Journal of Arts & Humanities

Volume 07, Issue 02, 2018, 44-58
Article Received: 31-01-2018
Accepted: 24-02-2018
Available Online: 27-02-2018
ISSN: 2167-9045 (Print), 2167-9053 (Online)
DOI: http://dx.doi.org/10.18533/journal.v7i2.1338

Vocabulary Learning Strategies used by Medical Students: Croatian Perspective

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ABSTRACT

In order to be able to fully develop their academic and professional competencies, medical doctors (MDs) need to be highly proficient in English, which, among other things, implies the acquisition of vocabulary as an essential part of language knowledge. Since English language proficiency is considered highly important in a medical setting and limited vocabulary size may have a negative effect on the exchange of information, this study aims at exploring vocabulary learning strategies (VLS) that medical students in Croatia use in order to learn target vocabulary, relationship between VLS subscales and different types of vocabulary knowledge, and differences in the mean strategy use between male and female students as well as among low-, middle- and high-scoring students. The results indicate that medical students use a core inventory of VLS, whereby showing preference for the category of self-initiated vocabulary learning (SI-IVL). A very small correlation was found between formal vocabulary learning (FVL) strategies and controlled-productive type of vocabulary knowledge. Findings also revealed that female students used SI-IVL and FVL strategies significantly more often than their male counterparts and that there were no statistically significant differences in the mean VLS use by English language proficiency. The results of this study imply the need for teacher training aimed at developing specific skills for providing their students with explicit instruction in VLS use.

Keywords: formal vocabulary learning, self-initiated vocabulary learning, spontaneous vocabulary learning, VLS instruction, vocabulary learning strategies.

1. Introduction

In order to establish effective communication in a foreign language, language learners need not only to increase their vocabulary size, but also to use the acquired vocabulary fluently across all four language skills (Nation, 2001). Since limitations in vocabulary knowledge may inhibit the flow of

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information, facilitating vocabulary acquisition has become one of the major issues for language teachers (Read, 2004). Over the last few decades, there has been the shift of responsibilities from teachers to learners. Thus, learners have been encouraged to self-direct their learning and select those VLS strategies that seem to be the most appropriate for them. A number of research studies (e.g. Gu and Johnson, 1996; Lawson & Hogben, 1996; Pavičić, 1999; Pavičić Takač, 2008) have shown that language learners on the average use different VLS, but it still does not seem possible to draw any definite conclusions in this field (Pavičić Takač, 2008).

Another important issue in terms of vocabulary learning is related to specific goals for which learners need to know particular type of vocabulary. For instance, the participants in this research, i.e. English for Medical Purposes (EMP) learners, should extend the high frequency word level to the level of medical academic vocabulary used in spoken and written discourse (Wang, Liang, & Ge, 2008). Therefore, based on the aforementioned background that clearly indicates the importance of vocabulary knowledge in the field of medicine, this study concentrates on the VLS that individual EMP learners develop in order to acquire a large amount of vocabulary items in a relatively short period of time. Moreover, attempts have also been made to gain insight into the possible relationship between the use of different VLS subscales and vocabulary test scores. Finally, the paper also reports on differences in medical students' VLS use by gender and vocabulary proficiency.

2. Theoretical background

2.1 Individual differences (IDs) and learning strategies

Among different theories and approaches prevailing nowadays within the area of second language acquisition, the cognitive theory, dealing with mental processes involved in learning, occupies a significant position. According to this theory, each individual language learner has his or her own way of approaching learning (Pavičić Takač, 2008), which, in turn, results in different outcomes in foreign language acquisition. In other words, the broader concept of IDs refers to stable characteristics that make individuals different from each other (Dörnyei, 2005). Insight into the literature on the subject reveals a variety of individual factors classified differently by researchers. For example, Ellis (1994) identifies three sets of variables, whereby (a) the first set comprises beliefs, affective states and various general factors, (b) the second set refers to different strategies employed by learners, and (c) the third deals with language learning outcomes. Further, according to Ehrman, Leaver, and Oxford (2003), learner differences are classified as learning styles, learning strategies, affective variables, learning aptitude, gender, culture, age and other demographic variables. Similarly, Dörnyei (2009) conceptualizes IDs through five basic factors that have traditionally been regarded as the principle ones: language aptitude, motivation, learning styles, learning strategies, and anxiety. In summary, as can be seen from the aforementioned, learning strategies occur across all definitions as one of the key notions in the area of IDs.

The learning strategy research in the L2 field started with the introduction of the concept of the "good language learner" (e.g. Naiman, Fröhlich, Stern, & Tedesco, 1978; Rubin, 1975; Stern, 1975) in the 1970s, focusing on the characteristics that made some learners more successful than others. The research into features of good language learners were undertaken in an attempt to make some generalizations and recommendations directed toward increasing learners' efficiency in L2 learning since good language learners were found to possess a rich repertoire of learning strategies. However, it was only at the beginning of the 1990s that the concept of language learning strategy achieved mainstream recognition due to publication of the summary books by O'Malley and Chamot (1990), Oxford (1990), and Wenden (1991). In the view of Dornyei and Skehan (2003), the aforementioned authors stress "the learners' proactive contribution to enhancing the effectiveness of their own learning" (p. 166).

