

# ON THE RELATIONSHIP BETWEEN SELECTED ASPECTS OF ENGLISH GRAMMAR AND COGNITIVE PROCESSES IN SLOVAK LEARNERS

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**Abstract:** The paper presents research conducted to determine correlations between selected aspects of grammar and cognitive processes in Slovak learners of English as a foreign language. The research was conducted in eight secondary schools and performance in four areas of grammar was correlated with five measured levels of cognitive processes (plus general intelligence). The results showed a significant interconnection between the respondents' performance in English grammar and the level of the cognitive skills tested. Creativity and associative thinking proved to be of the highest importance, followed by working memory, general intelligence, generalisation and analogy.

**Keywords:** foreign language acquisition, English grammar, Slovak learner, cognitive processes, g-factor

## Introduction

Due to its status in the world and the importance it is assigned, English is taught in every school in present-day Slovakia. Young people are provided with easy access to formal instruction; therefore, it could be said that every healthy individual able to attend school has an equal chance to be a good-level English speaker. However, not all people achieve the same level. The performance of learners who are provided with the same learning conditions can be considerably different.

To find out which factors, and in what way, influence acquisition of foreign languages is an on-going process and although it seems like a lot is already known, there is still a long way to go. This paper focuses on acquisition of selected grammatical aspects and the possible influence of cognitive processes in Slovak learners of English and, with its humble findings, makes an attempt to contribute to the given area.

## 1 Factors generally considered influential in acquisition of grammar

There are a number of factors generally considered to influence acquisition of grammar in a foreign language. A number of authors (Klein, 1986; Dulay, Burt and Krashen 1982, etc.) consider the following to be of significant importance:

- (1) **THE ROLE OF LANGUAGE ENVIRONMENT** where two types are distinguished:
  - (a) **Natural environment** where the learners can completely immerse themselves into the target language by listening to native speakers, exchanges in public places like shops or restaurants, conversations with friends, watching television, listening to the radio, or even reading street signs and labels on food and other products and is considered to be more efficient with regard to fluency in the target language.
  - (b) **Formal setting** where the learning process takes place in a classroom and formal instruction on rules in the target language is given and, by means of various techniques, the subject matter is practised. This environment is believed to

enhance accuracy and, therefore, contributing to better acquisition of skills in grammar.

- (2) **THE ROLE OF INPUT:** For foreign language acquisition to take place, some data in the target language must be available to the learner as *input*. “Input hypothesis postulates that humans acquire language in only one way – by understanding messages, or by receiving comprehensible input” (Svoboda and Hrehovčik, 2006:204).
- (3) **THE ROLE OF THE FIRST LANGUAGE** is another possible influence in the process of foreign language acquisition. There are contradictory opinions as to whether acquisition of the first language and a foreign language involve the same or distinct processes. According to Klein (1986:39), acquisition of a foreign language involves “the capacity to reorganise the language processor”, (which we used and developed while acquiring our first language), “to cope with another language”.
- (4) **INTERNAL PROCESSING**, according to Dulay, Burt and Krashen (1982), involves three major processes active when acquiring a foreign language:
  - (a) **Filter**, which screens all incoming language and allows it (or not) to undergo further processing;
  - (b) **Organiser**, which is responsible for the learner’s gradual organisation of newly presented language and is that part of the learner’s internal processing, which is responsible for conscious linguistic processing; and
  - (c) **Monitor**, which is responsible for conscious linguistic processing. According to Dulay, Burt and Krashen (1982:61), “[t]asks which focus on linguistic manipulation seem to encourage monitoring, while those which focus on communication do not”. This means that correct use of grammar (applying rules to morpheme and word manipulation), to a large extent, depends on the functioning of the learner’s monitor. Knowledge of grammar of a foreign language is mainly based on the formal instruction the learner is provided with. This, from the viewpoint of grammar acquisition, makes monitor the most important part of internal processing.
- (5) **INDIVIDUAL LEARNER DIFFERENCES** are those which vary from one learner to another and differ according to a learner’s inner characteristics.

### *1.1 Individual learner differences*

Various approaches can be found; however, many authors (such as Lujan-Ortega, Ellis, etc.) claim that age, motivation/attitude, personality, learning/cognitive style and aptitude/intelligence are of crucial importance. According to some sources, personality and cognitive style play an important role, too. Although all of the above aspects proved to play a significant role in the process of foreign language acquisition, the research conducted only focused on **cognitive processes** (as part of individual learner characteristics).

#### *1.1.1 Cognitive processes as part of learner’s intelligence*

According to Gardner’s model (in Norris-Holt, 2000:2), “in a formal setting, intelligence and aptitude play a dominant role in learning.” Genesee (1976, in Ellis, 1985:111) found that “intelligence was strongly related to the development of academic L2 French language skills (reading, grammar, and vocabulary), but was in the main unrelated to ratings of oral productive skills by native speakers.”

