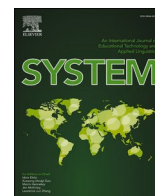


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Positive emotional stimuli in teaching foreign language vocabulary

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ABSTRACT

Positive emotional stimuli, when compared to neutral memories, persist longer in memory and are recalled with greater accuracy and readiness, which might be rather significant in foreign language learning. The primary objective of this study was to determine whether or not positive emotional stimuli enhance remembering of new foreign language vocabulary. The pre-test/post-test design was applied, and both declarative and procedural vocabulary knowledge were tested in control and experimental groups before and after the intervention. Participants' emotional comfort and foreign language enjoyment were evaluated by two standardized scales and their perception of the intervention was investigated through a feedback questionnaire. The findings revealed a significant increase of declarative vocabulary knowledge and foreign language enjoyment in the experimental group.

1. Introduction

The primary aim of foreign language vocabulary learning is to integrate words into the learners' mental lexicon (Thornbury, 2002). To do this, it is important to transform (proceduralize) their initial declarative (receptive, conscious, passive, explicit) knowledge into procedural (productive, subconscious, active, implicit) knowledge, to enable the use of the vocabulary in authentic communication (Gondová, 2012).

This process can aid the retention and recall of the lexis in many ways. Authenticity, context, and the usefulness of foreign language vocabulary help to promote its learning (Merrill et al., 2008). Repetition, retrieval, spacing, pacing, regular use, cognitive depth, personal organising, imaging, mnemonics, motivation, attention, arousal, and affective depth, are considered the most effective known memory aids (Thornbury, 2002, p. 24). Recent research (Dewaele & MacIntyre, 2016; Oxford, 2015; Piechurska-Kuciel, 2017) indicates that it is the affective aspect that might be of key importance in foreign language learning.

2. Literature review

2.1. Emotions and memory

Our brains constantly perceive thousands of sensory inputs and have to decide whether they are worth our attention. The *reticular*

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activating system sorts out what is worthy of further processing from the rest of the received inputs (Kelly, 2017). This system is extremely sensitive to anything with personal relevance and novelty, so it tags such inputs as important, causing us to easily engage with them. Specifically, when our brain detects emotionally significant stimuli, the *amygdala* releases dopamine, the ‘happy hormone’ that works as a chemical messenger (*neurotransmitter*) (Kelly, 2017). Dopamine boosts our motivation, positively affects our reward system (Wise, 2004), and strengthens the neural connections, thus enhances learning (Gallo, 2014). It is released mostly when learners deal with tasks or experiences they enjoy and which, as a result, increases their attention, motivation and memory.

Other powerful neurotransmitters – *serotonin*, *endorphin*, and *oxytocin* – which are also known as the hormones of happiness, play an important role in emotional experiencing and consequently in learning as well. Serotonin functions as a modulator of mood, cognition, reward, learning, and memory. Oxytocin is known as the neurotransmitter of social bonding, and endorphins relieve pain and are responsible for sensations of pleasure and euphoria (Concise medical dictionary, 2020).

The way we experience an event or perceive information influences later recall. Information that brings emotional excitement is remembered with more clarity than information considered as neutral (Todd, 2014). This goes hand in hand with the Krashen’s (1982) *Affective Filter Hypothesis*, which contends that it is mostly a learner’s inner feelings and attitudes that determine to what extent linguistic input is received.

In accordance with Krashen’s (1982) theory, Medina (2008) developed the *Active Filter Hypothesis*, which implies that emotional components of experiences are remembered better than other aspects. This phenomenon is called *emotionally enhanced vividness* (Todd, 2014) and it works like a flashbulb, illuminating specific events as they are captured in our memories. Such *flashbulb memory* (Gallo, 2014) determines how easily we recall the event or information later – as it activates the amygdala and thus emotional processing.

Greenspan and Shanker (2004) emphasise that positive attitudes, self-esteem, and emotive involvement enhance the deeper processing of language, as they help to activate neural pathways in the brain as well as to achieve multi-dimensional representations. The formation of mental images undoubtedly aids learning and emotions (Greenspan & Benderly, 1997), which arise through engagement in a learning task, creating the architecture of an individual’s mental structure. With regards to Paivio’s (1986) *Dual Coding Theory*, learned material can be expanded upon through verbal associations and visual imagery. The ability to code a stimulus in two different ways increases the chance of remembering that item – when compared to a stimulus coded in one way only.

In order to create persistent memories, it can be helpful to attempt to provide an emotional experience, or *emotionally competent stimuli* (Gallo, 2014). Positive emotional stimuli persist in our memories longer and are recalled with greater accuracy – when compared to “neutral” memories (Medina, 2008). Again, this is possible thanks to dopamine, which significantly aids memory and information processing. Gallo (2014) likens the information ‘flavoured’ with emotion to post-it-notes that we create to be noticed as often as possible and to be better remembered. Similarly, positive emotions tag specific information by dopamine – to help the amygdala notice them and our brain to better remember them.

