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*Accuracy and complexity as connected growers in L2 English speech at secondary school – a case study of a good, average, and poor language learner*

Abstract

Complex Dynamic Systems Theory (CDST), which originated in the natural sciences, has recently been applied to second language acquisition, underlining the interdisciplinary character of this humanistic discipline. According to this theory, language is a complex dynamic system consisting of subsystems which develop in a non-linear way forming different kinds of supportive, competitive, or conditional relationships. What is more, these subsystems compete for the learner's limited resources, which causes trade-offs within and between such subsystems as complexity, accuracy, and fluency, especially in speech. The present paper constitutes a part of a short series of articles which present different aspects of the same longitudinal case study on the development of L2 English speech at secondary school. The aim of this paper is to examine the relationships between language accuracy and a number of specific measures of syntactic complexity, i.e. general sentence complexity, subordination, coordination, and nominalisation; as well as lexical complexity, i.e. lexical density, sophistication, and variation, in the case of a good, average, and poor language learner at secondary school. In general, the results showed that the relationships between the selected variables fluctuated over time and often differed in the case of a good, average, and poor language learner.

Keywords: accuracy, syntactic and lexical complexity, Complex Dynamic Systems Theory, L2 speech, secondary school

Słowa kluczowe: poprawność, złożoność syntaktyczna i leksykalna, Teoria Złożonych Systemów Dynamicznych, mowa w J2, szkoła średnia

## 1. Introduction

Complex Dynamic Systems Theory (CDST) is a term coined by de Bot (2017) to refer to both Complexity Theory (CT) (Larsen-Freeman, Cameron, 2008) and Dynamic Systems Theory (DST) (Verspoor, de Bot, Lowie, 2011) as the two theories share the same theoretical principles and deal predominantly with the same issues but were developed in different research centres in North America and Europe, respectively. CDST is a theory which originated in the natural sciences but which has recently been applied to the social sciences, such as developmental psychology and second language acquisition. Although this theory has been criticised by some researchers for direct transfer from the natural to social sciences and its presumed inapplicability to language studies, it has already provided a new framework and methodological tools for numerous studies within applied linguistics, which underlines the interdisciplinary character of SLA as a scientific humanistic discipline.

CDST focuses on second language development (SLD) as opposed to acquisition (SLA). According to this theory, language is a complex dynamic system consisting of multi-layered subsystems which develop non-linearly in different ways and at different rates (Verspoor, de Bot, Lowie, 2011). Language development is an emergent and self-organising process characterised by intermittent periods of variability and stability (Larsen Freeman, Cameron, 2008). The periods of variability and stability, which signal the activity in the language system, are said to correspond respectively to progress and regress in language development. Hence, intra-individual variability is treated as an important developmental phenomenon. Furthermore, language subsystems develop while entering a complex network of interactions which may be supportive, competitive, or conditional (van Geert, van Dijk, 2002). These subsystems compete for the learner's limited resources so that the allocation of the resources to one subsystem causes trade-offs within and between these subsystems (Schmid, Verspoor, MacWhinney, 2011). Thus, despite the fact that language development usually involves a general increase of complexity, accuracy, and fluency, some trade-offs are observed between them, which is more evident in spoken than written data. Indeed, as Michel (2017: 52) says, complexity, accuracy, and fluency are "multifaceted, multi-layered, and multidimensional" phenomena which do not "progress in tandem" (Wolfe-Quintero, Ingaki, Kim, 1998: 4) but are inter-related in complex and non-linear ways (Hounsen, Kuiken, Vedder, 2012; Larsen-Freeman, 2009; Norris, Ortega, 2009).

Studies conducted within the CDST framework treat complexity, accuracy, and fluency as dynamic constructs which should be examined on the basis of dense, longitudinal, and individual data. The present case study has focused

so far on the phenomenon of intra-individual variability in the emergence of complexity, accuracy, and fluency, with a special emphasis on both syntactic and lexical complexity, in the case of a good, average, and poor language learner at the level of secondary school (Rokoszewska, 2019a, 2019b, 2020). The study has also examined dynamic relationships between general measures of complexity, accuracy, and fluency. Thus, the present part of the case study will examine the relationships between accuracy and specific measures of syntactic and lexical complexity.

## 2. Language accuracy and complexity in CDST

Language accuracy and complexity constitute inextricable components of the so called CAF triad, which is also referred to as CALF to account not only for complexity, accuracy, and fluency but to emphasise the importance of both syntactic and lexical complexity. The present paper deals with accuracy and a number of specific measures of syntactic complexity, i.e. general sentence complexity, subordination, coordination, and nominalisation, as well as lexical complexity, i.e. lexical density, sophistication, and variation.

Accuracy refers to the target-like or error-free use of language in speech or in writing and measures the extent of deviation from L2 norms (Michel, 2017). Investigating accuracy is a challenging task for a number of reasons. Such an analysis depends on the choice of linguistic norms which may be based either on the prescriptive description of the target language grammar or on native language use. What is more, a given language may have more than one normative standard, e.g. British and American English. In addition, raters may disagree not only on the choice of the norm, but also on what is in fact accurate, not to mention their different opinions on error gravity.

