = .035, 95% CI [.002, .068], p = .029) but not from T1 to T2 (M = .033, 95% CI [-.003, .069], p = .092), T2 to T3 (M = .00, 95% CI [-.038, .037], p = 1.000), T2 to T4 (M = .002, 95% CI [-.035, .039], p = 1.000) and T3 to T4 (M = -.002, 95% CI [-.03, .035], p = 1.000).

CN/C without outliers also reported a statistically significant change over time, F(3, 345) = 4.189, p = 0.006, η^2 = 0.035, increasing from T1 (M = 0.7183, SD = 0.1219) to T2 (M = 0.7594, SD = 0.12404) and decreasing to T3 (M = 0.7544, SD = 0.12167) to T4 (M = 0.7519, SD = 0.09538). Post hoc indicated that without outliers, CN/C statistically significantly increased from T1 to T2 (M = .041, 95% CI [.004, .078], p = .020), T1 to T3 (M = .036, 95% CI [.004, .068], p= .018) and T1 to T4 (M = .034, 95%

CI [.001, .066], p = .037) but not from T2 to T3 (M = -.005, 95% CI [-.043, .033], p = 1.000), T2 to T4 (M = -.008, 95% CI [-.044, .029], p = 1.000) and T3 to T4 (M = -.003, 95% CI [-.035, .03], p = 1.000).

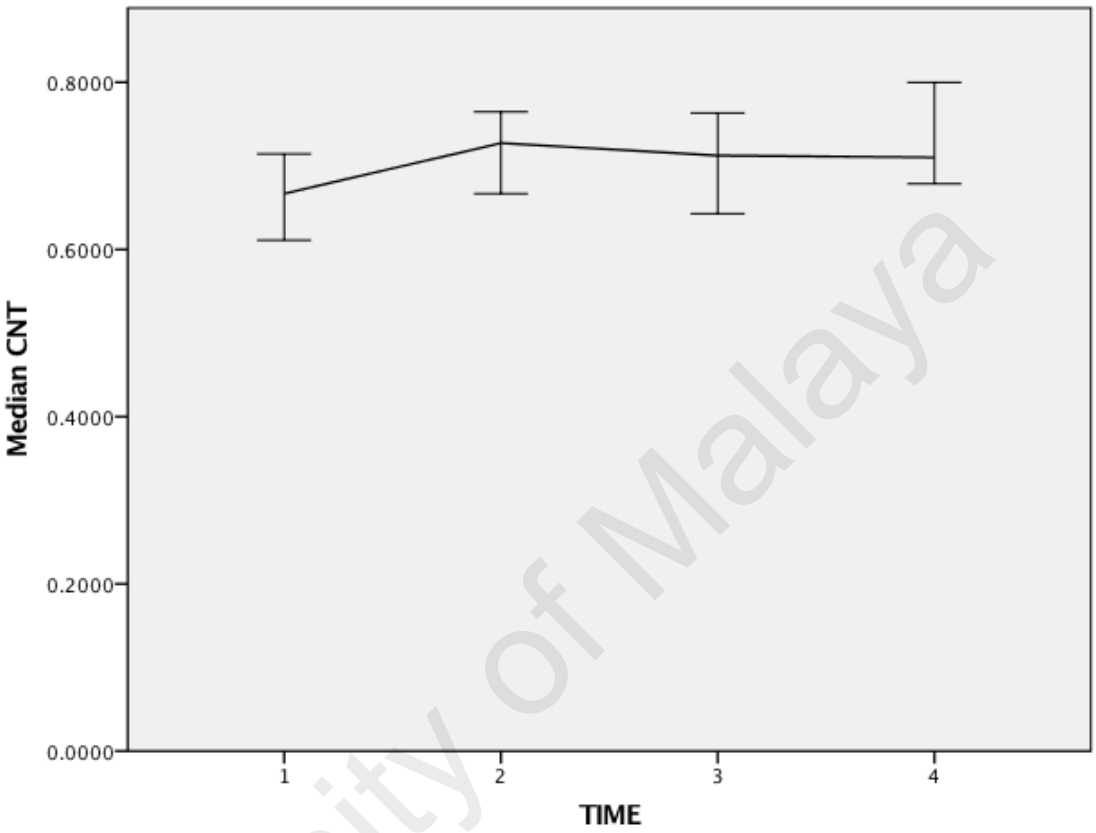

Figure 4.20: CN/T graph

A Wilcoxon signed-rank test with a bonferroni adjustment showed that CN/T statistically significant increased from T1 to T2 (Z = -2.840, p = .005) and T1 to T4 (Z = -3.689, p = .001) but not from T1 to T3 (Z = -2.603, p = .009), T2 to T3 (Z = -.223, p = .823), T2 to T4 (Z = -.733, p = .463) and T3 to T4 (Z = -.980, p = .327).

