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The Relationship between Language Learning Strategies and Lexical Complexity Measures

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ABSTRACT: This study examines the hypothesis that language learning strategies (LLS) partly account for the level of L2 proficiency (i.e. the level of L2 lexical complexity produced in the written output of English language learners). To test the hypothesis, 152 English-proficient freshman students of Bosnian L1 linguistic background were surveyed utilizing the Strategy Inventory for Language Learning (SILL) designed by Rebecca Oxford (1990). Their lexical output was collected through short essays that were written during formal exams held in English for Academic Purposes undergraduate courses at the International University of Sarajevo. The written samples were converted to an electronic format and analyzed with the Web-based Lexical Complexity Analyzer (Lu, 2012; Ai & Lu, 2010). Relationships between six SILL subscales and twenty-five lexical complexity (LC) measures were assessed through applying the principles of correlational design. The results confirmed the hypothesis. Statistically significant correlations were found between memory strategies and three LC measures, cognitive strategies and twenty LC measures, compensation strategies and nine LC measures, and affective strategies and three LC measures. It is concluded that the relationship between LLS and LC levels is mostly conditioned by LLS types.
Keywords: language learning strategies, lexical complexity, correlations.

Las relaciones entre las estrategias de aprendizaje de idiomas y las medidas de complejidad léxica

RESUMEN: Este estudio está basado en la hipótesis según la cual las estrategias de aprendizaje de idiomas (LLS) se pueden explicar en parte por el nivel de la complejidad léxica obtenida en la producción escrita de los estudiantes de inglés. Para probar a la hipótesis, un grupo de ciento cincuenta y dos estudiantes de inglés de primer año, de origen lingüístico bosniaco L1 c, fue encuestado en el marco del Inventario de estrategias para el aprendizaje de idiomas (SILL) diseñado por Rebecca Oxford (1990). Su producción léxica fue recogida a través de los ensayos cortos escritos durante los exámenes formales sostenidos en inglés con fines académicos de los estudios de pregrado en la Universidad Internacional de Sarajevo. Las muestras escritas fueron convertidas en un formato electrónico y fueron analizadas gracias al Analizador de Complejidad Léxica basado en la Web (Lu, 2012; Ai & Lu, 2010). Las relaciones entre seis subescalas SILL y veinticinco medidas de complejidad léxica (LC) fueron evaluados a través de la aplicación de los principios del diseño correlacional. Los resultados han confirmado la hipótesis. Se concluye que la naturaleza de las relaciónes entre los niveles de LLS y LC está, en su mayoría, condicionada por los tipos de LLS.
Palabras clave: estrategias de aprendizaje, lengua inglesa, complejidad léxica.

1. Introduction

It is generally accepted that an adoption of language learning strategies may facilitate second language (L2) proficiency. Numerous studies report positive, statistically significant, mainly weak and moderate correlations between language learning strategies and second language L2 proficiencies (Hsiao & Oxford, 2002; Oxford, 1999). Additionally, the relationship between strategies and language output is not only described as linear but also as curvilinear and complex (Oxford, 2013) and therefore empirically cryptic.

One of the reasons behind the identified complex and indirect nature of the relationship between strategies and proficiencies may be recognized in enthusiastic empirical attempts which explore the link between summative values of language learning strategy usage and total proficiency scores. The totality of scores disguises particularities of L2 features which may relate more to strategy use than to any other individual difference, contextual, or linguistic variables.

Another reason may be hidden in the seemingly unambiguous correlating features between certain sets of strategic actions and particular language skills or tasks. For example, it is argued that there is a tangible relationship between vocabulary learning strategies and vocabulary size of advanced learners (Waldvogel, 2013), form- and association-centred learning strategies and breadth and depth of vocabulary knowledge (Zhang & Lu, 2015), learning vocabulary with gestures and lexical recall scores (Mathison, 2017), and the frequency of employing cognitive strategies and focusing on object pronouns scores (Strambi, Kennedy & Dekker, 2016). However, a close comparison of their findings suggests that particular types of language learning strategies employed across various tasks by different L2 learners play changeable roles. Waldvogel (2013) reports that vocabulary learning strategies and vocabulary size correlate positively with the sample provided by high-scoring and negatively with the sample provided by low-scoring L2 learners. Strambi et al. (2016) find that more successful learners employ strategies with less frequency when compared to less successful learners. Zhang and Lu (2015) find that some mnemonic strategies correlate positively while some of them correlate negatively with vocabulary depth. Mathison's (2017) findings imply that self-generated strategies are more effective than imitated/adopted strategies.