Accuracy is measured by means of holistic, global, and specific scales (Michel, 2017). Holistic scales give a global impression of accuracy and involve general comments about the knowledge of grammar, vocabulary, and the number of errors made (Polio, 1997). Global scales measure general accuracy on the basis of the number of error-free clauses, sentences, or T-units (cf. 3). According to Michel (2017), such measures enable the comparison of accuracy in different languages, populations, and tasks, but as Lambert and Kormos (2014) notice, they may not measure minor differences which are found at higher levels of proficiency or which are caused by short-term pedagogical interventions. Specific scales focus on a particular teaching aim, task, or language form, e.g. subject-verb agreement. Such scales may capture small changes in accuracy, but the findings are not generalisable to other contexts. Apart from identifying errors, it is important to evaluate error severity. Kuiken

and Vedder (2008) proposed the classification of three types of errors with respect to communicative efficiency. According to them, first degree errors involve minor errors, e.g. problems with articles or spelling, second degree errors are more severe errors which make understanding difficult, e.g. problems with word order, and third degree errors make utterances incomprehensible, e.g. a combination of wrong words, word order, and omissions. According to Michel (2017: 55), categorising errors according to their gravity makes it possible to compare accuracy across different studies, but it involves making “strong interpretative choices” while defining categories and assigning errors. Housen et. al (2012) claim that the accuracy measure within the CAF or CALF construct should also account for appropriateness and acceptability in a given social context.

Complexity refers to different aspects in SLA literature, such as developmental complexity, i.e. “the order in which linguistic structures emerge and are mastered” in the first and second language (Pallotti, 2015: 2), cognitive complexity, i.e. the learner’s subjective perception of the difficulty of language items that are processed and learnt (Michel, 2017), and linguistic complexity, i.e. intrinsic formal, semantic, and functional properties of L2 items (Housen et al., 2012). In CALF studies, linguistic or, as Michel (2017:52) puts it, “objective complexity” is in focus. This type of complexity is a multidimensional construct defined as “the number of discrete components that a language feature or a language system consists of, and the number of connections between the different components” (Bulte, Housen, 2012: 24).

Linguistic complexity is divided into lexical and grammatical complexity. Lexical complexity is construed as lexical diversity, density, and sophistication. Lexical diversity or variation refers to the size of lexis usually measured by means of different type-token ratios (Lu, 2010). Lexical sophistication denotes the depth of lexis measured by means of frequency of rare, academic, or advanced words. Lexical density refers to the amount of information in a text, which is usually measured by the ratio of lexical to function words. In addition, according to Read (2000), lexical complexity or richness does not pertain only to lexical density, sophistication, and variation, but also to the number of lexical errors. Lexical errors may be analysed according to a comprehensive classification provided by James (1998) who divided them into formal errors, such as mis-selections, mis-formations, and distortions, as well as semantic relations and collocation, connotation, and stylistic errors.

Grammatical complexity may be analysed at different linguistic levels, such as syntax, morphology, and phonology in terms of length, variation, and interdependence (Bulte, Housen, 2012). The length of a production unit may be measured as the number of words per clause, sentence, or T-unit. Variation refers to a variety of units, e.g. the number of different morphemes, whereas

interdependence—to relations between units, e.g. coordination vs. subordination. In order to examine developmental changes at the syntactic level, Norris and Ortega (2009) suggest measuring coordination, i.e. the number of coordinated phrases, subordination, i.e. the number of subordinated clauses, and internal phrase complexification, i.e. the length of noun phrases. According to them, phrasal coordination is a good sign of complexification at lower levels of L2 proficiency, subordination is a useful indicator of this process at the intermediate level while internal phrase complexification—at higher levels of proficiency. However, it is important to point out that this view of development has been challenged by other researchers.

In Complex Dynamic Systems Theory (CDST), complexity, accuracy, and fluency are construed as the so-called coupled or connected growers which develop over time forming supportive, competitive, or conditional relationships (van Geert, van Dijk, 2011). The relationship between two growers is supportive if they develop together over time supporting each other so that they increase or decrease simultaneously. Such variables are called supportive or connected growers. The relationship between two variables is competitive if they develop in an alternating way competing with each other so that one variable increases while the other decreases and vice versa. Such variables are called competitive growers or competitors. The relationship between two growers may be also conditional when some level of one grower is a necessary condition for another grower to be subsequently developed. Such growers are called conditional growers or precursors. As it has already been pointed out, due to the competition of learners' language subsystems for their limited cognitive and linguistic resources, some substantial trade-offs between complexity, accuracy, and fluency arise. In addition to being non-linear and dynamic, the relationships between these variables might also be different for individual learners. Indeed, as van Dijk, Verspoor, and Lowie (2011: 59-60) point out, CDST aims at discovering 'when and how changes take place in the process of development, how different subsystems develop and interact, and how different learners may have different developmental patterns'.