The most prominent researchers in the field define learning strategies as (a) actions incorporating a functional dimension (Oxford, 1990, p.8); (b) thoughts or behaviours containing a cognitive dimension (O'Malley & Chamot, 1990, p.42); or (c) approaches and techniques advocating behavioural and mental dimension (Ellis, 1997, p.77). Similarly, Cohen (2003) defines language learning strategies as "conscious or semi-conscious thoughts and behaviours used by learners with the explicit

goal of improving their knowledge and understanding of a target language" (p. 280). As can be seen, different terms (actions, thoughts, behaviours, approaches, techniques) used in an attempt to provide the most precise definition of learning strategies suggest that there is still no consensus in the field of basic terminology. Yet, according to Pavičić Takač (2008), what can be recognized across all definitions is that strategies are goal-driven, they contribute to increased effectiveness in L2 learning, and comprise elements of intention, choice and appropriateness.

2.2 VLS taxonomies

VLS have been developed in learners' attempts to apply learning strategies in vocabulary acquisition. Thus, Nation (2001) defines them as "a part of language learning strategies which in turn are a part of general learning strategies" (p. 217). A number of studies exploring individual VLS have been conducted (e.g. Chin, 1999; Lawson & Hogben, 1998; Rodríguez & Sadoski, 2000). For the purpose of her large-scale study, Stoffer (as cited in Kudo, 1999), designed a Vocabulary Strategy Inventory (VOLSI) with 53 individual strategies. By means of factor analysis these strategies were clustered into (a) strategies involving authentic language use; (b) strategies used for self-motivation; (c) strategies used to organise words; (d) strategies used to create mental linkages; (e) memory strategies; (f) strategies involving creative activities; (g) strategies involving physical action; (h) strategies used to overcome anxiety, and (i) auditory strategies.

Schmitt (1997) developed his taxonomy on the basis of the questionnaire designed as a research tool for the survey involving 600 Japanese learners of English. Pavičić Takač (2008) believes that this classification is "[…] currently the most comprehensive typology of (exclusively) this subgroup of learning strategies […]" (p. 67). It is partly based on Oxford's classification system of general learning strategies into Social (SOC), Memory (MEM), Cognitive (COG), and Metacognitive (MET) strategies (Oxford, 1990). Yet, since no strategies in Oxford's taxonomy refer to discovery of a new word's meaning without assistance of another person, a new category called Determination strategies (DET) has been introduced. Accordingly, the result is Schmitt's taxonomy, consisting of five basic groups classified along Discovery and Consolidation strategy dimensions (Schmitt, 1997).

In another frequently cited research with Chinese EFL learners, undertaken for the purpose of comparing the frequency of VLS with learners' beliefs, vocabulary size and general English proficiency, Gu and Johnson (1996) compiled Vocabulary Learning Questionnaire (VLQ Version 3), in which (a) selective attention; (b) self-initiating; (c) guessing strategies, (d) dictionary use strategies, (e) strategies of recording vocabulary;

(f) strategies of memorisation by repetition; (g) strategies of memorisation by coding; and

(h) activation strategies were identified. Further, similarly to the above mentioned studies, Pavičić (1999) conducted research among primary, secondary and university English language learners in Croatia with the purpose to propose the new VLS taxonomy. As a result, the factor analysis identified (a) strategies for self-initiated independent learning; (b) strategies for formal practising; (c) strategies for functional practising; (d) memory strategies; and (e) compensation strategies. The results of the study led to the assumption that the combination of various strategies would produce the most favourable outcomes.

2.3 Findings of previous research

It can be seen that a number of researchers set out to classify VLS. Although no definite conclusions in terms of generally acceptable VLS typology have been drawn yet, these studies have provide evidence that learners possess a certain repertoire of VLS but the results of the research undertaken so far have still been rather inconsistent. For example, by using the think-aloud procedure, Lawson and Hogben (1996) found that Australian students learning Italian had a number of strategies at their disposal, but the VLS most frequently used by both top-scoring and bottom-scoring groups were repetition strategies. The results further indicated that the use of simple repetition strategies on the one hand, and paraphrasing and the use of some mnemonic devices, on the other (although the latter strategies were infrequently used) facilitated word recall.

Another study undertaken by Lawson and Hogben (1998) yielded again interesting, albeit rather opposite findings. The experimental group, provided with the Keyword Method instruction, recalled

the definitions of more words than did the control group, thus indicating powerful effects of the Keyword Method on vocabulary acquisition. In addition, Schmitt (1997) found that VLS used most frequently by Japanese learners were bilingual dictionaries and mechanical repetition. As opposed to Schmitt's findings, Fan's (2003) study revealed that Hong Kong learners showed preference neither for repetition, nor for more complex association strategies. The strategies most frequently used by the highest scoring group of students were sources, guessing, dictionary and known words strategies. On the other hand, the strategies used significantly more often by less proficient students were repetition and association strategies.