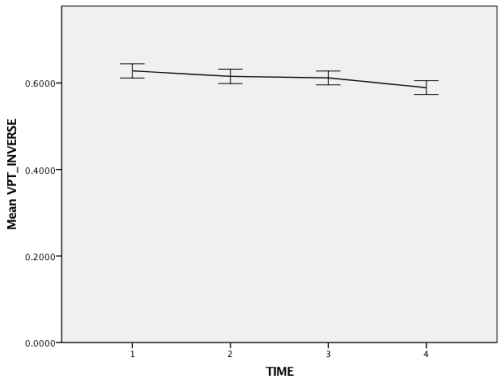

Figure 4.21: VP/T graph with outliers

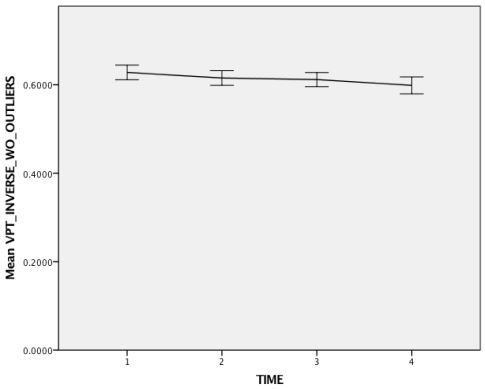

Figure 4.22: VP/T graph without outliers

VP/T also met the assumption of sphericity for both with outliers χ^2 (5) = 2.793, p = 0.732 and without, χ^2 (5) = 2.408, p = 0.79. With outliers, ANOVA indicated a statistically significant change in VP/T over time, F(3, 369) = 5.822, p = 0.001, η^2 = 0.045, with VP/T decreasing from T1 (M = 0.6279, SD = 0.09283) to T2 (M = 0.6152, SD = 0.09311) to T3 (M = 0.6117, SD = 0.08992) to T4 (M = 0.5892, SD = 0.09016). However, post hoc showed that statistically significant changes was only observed from T1 to T4 (M = -.039, 95% CI [-.065, -.012], p = .001) and T2 to T4 (M = -.026, 95% CI [-.051, -.001], p = .036) but not from T1 to T2 (M = -.013, 95% CI [-.039, .014], p = 1.000), T1 to T3 (M = -.016, 95% CI [-.041, .009], p = .530), T2 to T3 (M = -.003, 95% CI [-.027, .020], p = 1.000) and T3 to T4 (M = -.023, 95% CI [-.048, .003], p = .112).

Similarly, VP/T without outliers also showed a statistically significant change over time, F(3, 357) = 6.63, p = 0.001, η^2 = 0.053, with VP/T decreasing from T1 (M = 0.6265, SD = 0.09239) to T2 (M = 0.6151, SD = 0.09032) to T3 (M = 0.6118, SD = 0.08682) to T4 (M = 0.5853, SD = 0.08009). Post hoc revealed a statistically significantly decreased from T1 to T4 (M = -.041, 95% CI [-.068, -.015], p = 0), T2 to T4 (M = -.030, 95% CI [-.055, -.005], p = .011) as well as between T3 and T4 (M = -.027, 95% CI [-.052, -.001], p = .033). No significant changes were observed from T1 to T2 (M = -.011, 95% CI [-.039, .016], p = 1.000), T1 to T3 (M = -.015, 95% CI [-.041, .011], p = .79) and T2 to T3 (M = -.003, 95% CI [-.027, .021], p = 1.000).

