

Intra-individual variability in the emergence of syntactic complexity in L2 English speech at secondary school: A case study of a good, average, and poor language learner

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Abstract

According to complex dynamic systems theory (CDST), language development is a highly variable process in which various subsystems develop in different ways, forming supportive, competitive, or conditional relationships. Intra-individual variability, that is, variability within individual learners between repeated measurements in a time series, is said to be the main factor responsible for language development. In contrast to inter-individual variability, which is caused by individual learner differences connected with cognitive, affective, and social factors and which has so far received substantial attention in SLA research, intra-individual variability, which is predominantly connected with linguistic factors, remains to a large extent unexplained. Following the first part of a corpus-based case study, which focused on intra-individual variability in the emergence of complexity, accuracy, and fluency in speaking English as a foreign language at secondary school, the present paper describes the second part of the study, whose aim was to analyze this phenomenon in more detail with respect to various measures of syntactic complexity in the case of a good, average, and poor language learner. The study shows some statistically significant differences in the learners' development of syntactic complexity but no such differences in the patterns and levels of intra-individual variability in the development of this language subsystem. However, the analysis indicated a strong, positive correlation between the learners' level of intra-

individual variability and the rate of development of syntactic complexity in L2 English speech.

Keywords: complex dynamic systems theory (CDST); syntactic complexity; variability; learner corpus; foreign language development; L2 English speech

1. Introduction

Complex dynamic systems theory (CDST) (de Bot, 2017) is a general label proposed to refer to both complexity theory (Larsen-Freeman, 2016; Larsen-Freeman & Cameron, 2008) and dynamic systems theory (Verspoor, de Bot, & Lowie, 2011). This theory focuses on dynamic, non-linear, and variable development of a complex language system which consists of various interconnected subsystems. The subsystems are said to develop in different ways at different rates, and to interact, forming supportive, competitive, or conditional relationships (van Geert & van Dijk 2011). If two variables develop together as connected growers, the relationship is supportive. If they increase and decrease alternately, the relationship is competitive. If one variable develops as a precursor for the other variable, the relationship is pre-conditional. What is more, the learner's language subsystems are said to compete for his or her limited resources, which causes trade-offs between these subsystems, especially in speech (Schmid, Verspoor, & MacWhinney 2011). More importantly, however, on the basis of microgenetic studies in developmental psychology, this theory advocates a new approach to the role of variability in second language development (SLD) as opposed to second language acquisition (SLA).

In the 1980s, the role of variability was discussed in terms of the universalist approach to SLA as well as in terms of data-driven sociolinguistic and psycholinguistic approaches described below (see section 2). Generally, it is said that the proponents of CDST agree with research findings from the 1980s, which identified different types and causes of variability but argue that variability does not constitute a peripheral phenomenon but a major factor responsible for language development (van Dijk, Verspoor, & Lowie, 2011). Intra-individual or developmental variability is understood as "differences in the level of a developmental variable within individuals and between repeated measurements" (van Geert & van Dijk, 2002, p. 341). It may be examined only if usage-based, dense, and longitudinal data are collected. However, so far few such studies have been conducted (Verspoor, de Bot, & Lowie, 2011). The present paper constitutes the second part of a case study 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. After this phenomenon was examined with respect to general measures of complexity, accuracy, and fluency (Rokoszewska, 2019), the present study will focus in more detail on the role of intra-individual variability in the emergence of syntactic complexity in L2 English speech in the case of selected learners. More precisely, the paper will present the results obtained by the learners on specific measures of syntactic complexity, such as subordination, coordination, and nominalization, the patterns of intra-individual variability in the development of these aspects of language, as well as dynamic relationships which take place between these variables in a time developmental series.

2. Intra-individual variability

In mainstream SLA in the 1980s, variability was construed differently in the universalist, sociolinguistic, and psycholinguistic approaches. In line with the universalist approach, which is connected with the homogenous competence model, variability is treated as non-systematic and said to belong to the native speaker's performance (Chomsky, 1965). In line with the sociolinguistic (Bailey, 1973; Bickerton, 1975; Decamp, 1971; Labov, 1970) and psycholinguistic (de Bot, 1992; Levelt, 1989; Ochs, 1979) approaches, which are rooted in the heterogeneous competence model, variability is treated as a systematic part of the user's communicative competence (Hymes, 1971). According to Ellis (1994), the learner's interlanguage (Selinker, 1972) is characterized by horizontal variability, evident at a single point in time, and vertical variability, observed over a longer period of time in the route of SLA. Variability between learners, caused by individual learner differences, is called inter-learner or individual variability, while variability within the learner is referred to as intra-learner variability. Variability in interlanguage is divided into systematic and non-systematic. The former includes individual variability, mentioned above, and contextual variability, which refers to linguistic and situational factors (Tarone, 1983). The latter is divided into performance variability, which results from psycholinguistic factors, and free variation, which denotes a random use of two or more alternate forms and which results from incorrect form-function relationships (Gatbonton, 1978). According to Ellis (1994), such variation is an important mechanism in interlanguage development as it occurs at a high level in the early stages, but later it diminishes to make the system more advanced and efficient.

CDST represents a new approach to the role of variability in second language development. Firstly, it is stated that the language system consists of internally complex and interrelated subsystems which do not exhibit full stability but high variability, especially when this system is being intensively developed

(Schmid, Verspoor, & MacWhinney, 2011). Secondly, it is claimed that language development is a dynamic and non-linear process characterized by periods of regression and progression which correspond to alternating periods of low and high variability (Siegler, 2006). Low variability is said to indicate temporal stability in the system reached for a given aspect of language, whereas high variability is said to denote change in the direction of another stage in development before the next stabilization stage (Larsen-Freeman & Cameron, 2008). Thirdly, it is pointed out that substantial intra-individual or within-subject variability can be observed in using problem solving strategies for learners of all ages, during all phases of learning, and at all levels of analysis (Siegler, 2006). Most importantly, however, it is claimed that variability in the system is a precursor of change and development (Verspoor, de Bot, & Lowie, 2011). In line with Thelen and Smith's (1994, p. 342) study in developmental psychology, it is treated as "a metric of stability and a harbinger of change". Berenthal (1999) explains that variability yields flexibility and drives development because variation and selection lead to the storage and repetition of the behavior which has been more often successful than the behavior which has been less successful. In practice, this means that the more varied forms the learner can select from, the more likely it is that language development will take place. Finally, it is postulated that variability should be studied with respect to whole language subsystems, as opposed to single aspects of language, on the basis of dense, longitudinal, and individual data, in order to examine language development as opposed to acquisition.

As it has already been pointed out, research on intra-individual variability within the CDST framework is rather scarce. Van Geert and van Dijk (2002) as well as Verspoor, de Bot, and Lowie (2011) developed new tools and procedures to study this construct in a time series. Verspoor, Lowie, and van Dijk (2008), who analyzed the data gathered by Cancino, Rosansky, and Schumann (1978) on similarities in the acquisition of negatives in first and second language acquisition, revealed substantial variability in differing learning trajectories of selected learners. Larsen-Freeman (2006) reported the existence of both inter-individual and intra-individual variability in oral and written production of five Chinese learners of English not only with respect to selected language forms but to whole language subsystems, using measures of complexity, accuracy, and fluency. In the case study of a Dutch learner of Finnish, Spoleman and Verspoor (2010) concluded that intra-individual variability took place before significant developmental peaks in learning trajectories, signaling the transition between different periods in language development. A similar observation was made by Pfenninger (2019), who studied language development of children in different types of Content and Language Integrated Learning (CLIL) programs in Austria and Switzerland. However, Kowal (2016), in her longitudinal study of the dynamics of

complexity, accuracy, and fluency in the case of Polish students of Swedish, pointed out that the degree of intra-individual variability does not necessarily indicate improvement in language development.