Regarding the amount of strategy use, the study undertaken by Gu and Johnson (1996) revealed that Japanese students seldom used one single strategy. A very small group of high achievers reported learning vocabulary mostly through extensive reading, whereas the second best group reported using a variety of strategies, such as guessing, dictionary strategies, note taking, and even memorization strategies. The least proficient group preferred memorization strategies. Similar findings, in terms of the amount of strategy use, were obtained by Pavičić (2000) whose study indicated an extensive use of VLS, such as bilingual dictionary use, repetition strategies, correct usage of a word in a sentence, translation of the target word into L1, etc.

Another study that included Croatian primary school learners (Pavičić Takač, 2008) showed that among most frequently used VLS were listening to songs, remembering words from films and TV programmes, translating words into L1 and remembering words if they are written down. This finding was to some extent in line with the results reported by Rogulj and Čizmić (2016) suggesting that business and information technology students were in favour of those strategies that, through everyday exposure to authentic English language, facilitate spontaneous language learning.

In short, this brief overview reveals researchers' huge interest in the area of VLS, which, on the one hand, stems from research into general language learning strategies, and, on the other, from language learners' needs to master as many words as possible.

2.4 Importance of vocabulary knowledge

In Schmitt's (2008) words "one thing that students, teachers, materials writers, and researchers can all agree upon is that learning vocabulary is an essential part of mastering a second language" (p. 329). For the purpose of vocabulary selection, word frequency research emerged in the 1920s as an important area in applied linguistics.

According to Nation (2001), 4 groups of words, high frequency words, academic words, technical words, and low-frequency words may occur in the text. High frequency words include all function words and many content words that provide the basis for establishing and maintaining everyday communication. Academic vocabulary, sometimes called sub-technical vocabulary, occurs frequently in academic texts across different disciplines. Content-specific or technical vocabulary is related to specialized fields, whereas low-frequency words rarely occur and do not belong to the aforementioned groups.

According to the research on vocabulary learning, it is estimated that 98% text coverage is needed to function normally in written and oral discourse (Schmitt, 2008). In other words, knowledge of 8000-9000 and 6000-7000 word families is required to communicate effectively in speech and writing respectively.

Regarding the academic vocabulary, at the 95% academic text coverage level, EFL speakers are supposed to know approximately 4000 words, out of which 2000 high frequency words, about 570 general academic words and 1000 or more technical words, proper nouns and low-frequency words (Nation, 2001, p. 147). In an attempt to help both EFL speakers to study the vocabulary they need and teachers to provide teaching materials and curricula for their courses, researchers have developed lists of words most frequently appearing in different corpora.

2.4.1 Academic vocabulary across disciplines

It is clear that not all the words are equally important at different stages of the learning process. Accordingly, the beginners and low-intermediate students should first master the 2000 most frequently occurring word families. However, as students advance in their learning, they need to

expand their word knowledge by shifting to academic, technical and lower frequency vocabulary (Wang, Liang, & Ge, 2008). As a result, academic vocabulary lists were created, among which Coxhead's (2000) academic word list (AWL) has been widely cited. It contains 570 academic word families that cover 10% of the tokens in her academic text corpus related to arts, commerce, law and natural science.

Additionally, some researchers have also set out to conduct studies on vocabulary used in single disciplines, e.g. in electrical engineering (Mudraya, 2006) or medicine. With reference to the field of medicine, Chen and Ge (2007) reported that around 10% of the academic words included in Coxhead's (2000) AWL were found in medical research articles, whereas the research conducted by Wang et al. (2008) resulted in the only academic word list targeted at the field of medicine, Medical Academic Word List (MAWL).

Another research (Weber, 2005), which included a small sample of spoken and written medical corpora, revealed, on the one hand, a clear difference between spoken and written scientific discourse and, on the other, "shifts from formal academic language to the more conversational style" (p.174). Based on the aforementioned, it can be concluded that the target vocabulary that medical students should focus on, ranges from written and spoken academic area to the area of less formal conversational language.

2.5 Accommodating individual learners

However, it is not only the frequency of the occurrence of a word, but also the relevance to the needs of the target learners that has to be taken into consideration when determining the usefulness of the target vocabulary (Richards, 2001). Therefore, the starting point in developing an EMP course would be to determine learners' needs in terms of specific purposes to which doctors, non-native English speakers, need English in different target situations. Needs analysis conducted as part of the research carried out in the Croatian setting (Rogulj, 2005) indicated that MDs were fully aware of the need to be highly proficient in English.

Indeed, they ranked making presentations and participating in discussions at medical congresses as well as writing research articles as very important. Equally, they perceived listening to presentations, reading medical articles or speaking in a hospital setting as important. On the whole, it appears that among MDs, English language proficiency was considered important for the whole range of different target situations.

Accordingly, based on the aforementioned findings, the EMP curriculum should comprise different kinds of vocabulary knowledge. In addition, it is reasonable to believe that limitations in vocabulary size and knowledge may inhibit the exchange of written and spoken scientific information.