4.3 Summary and Conclusion of the Findings.

The findings of this study indicate a statistically significant change in the 10 out of the 14 constructs of syntactic complexity. L2 writers in this study employed more DC/C, DC/T, CN/C, MLT, C/S and CN/T. The use of CP/C, MLS, VP/T and C/T, on the other hand, have significantly decreased over time. Post hoc analyses revealed a significant decrease from Time 1 to Time 4 for MLS, significant increases from Time 1 to Time 4 for MLT, DC/C and DC/T, significant increases from Time 1 to Time 4, Time 2 to Time 4 and Time 3 to Time 4 for C/S. The test also revealed a significant decrease from Time 2 to Time 3 for CP/C, significant increases from Time 1 to Time 4, Time 1 to Time 2 and Time 1 to Time 3 for CN/C and significant decreases from Time 1 to Time 4, Time 2 to Time 4 and T3 to Time 4 for VP/T. Finally, a Wilcoxon signed-rank test showed a significant increases from Time 1 to Time 4 and Time 1 to Time 2 for CN/T.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter summarizes the findings that are discussed in Chapter 4 and discusses the implications of the findings. This chapter attempts to answer the following research questions:

I. What changes in syntactic complexity are observable over a 24-month period in L2 writing development?

II. What do changes observed in syntactic complexity contribute to our understanding of L2 writing development?

This chapter discusses changes of learner language at four different points in time and what these changes mean for L2 writing development. The chapter concludes by offering suggestions for future research in the area.

5.2 Learner Language at Four Different Points in Time

This section addresses the first research question:

What changes in syntactic complexity are observable over a 24-month period in L2 writing development?

Overall, syntactic complexity has significantly changed based on ten out of fourteen measures of complexity: MLS, MLT, DC/C, DC/T, CP/C, CN/C, C/S, VP/T, CN/T and C/T. What features of learner language are observable within this period? Learner language, specifically syntactic complexity of learners is dynamic and constantly changing (Larsen-Freeman, 2006). Changes occurred from time to time specifically for these particular constructs: C/S, CN/C, CN/T and VP/T. The changes that occurred in constructs over the period of 24 months are illustrated through graphs in Chapter 4 (see Figures 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, 4.14, 4.15, 4.16, 4.17, 4.18, 4.19, 4.20, 4.21 and 4.22). Though at some points in time,

changes were not significant, they were still noticeable as can be seen from the mean use of syntactic complexity constructs from Tables 5.1 and 5.2.

Table 5.1: Mean values of syntactic complexity measures with outliers

	With Outliers							
		T1		T2		T3		T4	
	n	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Type 1: Length of Production Unit									
MLC	124	.127	.022	.126	.020	.126	.021	.127	.019
MLS	124								
MLT	124	.991	.076	1.004	.071	1.001	.081	1.012	.077
Type 2: Sentence Complexity									
C/S	124	.109	.073	.116	.072	.114	.069	.133	.072
Type 3: Subordination									
C/T	124	.821	.117	.806	.118	.810	.113	.786	.122
CT/T	124	.288	.112	.302	.119	.292	.120	.318	.126
DC/C	124								
DC/T	124	.562	.139	.577	.150	.580	.141	.613	.148
Type 4: Coordination									
T/S	124	1.043	0.74	1.045	.067	1.046	0.73	1.067	.093
CP/C	124	.526	.146	.539	.123	.512	.121	.513	.125
CP/T	124	.582	.155	.602	.129	.570	.127	.580	.132
Type 5: Particular Structures									
CN/C	124	.724	.125	.757	.123	.757	.127	.759	.111
CN/T	124	.673	.217	.751	.234	.742	.279	.748	.226
VP/T	124	.628	.093	.615	.093	.612	.090	.589	.090

Table 5.2: Mean values of syntactic complexity measures without outliers

	Without outliers							
		T1		T2		T3		T4	
	n	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Type 1: Length of Production Unit									
MLC	118	.122	.019	.125	.019	.126	.019	.126	.016
MLS	124	.100	.019	.097	.018	.098	.019	.094	.017
MLT	118	.984	.069	1.002	.069	.998	.080	1.006	.068
Type 2: Sentence Complexity									
C/S	118	.108	.067	.116	.067	.113	.068	.137	.069