3. The study

3.1. Aims and research questions

The aim of the second part of the case study, presented in this paper, was to examine the role of intra-individual variability in the emergence of syntactic complexity in speaking English as a foreign language at the level of secondary school with respect to a good, average, and poor language learner. As already pointed out, the term *intra-individual variability* refers to fluctuations in the level of a particular variable within an individual learner between repeated measurements conducted over a longer period of time (van Geert & van Dijk, 2002). In line with Larsen-Freeman and Cameron (2008), the term *emergence* refers to micro-genetic growth in the development of a particular language sub-system which is observed at many regular measurement points in a time series. This part of the case study focused on the following research questions:

1. How does syntactic complexity develop in L2 English speech at the level of secondary school in the case of a good, average, and poor learner?
2. What is the rate of development of different aspects of syntactic complexity?
3. What are the levels and patterns of intra-individual variability in the development of these aspects?
4. What relationships can be observed between different measures of syntactic complexity?
5. What is the influence of intra-individual variability on the rate of development of the aspects of syntactic complexity under investigation?

3.2. Research design and variables

The present investigation represents a corpus-based case study. It involved the analysis of three mini-corpora taken from the *Spoken English Developmental Corpus of Polish Learners* (SEDCPL), which is being created on the basis of a larger quantitative and qualitative research project conducted on the sample of 106 learners at one of secondary schools in Czestochowa in the years 2014-2017 (see section 3.4). The case study was longitudinal, as it involved the so-called repeated measurements over a longer period of time, and exploratory, as its findings will be verified with respect to the whole research sample. In line with CDST procedures (Verspoor, de Bot, & Lowie, 2011), the study provided dense,

longitudinal, and individual data. It was divided into a few parts. The first part focused on intra-individual variability in the emergence of complexity, accuracy, and fluency in speaking English at secondary school (Rokoszewska, 2019). The second part, presented here, focused on this phenomenon in the development of syntactic complexity while the third part examined it with respect to lexical complexity (Rokoszewska, in press).

In the second part of the case study, a number of variables were distinguished. The independent variable referred to intra-individual variability in the development of syntactic complexity, operationalized as the differences in the level of syntactic complexity measures between repeated measurement points within individual learners. The scale for this variable was interval. More specifically, syntactic complexity was analyzed in terms of general syntactic complexity, subordination, coordination, and nominalization. The main unit of analysis was the so called T-unit, which is defined as the main clause with subordinated clauses (Hunt, 1965), and which is said to be a more reliable unit than a sentence in analyzing oral production (Larsen-Freeman & Cameron, 2008). General syntactic or grammatical complexity was operationalized as the number of clauses per T-unit (C/T) (Ellis & Barkhuizen, 2006), whereas subordination as the number of subordinated clauses per T-unit (DC/T) (Lu, 2010). Coordination referred to the number of coordinated phrases per T-unit (CP/T) while nominalization pertained to the number of complex nominals per T-unit (CN/T) (Lu, 2010). The dependent variable was the rate of development of syntactic complexity indices, operationalized as the differences in the level of these indices between the first (test 1, grade 1) and the last (test 21, grade 3) test conducted at the beginning and at the end of secondary school, respectively. The scale for this variable was interval. The intervening variable, measured on the basis of an interval scale, was described as the influence of variability on second language development (SLD). The moderator variable was learners' age established by a nominal scale. Control variables, determined on a nominal scale, involved the same nationality, coursebook, number of English lessons per week as well as the absence of a longer stay in an English-speaking country.

3.3. Participants

The participants in the present case study were three secondary school learners at the age of 16 who were classified as good, average, and poor in the whole sample of 106 learners involved in the main research project (see section 3.2.). At the time of the study, the participants had been learning English for about 10 years. At secondary school, they attended classes with an extended English program (4-6 lessons per week). They were selected on the basis of the results

obtained on a placement test conducted by school teachers as well as on the first oral and written test conducted in the project. The good learner (GL) obtained the average of 5.5 points (the placement test – 6.0; speaking – 5.0; writing – 5.5), the average learner (AL) scored 3.45 points (the placement test – 3.0, speaking – 3.75; writing – 3.5), and the poor learner (PL) was accorded 2.17 points (the placement test – 1.0, speaking – 2.0, writing – 3.5). Further information about the participants connected with their family background, school grades, and the final exam at the end of secondary school is presented in Table 1.

Table 1 The subjects in the case study

	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 program no extra classes, no longer stay in an L2 country								
RESIDENCE	city			village			city		
EDUCATION (F/M) ¹	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) ²	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
	Test	Speak.	Writ.	Test	Speak.	Writ.	Test	Speak.	Writ.
CLASSIFICATION (pts./grades)	6.0 (93pts.)	5.0	5.5	3.0	3.75	3.5	1.0	2.0	3.5
	Total: 5.5 pts.			Total: 3.42 pts.			Total: 2.17 pts.		

3.4. Instruments and procedures

As already mentioned, the case study was based on the analysis of three mini-corpora which traced the language development of a good, average, and poor language learner in speaking English during the whole learning period at secondary school.³ The mini-corpora were taken from The Spoken English Developmental Corpus of Polish Learners (SEDCPL), which is being created on the basis of the research project mentioned above. The whole corpus includes around 2,100 recorded interviews which are to be transcribed and verified. Each mini-corpus consisted of 21 semi-structured interviews on different topics conducted

¹ F/M – father/mother

² The students' opinions about their parents' knowledge of English.

³ 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 1st of September 2019 it will include 4 grades consisting of learners at the age 15-18.

once a month over the period of three years (see Table 2). Altogether, the case study was based on the analysis of 63 interviews. The procedure of building the mini-corpora involved interviewing and evaluating the learners, transcribing the recorded interviews, and analyzing the samples of around 200 words.

Table 2 Research design in a time series

RESEARCH DESIGN IN TIME SERIES										
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	-

The data were analyzed by Syntactic Complexity Analyzer (Lu, 2010) and procedures advocated by CDST researchers (e.g., Verspoor, Lowie, van Geert, van Dijk, & Schmid, 2011). More specifically, the analysis of syntactic complexity development involved raw data smoothed by means of a polynomial trend line of the 2nd degree to show general trends. In Figures 1-9 in section 4.1., trend lines are represented with a dotted curve. The analysis of intra-individual variability involved normalizing and detrending the data to show their net growth unaffected by increasing or decreasing developmental trends. The levels of intra-individual variability were calculated in terms of the coefficient of variation. The patterns of intra-individual variability were created by means of advanced visualization techniques, such as moving min-max graphs which show intra-individual variability as a bandwidth of minimum and maximum scores in a time series. Figures 13-24 in section 4.2. are min-max graphs in which the upper and lower solid lines respectively represent the learner's moving minimum and maximum scores while the dotted line between them shows the learner's normalized and detrended scores in the development of a particular language aspect. The differences in intra-individual variability between different learners were checked by means of a resampling procedure called Monte Carlo Analysis.

4. Results

The results of the present part of the case study will be described in three sections which refer to the selected learners' results on general sentence complexity, subordination, coordination, and nominalization, the patterns of intra-individual variability in the development of these variables as well as dynamic

relationships between these measures observed during the whole learning period at secondary school.