2.6 Research questions

This research study focused primarily on the type and frequency of VLS employed by medical students. The secondary aim was to provide empirical data on the relationship between the VLS use and different types of vocabulary knowledge as well as on potential differences in the VLS use by gender and vocabulary proficiency. In particular, the research questions are as follows:

1. Which strategies are most and least frequently used by medical students included in this study?
2. Is there a correlation between three vocabulary strategy use subscales (self-initiated independent vocabulary learning, formal vocabulary learning, and spontaneous vocabulary learning) and three types of vocabulary knowledge (receptive, controlled productive and free productive) measured by scores on different vocabulary tasks?
3. Are there any differences in the mean strategy use between male and female students and among low-, middle- and high-scoring students?

It was hypothesized that students would generally be in favour of using formal strategies (H1) and that there would be a positive correlation between formal strategies and vocabulary test scores (H2). Also, the research results were expected to show the difference in the strategy use between male and female students as well as between low- and high-scoring groups (H3).

3. Method

3.1 Participants

The participants in the research included freshmen and sophomore medical students from the University of Split School of Medicine in Croatia. By the time of the research, these learners had all had at least 5 years of elementary school and 4 years of high-school English learning experience. The sophomores had also completed an EMP course I in their first year of study, but due to a small number of lesson hours (20 lesson hours) and only a one-year span between EMP courses I and II, their experience was not believed to have made any significant difference in relation to their freshmen colleagues. When all unusable data had been eliminated, 116 students formed the final pool of participants, 37 male (32%) and 79 (68%) female students. As for their general proficiency in English, 82% of the participants reported to have attained *outstanding* (the best grade according to the official grading scale in Croatia) as the final high school grade in English, whereas 18% of them reported to have achieved *very good* (the second best grade).

3.2 Instruments

Two instruments were used in this research, the questionnaire and the vocabulary test. The Vocabulary Learning Strategy Questionnaire, developed by the Croatian researcher Pavičić Takač (2008, p. 152) was used in the research on the grounds that it was especially suitable for being applied in the Croatian setting. The original version of the questionnaire that consisted of 69 items (with responses presented on a three-point-Likert scale, ranging from *never*, *sometimes* to *often*) was piloted with a group of 95 students with the status similar to that of the students who participated in the main research. As a result of factor analyses, the initial number of items was reduced to 37 statements to be included in the study.

The vocabulary test used in this research was primarily designed as an achievement test (Read, 2000) composed of five tasks that evaluated students' knowledge of the vocabulary that they had been studying during the course. Tasks 1 and 2, receptive tasks (a matching task and a multiple-choice task), were intended to assess students' ability to recognize words as either isolated items (T1) or in a context (T2). Further, tasks 3, 4 and 5, productive tasks, were used to test their ability to produce the target word in writing. In T3 and T4 (gap-filling tasks), the target words were presented in a contextualised format with an initial letter (T3) and a Croatian equivalent (T4) as clues. Whereas T3 and T4 were used to test "controlled productive knowledge" (Read, 2000, p.125), T5 was intended to assess "free productive knowledge" (Read, 2000, p.125) in that students were asked to write a sentence containing the target word.

3.3 Procedure

At the beginning, students were explained the aim of the study and how the questionnaire should be completed. Although their names had to be written on the tests in order to be matched with their VLS questionnaires, they were told that their confidentiality would be protected and data used only for research purposes. All the students consented to participate in the study. It took students between 40 and 50 minutes to complete the test and questionnaire.

3.4 Data analysis

A statistical data analysis was performed by using SPSS 21.0 for Windows. Firstly, as measures of central tendency, mean and mode were computed in order to identify the strategies most and least frequently used by all the participants. Secondly, factor analyses using the principal component analysis with Varimax rotation were run to identify the underlying constructs, whereas a reliability analysis was conducted to measure the scales' internal consistency. The relationship between the frequency of VLS use and vocabulary test scores was investigated by using Pearson product-moment correlation coefficient. Further, the independent-sample t-test was applied to determine whether there were any differences in the VLS use between male and female students. Finally, one-way analysis of variance (ANOVA) with post-hoc tests was used to find out whether there were any differences among students

classified into high- (76%-90%), middle- (61%-75%), and low- (0-60%) scoring groups, according to the results obtained on the vocabulary test.

4. Results

4.1 Descriptive statistics

A preliminary analysis of the data showed that the average mean for all 37 strategies in the frequency of VLS use ranged from 1.22 (SD=0.47) for the statement "*I make word cards.*" to 2.83 (SD=0.38) for the statement "*I remember a word if I encounter it many times*". The overall average mean for the total sample was 2.07 (SD=0.45). A more profound insight into the overall VLS use was obtained by computing the mode, a measure of central tendency used in this case to reveal the most frequently selected response category (*never, sometimes* or *always*) for each strategy (Table 1).