Type 3: Subordination									
C/T	118	.812	.110	.798	.111	.808	.112	.779	.111
DC/C	124	.260	.094	.270	.098	.272	.094	.293	.099
DC/T	121	.563	.136	.582	.141	.581	.135	.616	.147
Type 4: Coordination									
CP/C	115	.526	.141	.543	.116	.507	.100	.508	.121
CP/T	118	.578	.150	.602	.124	.569	.114	.575	.128
Type 5: Particular Structures									
CN/C	116	.718	.122	.759	.124	.754	.122	.752	.095
VP/T	120	.627	.092	.615	.090	.612	.087	.585	.080

Table 5.1 and table 5.2 show changes that happened over a period of 24 months. This study reported both with and without outliers to show what the findings really are. As previously discussed in Chapter 4, outliers are reported to add details to the overall findings. It is also important to look at how the 'general' learners performed, the ones that are within the normal curve because most learners are within this category as discussed in Chapter 4. Table 5.1 shows the mean values of syntactic complexity measure with outliers while Table 5.2 shows the mean values of syntactic complexity measures without outliers (data that are far from the general range of values in the study). The mean use of fourteen constructs of syntactic complexity can be summed up as in the tables above.

Based on Table 5.1, two constructs; MLS and DC/C are not reported because no outliers were detected. In length of production unit category, the mean values of MLC with outliers are the same at both Time 1 and Time 4 (M = 0.127). As can be seen, no significant changes were detected in the use of MLC. The mean value of MLT at Time 1 (M = 0.991) has significantly increased at Time 4 (M = 1.012).

In sentence complexity category, the mean use of C/S at Time 1 (M= .109) has significantly increased to Time 4 (M= .133). The significant changes are also detected

from Time 2 (M= .116) to Time 4 (M= .133) and Time 3 (M= .114) to Time 4 (M= .133).

In subordination category, the mean use of C/T has decreased from Time 1 (M=.821) to Time 4 (M= .786). As previously mentioned, DC/C however, is not included in the table as no outliers were detected in the study. The mean use of DC/T has significantly increased from Time 1 (M= .562) to Time 4 (M= .613).

In coordination category, the mean use of T/S has slightly increased from Time 1 (M= 1.0430 to Time 4 (M= 1.067). However, no significant change was detected in the use of T/S. The mean values for both CP/C and CP/T have slightly decreased from Time 1 to Time 4 with Time 1 (M= .526) and Time 4 (.513) for CP/C and Time 1 (M= .582) and Time 4 (M= .580) for CP/T.

In particular structures category, CN/C, CN/T and VP/T have significantly changed over time. The mean use of CN/C has significantly increased from Time 1 (M= .724) to Time 4(M= .759) and from Time 1 (M= .724) to Time 3(M= .757). The mean use of VP/T has decreased from Time 1 (.628) to Time 4(M= .589) and from Time 2 (M= .615) to Time 4 (M= .589).

Based on Table 5.2, three constructs (T/S, CT/T and CN/T) are not in reported. This is because they were tested using Friedman test. In length production unit, even though the mean use of MLC has increased from Time 1 (M= .122) to Time 4 (M= .126), the increase was not significant. The mean use of MLT has significantly increased from Time 1 (M= .984) to Time 4 (M= 1.006) while the mean use of MLS has significantly decreased from Time 1 (M= .100) to Time 4 (M= .094).

In sentence complexity category, the mean use of C/S has significantly increased from Time 1 (M=.108) to Time 4 (M= .137), from Time 2 (M= .116) to Time 4 (M= .137) and from Time 3 (M= .113) to Time 4 (M= .137).

In subordination category, the mean use of C/T has decreased from Time 1 (M=.812) to Time 4 (M= .779). The mean use of DC/C has significantly increased from Time 1 (M= .260) to Time 4 (M= .293). A significant increase was also observed in the use of DC/T. The mean use of DC/T has significantly increased from Time 1 (M= .563) to Time 4 (M= .616).

In coordination category, the use of CP/T has slightly decreased from Time 1 (M= .578) to Time 4(M= .575). However, the decrease was not significant. The mean use of CP/T has significantly decreased from Time 2 (M= .602) to Time 3(*M* =. 569).

In particular structures category, all three measures have significantly changed. The mean use of CN/C has significantly changed from Time 1 (M= .718) to Time 2 (M= .759), Time 1 (M= .718) to Time 3 (M= .754) and Time 1 (M. 718) to Time 4 (M= .752). The mean use of VP/T on the other hand has significantly decrease from Time 1 (M= .627) to Time 4 (M= .585), Time 2 (M= .615) to Time 4 (M=. 585) and Time 3 (M=. 612) to Time 4 (M=. 585).