4.1. Development of syntactic complexity

The data included in Table 3 indicated that in terms of the development of general syntactic complexity (Rokoszewska 2019), the good learner (GL), on average, produced 2.30, the average learner (AL) 1.47, and the poor learner (PL) 1.51 clauses per T-unit in speech over the period of three years at secondary school. The rate of development in the case of the good learner was equal to 1.35 as this learner produced 1.65 clauses per T-unit on the first test (grade 1, test 1) and 3.00 clauses per T-unit on the last test (grade 3, Test 21). These results did not overlap with the learner's minimum (MIN = 1.15) and maximum (MAX = 4.46) scores, which was indicative of some variation (CV = 0.80). In the case of the average learner, the rate of development was 0.06, with variation equal to 0.04, whereas in the case of the poor learner, the rate was 0.53, with variation standing at 0.11. In addition, a general trend in the development of sentence complexity throughout secondary school was increasing for the good and poor learner (Figures 1 and 3). In the case of the average learner, the trend line showed some regress in the middle of the whole observation period (Figure 2)

Table 3 The development of syntactic complexity (raw data)

THE DEVELOPMENT OF SYNTACTIC COMPLEXITY – RAW DATA												
DATA	GENERAL SYNTACTIC COMPLEXITY			SUBORDINATION			COORDINATION			NOMINALIZATION		
	GL	AL	PL	GL	AL	PL	GL	AL	PL	GL	AL	PL
Test 1	1.65	1.27	1.28	0.60	0.36	0.32	0.40	0.23	0.16	1.15	0.59	0.32
Test 21	3.00	1.33	1.81	1.45	0.33	0.67	0.64	0.25	0.48	1.91	1.25	1.33
RD	1.35	0.06	0.53	0.85	-0.03	0.35	0.24	0.02	0.32	0.76	0.66	1.01
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
CV	0.80	0.04	0.11	0.35	0.04	0.07	0.11	0.02	0.01	1.00	0.08	0.15
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
ANOVA	0.000			0.000			0.163			0.000		
TUKEY-KRAMER TEST ⁴	GL≠AL			GL≠AL			-			GL≠AL		
	GL≠PL			GL≠PL						GL≠PL		
	AL=PL			AL=PL						AL=PL		

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

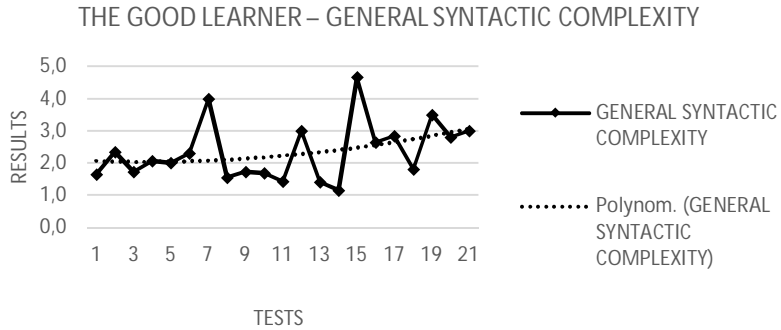


Figure 1 The good learner – the development of general syntactic complexity

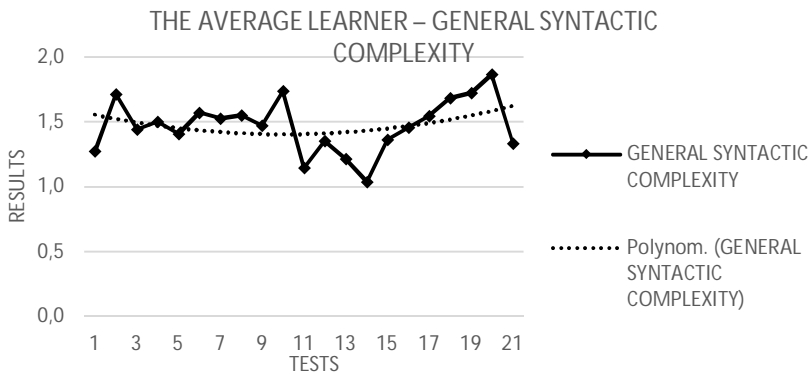


Figure 2 The average learner – the development of general syntactic complexity

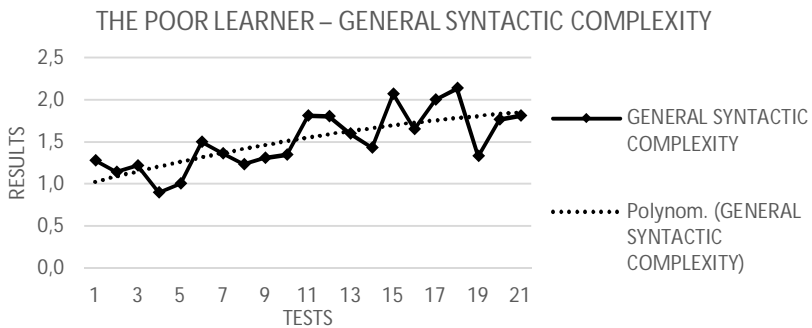


Figure 3 The poor learner – the development of general syntactic complexity

As far as more specific measures of syntactic complexity are concerned, it was observed that in terms of subordination, the good learner used 1.00, the average learner 0.47, and the poor learner 0.50 dependent clauses per T-unit while speaking English at secondary school. In the case of the good learner, the

rate of development was 0.85, with the level of variation being equal to 0.35. In the case of the average learner, the rate of development was equal to -0.03, with variation of 0.04. In the case of the poor learner, the rate of development was 0.35, variation being equal to 0.07. The general trend in the development of subordination indicated a systematic increase in the case of the poor learner (Figure 6). In the case of the good learner, a general increase was preceded by a slight decrease in the first half of the observation period (Figure 4). In the case of the average learner, some substantial decrease was observed in the middle of the period in question (Figure 5).

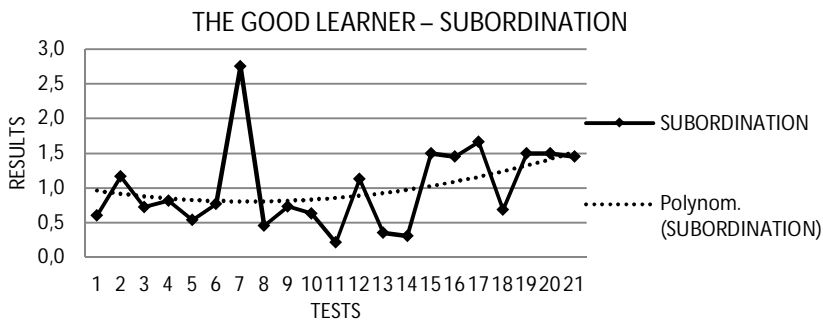


Figure 4 The good learner – the development of subordination

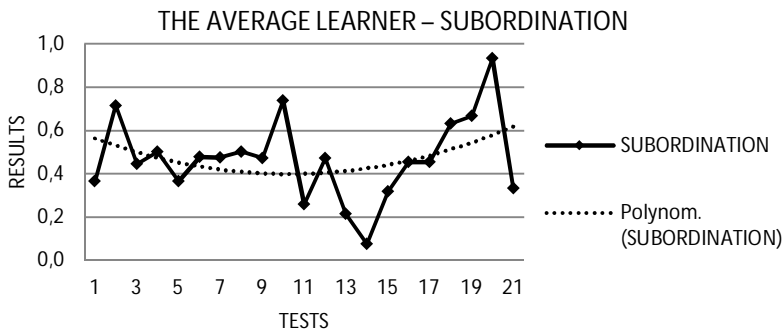


Figure 5 The average learner – the development of subordination

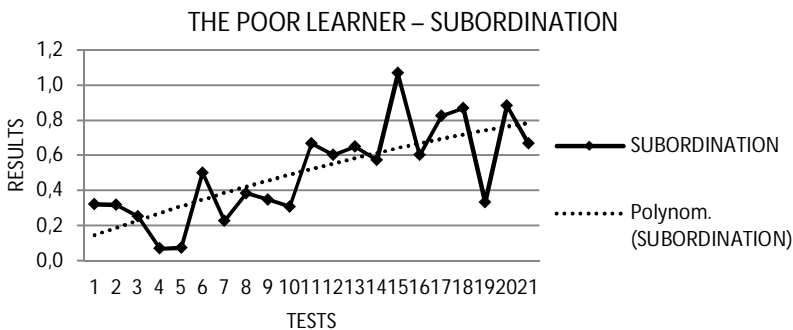


Figure 6 The poor learner – the development of subordination

With respect to coordination, the good learner created 0.40, the average learner 0.24, and the poor learner 0.32 co-ordinate phrases per T-unit. The learners obtained the following results for the rate of development: GL – 0.24, AL – 0.02, PL – 0.32 and for variation: GL – 0.11, AL – 0.02, PL – 0.01. The general trend in the development of coordination indicated a systematic increase in the case of the good and poor learner (Figures 7 and 9) but not in the case of the average learner who experienced a substantial decrease in the middle of secondary school (Figure 8).