2.2. Emotions and foreign language learning

The early research on emotions in foreign language learning (see Horwitz & Young, 1991) has overwhelmingly concentrated on negative emotions (anxiety), with positive emotions not being as widely studied (Bown & White, 2010). The impetus for a more detailed consideration of the role of positive emotions in foreign language pedagogy has been supported by developments in positive psychology after 2000 (Seligman & Csikszentmihalyi, 2000). While earlier empirical studies (e.g., Arnold, 2011; Dewaele, 2005) focused on the investigation of emotions and their effects in learning, currently, researchers seek how to optimize the emotional climate of foreign language teaching and learning to make them more enjoyable and effective (Dewaele et al., 2019). In this context, foreign language enjoyment, going beyond pleasure and extending the subjective comfort to new experiences and challenging tasks, has become one of the most examined affective phenomena (Dewaele & MacIntyre, 2016).

This leads to the important role of foreign language teachers, as they can strongly affect learners’ perceptions of a foreign language, and teacher-learner reciprocal emotion transmission (Frenzel et al., 2018) can be both positive and negative (Arnold, 2011; Dewaele et al., 2018). To create a positive emotional atmosphere and positive learning experiences for their learners, foreign language teachers need to use non-threatening techniques, including the support and promotion of group solidarity and the creation of an emotionally safe classroom environment that supports linguistic experimenting (Arnold, 2011; Baider et al., 2015; Borg, 2006; Dewaele, 2015; Dörnyei & Csizér, 1998; Gregersen & MacIntyre, 2014; MacIntyre & Gregersen, 2012; Williams et al., 2004).

When foreign language learners experience positive emotions during the process of learning, it can raise their consciousness of language input and perceptions of linguistic forms, as well as support their use of various problem-solving strategies (Boudreau et al., 2018; Piechurska-Kuciel, 2017). As Thornburry (2002, p. 26) emphasises, “affective (i.e., emotional) information is stored along with cognitive (i.e., intellectual) data, and may play an equally important role on how words are stored and recalled”. Several other researchers (Bower, 1981; Singer & Salovey, 1988) report that experiencing a positive mood during encoding facilitates the retrieval of input.

Vocabulary proceduralisation and automatisation require a deep processing of the material and creating individual mental structures. Vocabulary recall is a function of the depth of mental processing (Craik & Lockhart, 1972). Deeper levels of analysis produce more elaborate, longer-lasting, and stronger memory traces than shallow levels of analysis. Positive emotional stimuli can thus increase declarative and procedural vocabulary knowledge by melding conscious and unconscious processes in learning (DeKeyser, 2007).

Based on such findings, it can thus be hypothesized that positive emotions experienced during foreign language vocabulary learning enhance both vocabulary retention and the emotional status of the learners. However, relatively few authors have worked with emotion-inducing stimuli in foreign language learning. They have applied mostly audiovisual or visual materials (e.g., Matsumoto

et al., 2002; Mavrou & Dewaele, 2020). Music, exercise, and laughter were only occasionally used (Gregersen et al., 2016). These studies dominantly focused on participants' perceptions of the stimuli and their well-being rather than foreign language outcomes.

Only Li, Fan, and Wang (2020) examined the effect of post-encoding positive emotions in the form of video stimuli on associative memory for English vocabulary, but, to the best of our knowledge, there have not yet been any longitudinal studies involving varied emotional stimuli as an intervention specifically aimed at learning foreign language vocabulary. Given the research gap, the current study investigates the longitudinal effect of multisensory positive emotional stimuli on both new vocabulary learning and learners' well-being, applying a mixed-method approach.

3. Research questions and hypotheses

The primary objective of this study was to determine whether or not positive emotional stimuli (the independent variable) increase the retention of new foreign language vocabulary (dependent variable). The assumption was that the level of vocabulary retention would increase more significantly due to the application of positive emotional stimuli in the experimental group (E) compared to the control group (C).

Vocabulary retention was measured by identical Speaking Test (Appendix A) and Vocabulary Test (Appendix B) before and after eight weeks. During this period, the positive emotional stimuli (Appendix C) were applied in the experimental group once a week. The emotional stimuli were presented together with the target vocabulary selected by corpus methodology (Appendix D). The control group was taught the same vocabulary in the same time schedule (90-min seminar developing English speaking skills once a week) but without the application of positive emotional stimuli.

To reduce the learning effect, pre-test and post-test were performed in other courses with different teachers, and the speaking course assessment was based on participation in the discussion, not on vocabulary knowledge. Participants were not instructed to learn vocabulary after the lessons to minimize the influence of concomitant factors (e.g., their diligence or studiousness) on the retention rate.

The pre-test was designed to determine what percentage of the target vocabulary is comprised in participants' declarative (Vocabulary Test) and procedural (Speaking Test) knowledge. In the post-test, identical research instruments were applied to detect the increase of both declarative and procedural vocabulary. Norm-referenced measures accurately record deliberative speech-language processes, whereas social conversations and discourses about familiar topics with familiar listeners provide the best indication of proceduralized speech-language processes (Kahmi, 2019).

Taking into account these facts, the following primary research hypotheses were formulated:

Hypothesis 1. The retention of declarative vocabulary is higher among learners who experience positive emotional stimuli during learning the vocabulary than among learners who do not experience them.

Hypothesis 2. The retention of procedural vocabulary is higher among learners who experience positive emotional stimuli during learning the vocabulary than among learners who do not experience them.

The secondary objective of the study was to follow the emotional status of the participants after the intervention. The secondary dependent variable (emotions) was measured by two scales – The Emotional Habitual Subjective Comfort Scale (EHCS) (Dzuka & Dalbert, 2002) (Appendix E) and The Foreign Language Enjoyment Scale (FLES) (Dewaele & MacIntyre, 2014) (Appendix F). The EHCS measured participants' general emotional state and the FLES reflected their specific emotional state related to foreign language learning before and after the intervention. Both scales were evaluated by a psychologist. In this context, two secondary research hypotheses were formulated:

Hypothesis 3. Emotional habitual comfort is higher among learners who experience positive emotional stimuli during learning vocabulary than among learners who do not experience them.