From the above discussion, it can be seen how the present of outliers affect the findings of this study. First, a significant decrease in the use of CP/C was detected from Time 2 to Time 3 that was not observed with the presence of outliers. Second, when outliers were removed, the significant changes in the use of CN/C can be observed from Time 1 to Time 2, Time 1 to Time 3 and Time 1 to Time 4. With the presence of outliers, the significant changes in the use of CN/C can only be observed from Time 1 to Time 3 and Time 1 to Time 4. The same observation can be made from VP/T. When outliers were removed, the significant changes in the use of VP/T can be observed from Time 1 to Time 4, Time 2 to Time 4 and Time 3 to Time 4. With the presence of outliers, the significant changes in the use of VP/T can only be observed from Time 1 to Time 4 and Time 2 to Time 4. This shows how much different findings can be in the presence of outliers.

Other constructs (MLC, CP/T, T/S and CT/T) did not go through noticeable changes. This study looked at changes in learners' syntactic complexity at four different points in time that provided further evidence of syntactic complexity development in L2 learners.

5.3 Changes in syntactic complexity constructs: what does it mean for L2 writing?

This section addresses the second research question:

What do changes observed in syntactic complexity contribute to our understanding of L2 writing development?

As shown in 5.2, each category of syntactic complexity has several constructs that have significantly changed over time. In this section, how the changes in syntactic complexity constructs contribute to our understanding of L2 writing development will be discussed according to their categories.

In terms of length of production of unit category, learners were seen to heavily increase their MLT over time but less MLS. MLC on the other hand, did no go through any significant change. According to Chenoweth and Hayes (2001), an increase in linguistic experience is correlated with an increase in the length and number of words written. This insinuates that the length of production of writings is influenced by the linguistic experience of language users. Longer production units also correlate with learners' proficiency (e.g. Monroe, 1975; Cooper, 1976; Homburg, 1984; Wolfe-Quintero et al., 1998; Lu, 2011). For example, Hunt (1965) discovered age and length of clause are positively correlated to one another. Grade 4 students in the study have an average of 6.6 words, grade 8 have an average of 8.1 words, grade 12 have an average of 8.6 words while adults in the study have an average of 11.5 words. However, Hunt's (1965) study employed L1 speakers while this study employed L2 speakers. The finding of the use of MLC in this study is contradictory to the findings by Hunt (1965). This could be due to the different exposures received by L2 learners in this study as

discussed in 2.4. L2 writers in this study increased their production units over time (MLT), indicating syntactic maturity. The increase use of T-units showed that coordinate phrases were less employed over time. Over time, L2 writing becomes more academic and spoken-like in the context of narrative writing.

In syntactic complexity category, learners in this study have increased in the use of C/S over time. The function of a clause is a message in which meanings are merged together to express thoughts (Halliday et al., 2014). The significant changes in the use of clauses per sentence shows a lot of human experience is expressed in narrative writings. Narrative writing requires a lot of expressions to illustrate events and the processes involved surrounding these events. Each clause in a sentence is a highlight of an experience that is related to one another; from the first occurrence to the last one. (See 3.4.4 for examples and discussion). One action caused a chain reaction for another action. Therefore, it can be suggested that increasing use of clauses by learners was to express concurrences that happened.

In subordination category, narrative writings by L2 learners in this study showed a significant increase of dependent clauses in both DC/C and DC/T constructs. What is interesting about this finding is that high employment of dependent clauses is said to be a feature of spoken language (Biber, 1986; Biber et al., 2011). It is certainly too early to imply that narrative writing is almost similar to spoken language but it can be seen that over time, narrative writing is becoming more spoken-like. This calls for further studies.

Subordinate clauses served as anaphoric reference to describe ideas that are already being shared and discussed and can also serve as a contributor of new ideas in sentences (Meinunger, 2006). In other words, subordinate clauses can act as both anchors in the discussion of new ideas and as supplementary instruments to ideas that have been mentioned (Meinunger, 2006), insinuating that a high use of subordinate clauses means that narrative writing requires continuation of ideas. An increase use of

subordination indicates a high use of causative relations in writings (Ryshina-Pankova, 2015). Since learners in this study have increased in the use of subordination, it is therefore presumed that narrative writing uses frequent causative relations.