The present case study consisted of several parts. The first part focused on intra-individual variability in the emergence of complexity, accuracy, and fluency in speaking English as a foreign language at secondary school in the case of a good, average, and poor language learner (Rokoszewska, 2019a). The second part examined this phenomenon with respect to syntactic complexity, understood as general sentence complexity, coordination, subordination, and nominalisation (Rokoszewska, 2019b) while the third part—with respect to lexical complexity, understood as lexical density, sophistication, and variation (Rokoszewska, 2020). As it will be reiterated for the purpose of further analysis

presented in this paper, the previous parts of the case study showed that the language produced by the good learner in speech was characterised by significantly higher accuracy, fluency, and syntactic as opposed to lexical complexity while the language of the average and poor learner did not differ much. What is more, the former parts of the case study revealed statistically insignificant differences in the patterns of intra-individual variability in the emergence of general and specific measures of language development but indicated a positive relationship between the learners' level of intra-individual variability and the rate of development of the selected language variables. Finally, the study examined the relationships between general measures of complexity, accuracy, and fluency, pointing to their dynamic and individual character for different learners. Thus, the fourth part of the case study focused on the relationships between accuracy and specific measures of both syntactic and lexical complexity.

### 3. Research design

Following the analysis of the relationships between general measures of language development, such as complexity, accuracy, and fluency (Rokoszewska, 2019a), the present part of the case study aimed at the investigation of the influence of lexical and syntactic complexity on language accuracy in the development of the ability to speak English as a foreign language at secondary school in the case of a good, average, and poor language learner. More specifically, the aim was to examine various types of relationships which took place between these variables and which might have different character, i.e. supportive, competitive, or pre-conditional, in the case of the selected learners. Thus, the research questions were as follows:

1. What results are obtained by a good, average, and poor learner in accuracy, lexical complexity, and syntactic complexity in the development of L2 English speech at the level of secondary school?
2. What kind of dynamic relationships take place between accuracy and lexical complexity, i.e. lexical density, sophistication, and variation, in the development of L2 English speech at the level of secondary school in the case of a good, average, and poor language learner?
3. What kind of dynamic relationships take place between accuracy and syntactic complexity, i.e. general syntactic complexity, subordination, coordination, and nominalisation, in the development of English L2 speech at the level of secondary school in the case of a good, average, and poor language learner?

The research method was a corpus-based case study which constitutes a part of a larger quantitative and qualitative research project. This type of case study is best described as exploratory since its aim was to analyse selected language growers in L2 English speech in the case of a good, average, and poor learner, which needs to be followed by a quantitative study of the whole group and subgroups of different learner types. Such a research method was adopted since, according to CDST proponents, it is possible to examine how an individual learner or a group of learners develops only if data are “dense (i.e. collected at many regular measurement points), longitudinal (i.e. collected over a longer period of time), and individual (i.e. for one person at a time and not averaged out)” (van Dijk, Verspoor, Lowie, 2011: 62). The case study was based on three mini-corpora which documented the development of L2 English speech in a good, average, and poor language learner throughout secondary school<sup>1</sup>. Each mini-corpus consisted of 21 semi-structured interviews on different topics conducted once a month over a period of three years (Table 1). Altogether, this yielded 63 interviews for the whole analysis. The mini-corpora were built on the basis of the procedure which involved such steps as interviewing and evaluating the learners, transcribing and verifying the recorded interviews, and analysing the samples of around 200 words. The mini-corpora were taken from The Spoken English Developmental Corpus of Polish Learners (SEDCPL) built on the basis of the study conducted on the sample of 106 learners at one of secondary schools in 2014–2017. The whole corpus to be analysed consists of around 2100 recorded interviews.

THE PROCEDURE OF BUILDING THE SPOKEN CORPUS OF LEARNER ENGLISH										
DATA	SEMESTER 1					SEMESTER 2				
	Sept	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
GRADE 1	Org.	Test 1 Fashion	Test 2 Internet	Test 3 Music	Test 4 Education	Winter break	Test 5 Ecology	Test 6 Pets	Test 7 Work	Test 8 Holidays
GRADE 2	Org.	Test 9 Books & films	Test 10 Shopping	Test 11 Friendship	Test 12 Christmas	Winter break	Test 13 Family	Test 14 Health	Test 15 Fame	Test 16 Home & living
GRADE 3	Org.	Test 17 Love	Test 18 TV	Test 19 Crime	Winter break	Test 20 Terrorism	Test 21 Tolerance	End of school-year	Matura exam	-

Table 1: The procedure of building The Spoken English Developmental Corpus of Polish Learners (SEDCPL).

<sup>1</sup> At the time of the research project, secondary school in Poland included 3 grades consisting of learners at the age of 16-19. Since the 1<sup>st</sup> of September 2019 it will include 4 grades consisting of learners at the age 15–18.

In the fourth part of the case study, a number of variables were taken into account. The dependent variable was language accuracy operationalised as the number of correct T-units per all T-units in a given speech sample. A T-unit or minimal terminal unit, defined as the main clause with subordinated clauses (Hunt, 1965), was the main unit of the analysis as it is said to be more reliable than a sentence in examining oral production (Larsen-Freeman, Cameron, 2008). The scale for this variable was interval. The independent variable referred to language complexity understood as both syntactic and lexical complexity, the scale being interval. Syntactic complexity was analysed in terms of general syntactic complexity, i.e. the number of clauses per T-unit (C/T) (Ellis, Barkhuizen, 2006), subordination, i.e. the number of subordinated clauses per T-unit (DC/T) (Lu, 2010), coordination, i.e. the number of coordinated phrases per T-unit (CP/T), and nominalisation, i.e. the number of complex nominals per T-unit (CN/T) (Lu, 2010). Lexical complexity was construed as lexical density, sophistication, variation, and frequency. Lexical density (LD) was operationalised as the number of lexical tokens per total number of tokens (Laufer, Nation, 1995). Lexical tokens denote nouns, verbs, adjectives, and adverbs which have the same form as adjectives, e.g. fast, and which are formed on the basis of the adjectival base, e.g. careful-carefully (Lu, 2012). Lexical sophistication (LS) was defined as the number of more advanced tokens per total number of lexical tokens (Laufer, Nation, 1995), whereby more advanced tokens are words not included in the first 2000 words in The British National Corpus (BNC) (Lu, 2012). Lexical variation (LV) was calculated as the so-called sophisticated or complex type-token ratio (CTTR), which takes into account the length of the sample (Ellis, Barkhuizen, 2005; Larsen-Freeman, 2006). The intervening variable, measured on the basis of the interval scale, was described as the influence of language complexity on accuracy in the development of L2 English speech at the level of secondary school. The moderator variable was learners' age established by the nominal scale. The control variables, determined by the nominal scale, included the same nationality, course-book, number of English lessons per week as well as no longer stay in an English-speaking country.