Hypothesis 4. Foreign language enjoyment is higher among learners who experience positive emotional stimuli during learning vocabulary than among learners who do not experience them.

As supplementary information, the participants' heart rate was measured during the interviews to detect an autonomic stress response in both groups at the beginning and at the end of the experiment. Though several other physiological parameters (e.g., blood pressure, respiratory rate, skin temperature) are relevant in autonomic stress response, we preferred to apply a wearable and non-disturbing instrument to keep communication as natural as possible – a standard fitness bracelet.

Both dependent variables (vocabulary and emotions) are hypothesized to be affected by positive emotional stimuli. A further assumption was that there would also be a relationship between the dependent variables. Therefore, the correlations between the results obtained by all research instruments were calculated to examine the proportions between the variables analysed.

Hypothesis 5. A significant relationship exists between the dependent variables.

Learners' feelings and attitudes can significantly determine learning achievement (Greenspan & Shanker, 2004; Krashen, 1982). Therefore, a feedback questionnaire (Appendix G) was given to the participants to record their thoughts on the learning process after the intervention. Here, three research questions were asked:

Research question 1 What are the participants' perceptions of the classes?

Research question 2 What are the participants' perceptions of vocabulary recall after the classes?

Research question 3 What are the participants' perceptions of the positive emotional stimuli applied?

4. Material and methods

This mixed-method study is based on quantitative and qualitative data obtained by the tests, the rating scales and the feedback questionnaire, respectively (Creswell, 2015). The instruments were administered to the participants in the mentioned sequence. The individual scores of the respective parts were analysed using descriptive statistics in the program *Statistica 9.0 Standard Plus CZ* (StatSoft, 2009).

4.1. Participants

A total of 35 non-native (Slovak) first-year university students of English as a foreign language served as participants in this study, selected by convenience sampling. They were subdivided into two groups – the experimental group (E = 18 students) and the control group (C = 17 students). They shared an additional number of variables such as their level of English proficiency (B1–B2) (Council of Europe, 2001), age (18–19 years), age of onset of English learning (6–7 years) and training in English (the same type of English instruction in the formal setting of Slovak primary and secondary schools), and a comparable amount of experience in an English-speaking environment (no longer than several days). All participants provided written informed consent.

4.2. Instruments

4.2.1. Speaking Test

The Speaking Test was administered before the intervention, to find out the previous active use of the target vocabulary (243 items, Appendix D) in conversation ($\alpha = 0.731$). A post-test ($\alpha = 0.728$) was given after the intervention to compare the groups' level of target vocabulary use in conversation. One of the authors interviewed the participants individually in a face-to-face format, asking them questions related to the topics taught and inciting the target vocabulary use. The interviewer informed each participant about the purpose and form of the test and asked for permission to record the responses. The interviews were then transcribed and the occurrence of target vocabulary (in all morphological forms) was analysed with *WordSmith 8.0*, a corpus-analysis software that finds word patterns (Scott, 2020).

4.2.2. Vocabulary Test

The Vocabulary Test contained 40 items (Appendix D) in three types of exercises (translation, gap-filling and paraphrasing). Based on the authors' teaching experience and the pilot study, the items typically not known by the participants at this language level were selected from the target vocabulary.

The pilot test (internal consistency 0.87) was conducted on a group of 10 respondents with characteristics of the research sample who did not further participate in the experiment. The items were analysed, and items with a low index of discriminability and index of difficulty were removed.

The pre-test ($\alpha = 0.724$) was administered before the intervention to find out the initial level of the target vocabulary competence. The post-test ($\alpha = 0.719$) was given after the intervention to compare the vocabulary retention in the groups.

4.2.3. The Emotional Habitual Subjective Comfort Scale (EHCS)

The EHCS is a concise and reliable instrument created and verified by psychologists (Džuka & Dalbert, 2002) for detecting the self-reflected frequency of experiencing positive and negative emotions and physical feelings. The scale contains four positive emotions – joy, happiness, delight, and physical vigour ($\alpha = 0.67$ – 0.80 , stability coefficient $r = 0.63$), and six negative emotions – shame, sense of guilt, fear, sadness, pain, and anger ($\alpha = 0.68$ – 0.74 , stability coefficient $r = 0.66$), with their inter-correlation coefficient $r = -0.23$. The scale is a 6-point Likert scale with 6 points representing “almost always”, 5 points – “very often”, 4 points – “often”, 3 points – “sometimes”, 2 points – “seldom” and 1 point – “almost never”. Gross scores of positive and negative emotions were used in the statistical analysis.

4.2.4. The Foreign Language Enjoyment Scale (FLES)

The FLES created and verified by Dewaele and MacIntyre (2014) consists of 21 items with standard 5-point Likert scale ratings reflecting positive emotions towards the learning experience, peers and a teacher (within the interval 21–105 points), with all items positively phrased (absolutely disagree = 1, disagree = 2, neither agree nor disagree = 3, agree = 4, strongly agree = 5). The scale differentiates two main dimensions of FLE: social and private. Alphas obtained for the global FLE are 0.86, for FLE-Social 0.87, and for FLE-Private 0.78.