This study aims to further examine these narrowly targeted links which are assumed to exist between macro-notions of L2 proficiency and L2 learning strategies. It employs lexical complexity measures as estimations of L2 vocabulary proficiency and attempts to complement the available studies about the role of language learning strategies in L2 learning and production. The overall objective is to describe the hypothetical link between lexical complexity measures as identified by Lu (2012) and types of language learning strategies as suggested by Oxford (1990).

2. Theoretical Background

2.1. Language learning strategies

Although there is no ultimate agreement on the definition of language learning strategies (LLS), it seems that there is a consensus on what they represent. They are associated with the notions of "deliberate goal-directed attempts to manage and control efforts to learn the L2"

(Oxford, 2013: 12), "the learners' actions/behaviours and thoughts aiming at facilitating learning" (Dörnyei & Ryan, 2015: 140), and "personal mechanisms whose forms are determined by personal predispositions to use particular intelligences" (Kovačević & Akbarov, 2016: 2). For the purpose of a working definition in this article, language learning strategies are defined as intentionally self-employed acts whose goals are to shape language learning processes and outcomes, and whose forms may be conditioned by instruction or personal tendencies to act or not to act in certain ways.

It may appear that this research construct is inarticulate. This is evident in the fact that there is an "on-going, global interest in language learning strategies and strategy instruction, despite theoretical contention about strategies among some researchers in the AL [Applied Linguistics] field" (Oxford, quoted in De Bot, 2015: 128). Cohen and Griffiths (2015) asked 25 major researchers of language learning strategies to suggest new directions for this research construct. They surprisingly found a little overlap in their colleagues' suggestions and concluded that there must be the "breadth of potential research on LLS still left to conduct" (Cohen & Griffiths, 2015: 415).

It must be the 'breadth' that spiced up controversies regarding the role of language learning strategies in language learning and using. For example, the taxonomies proposed in Oxford (1990), Cohen, Oxford, and Chi (2002), and Tseng, Dörnyei, and Schmitt (2006) yield systematic attempts that both significantly contribute to our understanding of the dynamic nature of language learning strategies and add to the complexity of their phenomenon. These taxonomies offer a number of subscales whose items collect highly varied types of data. Oxford (1990) suggests six categories labelled as memory, cognitive, compensation, metacognitive, social, and affective strategies. Cohen, Oxford, and Chi (2002) propose listening, vocabulary, speaking, reading, writing, and translation scales. Tseng, Dörnyei, and Schmitt (2006) describe self-regulatory capacities using five scales they label commitment, metacognitive, satiation, emotion, and environmental control. Remarkably, the Strategy Inventory for Language Learning (SILL) designed by Oxford (1990) asserted itself as the most popular tool in assessing LLS so far (Dörnyei & Ryan, 2015). So did the taxonomy that is featured in the inventory.

The diversity of language learning strategies offered within particular inventories does not need to be viewed as an obstacle; it should rather be perceived as a reminder that empirical results produced with any of the inventories are far from conclusive unless the underlying hypotheses are double-checked with alternative ways such as observations, interviews, narratives, or other language learning strategy inventories.

2.2. Lexical complexity

The phenomenon of L2 complexity entered SLA studies when scientific interest in complex adaptive systems grew and the notion of complexity started asserting itself across various scientific disciplines. Although Bulté and Housen (2015) report an SLA interest in the notions of complexification and simplification that date back to the 1970s and 1980s, it may be argued that Larsen-Freeman's (1997) seminal article "Chaos/Complexity Science and Second Language Acquisition" gave a significant momentum to the L2 complexity research. This article's purpose was to consider nonlinear systems as integral parts of language and language acquisition. The article partly inspired viewing a language learning process as complex, adaptive, usage-based, and therefore not fully predictable series of operations; a viewpoint that is shared by many prominent linguists today (De Bot, 2015; Beckner et al., 2009).

Bulté and Housen (2015; 2012) suggest that the multidimensionality of this research concept may be captured with the two following premises. Firstly, complexity "refers to a property or quality of a phenomenon or entity in terms of (1) the number and the nature of the discrete components that the entity consists of, and (2) the number and the nature of the relationships between the constituent components" (Bulté & Housen, 2012: 22). Secondly, a difference between relative and absolute complexity may also be recognized. While relative complexity is performance- and experience-related, absolute complexity is objective, system-related and dependent on a linguistic theory (Bulté & Housen 2015; 2012).