In the present case study, dense, longitudinal, and individual data were gathered by means of systematically conducted semi-structured interviews mentioned above. The data were analysed by such instruments as Syntactic Complexity Analyser (Lu, 2010) and Lexical Complexity Analyser (Ai, Lu, 2010) as well as some CDST procedures (Verspoor, Lowie, van Geert, van Dijk, Schmid, 2011). The procedures were used to calculate the so-called moving correlations between the variables in a time series on the basis of normalised and de-trended data with the use of the moving window of five data collection

points. In contrast to standard correlations computed in terms of Pearson's product-moment correlation coefficients, moving correlations show the character and the dynamics of the relationship between two variables over time. As it will be shown later, when standard correlations point to non-existent relationships, moving correlations often reveal existent but dynamic relationships which involve pre-conditioning or duality.

The subjects in the present case study were secondary school learners at the age of 16–19 who attended classes with an extended English programme in the form of 4–6 lessons per week. They were chosen from the group of 106 learners on the basis of a placement test, a written essay, and an oral interview which were conducted upon entering secondary school. In total, the good learner (GL) obtained 5.5 points, the average learner (AL) 3.45 points, and the poor learner (PL) 2.17. The learners are described in more detail in Table 2.

	GOOD LEARNER			AVERAGE LEARNER			POOR LEARNER		
GENDER	female			male			male		
AGE	16-19 (grades 1–3)								
EXPOSURE TO L2	10 years (grade 1): 4–6 lessons (1–3 grades) - extended English programme no extra classes, no longer stay in an L2 country								
RESIDENCE	city			village			city		
EDUCATION (F/M) <sup>2</sup>	higher / higher			secondary / higher			higher / higher		
EMPLOYMENT (F/M)	white collar worker/ white collar worker			blue collar worker/ white collar worker			white collar worker/ white collar worker		
ENGLISH (F/M) <sup>3</sup>	very good/ basic			basic / average			very good/ basic		
GPA	5.01			4.25			3.54		
GRADES IN ENG.	5.17			3.92			2.67		
FINAL EXAM (%)	Basic	Extended	Oral	Basic	Extended	Oral	Basic	Extended	Oral
	100.0	98.0	100.0	70.0	66.0	77.0	98.0	-	96.0
CLASSIFICATION (pts./ grades)	Test	Speak.	Writ.	Test	Speak.	Writ.	Test	Speak.	Writ.
	6.0 (93pts.)	5.0	5.5	3.0 (61pts.)	3.75	3.5	1.0 (36pts.)	2.0	3.5
	Total–5.5 pts.			Total–3.42 pts.			Total–2.17 pts.		

Table 2: The subjects in the present study.

## 4. Research results

### 4.1 Accuracy and complexity – general results

With respect to language accuracy, the results of the present case study (Table 3) indicated that the good learner, on average, produced 60.0% (SD = 0.14), the average learner 26.0% (SD = 0.10), and the poor learner 28.0% (SD = 0.08)

<sup>2</sup> F/M–father/ mother

<sup>3</sup> The students' opinions about their parents' knowledge of English.

of correct T-units while speaking English at secondary school. The analysis of the results conducted by means of one-way analysis of variance (ANOVA) ( $p = 0.05$ ) and the Tukey-Kramer test, i.e. a means differentiation test, revealed that the differences between the good and average learner and between the good and poor learner were statistically significant, whereas the difference between the average and poor learner was not.

As far as the development of lexical density is concerned (Table 3), the good learner, on average, used around 46.0% (SD = 0.04) while the average (SD = 0.04) and poor (SD = 0.06) learner 48.0% of lexical tokens per all tokens in a speech on a given topic. As for lexical sophistication, it was found out that the good (SD = 0.07) and average (SD = 0.06) learner produced around 18.0% while the poor learner 21.0% (SD = 0.07) of sophisticated lexical tokens per all lexical tokens in speech. For lexical variation, the learners' results were as follows: the good learner 4.40 (SD = 0.39), the average learner 4.04 (SD = 0.47), and the poor learner 3.91 (SD = 0.33). In general, the differences between the learners' results (Table 3) were statistically significant in terms of lexical variation but not lexical density and sophistication. However, in terms of lexical variation, the differences between the good and average learner as well as between the good and poor learner were statistically significant, but the difference between the average and poor learner was not.