Table 1: Descriptive statistics for five most and five least frequently used individual VLS

Most frequently used VLS				
Item	M	SD	Mode	VLS Category
41	2.83	0.34	3 (83%)	1
5	2.66	0.56	3 (71%)	3
21	2.65	0.55	3 (68%)	1
69	2.55	0.56	3 (59%)	3
37	2.55	0.55	3 (60%)	1
Least frequently used VLS				
17	1.49	0.65	1 (60%)	3
42	1.43	0.55	1 (60%)	3
65	1.29	0.57	1 (77%)	3
64	1.29	0.57	1 (74%)	3
18	1.22	0.47	1 (81%)	3

Note: M=Mean, SD=Standard deviation; VLS Category: 1. SI-IVL; 2. SVL; 3. FVL; 41. I remeber a word if I encounter it many times.; 5. I pick up words from films and TV programmes I watch.; 21. I remember a word if I see it written down; 69. I pick up words from the Internet.; 37. I translate the words into my mother tongue to understand them.; 58. I connect words to physical objects to remember them.; 17. I write down words while I read books and magazines for pleasure.; 42. I "act out" the meaning of a new word to remember it.; 65. I keep a separate vocabulary notebook.; 64. I practice with friends in order to remember words.; 18. I make word cards.

These findings indicate that medical students have developed a repertoire of VLS that they use rather frequently. According to the results obtained by means of factor analyses, three underlying subscales were identified. Thus, the following classification, proposed by Pavičić Takač (2008, p. 100), was confirmed in this study:

- Formal vocabulary learning (FVL);
- Self-initiated independent vocabulary learning (S-IIVL);
- Spontaneous (incidental) vocabulary learning (acquisition) (SVL).

The internal consistency of the FVL subscale was 0.835, of the S-IIVL subscale was 0.803 and of the SVL subscale 0.701, whereas Chronbach alpha for the total scale was 0.855. A closer look at the strategies employed, yielded some interesting observations. Namely, as presented in the Appendix, out of fourteen most frequently used strategies (with the most frequently selected response *always*), seven are included in the subcategory labelled S-IIVL, whereas the remaining seven strategies are distributed along the categories of SVL and FVL (four and three strategies respectively). Interestingly, the results also indicate that by far the least frequently used strategies are FVL strategies.

4.2 Correlations

The Pearson product-moment correlation provided insight into the relationship between each of the three subscales of VLS use and vocabulary knowledge.

Table 2: Correlations between VLS categories and types of vocabulary knowledge

VLS categories	Vocabulary knowledge		
	Receptive	Controlled-productive	Free productive
S-IIVL	-0.06	0.15	0.14
SLV	-0.16	0.05	0.14
FVL	0.07	0.19*	0.13

Note. *p < 0.05

The results of the correlational analysis, presented in Table 2, indicate a small significantly positive correlation between the scores obtained on *controlled productive vocabulary knowledge* (T3 and T4) and FVL strategy use (r=.19), but no relationship was found between receptive and free productive types of vocabulary knowledge and VLS subscales.

4.3 T-test and one-way analysis of variance (ANOVA)

In order to determine whether there were any differences in the mean use of VLS subscales between male and female medical students, *t*-test was used.

Table 3: VLS use by gender

Differences in VLS use between male and female students					
	Male		Female		t
	M	SD	M	SD	
S-IIVL	31.57	4.55	33.70	4.92	-2.236*
SLV	16.54	2.70	15.63	2.57	1.742
FVL	26.32	5.15	28.45	4.93	-2.140*

Note. *p < 0.05; M=Mean; SD=Standard deviation; t=T-test value

As shown in Table 3, the results obtained by using *t*-test indicate that female medical students used both S-IIVL and FVL strategies significantly more frequently (p=0.03 and p=0.04, respectively) than their male counterparts. With reference to SVL use, the results suggest that there is no statistically significant difference between female medical students and their male colleagues.

Finally, a one-way analysis of variance (ANOVA) with Tukey post-hoc tests was performed to investigate potential differences in the frequency of VLS use among high-, middle-, and low-scoring students based on the total scores obtained on vocabulary tasks.

Table 4: VLS use by vocabulary proficiency

Levels of vocabulary proficiency								
	Low		Middle		High		F	p
VLS categories	M	SD	M	SD	M	SD		
S-IIVL	32.97	4.96	32.87	4.91	33.33	4.92	0.094	0.911
SLV	15.57	2.59	16.43	2.55	15.42	2.75	1.886	0.156
FVL	27.40	4.69	27.94	5.72	27.85	4.39	0.113	0.894

As can be seen from Table 4, a one-way analysis of variance (ANOVA) with Tukey post-hoc tests did not reveal any statistically significant differences in the frequency of overall VLS use among high-, middle-, and low-scoring groups of medical students.

5. Discussion

The findings of this research indicate that medical students use a repertoire of core vocabulary learning strategies, thus supporting the observation made by Pavičić Takač (2008) that more advanced learners use strategies more frequently. Firstly, the largest number of strategies reported by students to be used *always* (Mo 3) were classified as SI-ILV and refer to *remembering a word if it is encountered many times or seen written down, if it is connected to their personal experience, picture, illustrations, image of the word's meaning or physical objects or if they translate it in their L1*. By using these strategies,

students show more elaborate and effortful way of approaching vocabulary learning and preference for association strategies that, according to Oxford (1990), fall into the category of memory strategies. This finding is not consistent with findings reported in some studies (e.g. Schmitt, 1997; Fan, 2003; Gu & Johnson, 1996, Kulikova 2015; Pavičić Takač, 2008; Rogulj & Čizmić, 2016) including participants of different age groups and from different academic disciplines. Thus, the frequent employment of some association strategies by medical students seems to be discipline-specific. Namely, at the very beginning of their medical education, students have to find best ways of memorizing a large number of anatomic terms that are presented along with illustrations in their anatomy course books, or by means of digital technology or cadaver - based instruction in their anatomy classrooms. It appears that medical students have become aware that they can enhance their vocabulary learning process by making conscious efforts to link verbal material with visual (pictures and illustrations), tactile (physical objects) and personal experience. Based on the aforementioned, it can be concluded that they have developed a set of basic association strategies for the purpose of the anatomy course and then, later, transferred it to learning other contents including medical English.