4.2.5. Feedback questionnaire

After the intervention, a questionnaire was administered to both groups in order to receive participants' feedback on the course and the impact of the teaching. The questionnaire contained three open-ended questions and two closed questions. In the experimental group, five more questions were asked to ascertain the participants' perceptions of the emotional stimuli applied.

The pilot questionnaire (internal consistency 0.81) was conducted on a group of 10 respondents with characteristics of the research sample who did not further participate in the experiment. Amendments were made to the layout and wording of the questions.

4.3. Intervention

During an eight-week period, both groups had one 90-min lesson developing English speaking skills once a week, focused on a given topic following an identical lesson plan: warm-up discussion, presentation of target vocabulary, practice activities focused on receptive language skills, and practice activities focused on productive language skills. During the lesson, a topic-related emotional stimulus was presented in the experimental group for 10 min on average.

Emotionally competent stimuli (Gallo, 2014) or emotionally charged events (Dörnyei & Ryan, 2015) apply all kinds of sensory experiences and the sense of novelty through narratives, videos, music, games, arts and crafts, physical activity, etc. (Kamenická & Králová, 2021). They arise through engagement in a learning task, trigger emotional arousal, and thus create not only memories of events or objects but also of accompanying emotional sensations (Greenspan & Benderly, 1997).

5. Results

5.1. Speaking Test

The total number of target vocabulary items was 243, and participants used only about 6% of it on average in the pre-test ($E = 6.35\%$, $C = 6.63\%$). The statistical difference between the groups in the pre-test, verified by the Wilcoxon Rank Sum Test, was insignificant ($p > 0.01$) (Table 1, Fig. 1). The post-test improvement was a little higher in the experimental group ($E = 9.37\%$, $C = 8.09\%$), even though the increase was not statistically significant ($p > 0.01$) in any of the groups according to the Wilcoxon Signed Rank Test (Table 2).

5.2. Vocabulary Test

The average scores obtained in both groups (from the total 40 items) in the pre-test are similar ($E = 7.78$, $C = 9.82$, $p > 0.01$), while the post-test scores significantly differ ($E = 23.94$, $C = 16.35$, $p < 0.01$) (Table 1, Fig. 2). The improvement in the experimental group in the post-test was more than double compared to the control group. Nevertheless, the pre-test – post-test difference was statistically significant ($p < 0.01$) in both groups (Table 2).

5.3. Emotional habitual subjective comfort scale (EHCS)

The gross scores reflecting participants' positive ($E = 15.7$, $C = 14.6$) and negative ($E = 16.7$, $C = 18.6$) state of mind obtained in both groups in the pre-test were similar ($p > 0.01$). In the post-test, the positive state of mind increased ($E = 18.6$, $C = 15.5$), and the negative state of mind decreased ($E = 15.6$, $C = 16.4$) in both groups, but the difference between the groups remained statistically insignificant ($p > 0.01$) (Table 1). The pre-test – post-test difference within the groups was also not statistically significant (Table 2).

5.4. Foreign language enjoyment scale (FLES)

The average scores reflecting participants' positive emotions towards the foreign language learning experience obtained in both groups in the pre-test ($E = 78.4$, $C = 77.6$) were rather similar ($p > 0.01$) (Table 1). Enjoyment increased in both groups in the post-test, but the increase was more than twice as much in the experimental group, and the groups markedly differed ($E = 82.2$, $C = 79.1$, $p < 0.01$). The pre-test – post-test difference was statistically significant in both groups (Table 2).

5.5. Heart rate measurement

Participants' heart rates were higher in the pre-test ($E = 115.94$, $C = 113.82$) without any significant statistical difference between the groups ($p > 0.01$). In the post-test, reduced stress was measured in the experimental group ($E = 105.00$, $C = 106.47$). However, the difference between the groups in the post-test (Table 1) and the intra-group change (Table 2) were statistically insignificant ($p > 0.01$).

5.6. Correlations

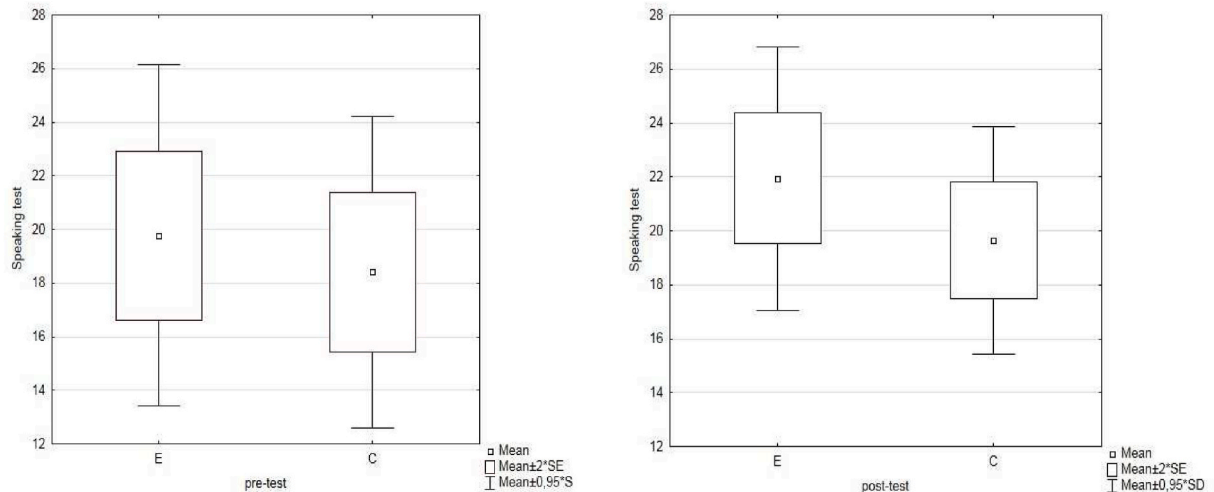
As the variables were scaled and did not have normal distribution, the data obtained by research instruments applied in the pre-test and post-test were further submitted to a correlation analysis using Spearman's Rank Correlation Coefficients (R).¹