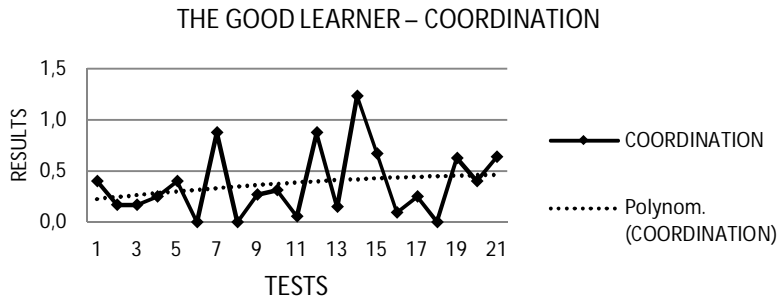


Figure 7 The good learner – the development of coordination

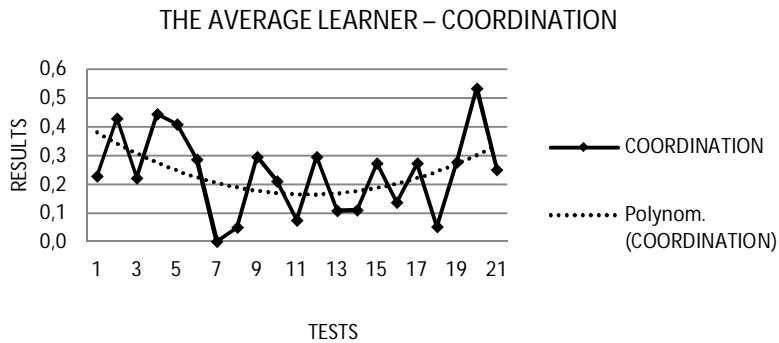


Figure 8 The average learner – the development of coordination

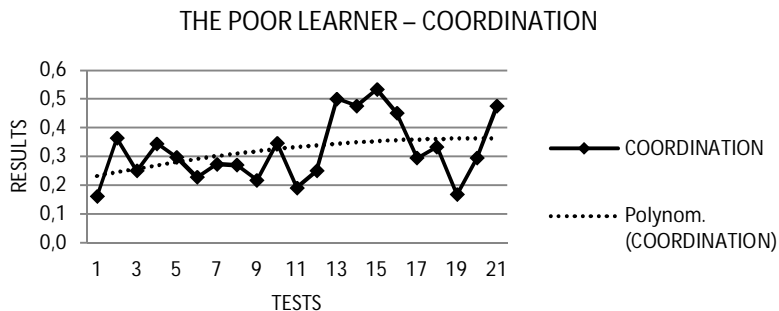


Figure 9 The poor learner – the development of coordination

With respect to nominalization, the good learner built 1.70, the average learner 0.80, and the poor learner 0.86 complex nominals per T-unit. The learners' results for the rate of development and variation were respectively as follows: GL – 0.24, AL – 0.02, PL – 0.32 and GL – 0.24, AL – 0.02, PL – 0.32. The general trend in the data set indicated a systematic increase in the case of the good and poor learner and a substantial decrease in the middle of secondary school in the case of the average learner (Figures 10, 11, and 12).

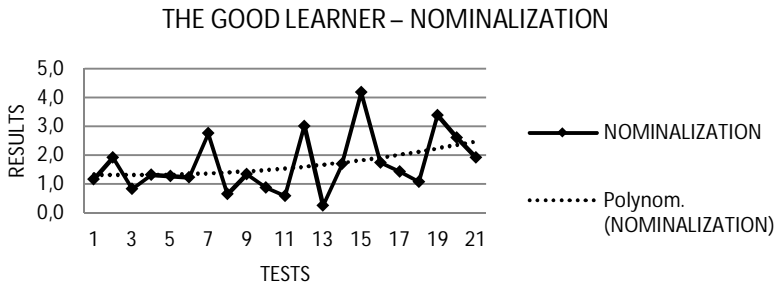


Figure 10 The good learner – the development of nominalization

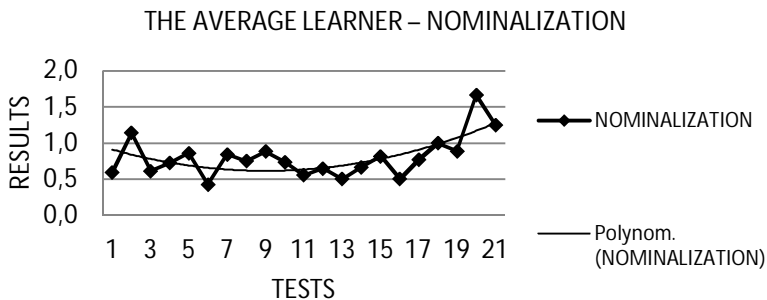


Figure 11 The average learner – the development of nominalization

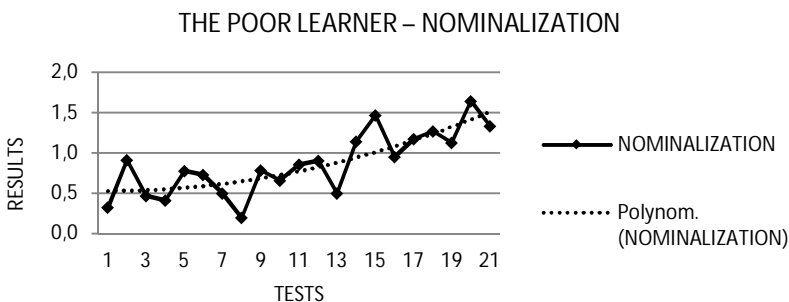


Figure 12 The poor learner – the development of nominalization

The results of the statistical analysis conducted by means of one-way ANOVA ($\alpha = 0.05$) showed that the differences between the three learners were statistically significant in general syntactic complexity, subordination, and nominalization but not in coordination (Table 3). What is more, Tukey-Kramer Test (i.e., a means differentiation test) showed that, in terms of these three measures of syntactic complexity, the differences between the good and average learner as well as between the good and poor learner were statistically significant, whereas the differences between the average and poor learner were insignificant (see Table 3).

4.2. The patterns of intra-individual variability

Analyzing the patterns of intra-individual variability in the development of general syntactic complexity (Figures 13, 14, and 15) (Rokoszewska, 2019), it was observed that two periods of substantial variability (tests 2-8 and tests 10-16) appeared in the case of the good learner and one period of moderate variability (tests 6-11) in the case of the average learner. In the case of the poor learner, the bandwidth was narrow for the majority of the observation period (tests 1-14). Such a stable pattern usually indicates lack of activity in a given subsystem and the allocation of cognitive resources to a different language subsystem. However, in the case of both average and poor learners, the bandwidth became wider towards the end, which indicated a potential change and development in the subsystem of general syntactic complexity.