THE DEVELOPMENT OF ACCURACY AND LEXICAL COMPLEXITY												
DATA	ACCURACY			LEX. DENSITY			LEX. SOPHISTICATION			LEX. VARIATION		
	GL	AL	PL	GL	AL	PL	GL	AL	PL	GL	AL	PL
MEAN	0.60	0.26	0.18	0.46	0.48	0.48	0.18	0.18	0.21	4.40	4.04	3.91
SD	0.14	0.10	0.06	0.04	0.04	0.06	0.07	0.06	0.07	0.39	0.47	0.33
MIN	0.37	0.05	0.10	0.12	0.40	0.36	0.03	0.10	0.12	3.76	3.14	3.27
MAX	0.86	0.42	0.26	0.35	0.56	0.60	0.31	0.26	0.35	5.02	5.15	4.41
ANOVA	0.000			0.505			0.505			0.001		
TUKEY-KRAMER TEST <sup>4</sup>	GL≠AL GL≠PL AL=PL			-			-			GL≠AL GL≠PL AL=PL		

Table 3: The development of accuracy and lexical complexity – all learners.

As far as the development of syntactic complexity is concerned (Table 5), the results of the study indicated that in terms of general syntactic complexity, the good learner, on average, produced 2.30 (SD = 0.92), the average learner 1.47 (SD = 0.21), and the poor learner 1.51 (SD = 0.35) clauses per T-unit in speech over the period of three years at secondary school. As far as more specific measures of syntactic

<sup>4</sup> As this test involves the comparison of absolute difference and critical range, detailed numbers are not provided here.

complexity are concerned, it was observed that in terms of subordination, the good learner used 1.00 (SD = 0.61), the average learner 0.47 (SD = 0.19), and the poor learner 0.50 (SD = 0.27) dependent clauses per T-unit while speaking English at secondary school. With respect to coordination, the good learner built 0.40 (SD = 0.33), the average learner 0.24 (SD = 0.14), and the poor learner 0.32 (SD = 0.11) co-ordinate phrases per T-unit. With respect to nominalisation, the good learner uttered 1.70 (SD = 1.00), the average learner 0.80 (SD = 0.29), and the poor learner 0.86 (SD = 0.39) complex nominals per T-unit. The results of the statistical analysis conducted by means of one-way ANOVA ( $p = 0.05$ ) showed that the differences between the three learners were statistically significant in general syntactic complexity, subordination, and nominalisation, but not in coordination (Table 4). What is more, the Tukey-Kramer test showed that, in terms of these three measures of syntactic complexity, the differences between the good and average learner as well as the good and the poor learner were statistically significant, whereas the differences between the average and poor learner were insignificant (Table 4).

THE DEVELOPMENT OF SYNTACTIC COMPLEXITY												
DATA	GENERAL SYNTACTIC COMPLEXITY			SUBORDINATION			COORDINATION			NOMINALISATION		
	GL	AL	PL	GL	AL	PL	GL	AL	PL	GL	AL	PL
MEAN	2.30	1.47	1.51	1.00	0.47	0.50	0.40	0.24	0.32	1.70	0.80	0.86
SD	0.92	0.21	0.35	0.61	0.19	0.27	0.33	0.14	0.11	1.00	0.29	0.39
MIN	1.15	1.04	0.90	0.21	0.07	0.07	0.15	0.00	0.16	0.25	0.43	0.19
MAX	4.67	1.87	2.13	2.75	0.93	1.07	1.23	0.53	0.53	4.17	1.67	1.65
ANOVA	0.000			0.000			0.163			0.000		
TUKEY-KRAMER TEST	GL≠AL GL≠PL AL=PL			GL≠AL GL≠PL AL=PL			-			GL≠AL GL≠PL AL=PL		

Table 4: The development of syntactic complexity – all learners.

#### 4.2. Dynamic relationships between accuracy and lexical complexity

Analysing dynamic relationships between accuracy and lexical complexity, it may be said that the correlation between accuracy and the first lexical measure, i.e. lexical density, was very weak and positive for the good learner (.1633) but non-existent for the average (.0019) and the poor (-.0351) learner (Table 5). However, moving correlations, which illustrate how the relationship between the two variables changes over the period of three years, revealed a clear pre-conditional relationship between accuracy and lexical density in the case of the good learner, which means that the two variables first competed but then supported each other (Figure 1). In the case of the average and poor learner, a dual relationship could be observed in that the two variables competed and supported each other in an alternating fashion (Figure 1).

ACCURACY AND LEXICAL COMPLEXITY – CORRELATIONS AND RELATIONSHIPS							
DATA	Ls	LEX. DENSITY		LEX. SOPHISTICATION		LEX. VARIATION	
		COR.	REL.	COR.	REL.	COR.	REL.
ACCURACY	GL	0.1633	pre-cond.	0.1830	supportive	.3137	pre-cond.
	AL	0.0019	dual	-0.0422	pre-cond.	.0535	dual
	PL	-0.0351	dual	-0.3999	competitive	.0404*	dual

Table 5: Correlations and relationships between accuracy and lexical complexity measures – all learners.