If the complexity of a system can indeed be described, then 'more' and 'less' complex systems can be identified by comparing their underlying sets of entities presupposed by background theories. Assuming that lexicon is a linguistic subsystem that bears elements of complex systems (Cappelli 2010) and that complexity is a "property of organized entities, of organisms, or systems" (Givón, 2009: 3), lexical complexity may be simply defined then as a measurable quality of a lexical system.

In a research project that explores the relationship between lexical richness and quality of ESL learners' oral narratives, Lu (2012) utilizes 26 measures (see Table 1) as indices of lexical complexity/richness proposed in the language acquisition literature. Utilizing these measures, Lu (2012) investigates the relationships between 408 test takers' oral narratives and the ratings provided by a pool of English teachers. The author reports statistically significant findings that vary across the lexical complexity measuring alternatives (Lu, 2012: 198-203). His results support the premise according to which lexical complexity diagnostics should rely on diverse measures. Furthermore, any scientific attempt that explores the relationship between lexical complexity phenomenon and other research constructs will yield more reliable results if it includes a wider array of lexical complexity indices.

Lu (2012) classifies measures of lexical complexity as the measures of lexical density (LD), lexical sophistication (LS1, LS2, VS1, CVS1, and VS2), and lexical variation (NDW-ModV; see Table 1). While all three types of measures can be used for diagnosing lexical richness, they moderately correlate (Lu 2012) and therefore can be described as different constructs. Lexical density measures the ratio between lexical and grammatical words. Lexical sophistication is diagnosed with formulas that identify the ratios between sophisticated and total words/verbs. Lexical variation is calculated with formulas that diagnose the number of different words and specific word types in a language sample (see Lu 2012).

2.3. Language learning strategies and vocabulary knowledge

The following paragraphs review recently published articles relevant to the current study. The review shows that the conclusions about the nature of the relationship between language learning strategies and vocabulary use depend on learners' proficiency levels, strategy types, and elements that may have been either intentionally or unintentionally left out of the research design procedures.

Zhang and Lu (2015) explore the link between vocabulary learning strategies and vocabulary breadth and depth with a sample collected from 151 freshman undergraduate students in China. They utilized vocabulary learning strategies survey (Schmitt, 1997) for which they provided an alternative list of factors (scales). They conclude that different strategy scales have different predictive powers. Mnemonic strategies consisting of analyzing words orthographically and phonologically and connecting words with morphologically and semantically related pairs are found to be moderate predictors of vocabulary breadth and depth. Moreover, a positive correlation with both of the aspects of vocabulary knowledge is reported. However, mnemonic strategies which include ways of connecting words to mental pictures correlate moderately but negatively with vocabulary depth. They also find that cognitive strategies which involve studying word lists and using vocabulary textbook sections are in weak negative correlation with vocabulary depth and meaning recognition as an aspect of vocabulary breadth.

Strambi et al. (2016) explore the relationship between adopting cognitive and metacognitive strategies and knowledge of Italian object pronouns. Four sophomore Italian major students at an Australian university participated in two tasks. The former measured locating and the latter measured producing object pronouns. Strategy use was diagnosed through think-aloud protocols. The results reveal inverse relationships between frequencies of strategy use (mostly cognitive) and task scores.

Waldvogel (2013) explores the relationship between the subscales of the Vocabulary Learning Questionnaire and vocabulary using of 475 Spanish as a foreign language learners who were divided into beginner, intermediate, and advanced groups. The results show that consolidation-social, cognitive, and metacognitive vocabulary learning strategies are in a positive relationship and can weakly predict the advanced learners' vocabulary using, while determination, discovery, and memory strategies cannot be associated directly with lexical use and knowledge. The findings also suggest that the benefits of the adoption of language learning strategies are not easy to identify at lower levels of foreign language proficiency.

Fellner and Apple (2006) report that a systematic adoption of blogging as a language learning and production strategy in a week long intensive English program designed for Japanese undergraduate learners produced an increase of 350% in the number of words used in their blog entries and resulted in a significant increase of using 2000-level, academic, and off-list words.

Having utilized the Self-Regulatory Capacity in Vocabulary Learning Scale (Tseng et. Al., 2006) to collect data about the participants' learning strategy adoption, Bilican and Yesilbursa (2015) report that one month of systematic promotion of vocabulary learning strategies with an experimental EFL learners group at a private high school in Turkey did not produce statistically significant results when compared to the control group's vocabulary test results and strategy use. The researchers explain the nonsignificant statistical results by speculating that the control group was academically more superior and had a better classroom atmosphere that facilitated the learning process.

Johnson et al. (2012) find no effect of pre-task planning on lexical complexity levels in the essays written by EFL Spanish learners. Their finding implies that planning, as a cognitive/metacognitive strategy, does not facilitate the learner's lexical complexity levels in the written output.