Further, some of the most frequently used individual strategies fit into the SVL category, including *picking up words from films, TV programmes, Internet, computer games, books and magazines.* These findings are in line with some other Croatian VLS studies (e.g. Pavičić, 2000, Pavičić Takač, 2008; Rogulj & Čizmić, 2016) and can probably be attributed to the extent to which children and young adults in Croatia are exposed to authentic English language input (via TV programmes with shows and movies subtitled and not dubbed, use of Internet, computer games and songs). Moreover, medical students have the opportunity to acquire the highly specialized medical register spontaneously not only by reading professional literature, but also by watching popular medical TV series such as *Grey's Anatomy or House MD*. This input-rich environment provides opportunities for acquiring new vocabulary on a subconscious level and is thus strikingly similar to an English as a Second Language (ESL) environment (Kojic-Sabo & Lightbown, 1999). As Medved Krajnović (2010) suggests, in the Croatian context, the English language learning and acquisition processes are closely intertwined.

Finally, only two of the strategies most frequently used by medical students fall into the FVL category and they relate to the use of *bilingual dictionaries* and dealing with *word lists*. This finding does not confirm the first hypothesis (H1) according to which students would most favour the FVL category. However, in terms of individual FVL strategies applied, 56% of medical students reported using bilingual dictionaries all the time, which is similar to findings in many other studies (e.g. Fan, 2003; Gu & Johnson, 1996; Zhang, 2009, Mokhtar, Rawian, Yahaya, Abdullah, & Mohamed, 2017; Kulikova, 2015; Rogulj, 2016).

On the contrary, unlike in some VLS studies (e.g. Fan, 2003; Gu & Johnson, 1996; Kulikova, 2015; Pavičić, 2000, Pavičić Takač, 2008; Rogulj & Čizmić, 2016) in which participants did not report frequent use of *word lists*, more than 40% of medical students in the current study reported *always* using this form of a repetition strategy. Although, according to Schmitt (1997), the usefulness of some strategies such as *wordlists* decreases as learners become more mature, one of the possible explanations for the extensive use of this strategy in our study may be that it is halfway between an association and repetition strategy (it seems to combine bilingual dictionary use, translation into L1 and association with the word's orthographic form) that are reported to be frequently used by medical students. Another plausible explanation for frequent employment of the *wordlist strategy* is that, as cognitively less demanding, it seems to be more suitable when a large number of new facts, terms and concepts has to be memorized in a short period. However, this shallow processing does not lead to higher retention in memory (Schmitt, 1997). A final remark on the highly frequent use of the two aforementioned formal strategies should also be made. Since these strategies are employed in the context of formal language learning, their use is based on students' instrumental motivation to get a high mark (Pavičić Takač, 2008). Thus, this finding might point to a potentially crucial role of teachers and their teaching practices in developing students' awareness about the usefulness of these formal strategies.

Contrary to our expectations, as already stated, all of the seven least frequently employed strategies (Appendix) are found among those classified as FVL strategies. More than half of medical students in this study reported *never* using the following strategies: *planning learning in advance, reading and leafing through a dictionary, writing down words while reading, "acting out" the meaning of*

new words, keeping a separate vocabulary notebook, practicing with friends and making word cards. This finding, to a considerable extent, corroborates the findings reported in some Croatian research studies (e.g. Pavičić, 2000; Pavičić Takač 2008; Rogulj & Čizmić, 2016). It seems that some of these strategies are age-dependent, i.e. more appropriate for younger learners (e.g. *making word cards, "acting out" the meaning of new words).* The others, on the other hand, appear to integrate SVL and SI-IVL activities (*writing down words while reading books / magazines for pleasure).* This probably implies that these spontaneous learning situations, typical for the input-rich Croatian setting, are related to enjoyable leisure time activities during which medical students are not likely to invest additional cognitive efforts into the vocabulary learning process. Similarly, the reasons for their reluctance to plan learning in advance, keep a separate vocabulary or practice with friends may be twofold. On the one hand, medical students are, on average, highly proficient English language users and it is possible that they consider themselves able to communicate effectively without investing any additional mental efforts into vocabulary learning. On the other hand, it might also be that due to excessive student workload in medical education, medical students cannot dedicate much of their time and cognitive efforts to learn certain subjects. On the whole, it can be concluded that medical students use a set of vocabulary learning strategies that can clearly be interpreted in terms of the Croatian cultural setting, their academic discipline and English proficiency level.