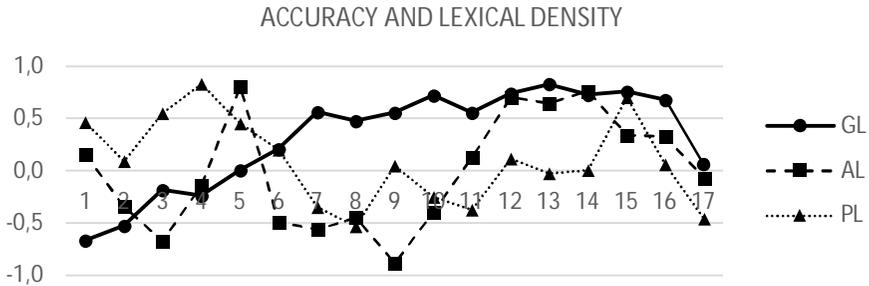


Figure 1: Moving correlations between accuracy and lexical density – all learners.

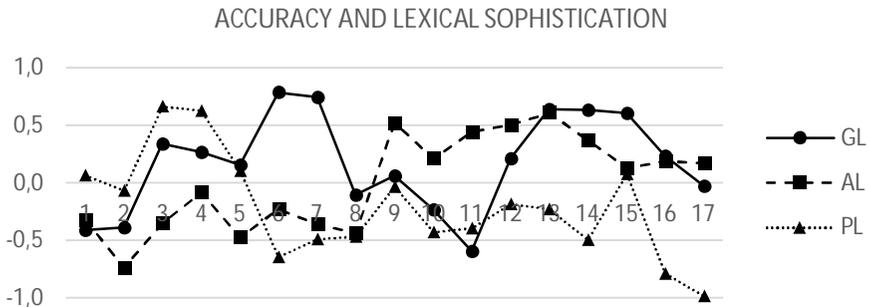


Figure 2: Moving correlations between accuracy and lexical sophistication – all learners.

The relationship between accuracy and lexical sophistication was very weak and positive for the good learner (.1830), non-existent for the average learner (-.0422), but weak and negative for the poor learner (-.3999) (Table 5). The analysis of moving correlations pointed to a predominantly positive relationship between accuracy and lexical sophistication in the case of the good learner, though some duality could also be observed in that quite strong support dropped down twice (Figure 2). In the case of the average learner, the analysis indicated a pre-conditional relationship in which systematically increasing support between the two measures might be observed (Figure 2). In the case of the poor learner, it showed a predominantly negative relationship in which systematically decreasing

support could be noticed, as initial support between the two variables changed into persistent competition (Figure 2). In other words, accuracy and lexical sophistication constituted supportive growers for the good learner, competitive growers for the poor learner, and pre-conditional growers for the average learner.

The correlation between accuracy and lexical variation was positive but weak in the case of the good learner (.3137) but non-existent in the case of the average (.0535) and poor learner (.0404) (Table 5). However, moving correlations graphically represented a pre-conditional relationship for the good learner and a rather dual relationship for the average and poor learner (Figure 3). Thus, for the good learner, accuracy and lexical variation were pre-cursors, whereas for the average and poor learner, they were intermittent supporters and competitors.

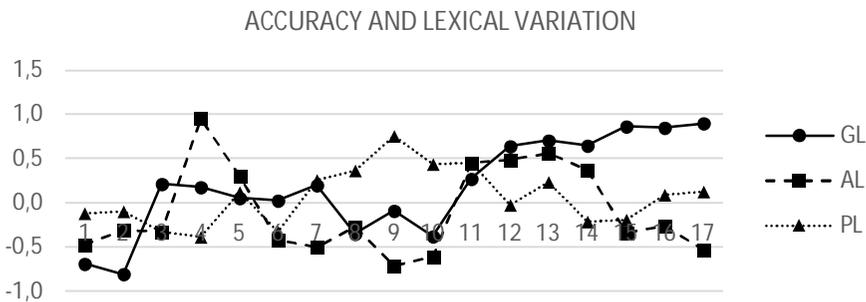


Figure 3: Moving correlations between accuracy and lexical variation – all learners.

#### 4.3. Dynamic relationships between accuracy and syntactic complexity

Analysing dynamic relationships between accuracy and syntactic complexity, it may be pointed out that the correlation between accuracy and general syntactic complexity indicated a weak, negative relationship for the good (-.2135) and average (-.3755) learner, but a weak, positive (.2410) relationship for the poor learner (Table 6). However, in the case of the poor learner, moving correlation illustrated a typical pre-conditional relationship in which the two variables first formed a competitive and then a supportive relationship (Figure 4). Such pre-conditioning, though more moderate, could also be observed in the case of the good learner (Figure 4). In the case of the average learner, the relationship was probably best described as dual (Figure 4).

As far as more specific measures of syntactic complexity are concerned (Table 6), it was observed that there was a weak, negative relationship between accuracy and subordination in the case of the oral production of the good (-.3398) and average (-.3236) learner, but no relationship in the case of the oral production of the poor learner (.0498). Moving correlations revealed

a predominantly negative relationship between the two variables with some outliers at the beginning and end of the observation period in the case of the good learner, a dual relationship in the case of the average learner, and a pre-conditional relationship in the case of the poor learner (Figure 5).