“Cognitive psychology postulates a variety of different processes or operations involved in the performance of cognitive tasks, [...] including sensory analysis, transformation of input, formation of representations, memory (iconic, working, etc.) and so

on” (Mackintosh, 1998:227). According to Anderson (1992), a cognitive architecture of human intelligence consists of a basic processing mechanism supplemented by a number of specific processors and modules. He adds that variations in the speed and efficiency of this processing mechanism are responsible for variations in *general intelligence (g-factor)*, because they set limits to the performance of the specific processors operating on particular (including verbal) types of information.

**Cognitive processes** are those that human beings perform with their minds, such as imagination, reasoning and the like. In the research, five of them (tested by means of five tasks) were given closer attention:

- 1 **Creativity** (or **creativity**) – a mental process involving generation of new ideas or concepts, or new associations between existing ideas or concepts;
  - 2 **Association** – the process of connecting one thing with another;
  - 3 **Working memory** – a broader system that both stores information briefly and allows manipulation and use of the stored information<sup>20</sup>;
  - 4 **Generalisation** – the process of general concept formulation from specific instances by abstracting common properties;
  - 5 **Analogy** – the use of a similar example or model to explain or extrapolate from.
- (After Microsoft Encarta Encyclopaedia, 2004 and Wikipedia, 2006)

## 2 Research characteristics

The presented research intended to find out correlations between selected aspects of grammar and cognitive processes in Slovak learners of English as a foreign language. Within grammar, the research focused on active verb forms, passive voice, countability in nouns and the use of prepositions. With regard to cognitive processes, creativity, associative thinking, working memory, generalisation and analogy were tested.

### 2.1 Target group characteristics

A group of 143 students (83 girls and 60 boys), aged 14 to 15, attending secondary comprehensive schools in eight Slovak towns were examined. At the time of the research, all the students involved had been taking formal instruction in the form of English lessons with qualified teachers for four years. The selection of schools was based on accessibility and cooperativeness of their directorships and the teachers.

### 2.2 Research methodology

To obtain the data, the respondents were subjected to two tests – one measured their grammatical performance, the other was aimed at determining the level of their cognitive processes. To process the acquired data, correlation analysis was used.

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<sup>20</sup> To point out the contrast, the following types of memory are also involved in language acquisition but were not tested in the research.

a *Sensory memory* – corresponds approximately to the initial 200 – 500 milliseconds after an item is perceived. Some of the information in sensory memory is then transferred to short-term memory.

b *Short-term memory* – allows one to recall something from several seconds to as long as a minute without rehearsal. Its capacity is  $7 \pm 2$  items.

c *Long-term memory* – can store much larger quantities of information for potentially unlimited duration, sometimes a whole lifespan.

### 2.2.1 Testing grammar

The respondents' grammatical performance was examined by means of a **grammar test** specifically designed for this purpose and pre-tested on a group of learners of English as a foreign language of the same age and level. Those items which caused confusion were removed from the final draft.

The test consisted of four sections, each examining a different area of English grammar.

- (1) The first section concerned **active verb forms**. In four, clearly and unambiguously constructed dialogues, verbs were to be put into the correct forms (twenty verb forms altogether). The respondents were supposed to fill in the following verb forms: present simple and continuous, past simple and continuous, present perfect simple and continuous, future simple and continuous.
- (2) Section two was dedicated to **passive voice** where the respondents were supposed to rewrite eight sentences using the mentioned grammatical structure.
- (3) To test the respondents' comprehension of the concept of **countability**, in the third section, they were asked to fill in the blanks in twelve sentences, choosing between the correct form of the indefinite article (a/an) and the article-like pronoun some.
- (4) The fourth section tested the correct use of basic English **prepositions** in fifteen sentences of varying difficulty. With no options given, the respondents were asked to provide their own answers.

### 2.2.2 Testing cognitive processes

The testing device covering selected cognitive processes was compiled using subtests of two test batteries: **Intelligence Structure Test** and **Test of Cognitive Skills Level**. The final test included five subtests (sections) examining five cognitive processes (plus general intelligence – g-factor). Throughout the test, Slovak was used both as the language of instruction and the language used to work with within particular sections. Each subtest examined one or two cognitive processes that, as supposed, could contribute to successful acquisition of grammatical issues in English as a foreign language.

- (1) **General intelligence (g-factor)** was tested by means of a subtest requiring digit sequence completion. The ability to find the rule by which numbers in sequences were ordered was examined and the task was to complete the sequence by two more numbers according to the rule in each item. Example: 5, 2, 6, 2, 7, 2, ..... => 8, 2
- (2) In the second section (sentence identification) the respondents were asked to form sentences using a group of provided words, omitting the three words that were redundant. This subtest measured **creativity** and **associative thinking**. Example: pupil – pen – was – a – has – called – This – new => This pupil has a new pen.
- (3) **Working memory** was tested by means of the third subtest. The respondents were given time to learn five word sequences, each forming a category of common nouns (flowers, tools, birds, artistic works and animals). When the time limit was up, they were asked to recall to which category the word in question belonged. Example: The word beginning with **r** was a/an: a) flower, b) tool, c) bird, d) artistic work, e) animal. The correct answer was a), as the word beginning with **r** was **rose**, which is a flower.
- (4) **Generalisation** was a subtest aimed at finding the element which linked three out of six words. The respondents were asked to put these in meaningful groups and highlight the three words they chose. Example: gold – clay – silver – wood – copper – stone => gold – silver – copper (they are all metals).
- (5) The ability to find an **analogy** was tested in the fifth section. The respondents were asked to recognise the relationship between the two given words and choose the word

that forms an analogical relationship with the word after the equals sign. Example: find : lose = remember : ..... a) keep b) recall c) forget d) think e) dream  
The correct answer was: c).