The second research question dealt with the relationship between the VLS subscales and three types of vocabulary knowledge. The results only partially supported our hypothesis (H2) that some positive correlation would be found between the use of FVL strategies and vocabulary knowledge. Namely, the use of FVL strategies was associated only with controlled-productive knowledge measured through gap-filling tasks where the target words were presented in a contextualised format with initial letters or Croatian equivalents as clues. In other words, the more frequently students tend to use dictionaries and wordlists, check the retention of new vocabulary, use new words in sentences, take notes in the classroom, etc., the more likely they are to remember and use new words in the context. Although the literature suggests that when students make conscious efforts to memorize certain vocabulary items, they are likely to perform better (Kojic-Sabo & Lightbown, 1999), the finding in the current study is restricted only to the positive relationship between the use of formal strategies and one specific type of vocabulary knowledge. Therefore, further research into this area is needed.

Particularly interesting in this study is that, except for the above mentioned association between FVL strategies and controlled-productive vocabulary knowledge, no other correlations between VLS categories and any type of vocabulary knowledge were found. In contrast to findings reported by Rogulj and Čizmić (2016), where a larger number of significant correlations were found, this pattern of results may be attributed to the selection of sample. Since it was a quite homogeneous sample (medical students sharing similar age, educational background, previous English language learning experience and proficiency), there was a reduced range of variability in scores which, consequently, resulted in absence of significant correlations.

The third research question provided some evidence related to differences in the VLS use between, male and female students as well as among low-, middle- and high-scoring groups. The findings of previous studies show inconsistent results referring to the difference in strategy use between male and female participants. For instance, whereas some findings do not indicate any differences between them (Zhang, 2009), some researchers, e.g. Green and Oxford (1995), Gu (2002) and Rogulj and Čizmić (2016), reveal female dominance in the VLS use. As expected, in the current study female students reported using FVL and S-IIVL strategies significantly more frequently than male students did. As for SVL strategies, there was no statistically significant difference between males and females except in the use of two individual strategies related to *remembering words from computer games and from the Internet,* used more frequently by male students. This seems to imply a generally more mature and conscientious attitude toward language learning by female medical students. However, this finding is all the more interesting if it is considered that, despite the less frequent VLS use in general, male students obtained slightly better scores (although with no statistically significant difference) on the vocabulary test. Thus, it is reasonable to accept Cohen's (1998) view that learning success is determined by the flexibility of strategy use and not by the number of strategies applied or the frequency with which they are used.

Finally, contrary to expectations, the results of the present study revealed that low-, middle- and high-scoring medical students used VLS without any statistically significant differences. Since the sample in this research study included highly proficient English language learners, it seems safe to assume that lower vocabulary test scores obtained by a group of students were not indicators of their poor general proficiency. Therefore, given the assumption that medical students are on the average highly proficient in English as well as at the same time rather frequent strategy users, the findings of this research, to a certain extent, appear to corroborate the results of many previous studies (e.g. Fan, 2003; Gu & Johnson, 1996; Lawson & Hogben, 1996) suggesting that high proficiency students tend to use VLS significantly more often than lower proficiency students.

6. Conclusion and policy implication

The results of this study indicate that medical students on the average use a core inventory of VLS. A deeper insight into the strategies employed by medical students suggests that some strategies are universally used, some are socio-culturally-specific for English language learners in the Croatian context, and some of them seem to be discipline-specific. However, the general absence of statistically significant correlations between VLS use and vocabulary knowledge (except for the very small one between FVL and controlled productive knowledge) raises some interesting implications for classroom practice related to the crucial role of teachers in enhancing their students' vocabulary acquisition. Although students, based on their individual preferences, previous learning experience, culturally-determined phenomena, etc., develop their own VLS, they might not be consciously aware of their employment. Therefore, teachers' task should be raising students' awareness about VLS use and the effectiveness of VLS use in performing different vocabulary tasks. Moreover, teachers also bear responsibility for expanding the repertoire of their students' VLS and for explicitly teaching them how to effectively use and organize VLS in accordance with their individual strategy preferences and vocabulary learning tasks. This means that in the era of learner-centred approach to language teaching, teachers need to meet the constant challenge of identifying their students' VLS use and not only adjusting their teaching practices accordingly, but also making students aware that systematic implementation of familiar and newly acquired VLS is likely to have a positive effect on academic learning outcomes.

However, the major problem that should be addressed here is related to the extent to which language teachers (specifically in Croatia) are trained to teach their students which, when and how certain VLS can be used, and to make them evaluate their strategy use. Therefore, within Continuing Professional Development programmes for language teachers, specific courses and workshops on strategy-based instruction should be provided. Language teachers need to gain knowledge and skills on how to integrate strategy instruction into given course materials, i.e. how to combine appropriate VLS with vocabulary learning tasks while at the same time paying attention to their students' individual needs and VLS preferences. In this way they will be able to enhance their students' autonomy in vocabulary learning and promote self-directed language learning.