Statistically significant correlations were detected between the following variables (Tables 3 and 4): Speaking Test and Vocabulary Test (in both groups in the pre-test and post-test), EHCS and FLES (in both groups in the pre-test and post-test, both EHCS positive and EHCS negative). The positive correlation between the Speaking Test and Vocabulary Test was within the “moderate” to “strong” significance interval (Fig. 3), while the weak correlation between EHCS and FLES was direct for EHCS (positive) and indirect for EHCS (negative).

¹ $0 \leq |R| < 0.3$ – insignificant correlation, $0.3 \leq |R| < 0.5$ – weak correlation, $0.5 \leq |R| < 0.7$ – moderate correlation, $0.7 \leq |R| < 0.9$ – strong correlation, $|R| \geq 0.9$ – very strong correlation.

Table 1The difference between the experimental and control groups ($\alpha = 0.01$).

Research instrument	pre-test		post-test	
	Z	p	Z	p
Speaking Test	-0.0990	0.9211	1.9638	0.0496
Vocabulary Test	-0.6436	0.5198	2.9869	0.0028 ^a
EHCS (Positive)	1.1222	0.2618	1.5909	0.0457
EHCS (Negative)	-1.6007	0.1094	-2.1123	0.0347
FLES	0.9570	0.3380	2.4094	0.0160 ^a
Heart Rate	0.5283	0.5973	-2.0308	0.0423

^a Statistically significant difference.**Fig. 1.** Speaking Test results in the pre-test and post-test.**Table 2**The difference between the pre-test and post-test ($\alpha = 0.01$).

Research Instrument	experimental group		control group	
	Z	p	Z	p
Speaking Test	1.5772	0.1148	1.5622	0.1183
Vocabulary Test	3.7236	0.0002*	2.6746	0.0075*
EHCS (Positive)	0.7452	0.4561	1.3728	0.1698
EHCS (Negative)	1.7322	0.0832	1.6288	0.1034
FLES	3.7236	0.0002*	2.8031	0.0051*
Heart Rate	1.4589	0.1446	0.6154	0.5383

5.7. Feedback questionnaire

All participants responded to all feedback questionnaire items. The participants in the experimental group (61.1%) liked the positive emotional stimuli (“activities”) most about the classes. The participants from the control group appreciated mostly the teacher’s attitude (58.8%). Both groups positively evaluated the classroom atmosphere (17.1%) and the teacher’s clear instructions (8.6%). The participants disliked technical problems caused by classroom equipment (2.9%) and measuring their heart rate (2.9%). Students from the experimental group would have appreciated more “activities”, and some of the control group students missed the active participation of their peers.

Most participants (E = 88.9%, C = 52.9%) felt they had learned new vocabulary right in the class and had recalled vocabulary after the class (E = 77.8%, C = 47.1%) though there were less affirmative responses in the control group (Fig. 4).

The experimental group answered five more questions and most of them (94.4%) thought the implemented emotional stimuli had helped them remember new vocabulary mainly because they were fun, incited creativity and associations, and “involved more senses”. They liked all the activities, but most of them enjoyed the stimuli related to the topics Sports and Games, Culture and Art, and Society (Fig. 5) – because they developed their creativity and cooperation and “it was so much fun”. The participants described the applied stimuli as quite interesting (50.0%), very interesting (33.3%) or interesting (16.7%).

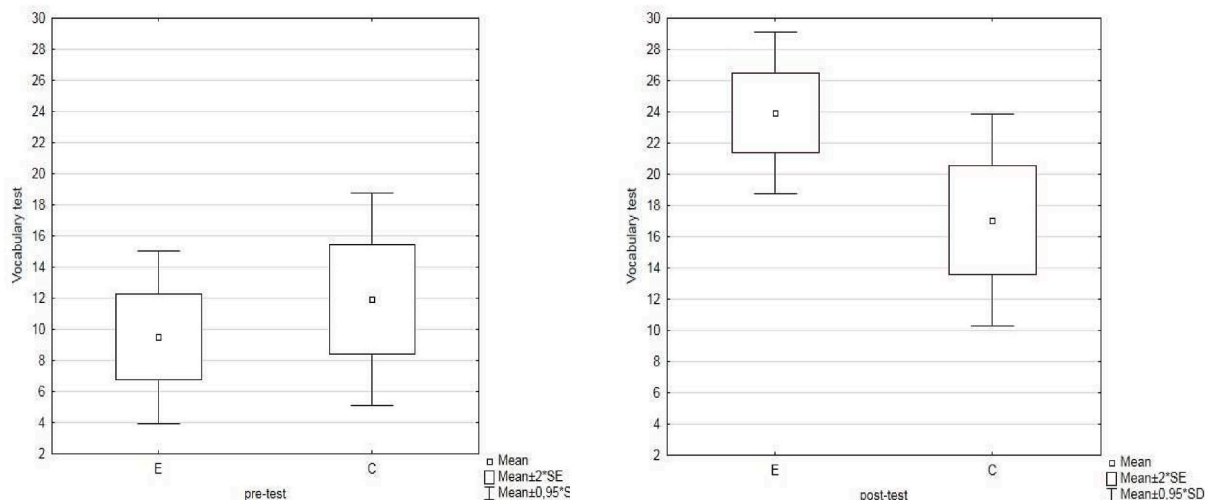


Fig. 2. Vocabulary Test results in the pre-test and post-test.