Overall, these findings show that particular language learning/production strategies play changeable roles in the process of shaping the lexical output. Therefore the research on the relationship between language learning strategies and vocabulary using seems not to have reached a conclusive point and requires further empirical testing.

The major aim of this project is to explore how language learning strategy clusters are related to lexical complexity measures. The findings are expected to provide new information that would help in describing the link between language learning strategies and vocabulary use.

3. Research Design

This research project is driven by correlational design principles. The research subject is the relationship between language learning strategies (LLS) clusters as identified in the SILL and 25 lexical complexity (LC) measures (D Measure was not calculated, see Table 1) obtained from an EAP learner corpus that is composed of 152 general knowledge essays written during in-class exams. The samples were collected from EAP learners who were found proficient to attend undergraduate programs with English instructions. Based on the available findings of which some are reviewed in the previous section, it is hypothesized that language learning strategies and lexical complexity measures correlate.

3.1. Research questions

RQ1: Is there a relationship between language learning strategies and lexical complexity measures?

RQ2: What is the magnitude of the correlations between language learning strategies and lexical complexity measures, if any?

RQ3: Which language learning strategies are not in significant correlations with lexical complexity measures, if any?

3.2. Participants

The participants (*N*=152) were Bosnian undergraduate students at the International University of Sarajevo. Eighty-nine female and sixty-three male freshman students participated in the study. Twenty-eight of them studied at the Faculty of Arts and Social Sciences, twenty-five of them studied at the Faculty of Business and Administration, and ninety-nine of them studied at the Faculty of Engineering and Natural Sciences. All of the participants were found to be English-proficient (B2-C2) by the institutional language proficiency test.

3.3. Data collection procedure and analysis

The written output data used in this study was collected over three semesters (Fall 2014, Spring and Fall 2015) with in-class essay exams on general knowledge topics without using referential books such as dictionaries or grammar manuals. The essays were converted to an electronic format and processed with the Web-based Lexical Complexity Analyzer (LCA) (Lu, 2012; Ai & Lu, 2010; see Table 1). Before they were analyzed, spelling errors were corrected. The essays were also used in a study that examines the relationship between language learning beliefs and syntactic complexity indices (Kovačević, 2017).

Table 1: Measures of lexical density, sophistication, and variation (Lu 2012)*

Type	*Measure*	*Code*	*Formula*	*Explanation*
Lexical Density	Lexical Density	LD	N_{lex}/N	lexical words to the number of words
Lexical Sophistication	Lexical Sophistication-I	LS1	N_{slex}/N_{lex}	sophisticated lexical words to the total number of lexical words
	Lexical Sophistication-II	LS2	T_s/T	sophisticated word types to the total number of word types
	Verb Sophistication-I	VS1	T_{sverb}/N_{verb}	number of sophisticated verb types to the total number of verbs
	Corrected VS1	CVS1	$T_{sverb}/\sqrt{2N_{verb}}$	variations (corrections) of VS1 measure
	Verb Sophistication-II	VS2	T^2_{sverb}/N_{verb}	
Lexical Variation	Number of Different Words	NDW	T	number of different words used in a language sample
	NDW (first 50 words)	NDW-50	*T* in the first 50 words of sample	
	NDW (expected random 50)	NDW-ER50	Mean *T* of 10 random 50-word samples	
	NDW (expected sequence 50)	NDW-ES50	Mean *T* of 10 random 50-word sequences	
	Type-Token Ratio	TTR	T/N	number of word types to the number of words in a text
	Mean Segmental TTR (50)	MSTTR-50	Mean *TTR* of all 50-word segments	
	Corrected TTR	CTTR	$T/\sqrt{2N}$	
	Root TTR	RTTR	$T/\sqrt{N}$	
	Bilogarithmic TTR	LogTTR	$LogT/LogN$	
	Uber Index	Uber	$Log^2N/Log(N/T)$	
	D Measure	D	*D* (see Lu, 2012)	
	Lexical Word Variation	LV	T_{lex}/N_{lex}	variation of specific classes of words
	Verb Variation-I	VV1	T_{verb}/N_{verb}	
	Squared VV1	SVV1	T^2_{verb}/N_{verb}	
	Corrected VV1	CVV1	$T_{verb}/\sqrt{2N_{verb}}$	
	Verb Variation-II	VV2	T_{verb}/N_{lex}	
	Noun Variation	NV	T_{noun}/N_{lex}	
	Adjective Variation	AdjV	T_{adj}/N_{lex}	
	Adverb Variation	AdvV	T_{adv}/N_{lex}	
	Modifier Variation	ModV	$(T_{adj}+T_{adv})/N_{lex}$	

* D measure is not calculated for the current sample.