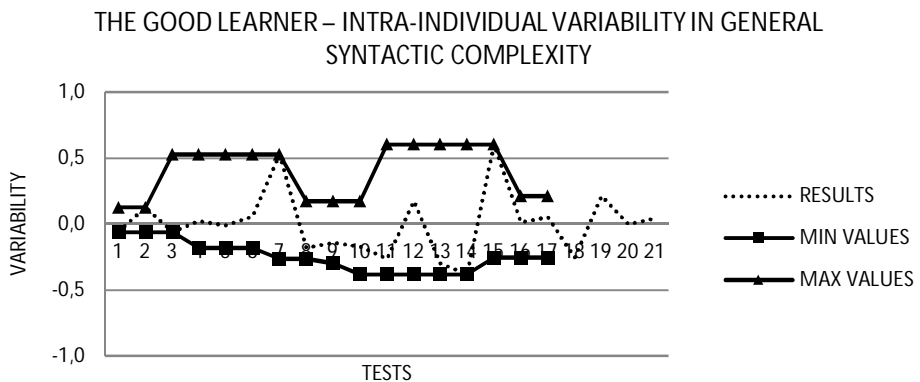


Figure 13 The good learner: intra-individual variability in general syntactic complexity

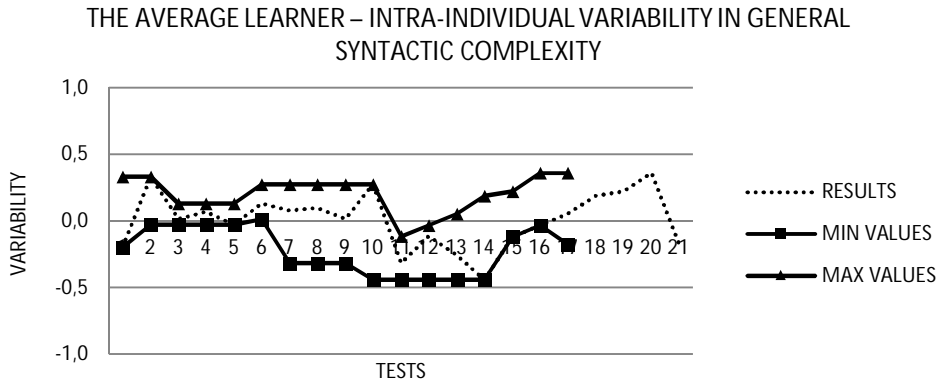


Figure 14 The average learner: intra-individual variability in general syntactic complexity

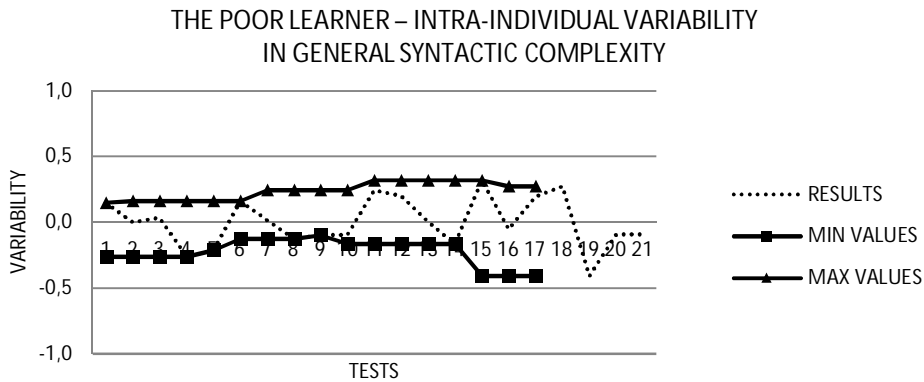


Figure 15 The poor learner: intra-individual variability in general syntactic complexity

The patterns of intra-individual variability in the development of subordination showed a period of rather high variability in grade 1 (tests 3-7) followed by a period of low variability in grades 2 and 3 (tests 8-21) in the case of the good learner (Figure 16). In the case of the average learner, the periods of moderate variability could be observed at the beginning (tests 1-2), in the middle (tests 6-14), and at the end (tests 17-21) of the observation period (Figure 17). It is important to add that a broadening bandwidth at the end indicated potential development in subordination. In the case of the poor learner, variability was low in the first half of the observation period (tests 1-10) and average in the second half of this period (tests 11-21) (Figure 18).

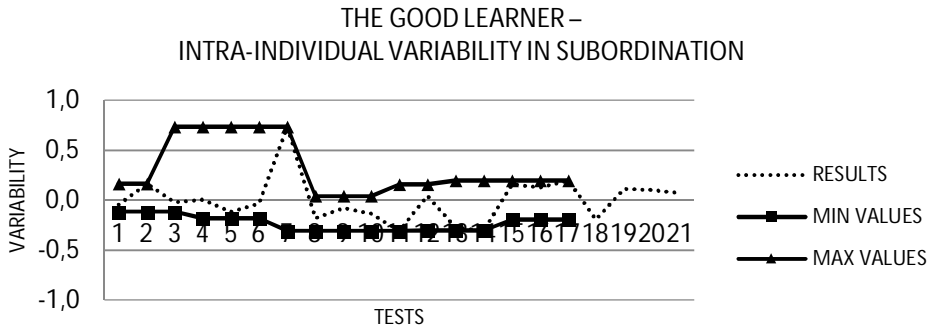


Figure 16 The good learner: intra-individual variability in subordination

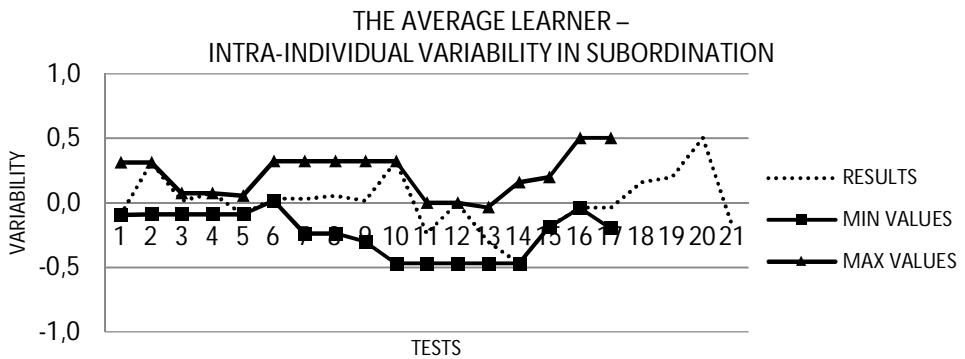


Figure 17 The average learner: intra-individual variability in subordination

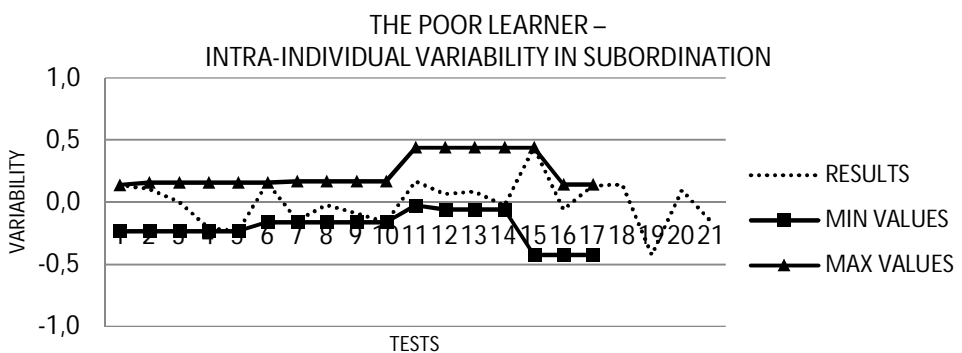


Figure 18 The poor learner: intra-individual variability in subordination

The patterns of intra-individual variability in the development of coordination indicated rather high variability in the first and second grades (tests 3-

14), followed by low variability in the third grade of secondary school (tests 15-21) in the case of the good learner (Figure 19). In the case of the poor learner, low variability occurred in the first grade (tests 1-8) and moderate variability took place in the second and third grades (tests 9-21) (Figure 21). In the case of the average learner, a long period of low variability (tests 6-15) was preceded and followed by short periods of moderate (tests 3-5) and high (tests 16-21) variability, respectively, pointing to some potential development in coordination (Figure 20).