Table 3

The correlations of variables in the experimental group.

Variable		pre-test					
		Speaking Test	Vocabulary Test	EHCS (positive)	EHCS (negative)	FLES	Heart Rate
post-test	Speaking Test	1	0.663	0.152	0.190	-0.095	0.032
	Vocabulary Test	0.883	1	-0.081	0.182	-0.249	0.139
	EHCS (Positive)	-0.037	-0.108	1	-	0.569	-0.020
	EHCS (Negative)	-0.007	0.040	-	1	-0.575	-0.050
	FLES	-0.189	0.091	0.313	-0.391	1	-0.141
	Heart Rate	0.274	0.214	-0.091	0.045	0.298	1

Table 4

The correlations of variables in the control group.

Variable		pre-test					
		Speaking Test	Vocabulary Test	EHCS (positive)	EHCS (negative)	FLES	Heart Rate
post-test	Speaking Test	1	0.558	-0.092	-0.148	0.050	-0.037
	Vocabulary Test	0.773	1	-0.080	-0.173	0.173	-0.115
	EHCS (Positive)	-0.059	-0.090	1	-	0.530	0.029
	EHCS (Negative)	-0.110	0.060	-	1	-0.391	0.004
	FLES	0.043	0.122	0.485	-0.489	1	0.124
	Heart Rate	0.254	0.203	-0.039	0.158	-0.047	1

6. Discussion

Based on previous research findings, it was expected that emotionally enhanced vividness of stimuli could support remembering and recall of the taught vocabulary (Todd, 2014). Yet, the experiment revealed a more convincing impact of positive emotional stimuli on declarative vocabulary knowledge. The difference between groups in the Speaking Test was only minute – which might be interpreted as the result of the insufficient extensive practice of each topic during a standard course. To proceduralize or automatize vocabulary, multiple exposures, sufficient practice, and retrieval are necessary, with methodologists suggesting that 8–25 varied exposures are needed to remember a word (Gondová, 2012).

As Craik and Lockhart (1972) first identified in their Levels of Processing Theory, semantic processing is the only type of deep processing that is able to create solid retrieval paths in memory (Karlsson, 2019), which can be facilitated (Paivio, 1986), but not compensated, by affective stimuli. Hypothesis 1 was thus confirmed, but Hypothesis 2 was rejected – the retention of declarative vocabulary but not of procedural vocabulary was higher among learners who experienced positive emotional stimuli. However, the correlation analysis revealed a significant positive correlation with both types of tests, which proves their natural interface in the process of learning (DeKeyser, 2007).

The results further revealed a minimum shift in participants' emotional habitual subjective comfort after the experiment, which is

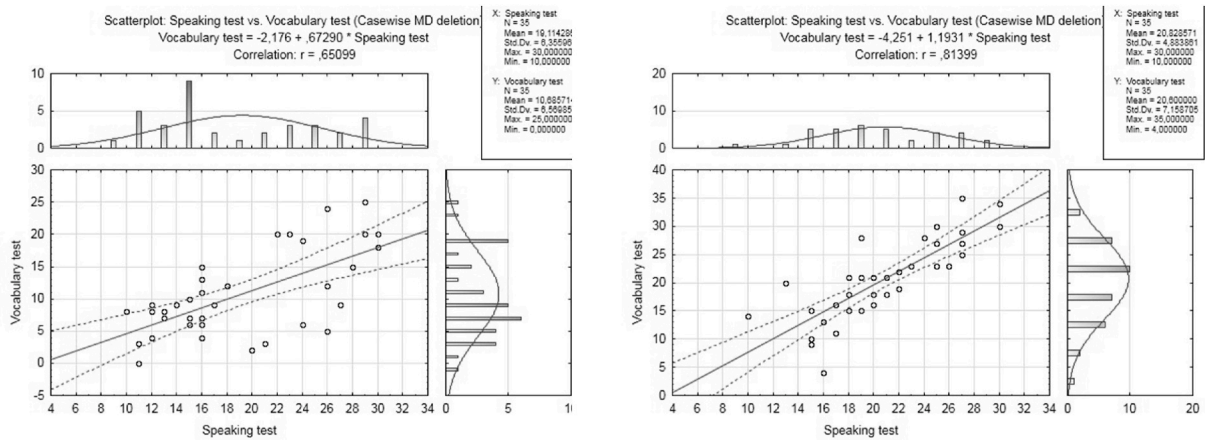


Fig. 3. Speaking Test – Vocabulary Test correlation in the pre-test and post-test.