### 2.2.3 Correlation analysis

In this research, statistical analysis (particularly correlation analysis) was applied to find out any existing relationships between performance in selected grammatical aspects and cognitive processes measured in the respondents.

## 3 Research results

Table 1: Correlations between selected grammatical aspects and cognitive processes

	General intelligence	Creativity and associative thinking	Working memory	Generalisation	Analogy
Active verb forms	0.19	<b>0.46</b>	<b>0.37</b>	<b>0.3</b>	0.16
Passive voice	<b>0.24</b>	<b>0.37</b>	<b>0.26</b>	<b>0.22</b>	0.15
Countability	<b>0.27</b>	<b>0.25</b>	<b>0.31</b>	0.16	0.13
Prepositions	<b>0.23</b>	<b>0.37</b>	<b>0.32</b>	0.17	<b>0.22</b>
Average	<b>0.23</b>	<b>0.36</b>	<b>0.32</b>	<b>0.21</b>	<b>0.17</b>

As can be seen in Table 1, in the respondents, various cognitive processes played variously important roles in each grammatical area. The correlations are highlighted according to the level of their significance (the darkest being of the highest significance).

On the whole (as shown in the bottom line of the table), creativity and associative thinking (measured by a test involving identification of sentences) seemed to play a key role in all studied grammatical areas, with the exception of countability where the first place was taken by working memory, followed by general intelligence. Working memory seemed to be of importance, too, throughout all grammatical areas studied, which came as a surprise, as one would have expected the respondents to mainly employ their long-term memory when solving tasks on grammar they had acquired a long time prior to taking the test.

According to the results, general intelligence (measured by a test involving completing digit sequences) appears to be of value. Analogy seemed to be of lesser importance, which is quite surprising as, especially in the formation of passive and the application of rules learnt with regard to the concept of countability and the use of prepositions, the ability to find analogical relationships seems like a useful competence.

Table 2: Correlations between verb forms and cognitive processes (in order of significance)

	Creativity and associative thinking	Working memory	Generalisation	General intelligence	Analogy
Active verb forms	0.46	0.37	0.3	0.19	0.16

When completing the tasks regarding active verb forms, creativity, associative thinking and working memory proved to be of the greatest importance, closely followed by generalisation. General intelligence and analogy were left far behind with a gap of 0.11 and 0.14 respectively.

Table 3: Correlations between passive voice and cognitive processes (in order of significance)

	<b>Creativity and associative thinking</b>	<b>Working memory</b>	<b>General intelligence</b>	<b>Generalisation</b>	<b>Analogy</b>
<b>Passive voice</b>	0.37	0.26	0.24	0.22	0.15

In the area of passive voice, lower correlations were found in comparison to active verb forms. The order of importance of the tested cognitive processes was the same with the exception of general intelligence and generalisation, which swapped places. I found it quite surprising that analogy came last again, as it seems logical that changing sentence structures to different ones according to a set pattern requires the employment of analogy.

Table 4: Correlations between countability and cognitive processes (in order of significance)

	<b>Working memory</b>	<b>General intelligence</b>	<b>Creativity and associative thinking</b>	<b>Generalisation</b>	<b>Analogy</b>
<b>Countability</b>	0.31	0.27	0.25	0.16	0.13

A significantly different order was found in the case of countability. Here, working memory took first place in terms of importance, followed by general intelligence, creativity and associative thinking. Generalisation and analogy occupied the bottom rungs of the ladder, with only 0.03 separating the two.

Table 5: Correlations between prepositions and cognitive processes (in order of significance)

	<b>Creativity and associative thinking</b>	<b>Working memory</b>	<b>General intelligence</b>	<b>Analogy</b>	<b>Generalisation</b>
<b>Prepositions</b>	0.37	0.32	0.23	0.22	0.17

The correct use of prepositions was most closely related to creativity and associative thinking; working memory, however, played an important role, too. General intelligence seemed to be employed to a similar extent to that of the other tested aspects of grammar. Once again, analogy and generalisation came last.

## Conclusion

The research conducted showed that, in the respondents participating, there was a significant interconnection between their performance in English grammar and the level of the cognitive processes tested. On the whole, creativity and associative thinking proved to be of the highest importance, achieving an average of 0.36, followed fairly closely by working memory with 0.32. General intelligence came third with 0.23, followed by generalisation (0.21) and analogy (0.17).

These results, however, only relate to the group involved in the research and might not apply to the whole population. On the other hand, the correlations found were significant and they suggest that there is a relationship present between the acquisition of the examined grammatical areas and the involvement of the cognitive processes in question.

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