The finding of this study showed that there was a significant increase in the use of subordinate clauses in students' essays over time. This could be due to the nature of narrative writing that demands continuation of events. This finding is similar to Dasinger and Toupin (1994) as cited in Kosmos (2011). The high employment of subordinate clauses in Dasinger & Toupin, (1994) as cited in Kosmos, (2011, p.158) in the study according to them was because

> subordinate clauses in general and relative clauses in particular have several important discourse and linguistic functions in narratives, namely to name, situate, and identify old and new referents in the story, to present main characters, to motivate, enable, and continue narrative actions, to set up expectations about narrative entities and events, and to sum up past or upcoming event (see 3.4.7 and 3.4.8 for examples and discussion).

For example and discussion of subordinate clause, see 3.4.7 and 3.4.8. It can be concluded that over time, learners' narrative writing is becoming more spoken-like and the increasing use of subordinate clauses was due to continuation of events.

Coordination category is measured through CP/C, CP/T and T/S. The findings of this study show a significant decrease in the use of CP/C but no significant change is observed in the use of CP/T. Though it was not significant, the use of CP/T in narrative writings by L2 learners has decreased from time 1 to time 4 in both with and without outliers as can be seen from the above tables. High use of T-units also suggests separations of coordinated sentences allowing a deeper insight into how learners view the structures of a language (Bardovi- Harlig (1992). This simply means that T-units, rather than conjunctions to coordinate sentences, t-units are used to separate sentences. The increasingly used of T-units may dissimulate "a certain rhetorical sophistication" (Bardovi-Harlig, 1992, p. 391) because of how sentences are organized. The mean

number of T-units used in the corpus of this study has increased from time 1 (18.7 ± 5.8 t-units to time 4 (26.2 ± 9.6 t-units). This explains why CP/C significantly reduced from time 2 to time 3. Though the mean use of CP/T at time 1 to time 4 has decreased in both with and without outliers, the changes were not significant. However, to what extent the notion that the increase use of T-units causes lesser use of coordinate phrases should be explored further.

In particular structures category, all the three constructs (CN/C, CN/T and VP/T) have significantly changed over time. Complex nominals that are considered as a very important linguistic tool in academic genres (e.g. Biber, 1988; Fang, Schleppegrell & Cox, 2006; Biber & Gray, 2010, Biber & Gray, 2016) are employed to create accuracy and cohesions in texts. It is also used to avoid ambiguity and imprecision while creating a reference to the technical details and contexts that have been mentioned previously (Bhatia, 1992). Levi (1979) pointed out: each sequence of nouns carries semantic interpretation because meanings are changed through the shift of head noun (as cited in Moldovan, Badulescu, Tatu, Antohe, & Girju, 2004). This suggests that the ability to use nominals depends on the contextual information that learners have as well as experiences in encountering such words in order to adopt the production unit in suitable contexts. Thus, significant increase in the use of complex nominal suggests that learners recognize which one is the *Head* and which one comes after the *Head* noun, implying that writings by L2 learners are contextually structured.

The increase use of complex nominals is might be due to the increase use of prepositional phrases, relative and nominal clauses and gerunds to add details, while emphasizing certain elements in their stories (see also Kosmos, 2011 for similar observation in L1 writings). It should be noted however, the increase use of complex nominals in this study was not based on a comparison with other genres. It can be implied here that over time, learners' writing is becoming more academic.

The use of verb phrases has significantly decreased in this study. This is similar to the findings of Crossley and McNamara (2014) that discovered L2 writers used less verb phrases over the course of a semester. However, this study employed narrative essays while in Crossley and McNamara's, descriptive essays were used. Assuming that descriptive essays need less verb phrases, the same notion is applicable to narrative essays.

5.4 Further Findings

The findings suggest that while changes as measured in certain constructs can be observed after six months (e.g. CN/C, CN/T), changes in other syntactic features may only be observable over a full period of 24 months (MLS, MLT, DC/C, DC/T and C/T). Additionally, an observed change in coordinate phrases per clause (CP/C) only prevailed over a period of 18 months. Changes in C/S and VP/T only surfaced from time to 2 to time 4, time 3 to time 4, and time 1 to time 4, which means they can only be observed after 18 months. Findings such as this may indicate volatility as a characteristic of certain syntactic complexity constructs.