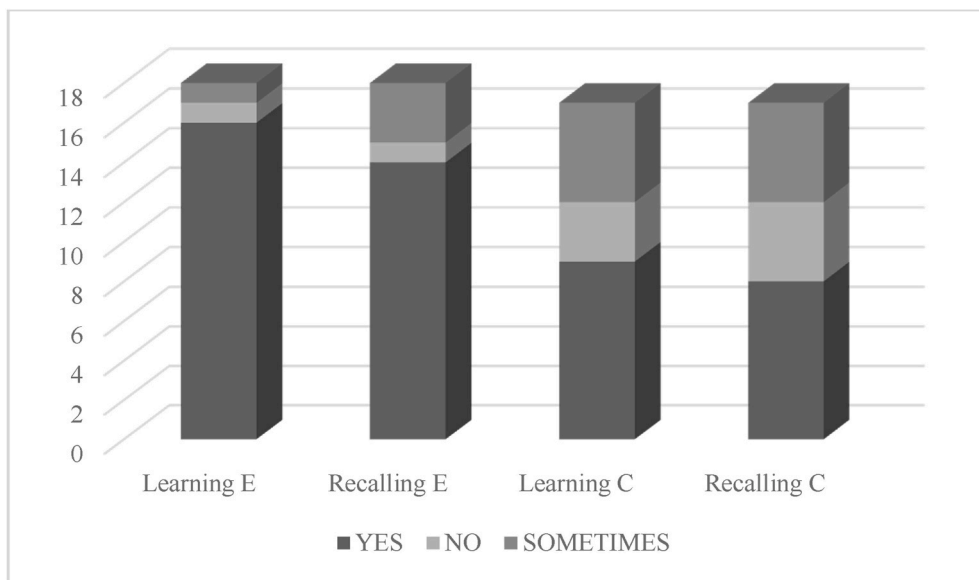


Fig. 4. Self-perception of learning and recalling vocabulary.

in line with most trait theories of personality (e.g., Alport, 1961; Eysenck, 1981), which consider personality features to be significant predictors of daily emotional processes and identify them as relatively stable, long-term and consistent (Mill et al., 2018). To the contrary, attitudes are not biologically inherited but built out of continuous experiences of the world around us and may be modified over time (Wood, 2000). Participants' foreign language enjoyment increased after the affective intervention, and significantly more after the application of emotional stimuli. Hypothesis 3 can thus be rejected, and Hypothesis 4 confirmed in this context – foreign language enjoyment but not emotional habitual comfort increased among learners who experienced positive emotional stimuli. Notwithstanding, foreign language enjoyment appeared significantly directly related to the self-perceived positive emotional comfort of participants.

Speaking is recognized as one of the most stressful activities in foreign language learning (Horwitz, 1996). Generally, stressors cause an increase in sympathetic activity of the nervous system innervating the heart, and thus an increase in heart rate (Hammoud et al., 2019). Therefore, participants' heart rates as an autonomic physiological parameter were measured during the pre-test and post-test Speaking Test – in order to objectify the magnitude of the subjective EHCS and FLES scales. Average heart rates slightly decreased after the intervention, probably as a result of participants' adaptations without any significant difference between the groups and without relevant correlation with any of the measured variables.

The current findings thus lend support for the interface hypothesis of declarative and procedural knowledge (DeKeyser, 2007), as the results of the Vocabulary Test and Speaking Test correlated in both groups in the pre-test and post-test. A significant correlation between the scores of EHCS measuring pleasure and comfort and the results of FLES reflecting participants' foreign language

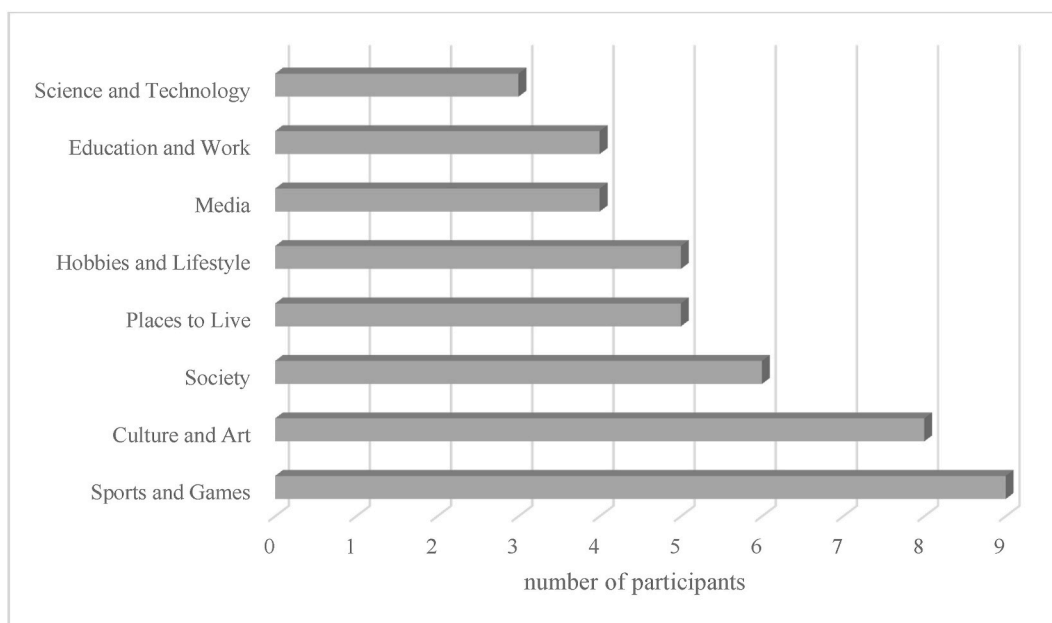


Fig. 5. Positive evaluations of the emotional stimuli.

enjoyment is consonant with the inclusive relationship of pleasure and enjoyment (Dewaele & MacIntyre, 2016). Additionally, the stated EHCS (Positive)/EHCS (Negative) inter-correlation coefficient of 0.23 (Džuka & Dalbert, 2002) was proved in the experiment. However, Hypothesis 5 must be rejected, as there is a significant correlation only within the dependent variables (vocabulary and emotions) but not between them.