ACCURACY AND SYNTACTIC COMPLEXITY – CORRELATIONS AND RELATIONSHIPS									
DATA	Ls	GEN. SYNTACTIC COMPLEXITY		SUBORDINATION		COORDINATION		NOMINALISATION	
		COR.	REL.	COR.	REL.	COR.	REL.	COR.	REL.
ACCURACY	GL	-.2135	pre-cond.	-0,3398	comp.	-0.1285	pre-cond.	-0.3060	comp.
	AL	-.3755	dual	-0,3236	dual	-0.1574	dual	-0.2723	pre-cond.
	PL	.2410	pre-cond.	0,0498	pre-cond.	-0.2383	dual	0.3195	support.

Table 6: Correlations and relationships between accuracy and syntactic complexity measures – all learners.

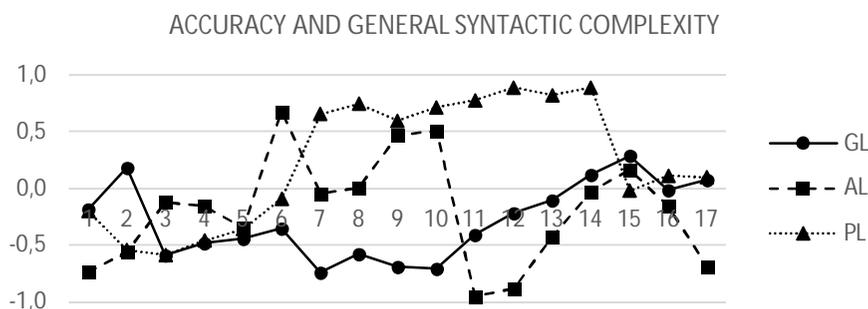


Figure 4: Moving correlations between accuracy and general syntactic complexity – all learners.

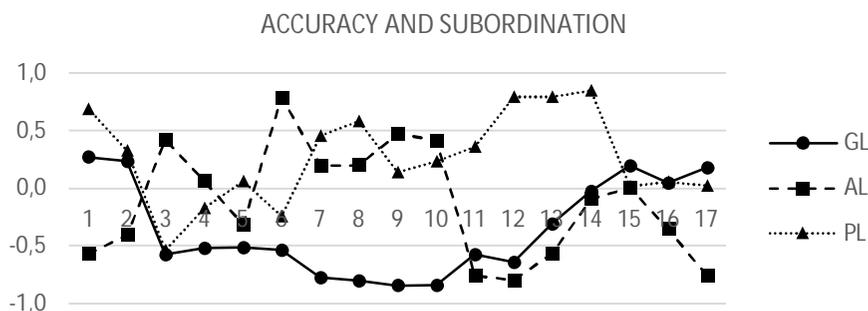


Figure 5: Moving correlations between accuracy and subordination – all learners.

Looking at accuracy and phrasal coordination, it was observed that standard correlations indicated the existence of a weak, negative relationship

between the two factors in the case of all three learners as the precise results were as follows  $-.1285$  for the good learner,  $-.1574$  for the average learner, and  $-.2383$  for the poor learner (Table 6). However, moving correlations clearly indicated a pre-conditional relationship in the case of the good learner and a completely opposite type of relationship for the poor and average learner, in that the two variables first supported each other and then competed, which made the relationship dual and changeable (Figure 6).

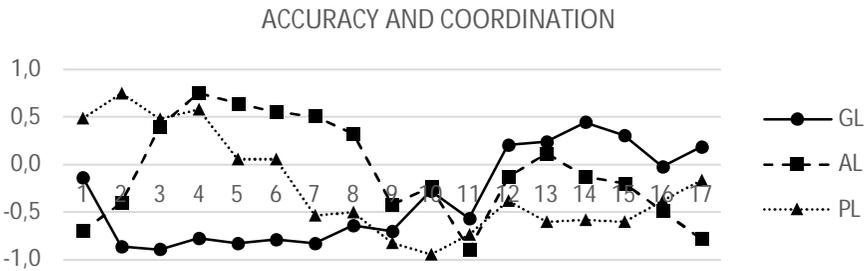


Figure 6: Moving correlations between accuracy and coordination – all learners.

Examining accuracy and nominalisation, it was found out that the relationship between the two factors was weak and negative in the case of the good ( $-.3060$ ) and average ( $-.2723$ ) learner, but weak and positive for the poor learner ( $.3195$ ) (Table 6). Moving correlations confirmed that the relationship was predominantly negative in the case of the good learner but predominantly positive in the case of the poor learner, though some decrease of this support was noticed at the end of the observation period. For the average learner, this relationship was pre-conditional. It is interesting to notice that support went down for all learners towards the end of the observation period (Figure 7).

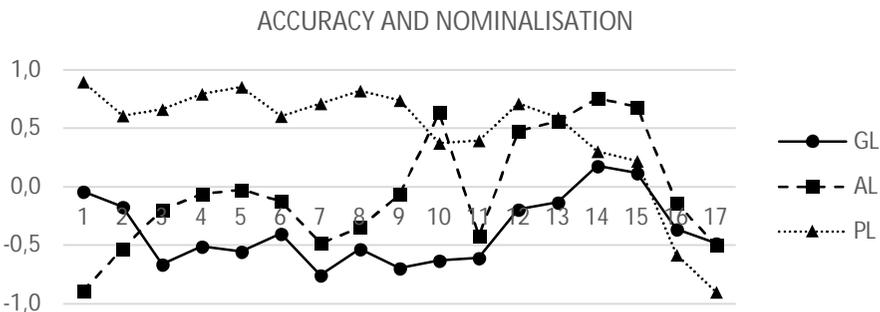


Figure 7: Moving correlations between accuracy and nominalisation – all learners.