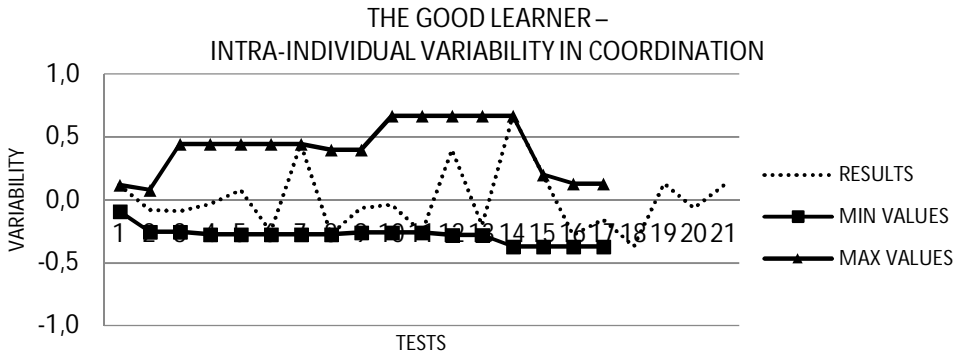


Figure 19 The good learner: intra-individual variability in coordination

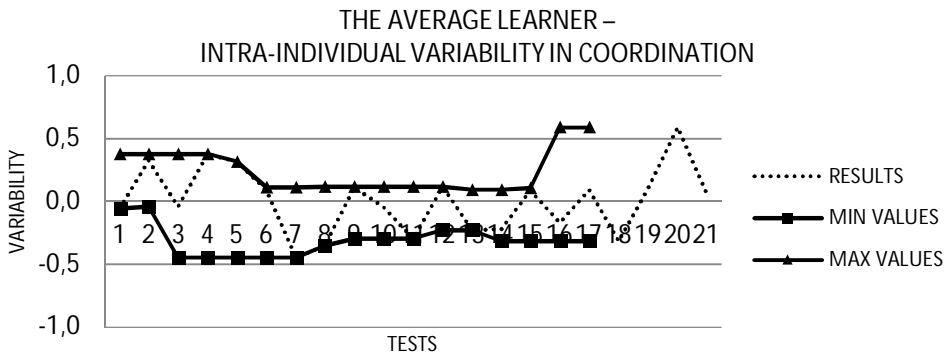


Figure 20 The average learner: intra-individual variability in coordination

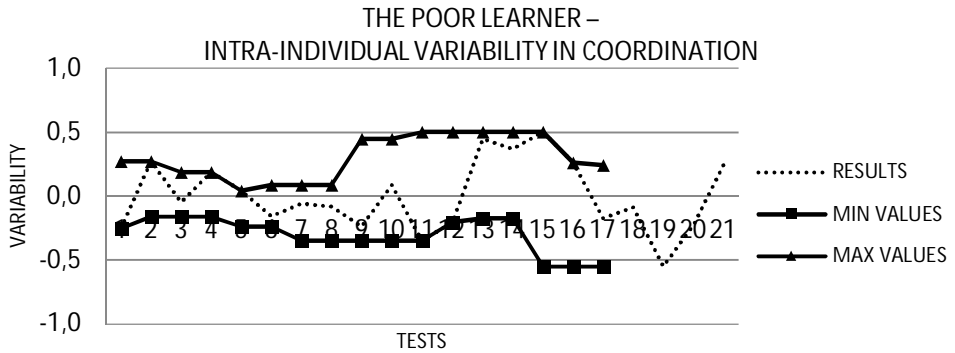


Figure 21 The poor learner: intra-individual variability in coordination

The patterns of intra-individual variability in the development of nominalization manifested rather moderate (tests 3-10) and high (tests 11-15) variability in the case of the good learner (Figure 22), which contrasted with rather low variability in the case of the average and poor learner (Figures 23 and 24). In the case of the latter, higher variability appeared in the third grade (tests 16-21).

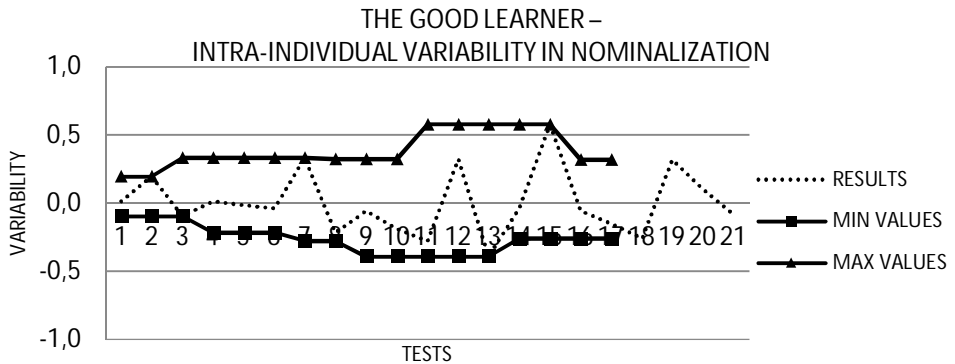


Figure 22 The good learner: intra-individual variability in nominalization

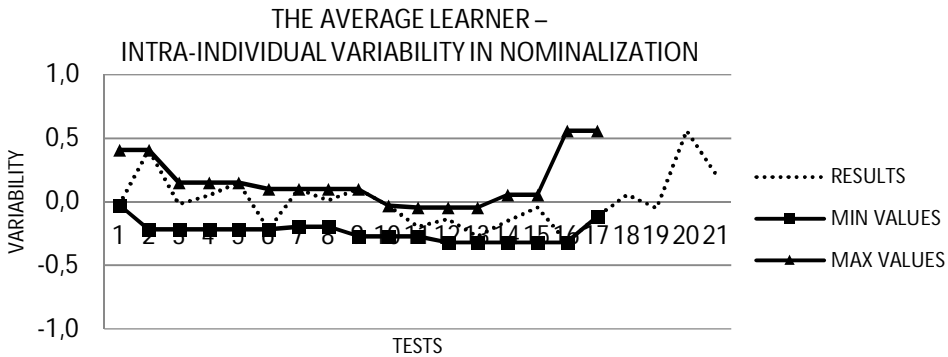


Figure 23 The average learner: intra-individual variability in nominalization

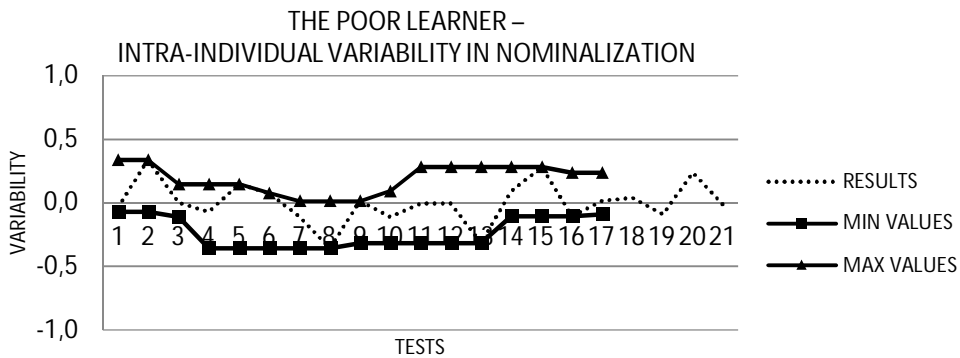


Figure 24 The poor learner: intra-individual variability in nominalization

As far as statistical significance of intra-individual patterns in the development of syntactic complexity is concerned (Table 5), it is worthwhile to point out that, in terms of subordination, the results of Monte Carlo Analysis indicate that 57.2% of the good and average learner’s results were the same while the remaining 42.8% were different. The same was true for the results of the good and poor learner. In the case of the average and poor learner, the results overlapped in 49.0%. Similar differences could be observed for the good and average learner in terms of coordination (62.5%) and for the average and poor learner in terms of nominalization (53.3%). However, on the whole, the results of the Monte Carlo Analysis proved that the patterns of intra-individual variability in the development of general sentence complexity, subordination, coordination, and nominalization did not significantly differ for the good, average, and poor learner. In other words, despite apparent qualitative differences described above, the patterns in question were not meaningful but random.