Besides the quantitative data, the feedback questionnaire introduced no less relevant findings. Most students perceived the classes positively (Research question 1) and many of them appreciated teacher-related issues – good atmosphere, positive attitude, and clear instruction. This proves that the role of the teacher is crucial in regulating the classroom atmosphere (Al-Saraj, 2011; Hashemi & Abbasi, 2013; Horwitz & Young, 1991), which is in accordance with previous empirical claims that the level of enjoyment is linked to the attitude towards the language and language teacher (Dewaele et al., 2018).

More than three-quarters of the experimental group and more than half of the control group felt they had learned new vocabulary right in the class, and they had been able to recall the vocabulary after class (Research question 2). All participants underwent a delayed post-test to identify the retention ratio of the target vocabulary (which is outside the scope of the current study but provides an interesting impetus for further research).

Almost all experimental group members liked the emotional stimuli introduced in their classes and would have appreciated more of them (Research question 3). They evaluated them as interesting and preferred those involving their own activity and creativity, which is in line with modern educational concepts (Richards & Renandya, 2002). It is believed that if learners actively perform authentic and real-world tasks, it is likely they will be motivated to learn (Greenspan & Benderly, 1997).

7. Conclusions

Applying affective intervention in the form of positive emotional stimuli in teaching is in line with the current trends in foreign language pedagogy. The post-communicative approach (Modern Language Association of America, 2007) utilizes psychological methods and techniques to make learning more effective and enjoyable, and the positive psychology (Oxford, 2015) aims to activate character strengths and self-regulated learning to enhance professional and personal well-being.

We believe that positive emotional stimuli are an easily applicable strategy in foreign language education, transferable across diverse cultural and language contexts. Kamenická and Kováčiková (2019) concluded that learning with the use of emotional stimuli suits all three types of learning styles: visual, auditory, and kinesthetic (Scrivener, 2011). The stimuli were positively accepted by most students who were enthusiastic to take part in the activities, especially in the authentic tasks inciting their activity and promoting behavioral engagement (cf. Oga-Baldwin, 2019). The power of authentic tasks to trigger emotional responses can enhance learning. In addition, by experiencing positive emotional experiences in classes, it is possible to build a positive relationship not only towards a foreign language, but also towards the learning process as such.

At the same time, adequate distribution of material and practice should be respected. The traditional foreign language teaching design with limited contact hours spread over several weeks or months without sufficient repetition and application of taught material offers only a little space for proceduralization. Even the most positive emotions involved probably cannot serve as a substitute for long-run practice distribution. Integrated, autonomous or e-learning might be some solutions to the problem.

Beyond a doubt, the teacher possesses the major responsibility for the learning atmosphere in a classroom (Horwitz, 1996). As the number of non-native foreign language teachers increases by the year, it is clear that more research is needed in this area, and the related aspects of positive psychology should be incorporated into pre-service and in-service language teacher training.

Future studies may also want to classify the types of emotional stimuli (e.g., in relation to the multisensory approach), how they engage learners with different learning styles, ages and personalities (Ni, 2012), or how they work in distance and online learning. Because of the dynamic character of classroom emotions, it would be worth combining macro- and micro-developmental perspectives to study learners' emotions over long- and short-time scales (cf. Li, Dewaele, & Jiang, 2020). Ideally, future studies should collect more physiological data so as to have a comprehensive understanding of the effect of emotions. Here, finding measurement instruments not interfering with natural learning conditions might be a challenge.

8. Limitations

This study provides more empirical data for research on positive emotions in teaching foreign languages. However, the findings should be interpreted in the light of several limitations. The first one is the space limit, which precluded publishing data on all parts of the experiment in a single article. The second limitation is the small sample size. Though the groups showed clear tendencies in the data, larger groups included in the course of an experiment may allow group distinctions to emerge more clearly. Further, it was not possible to explore changes after a longer period of intervention, as the university courses are limited to a 12-week period in Slovakia. Future research may want to verify the optimum length of the intervention for foreign language students.

An overall maturation effect that occurs naturally over time and does not result from the intervention applied and the effect of concomitant factors on the variables analysed (Pervin & Cervone, 2010) have to be taken into account when interpreting the data. However, we are aware of the impossibility of achieving total objectivity in this type of research – which was maximized through the combination of quantitative and qualitative methods.

Despite these limitations, it is hoped that another small step has been taken towards a greater understanding of emotions in foreign language teaching and learning.

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Declaration of competing interest

We have no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.system.2021.102678>.

Author statement

Zdena Kralova: Conceptualization, Methodology, Validation, Data curation, Writing – Original Draft, Writing – Review & Editing, Supervision, Project administration, Funding acquisition. Jana Kamenicka: Investigation, Resources. Anna Tirpakova: Formal analysis, Visualisation.

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