With their consent, the students who wrote the essays were surveyed with the SILL (Oxford, 1990) during the lectures across the three semesters. The data was primarily collected for the purposes of a PhD dissertation (Kovačević, 2016) with the author's permission. The instrument comprises 44 Likert-scale items (5 answer options that range between never- and always true for me) classified across 6 subscales, namely: memory (9 items; e.g. *I use rhymes to remember new English words*), cognitive (14 items; e.g. *I read for pleasure in English*), compensation (6 items; e.g. *I make up new words if I do not know the right ones in English*), metacognitive (9 items; e.g. *I try to find out how to be a better learner of English*), affective (e.g. *I try to relax whenever I feel afraid of using English*), and social (6 items; e.g. *I practice English with other students*). A reliability analysis revealed the Cronbach's alpha of 0.90 (Kovačević, 2016).

The correlations between the SILL subscales and LCA indices were calculated with the IBM SPSS Statistics 21 program. The data distribution was assessed and showed that several of the variables were not normally distributed. Therefore, the correlations between the variables were diagnosed utilizing Spearman's rank correlation coefficient.

4. Results

4.1. Descriptive statistics

Table 2 presents the SILL subscales' mean values. The frequency of using particular strategy type is assessed on the scale between 1 (never or almost never) and 5 (always or almost always) scale. A comparison of the arithmetic means calculated for the SILL subscales show the highest frequency for using metacognitive strategies (M=3.62). The means for the other five subscales of SILL strategies can be ordered as follows: cognitive (M=3.57), social (M=3.53), compensation (M=3.38), memory (M=2.92), and affective (M=2.63).

If the score 3 (somehow true for me) is used as the cut-off value below which it may be assumed that a particular type of strategies is rarely applied, the results suggest that the participants do not often employ memory and least rely on affective strategies.

Table 2: Mean values across the SILL subscales

	Memory	*Cognitive*	*Compensation*	*Meta-cognitive*	*Affective*	*Social*
Overall mean	26.28	50.10	20.29	32.64	15.78	21.21
SD	5.40	6.59	3.97	6.00	3.87	3.74
Number of items	9	14	6	9	6	6
Overall mean/ number of items	2.92	3.57	3.38	3.62	2.63	3.53
N	152	152	152	152	152	152

Table 3: Average results across lexical and syntactic sample descriptors

	N	*Mean*	*SD*		*Mean*	*SD*
Words	152	333.72	98.69	Slextokens	30.48	14.14
Wordtypes	152	148.33	34.94	Sentences	17.86	6.98
Swordtypes	152	26.92	12.33	Verb phrases	52.33	16.50
Lextypes	152	105.07	30.19	Clauses	37.53	12.24
Slextypes	152	24.04	12.01	Dependent clauses	15.79	6.46
Wordtokens	152	334.07	99.00	Complex T-units	11.03	3.83
Swordtokens	152	35.20	14.99	Coordinate phrases	9.65	5.08
Lextokens	152	170.37	51.54	Complex nominals	36.30	12.59

Table 3 presents 16 parameters which describe the overall characteristics of the learner corpus utilized in this study. During the formal exams, the participants wrote short essays which comprised 333.7 words and 26.92 swordtypes (i.e. beyond 2,000 words; see Lu 2012) combined across 17.86 sentences and 37.53 clauses on average. Standard deviation values show that the sample was not homogenous; the distribution of its means implies that the sample is valid for a correlational research design.

Table 4 shows the mean values of 25 indices of lexical complexity which were calculated with the above presented corpus. As suggested in Lu (2012), these measures do not strongly correlate and therefore offer an opportunity for revalidating any link between lexical output and another variable.

Table 4: Average results across measures of lexical complexity

	N	*M*	*SD*		*M*	*SD*
LD	152	0.51	0.04	RTTR	8.13	0.97
LS1	152	0.18	0.05	LOGTTR	0.86	0.02
LS2	152	0.18	0.04	UBER	18.60	2.59
VS1	152	0.08	0.05	LV	0.65	0.11
VS2	152	0.41	0.51	VV1	18.47	6.86
CVS1	152	0.38	0.25	SVV1	2.99	0.56
NDW	152	148.33	34.94	CVV1	0.63	0.08
NDWZ	152	38.74	3.10	VV2	0.17	0.03
NDWER	152	39.41	1.77	NV	0.61	0.10
NDWERZ	152	38.78	2.03	ADJV	0.12	0.03
TTR	152	0.46	0.06	ADVV	0.09	0.03
MSTTR	152	0.77	0.04	MODV	0.21	0.04
CTTR	152	5.75	0.69			

4.2. RQ1: Is there a relationship between language learning strategies and lexical complexity measures?

As can be concluded from Table 5, the results show statistically significant correlations between memory strategies and three LC measures, cognitive strategies and twenty LC measures, compensation strategies and nine LC measures, and affective strategies and three LC measures.