## 5. Discussion

The aim of the present part of the case study was to examine the influence of lexical and syntactic complexity on language accuracy in the development of L2 English speech at secondary school in the case of a good, average, and poor language learner. For this reason, first the results which the learners obtained in the development of these measures were reiterated, and then the relationships between these variables were examined. Generally speaking, the results of the case study showed that the good language learner produced more accurate and complex language in speech than the average and poor learner, whose language did not differ (Rokoszewska, 2019a). With respect to syntactic complexity, it was found out that the good learner produced more complex language than the average and poor learner in terms of general sentence complexity, subordination, and nominalisation, but not in terms of phrasal coordination. What is more, the language of the average and poor learner was characterised by the same level of complexity in terms of all aspects of syntactic complexity (Rokoszewska, 2019b). With respect to lexical complexity, it was found out that the good learner's speech differed from the average and poor learner's speech only in terms of lexical variation but not density and sophistication (Rokoszewska, 2020).

The analysis of dynamic relationships between accuracy and complexity revealed some patterns in the development of L2 English speech at secondary school. In the case of the good learner, the analysis indicated that the relationship between accuracy and lexical sophistication was positive while the relationship between accuracy and either subordination or nominalisation was negative. This means that the good learner was able to build accurate utterances using more sophisticated words, but the use of subordinated clauses and complex nominal phrases took place at the cost of accuracy. Furthermore, the analysis indicated that the remaining relationships between accuracy and some measures of syntactic complexity, like general sentence complexity and coordination, and some measures of lexical complexity, like lexical density and variation, were pre-conditional. It seems reasonable to assume that the good learner needed to learn how to build more syntactically complex utterances, including coordinated phrases, and how to use denser and more varied vocabulary before reaching the level of more accurate L2 speech. In the case of the average learner, the analysis of dynamic relationships indicated rather chaotic language development as most of the variables, except lexical sophistication and syntactic nominalisation, formed dual relationships with accuracy, which were characterised by alternating support and competition. In the case of the poor learner, such duality was observed in terms of

accuracy and lexical density and variation as well as phrasal coordination. In contrast to the good learner, the poor learner was able to use longer nominal phrases but not more advanced words without compromising the accuracy of his speech. At the same time, for this learner, the development of general sentence complexity, including subordination, appeared to pre-condition the development of accuracy in L2 English speech.

The results of the present part of the case study lead to a number of conclusions. Firstly, it may be said that language variables, such as accuracy, syntactic complexity, and lexical complexity, develop as the so-called coupled or connected growers which form a variety of positive, negative, or conditional relationships over the course of time. Secondly, these relationships are complex and dynamic as their character may change over the language learning period. In other words, similarly to learners' individual learning trajectories, the trajectories of moving correlations between two variables are non-linear and dynamic. Thirdly, the relationships between different variables involve substantial competition between the connected growers as most of the relationships found in the case of a good, average, and poor learner were negative, pre-conditional, or dual. This illustrates the trade-offs between different language subsystems which are due to the fact that language processing is dependent on the learner's limited linguistic and cognitive resources. Finally, such relationships might be different for individual learners. However, the validity of this claim should be sought in the future in the course of comparing these individual learning trajectories and moving correlations with the data from the whole group of learners.

## 6. Conclusions

To conclude, it is important to highlight the fact that Complex Dynamic Systems Theory constitutes one of alternative approaches to second language acquisition which contributes to the interdisciplinary character of this scientific discipline. Since CDST, which originated in the natural sciences, is in fact the theory of change, it was only a matter of time before the theory was implemented in the social sciences, including developmental psychology and applied linguistics, in order to examine the mechanisms of change in human development. CDST emphasises the importance of investigating the process of second language development as opposed to second language acquisition, providing a new theoretical framework as well as a set of methodological tools and procedures. Rooted in the CDST framework, the present part of the case study showed that the good learner was able to produce more accurate and more syntactically, but not lexically, complex language in oral production in

English as a foreign language than the average learner and the poor learner between whom hardly any differences were found. This indicates that the learners allocated their linguistic and cognitive resources to different language subsystems. The good learner paid attention mainly to accuracy and syntactic but not lexical complexity. The average learner developed accuracy to the disadvantage of both syntactic and lexical complexity. The poor learner developed his syntactic and lexical complexity at the cost of accuracy. Such non-linear development of different language subsystems in the case of selected individual learners is reflected in a variety of moving correlations between accuracy and syntactic complexity, understood in terms of general sentence complexity, subordination, coordination, and nominalisation, as well as between accuracy and lexical complexity, understood in terms of lexical density, sophistication, and variation. Thus, the study points to the fact that both learning paths and trajectories of moving correlations are complex, dynamic, and fluctuant over a longer period of time and that they might indeed differ among individual learners. Nevertheless, despite the fact that CDST proponents are preoccupied with individual language development, it is crucial to compare the findings of the present case study with language development of the whole group of learners in order to discern generalisable patterns of language development on the basis of the myriad of individual learning paths and trajectories.

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