Table 5 Intra-individual variability: Monte Carlo Analysis ($\alpha < 0.05$)

DATA	INTRA-INDIVIDUAL VARIABILITY			
	SYNTACTIC COMPLEXITY	SUBORDINATION	COORDINATION	NOMINALIZATION
GOOD & AVERAGE LEARNERS	0.848	0.572	0.625	0.918
GOOD & POOR LEARNERS	0.821	0.570	0.825	0.928
AVERAGE & POOR LEARNERS	1.000	0.490	0.798	0.533

4.3. Moving correlations between syntactic complexity measures

The results of the case study also showed how the relationships between various measures of syntactic complexity developed in a time series. With respect to general sentence complexity and subordination, correlation coefficients, calculated by means of Pearson Product Moment Correlation (PPMC), indicated a strong positive relationship between the two variables in the case of the good (.8434), average (.9559), and poor (.8724) learner (Table 6). The so-called moving correlations in a dynamic diagram (Figure 25) confirmed this finding, pointing to the fact that these two variables developed as the so-called supportive growers in that the development of one supported the development of the other.

Table 6 Correlations between syntactic complexity measures

DATA	LEARNER	SYNTACTIC COMPLEXITY MEASURES–CORRELATIONS ⁵			
		GEN. SENT. COMPLEXITY	SUBORDINATION	COORDINATION	NOMINALIZATION
GENERAL SENTENCE COMPLEXITY	GL	-	.8434	.3474	.8704
	AL	-	.9559	.3848	.5140
	PL	-	.8724	.0284	.2379*
SUBORDINATION	GL		-	.3073	.6530
	AL		-	.4417	.5770
	PL		-	.2281*	.3717
COORDINATION	GL			-	.5961
	AL			-	.5514
	PL			-	.1056*
NOMINALIZATION	GL				-
	AL				-
	PL				-

⁵ Statistically insignificant correlations are marked with an asterisk.

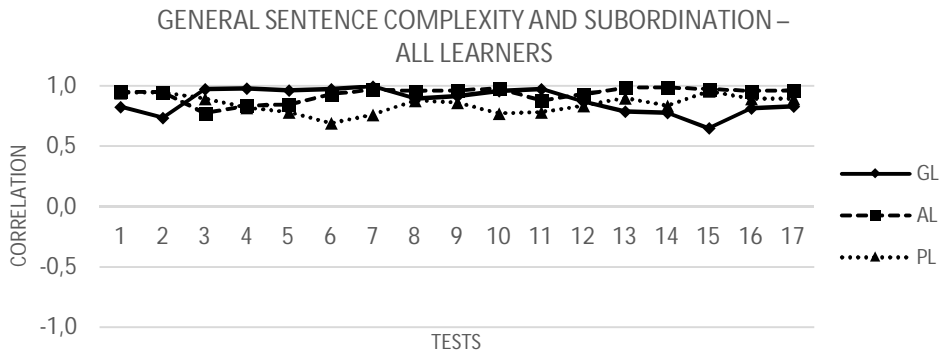


Figure 25 Correlation between general sentence complexity and subordination for all learners

The relationship between general syntactic complexity and coordination was weak and positive in the case of the good (.3474) and average (.3848) learner but non-existent in the case of the poor learner (.0284) (Table 6). Moving correlations illustrated a dual relationship in the case of the good and average learner in that the variables sometimes supported each other and sometimes competed with each other, and a pre-conditional relationship in the case of the poor learner in that the development of one variable was necessary for the other variable to develop (see Figure 26).

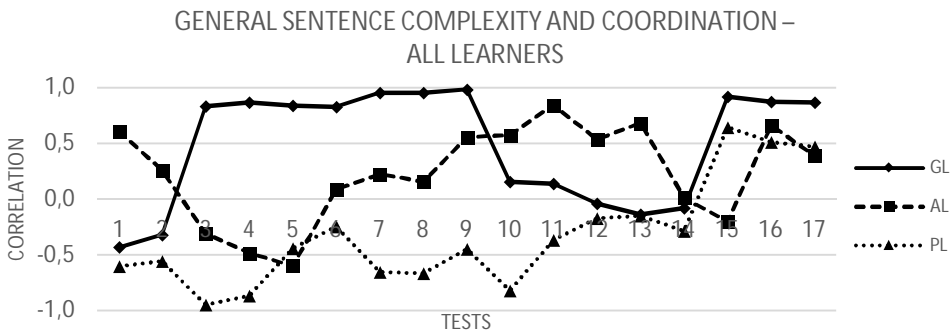


Figure 26 Correlation between general sentence complexity and coordination for all learners

The relationship between general syntactic complexity and nominalization (Table 6) was positive for the good (.8704) and average (.5140) learner, but for the former it was strong while for the latter it was weak. The relationship for the poor learner was insignificant (*.2379). Dynamic diagrams of moving correlations showed a strong supportive relationship between the two variables for

the good learner, a weak supportive relationship for the poor learner, and a dual relationship for the average learner (Figure 27).

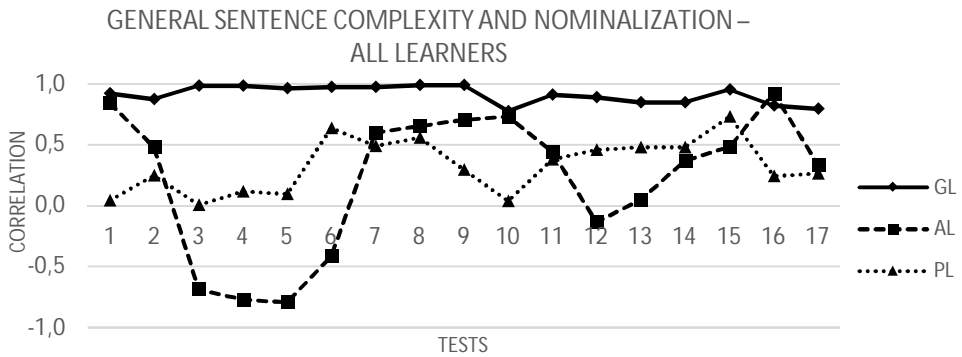


Figure 27 Correlation between general sentence complexity and nominalization for all learners

The correlation between subordination and coordination was weak and positive for the good (.3073) and average (.4417) learner, but it was insignificant for the poor learner (*.2281) (Table 6). Moving correlations graphically represented a dual relationship between the two factors in the case of the good and average learner but a pre-conditional relationship for the poor learner (Figure 28).

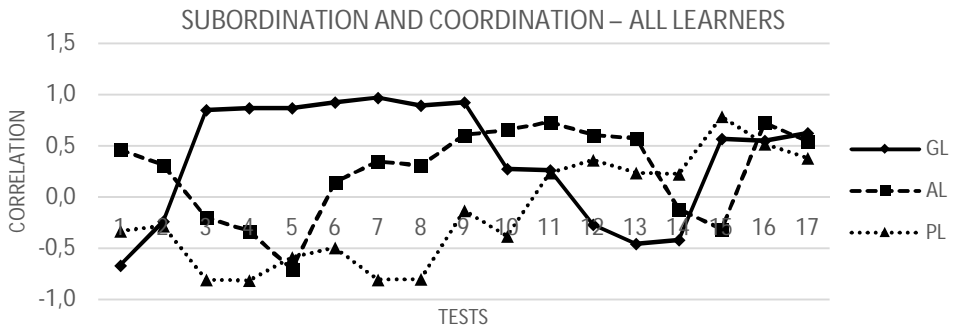


Figure 28 Correlation between subordination and coordination for all learners

The correlation between subordination and nominalization was positive for the good (.8704) and average (.5140) learner (Table 6). It was strong for the former and weak for the latter. For the poor learner, the relationship was insignificant (*.2379). Moving correlations graphically visualized a strong positive relationship for the good learner, a positive pre-conditional relationship for the poor learner, and a dual relationship for the average learner (Figure 29).