Table 5: Statistically significant correlation coefficients between LC measures and SILL subscales

LC Measures	*SILL Subscales*			
	Memory	*Cognitive*	*Compensation*	*Affective*
LS1		r_s= .24 (p= .01)	r_s= .17 (p= .03)	
LS2		r_s= .18 (p= .02)	r_s= .17 (p= .03)	
VS1		r_s= .18 (p= .02)		
VS2		r_s= .18 (p= .02)		
CVS1		r_s= .17 (p= .02)		
NDW	r_s= -.19 (p= .01)			r_s= -.16 (p= .03)
NDWZ		r_s= .26 (p= .01)		
TTR		r_s= .18 (p= .02)	r_s= .17 (p=.02)	
MSTTR		r_s= .16 (p= .03)		
CTTR		r_s= .20 (p= .01)		
RTTR		r_s= .20 (p= .01)		
LOGTTR		r_s= .21 (p= .01)	r_s= .18 (p= .02)	
UBER		r_s= .23 (p= .01)	r_s= .17 (p= .03)	
LV		r_s= .21 (p= .01)	r_s= .16 (p= .03)	
VV1	r_s= -.18 (p= .02)	r_s= .19 (p= .01)		r_s= -.18 (p= .02)
SVV1	r_s= -.18 (p= .02)	r_s= .18 (p= .01)		r_s= -.18 (p= .02)
CVV1		r_s= .28 (p=.01)	r_s= .22 (p= .01)	
VV2		r_s= .23 (p= .01)	r_s= .22 (p= .01)	
NV		r_s= .27 (p= .01)	r_s= .26 (p= .01)	
ADJV		r_s= .18 (p= .01)		
MODV		r_s= .19 (p= .01)		

The results show that cognitive strategies, such as practicing (e.g. practicing naturalistically), receiving and sending messages, analyzing and reasoning (e.g. transferring/translating), and creating structure for input/output (e.g. taking notes), partly account for lexical complexity measures in the L2 learner's use of the language learned.

The results also provide evidence that compensation strategies, such as guessing intelligently and overcoming limitations in speaking and writing, may partly explain the L2 learner's use of sophisticated lexical words/word types. It needs to be noted that out of 25 LC measures only nine measures are in statistically significant relationship. Yet all nine correlation coefficients are positive.

The results reveal that memory strategies are in negative correlation with lexical complexity measures. Therefore, it may be suggested that communication tasks that trigger deliberate utilization of language learning strategies for the purposes of message coding or decoding actually facilitate increase in LC levels rather than the strategies that are utilized for storing L2 lexical items.

Another important finding in this study are statistically negative correlation coefficients between affective language learning strategies and three LC measures which also negatively correlate with memory strategies (NDW, VV1, and SVV1). The fact that affective strategies, such as lowering your anxiety, encouraging yourself, or taking your emotional temperature (e.g. writing a language learning diary), are in negative correlation with LC measures may be interpreted as a possibility that L2 learners who more often utilize affective strategies are actually producing less complex lexical items when writing a text. In other words, it is likely that less proficient L2 users apply affective and memory strategies more often.

4.3. RQ2: What is the magnitude of the correlations between language learning strategies and lexical complexity measures, if any?

All statistically significant correlation coefficients between LLS subscales and LC measures presented in Table 5 are of weak magnitude; positive correlation coefficients vary between .16 and .28, and negative correlation coefficients vary between -.16 and -.19. The results partly confirm previously published findings according to which language learning strategies are found to correlate either weakly or moderately with vocabulary use (Zhang & Lu, 2015; Waldvogel 2013).

4.4. RQ3: Which language learning strategies are not in significant correlations with lexical complexity measures, if any?

No statistically significant correlations between social LLS and LC measures could be found in this study. However, four positive correlation coefficients have p-value less than 0.1. The findings imply that social strategies, such as asking questions, cooperating with others, or empathizing with others, may partly explain the variety of L2 lexical items produced in the L2 output. Yet these findings should be taken with a reservation due to their p-values.