This opens up the question on how to approach the study of syntactic complexity development. It appears that the use of some constructs in writing (e.g. CN/C, CN/T) needed six months to surface while some (C/S, VP/T, CP/C) need 18 months and others 24 months (MLS, MLT, DC/C, DC/T and C/T). Therefore, prior studies of syntactic complexity development in L2 writing that approached the study less than 24 months period should be revisited as the results may not truly capture the syntactic complexity development of learners.

Other constructs (CP/T, MLC, T/S, CT/T) on the other hand, did not change. Two assumptions can be drawn from the unchanged values of the constructs. First, development in these constructs need more than 24 month to surface. Second, these constructs have already stabilized. Therefore, no changes were detected.

5.5 To What Extent do Syntactic Complexity Constructs Measure What They are Supposed to Measure?

The decreasing use of MLS was not due the decrease use of words instead; it might be due to the double increase of number of sentences. For example, in 3.4.1, the number of words in an essay from learner 034-a is 121 words while at time 4; the number of words has increased to 153. At Time 1, learner has employed 9 sentences and 18 sentences at Time 4, making the MLS ratios as 13.444 and 8.5 at time 1 and 4 respectively. Generally, the use of MLS in this study has decreased from time 1 to time 4. In the example from 3.4.1, it can be seen that the decrease was not due to the decrease of words per se; rather, it was caused by the double increase of sentences in the essays. By looking at the same sentence, it can be seen that overall, learner has longer MLS at time 4 but, the ratio (increase of sentences) makes it 'lesser' than at time 1. This is a concern, as the measure does not actually reflect learner's writing. According to the statistical value, the words were less employed at time 4. At a closer inspection, the decrease was actually caused by the sentences that have doubled at time 4.

Second, longer production units do not necessarily imply any thing. Though it has been mentioned that longer production units are associated with learners' linguistic experience (Chenoweth & Hayes, 2001) and proven that more information are retrievable when more words are used (refer to 3.4.3 for explanation), what happens to essays or learners that do not comply with this notion? For example:

Learner	Sentence	Number of words
105-a	Fishing was their weekend routine.	5
105-d	They were always fishing together every weekend.	7

The above sentences are taken from time 1 and 4 from the same learner. While the first sentence at time 1 has five words, the second sentence at time 4 has seven words, 2 words longer than the first sentence. Both of the above sentences bring out the same meaning: 'they' had always fished together every weekend.

The first sentence is the continuation of the previous sentences "John, Jason and Josh were walking together to the river. They were going to fish". The second sentence is the continuation of the previous sentence "Kevin, John and Sam were on their way to go fishing at the river". In both of these sentences, 'fishing together' has already being mentioned. In what follows the sentences was the idea that 'fishing together had always been their routine'.

The first sentence was written as 'their weekend routine' while the second sentence was written as 'fishing together every weekend'. In both of these sentences, the meaning is the same though the choice and number of words were different. Even though, one might argue that the first sentence is complexity at a phrasal level and the latter is complexity at a clausal level, the focus is the number of words that bring out the same meaning. As can be seen, even though the second sentence has longer sentence, the meaning is still the same with the first sentence. This shows that the increase in the number of words does not bring new information in the writing. This brings about the question; if the length of production unit is a measure of linguistic experience (Chenoweth & Hayes, 2001) and maturity (e.g. Monroe, 1975 & Cooper, 1976), to what extent does this notion apply? From the examples given, it can be seen that the focus should be on inspecting sentences' structures by their levels rather than using length of production unit as a measure of syntactic complexity.

5.6 Summary of the study

The analysis of this study revealed that, in the length of production unit category, the use of MLS decreased noticeably from time 1 to time 4 while the use of MLT has increased from Time 1 to Time 4. MLC however, did not go through any noticeable changes. In subordination category, DC/C and DC/T have increased from Time 1 to Time 4. In coordination category, CP/C was mostly applied from time 2 to time 3.