7. Limitations and implications for further research

The ability to generalize data based only on this homogenous group of participants from a single academic discipline and with high English language proficiency is rather limited. Therefore, following findings of some previous studies (Gu, 2002; Peacock & Ho, 2003; Rogulj & Čizmić, 2016), indicating that students from different disciplines employ strategies in a different way, it can be concluded that a wider sample of students from more than one discipline should be included in the future study.

Further, information in this research were gathered through a self-report questionnaire that, as a single source of information, provides data on what participants think they do, and not on what they actually do. Yet, as in view of Pavičić Takač (2008), in order to reach valid conclusions, it is necessary to use triangulation, in other words, to complement findings obtained by questionnaires with those collected through other research methods such as interviews, think-aloud protocols, classroom observations, etc.

As already stated, results of this study provide preliminary indication that students are in favour of using a set of core strategies. However, further research should explore the combination of strategies used by the most proficient students (Peacock & Ho, 2003). Moreover, since in the current study medical students did not perform outstandingly well on the vocabulary test (M=69.96; SD=13.58), which could have been expected given their high levels of general English language proficiency, it can be assumed that some other factors besides strategy use (e.g. students' beliefs, motivation, personality, previous learning experience, extracurricular time spent in learning vocabulary items, and, above all, explicit VLS instruction) have a great impact on vocabulary learning outcomes, which is another issue that should be further explored.

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Appendix

Frequency distributions of all VLS in the total sample

Variable	Mean	Mode	SD	VLS Category*
41 I remember a word if I encounter it many times.	2.83	3 (82.8%)	.34	1
5 I pick up words from films and TV programmes I watch.	2.66	3 (70.7%)	.56	3
21 I remember a word if I see it written down.	2.65	3 (68.1%)	.55	1
69 I pick up words from the Internet.	2.55	3 (58.6%)	.56	3
37 I translate the words into my mother tongue to understand them.	2.55	3 (59.5%)	.58	1
58 I connect words to physical objects to remember them.	2.54	3 (58.6%)	.58	1
12 If I do not understand a word, I look it up in a bilingual dictionary.	2.52	3 (56%)	.58	2
56 I remember a word if I connect it with my personal experience.	2.50	3 (54%)	.58	1
46 I remember a word if I associate it with pictures, drawings or illustrations.	2.48	3 (56.9%)	.65	1
48 I pick up words while reading books and magazines in English	2.46	3 (52.6%)	.62	3
24 I connect an image with a word's meaning in order to remember it.	2.44	3 (55.2%)	.69	1
52 I remember a word if I remember the context in which I heard it.	2.40	2 (52.2%)	.54	1
27 I associate new words with the ones I already know.	2.37	2 (50.9%)	.56	1
67 I test myself with word lists to check if I remember the words.	2.25	3 (44%)	.76	2
34 I make a mental picture of a word's written form in order to remember it.	2.22	2 (48.3%)	.67	1
6 I use familiar words in various ways in new situations in order to remember them.	2.22	2 (50.9)	.67	3
2 I make word lists and write their translations in my mother tongue.	2.17	3 (42.2%)	.80	2
54 I pick up words from computer games.	2.16	3 (42.2%)	.81	3
19 I look for similarities in sound and meaning between words in my mother tongue and foreign words (cognates) in order to guess the meaning.	2.08	2 (44%)	.75	1
36 I imagine a context in which a word could be used in order to remember it.	2.08	2 (57.8%)	.65	1
43 I try to use the new words I learn immediately in conversations or writing.	2.03	2 (62.9)	.61	3
11 I remember a word by remembering its initial letter.	2.00	2 (62.1%)	.62	1
4 I test myself to check if I remember the words.	2.00	2 (51.7%)	.70	2
1 I use new words in a sentence in order to remember them.	1.91	2 (73.4%)	.52	2
63 I look up words in computer dictionaries.	1.90	2 (51.7%)	.70	2
8 I remember a word by remembering its location in the notebook, textbook, or on the board.	1.89	2 (45.7%)	.73	1
50 When I test myself I try to give the word's definition in the foreign language.	1.84	2 (53.4%)	.76	3

14 If I hear a new word in class, I immediately write it down.	1.82	2 (56%)	.64	2
31 I write down words repeatedly to remember them.	1.74	2 (50%)	.66	2
3 I review words regularly outside the classroom.	1.64	2 (48.3%)	.62	2
20 I plan for vocabulary learning in advance.	1.59	1 (52.6%)	.69	2
32 I read and leaf through a dictionary to learn some new words.	1.53	1 (51.7%)	.60	2
17 I write down words while I read books and magazines for pleasure.	1.49	1 (59.5%)	.65	2
42 I "act out" the meaning of a new word to remember it.	1.43	1 (59.5%)	.55	2
65 I keep a separate vocabulary notebook.	1.29	1 (76.7%)	.57	2
64 I practice with friends in order to remember words.	1.28	1 (74.1%)	.49	2
18 I make word cards.	1.22	1 (81%)	.47	2

* category 1 - self-initiated independent vocabulary learning strategies (S-IIVL)
category 2 - formal vocabulary learning strategies (FVL)
category 3 - spontaneous vocabulary learning strategies (SVL)