Unlike social strategies whose correlation coefficients may be sample dependent, metacognitive strategies (such as centring, arranging and planning, or evaluating your learning) were found to be in no correlation with LC measures. It needs to be noted that these strategies were identified as most frequently adopted language learning strategies in this research sample. These results contradict Waldvogel's (2013) report according to which metacognitive and social strategies correlate with vocabulary size.

5. Discussion

Previous studies (Strambi et al. 2016; Zhang & Lu 2015; Waldvogel, 2013) have shown that learning strategies may be related to different aspects of vocabulary knowledge. However, any further overgeneralizations of their results may be misleading without an additional input of new research data; their findings already point at the varying nature of the role of particular strategies that seems to depend at least on the context (i.e. type of task) and stage of L2 proficiency development. In this regard, the current study explores whether and how language learning strategies are related to lexical complexity measures as indicators of the level of L2 vocabulary knowledge displayed in the written output. Based on the correlational design and inspired by relevant and available publications, the main hypothesis assumed that language learning strategies and lexical complexity measures would correlate. Due to the different approaches and mixed results of the reviewed studies, the magnitude and direction of the correlations was hard to predict; the previous findings suggested that the correlation would not be strong (but could be both weak or moderate), and that it could be both positive (direct) or negative (inverse).

Strambi et al. (2016) found that less successful students apply cognitive strategies more often than more successful students do when solving Italian object pronouns tasks, and they concluded that the frequency of adoption of cognitive language learning strategies and vocabulary knowledge appears to be in inverse relationship. These strategies include, deduction, inferencing, engaging prior knowledge and translation, among few others (Strambi et al. 2016: 126). Their finding appears not to be aligned with the results of the current study; cognitive strategies are found to be in positive correlation with lexical complexity measures; the more often they are applied, the higher are the complexity values. However, Strambi et al.'s (2016) focus was object pronouns, which are not categorized as lexical words in this study. It may be speculated that these two studies are dealing with very different vocabulary knowledge parameters, and therefore may complement each other. This conclusion can be used to support the argument that the relationship between features of vocabulary knowledge and language learning strategies is conditioned by the type and nature of linguistic units utilized in a research equation. Strambi et al.'s (2016) results can be used for an argument that some cognitive strategies are abandoned along the path of L2 skills development. However, the results of the current study show that proficient students often apply cognitive strategies, such as reasoning deductively, translating, or taking notes.

Zhang and Lu (2015) reported statistically significant, negative, weak correlations between the cognitive strategies factor and vocabulary depth as well as meaning recognition scores. It needs to be noted that their factor comprised only two survey items which assessed whether their participants "use word lists to recite and study new words" and "use vocabulary section of [their] textbook" (Zhang & Lu, 2015: 746). The subscale of cognitive strategies used in the current study comprises fourteen items which include the items of repetition that Zhang and Lu (2015) did not find to be (as a separate factor) in statistically significant correlation with vocabulary breadth and depth. It may be worth noting that this study reveals 20 statistically significant correlations between cognitive strategies and all of the five measures of lexical sophistication, and 15 measures of lexical variation. These measures include formulas suggested for value corrections, and therefore provide valid and reliable evidence that the relationship is indeed statistically tangible. The misalignment regarding the direction of correlation between cognitive strategies and vocabulary use reported in Zhang and Lu's (2015) and this study indicates that the direction of the relationship needs to be carefully approached and further explored. The magnitude as such was confirmed though; cognitive strategies are weak predictors of vocabulary knowledge.

Waldvogel (2013) found that cognitive, metacognitive, and consolidation-social strategies may predict vocabulary size of L2 learners. While the present study's results also show that cognitive strategies may partly explain vocabulary aspects of L2 performance, this study does not confirm that metacognitive and social strategies can be described as predictors of lexical knowledge. The source of misalignment could be attributed to the difference in the survey types utilized in the two studies. However, both of the surveys attribute progress evaluation and self-generated learning opportunities as features of metacognitive strategies, and cooperating with peers or proficient L2 users as features of social strategies. It needs to be noted that Waldvogel (2013) reports that metacognitive and social strategies may predict vocabulary of advanced rather than beginner or intermediate L2 learners. The proficiency levels of the participants in this study were diagnosed with an institutional test to be at least at the B2 level. Therefore the proficiency parameter cannot explain the misalignment either. Yet it may be noted that Waldvogel (2013) inspected the relationship between vocabulary learning strategies and vocabulary size utilizing total scoring method (0-150) for estimating participants' vocabulary size. Starting with the premise that overall scores disguise the particularities of L2 performance, the current study utilized specific lexical complexity measures as estimations of vocabulary knowledge.