In particular structures category, learners have also increased the use of CN/C from time 1 to time 2, time 1 to time 3, and time 1 to time 4. CN/T was used mostly at time 1 to time 2 and time 1 to time 4. VP/T is another construct apart from MLS and C/T that has a noticeable decrease in use from time 1 to 4, time 2 to time 4, and time 3 to time 4. Over time, the syntactic complexity of L2 learners significantly changed in 10 out of 14 measures of complexity from time 1 to time 4. From the first task to the last task, L2 writers in this study employed more DC/C, DC/T, CN/C, MLT, C/S and CN/T. The use of CP/C, MLS, VP/T and C/T on the other hand, have significantly decreased over time.

The extent to which syntactic complexity constructs reflect learners' linguistic system should be revisited. As previously discussed, the changes in MLS construct was probably need not to be observed as the number of words did not reflect learners' maturity and additional information in the texts were unnecessary (see 5.5 for further discussion). Additionally, no changes in the use of CP/T, MLC, T/S, CT/T were detected. This brings about the discussion of whether the uses of these five measures are still reliable in measuring syntactic complexity of L2 learners. Second, the change in the value of construct (e.g. MLS) does not reflect the true linguistic production of learners. From the example given (3.4.1), the change might be due to the increase use of sentences and not decreases use of the number of words. Thus, sentences were actually

longer at time 4 (for some), not shorter even though the study found that overall; the use of MLS has decreased over time.

Some phrasal units in this study (e.g. CN/C, CN/T) have significantly increased over time, others (e.g. VP/T, CP/C) have significantly decreased over time. Clausal measures in the study (e.g. DC/C, DC/T, MLT, C/S) have been shown to increase over time while MLS and C/T have been shown to decrease as time progresses.

In the context of fourteen constructs of syntactic complexity in this study (Lu, 2010), learners seemed to be increasing in the use of clausal units more than phrasal units. Staples, Egbert, Biber and Gray (2016) found that clausal features allow writers to review arguments by others (e.g., History essay). The use of clausal features by learners reflects a more clear connection between ideas and to express step-by-step arguments (Staples, Egbert, Biber & Gray, 2016). This could be due to the nature of narrative writing that needs a lot of step-by-step description of what happened to create a smooth story line. In this study for example (see Figure 3.1), the first picture shows three boys and two girls are standing beside a river. In the second picture, one of the girls fell down the river. Next, the girls screamed for help. Then, one of the boys jumped into the river. The last picture shows a '?' (question mark), asking story narrators to tell what might have happened after the boy jumped into the river. It can be clearly seen that a step-by-step description is required to create a story line. Therefore, more clausal measures were used in the narrative task.

5.7 Implications for Future Research

This study uses participants from a single demography with the same participants from the same L1 background, which is Malay. Thus, the results are not applicable to other learners of different first languages.

Though nominals are highly used in academic writing, the finding of this study yielded a heavy use of nominals over time. Future research may replicate this study with an addition of another writing genre to compare the use of nominal in learner's writing between different genres to see which genre yields the most significant use of nominals. Third, the research does not look at which specific features of the L1 accounts for an L2 write's level of syntactic complexity. Future research should attempt to identify which features of L1 contribute to L2's variations of performance.

Based on the discussion in 5.5, future research should identify whether number of words really bring out new information in learner's writing. Apart from that, the extent to which syntactic complexity explains the variation of results can be validated by triangulating data. Future research can triangulate the data by providing additional factors of what may have caused the differences in syntactic complexity, e.g. doing a survey to observe if there are other confounding variables that influence the participants' syntactic complexity.

5.8 Conclusion

While the observed increase in complexity may imply that there is evidence of more sophisticated language use over time in the writing of the students, it should be remembered "more complex does not necessarily mean better" (Ortega, 2003, p. 494). The ability for learners to put syntactic complexity into use means that not only it includes syntactic complexification but it "also entails the development of discourse and sociolinguistic repertoires that the language user can adapt appropriately to particular communication demands" (Palotti, 2009, p. 14).

It should be noted that the measures of syntactic complexity cannot be taken for granted and used without caution. The results yield a discussion towards the majority learners. In some aspects, the results are not generalizable towards certain learners in certain constructs.

Finally, the findings of this study indicate that language development occurs gradually and can only be observed longitudinally, as shown by the changes in constructs that took more than 12 months to develop (e.g. MLS, MLT, DC/C, DC/T). As pointed out by Larsen- Freeman (2006), it s a dynamic system that "grows and organizes itself from the bottom up in an organic way" (p.591)

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