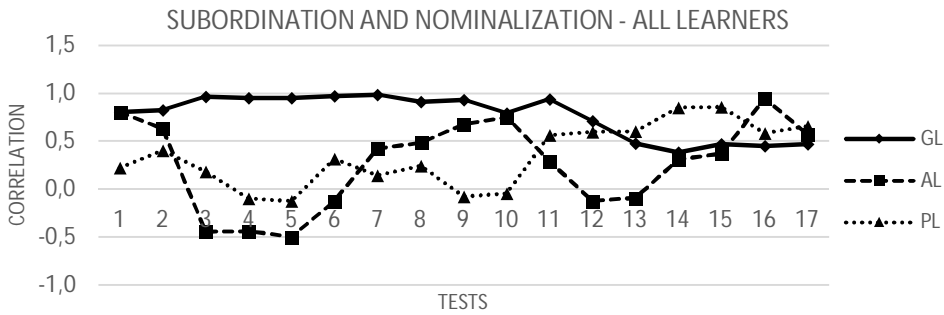


Figure 29 Correlation between subordination and nominalization for all learners

The relationship between coordination and nominalization was positive and weak for the good (.5961) and average (.5514) learner, but it was insignificant for the poor learner (*.1056) (see Table 6). Moving correlations graphically represented a pre-conditional relationship in the case of the good learner and a dual relationship in the case of the poor and average learner (Figure 30).

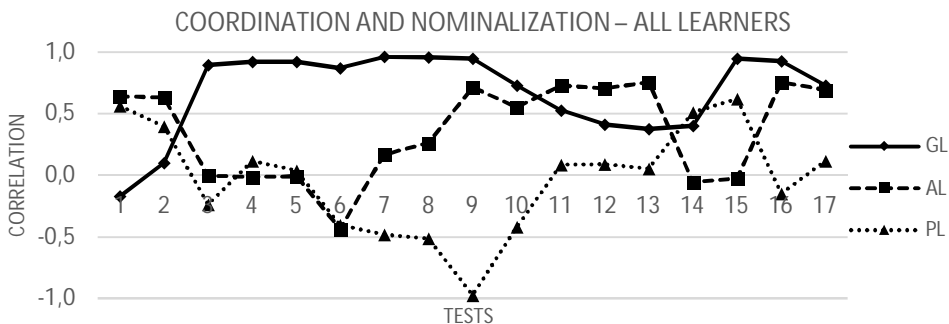


Figure 30 Correlation between subordination and nominalization for all learners

Table 7 The rate of development and intra-individual variability in syntactic complexity

THE RATE OF DEVELOPMENT & INTRA-INDIVIDUAL VARIABILITY IN THE DEVELOPMENT OF LEXICAL COMPLEXITY			
GOOD LEARNER	AVERAGE LEARNER	POOR LEARNER	ALL LEARNERS
.6736	.9332	.8607	.9887

Finally, the relationship between the rate of development and intra-individual variability was very strong and positive in the case of all three learners (.9887). More specifically, it was strong and positive for the average (.9332) and poor (.8607) learner but weak for the good learner (.6736) (see Table 7). However, these results should be treated as preliminary since it is necessary to include more developmental variables in the analysis conducted with a larger sample of learners.

5. Discussion

With respect to the first research question, which concerned the way in which syntactic complexity emerges in speaking English as a foreign language at secondary school, 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 nominalization but not in terms of coordination. However, the average and the poor learner produced language at the same level of complexity with respect to all these measures.

With respect to the second research question, which referred to the rate of development of particular measures of syntactic complexity, it was established that the good learner made greater progress than the average and poor learner in the development of general sentence complexity as well as its more specific aspects, such as subordination, coordination, and nominalization. It was surprising to find out that the poor learner made more progress than the average learner in all aspects of syntactic complexity, except nominalization. These results were reflected in general trend lines which illustrated fairly systematic progress in the development of all aspects of syntactic complexity in the case of the good and poor learner but substantial regress in the case of the average learner. Thus, it may be said that within the syntactic subsystem, the good learner developed mainly general syntactic complexity, subordination, and nominalization, with little progress in terms of coordination. The poor learner progressed mainly in general syntactic complexity, subordination, and coordination at the cost of nominalization. The average learner made hardly any improvement in general syntactic complexity, subordination, and coordination, his progress being visible only in nominalization. It is worthwhile to point out that the first part of the case study (Rokoszewska, 2019) showed that this learner developed accuracy at the cost of both complexity and fluency.

With respect to the third research question, which related to the patterns of intra-individual variability in the development of syntactic complexity, it was revealed that the periods of variability occurred at different times, and exhibited different intensity and duration in the case of the good, average, and poor learner. For example, the good learner's variability seemed to be rather short and high, as in the development of general syntactic complexity and subordination, or rather long and high, as in the development of coordination and nominalization, in contrast to the average learner's and poor learner's variability which tended to be low and moderate, sometimes increasing towards the end of the observation period. However, the differences in these patterns were statistically insignificant.

With respect to the fourth research question, which concerned the relationships between selected measures of syntactic complexity, the results of the

study indicated that they might not be the same in the case of the good, average, and poor learner. The relationship between general syntactic complexity and subordination was supportive for all three learners. The relationship between general syntactic complexity and coordination was dual for the good and average learner but pre-conditional for the poor learner. The same was true in the development of subordination and coordination. The relationship between general sentence complexity and nominalization was supportive for the good and poor learner but dual for the average learner. The same could be observed in the case of subordination and nominalization. Finally, in the case of coordination and nominalization, the relationship was pre-conditional for the good learner and dual for the average and poor learner. Such differences between the learners should not be surprising in the light of CDST, according to which a learner's developmental paths do not have to overlap either with another learner's paths or with the whole group's average learning trajectory.

With respect to the last research question, which referred to the relationship between the learners' level of intra-individual variability and the rate of development of syntactic complexity, the results of the case study indicated a strong, positive, and statistically significant relationship between the two factors in the case of the good, average, and poor learner. If the analysis of the whole corpus confirms that the level of intra-individual variability differs among learners and influences the rate of language development, it should be possible to consider whether this phenomenon could be treated as an individual learner difference of linguistic character.

Summing up, it is important to point out that these findings have preliminary character. The main limitation of the present case study is that one subject represents the categories of good, average, and poor learners. Bearing in mind that CDST researchers emphasize the individuality of one's language development, there is no guarantee that another good, average, or poor learner would develop the subsystem of syntactic complexity in a similar way to the learners selected for the purpose of the present case study. Thus, it is necessary to verify the findings of this study with a bigger number of learners representing different learner types. Nevertheless, it is possible to conclude that teachers should pay attention not only to accuracy and fluency but also to complexity of learners' speech. However, they should realize that the development of language complexity, in particular syntactic complexity, is a long, complex, and variable process.

6. Conclusions

To conclude, it is important to acknowledge the importance of variability in SLD and to reiterate the fact that, unlike inter-individual variability, intra-individual

variability remains to a large extent unexplored and unexplained. In contrast to the theoretical and empirical approaches to variability in mainstream SLA in the 1980s, the proponents of CDST argue that intra-individual variability is an important developmental mechanism in the complex language system. Thanks to a number of new tools and procedures used in SLD to examine specifically this phenomenon, it is possible to continue the studies from the 1980s from a new perspective. The study described in this paper first of all showed some statistically significant differences in the learners' development of syntactic complexity. More specifically, it showed that the differences between the good and average learner and between the good and poor learner, but not between the average and poor learner, were statistically significant in the development of such measures as general syntactic complexity, subordination, and nominalization but not coordination. At the same time, these results pointed to the need and challenge to help learners use syntactically more complex language while communicating in a foreign language. Second, the study revealed that the differences in the patterns and levels of intra-individual variability in the development of syntactic complexity were insignificant. Third, the study indicated a strong, positive correlation between the learners' level of intra-individual variability and the rate of development of syntactic complexity in L2 English speech at this level. Nevertheless, it is crucial to verify these findings with a bigger sample of learners using quantitative data but not losing the sight of individual learners.

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