This study makes a significant contribution to the body of literature about language learning strategies by providing novel statistical evidence that shows compensation, affective, and memory strategies in weak correlations with lexical complexity measures. While compensation strategies are in correlation with two measures of lexical sophistication and seven measures of lexical variation, affective and memory strategies are in negative correlation with three measures of lexical variation. Considering the overall number of lexical complexity measures, the findings about affective and memory strategies may need to be interpreted with minor reservations.

Compensation strategies involve employing alternative language resources with the aims of compensating for unfamiliarity with linguistic units encountered or needed during receptive and productive tasks. As already emphasized, the participants' L2 proficiencies in this study oscillate between B2 and C2 levels. Therefore these participants are probably able to rely on existing personal resources when coining new or assuming the meaning of unfamiliar words. In addition, significant standard deviations are identified across measures of lexical complexity in this sample, and it may be concluded that the positive correlations between compensation strategies and lexical complexity measures may be explained (without implying causality) by the varying levels of participants' L2 skills and experience; the resources increase with the L2 proficiency growth. The proficiency argument may also be used for explaining the negative direction of the relationship between affective strategies and lexical complexity measures; the lack of L2 experience may explain the need for employing affective strategies that help an L2 learner cope with completely novel and difficult language using situations.

Regarding the negative direction, it is pointed out that memory strategies may be more common with lower proficiency levels (Waldvogel, 2013). However, Zhang and Lu (2015) report statistically significant positive correlations between vocabulary knowledge and mnemonic strategies which 'include form analysis and a number of association techniques' and a statistically significant negative correlation between vocabulary depth and mnemonic strategies which include 'linking words to images and situations'. The memory strategies scale utilized in this study combines all of the three factors of mnemonic strategies that Zhang and Lu (2015) proposed. The current study's results show three weak correlation coefficients ($r_s <$ 0.4), and Zhang and Lu (2015) report four moderate correlation coefficients ($r_s>0.4$). Although it may seem a bit farfetched, it should be noted that Zhang and Lu (2015) conducted their study with a sample provided by L2 learners of Chinese L1 background, and that the current study utilizes the sample provided by L2 learners of Bosnian L1 background. Some studies (Kovačević & Akbarov 2016; Deneme 2010) report statistically significant differences in adoption of memory and affective strategies between L2 users of different L1 backgrounds. It is recognized that further empirical research is necessary for ascribing the variation in correlation coefficients between the current and referenced studies to any features of L1 cultural and linguistic background.

6. Conclusion

Exploring various data samples with automatic language analyzers, such as the Web-based Lexical Complexity Analyzer (LCA) (Lu, 2012; Ai & Lu, 2010), may indeed generate a new set of perspectives regarding the role and nature of often and traditionally researched individual-centred constructs such as language learning strategies. This study revealed that twenty-one lexical complexity measures and four types of language learning strategies are in statistically significant, weak, mainly positive, and negative correlations. The findings suggest that the contemporary mainstream academic radar should systematically target reopening some of the insufficiently or inconsistently answered questions. The results would probably reposition or at least challenge some findings about a number of research constructs and point at the potential of newly developing research instruments and approaches.

6.1. Limitations of the present study

One of the limitations of the present study may be found in the utilized instrument for collecting language learning strategies data. Although its popularity is undoubted (Dörnyei & Ryan, 2015), the Strategy Inventory for Language Learning (SILL) (Oxford, 1990) was developed back in the late 1980s when language learning strategies research significantly gained its momentum. Now being approximately thirty years old, it was utilized in this study primarily because of its firm theoretical ground. However, it is acknowledged that updated inventories of language learning strategies could verify the present findings and offer new information.

Another limitation may be noticed in the type of learner corpus; it is comprised of written output only. If complemented with the corpus of spoken output, the relationship between language learning strategies and vocabulary use could be described in greater detail.

One needs to be reminded that correlation research output does not provide findings that imply causality. Therefore, the results should only be interpreted through the norms of correlation design.

6.2. Implications for further research

Further research should explore the relationship between language learning strategies and lexical complexity measures by utilizing alternative inventories, think aloud protocols or interviews, as well as both written and spoken output sets. It is also advised that the LCA is utilized in researching other individual-centred constructs such as motivation, anxiety, or learning styles. Future research should also attempt to identify the benchmarks for acquiring and abandoning particular types of language learning strategies. It could be useful to describe any oscillation patterns in the frequency of employing particular strategies.

7. References

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