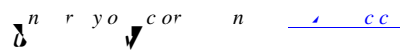


Second language vocabulary acquisition: Male vs female learners and the role of words associated with emotion

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1. Introduction

Among other things, one challenge when learning a s

experiments each, were approved by the university's Ethics board and funded with an internal research grant. The procedure, material used, and setting of the studies was similar to ensure reliability of the results.

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Students were undergraduates age seventeen to twenty-four. Students taking 'Beginning German I' are supposed to have no or very little knowledge of German. However, in order to ensure that the students participating in the experiments were indeed beginning learners, students had to fill out a background questionnaire identifying previous knowledge of German, previous instruction in German, German heritage, proficiency in other languages, and provided social data on faculty, major, and years of study. The questionnaire was used to exclude students from the study who did not fit the profile required for the experiments.

In 2014, in group I (section one: one encounter), twenty-four students (twelve female/twelve male) who did fit the profile participated in the experiments from start to finish. In group II (section two: three encounters), twenty-seven students (fifteen female/twelve male) did and in group III (section three: five encounters) twenty-five students (twelve female/thirteen male).

practice had occurred. In each test, all twenty-four words were tested. In all tests, the English word was given and participants had to write down the German word. In each test, the order of the words in the test was different.

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It was possible that students did have contact with the words tested outside the study by for example surfing for things German on the internet. However, based on the experience of other studies carried out on vocabulary acquisition at the beginners' level, the probability of such a situation was quite low due to the busy schedule of students taking five to six courses per term. Furthermore, the probability was the same for all groups.

4. Results

The success of recalling words was measured using inferential statistics. The 2014 study showed that overall participants who encountered all twenty-four words five times recalled significantly more words in all three tests than participants who saw the PowerPoint three times than participants who saw the words once. An analysis using ANOVA showed these differences were statistically significant with all p values below .05 (see Table 1). On long-term retention (test 3), recall rates were close to fifty percent for group III, a bit over thirty percent for group II, and ten percent for group I. These rates confirmed results of previous experiments (Schuetze & Weimer-Stuckmann, 2011; Schuetze, 2015).

Table 1

	1 encounter		3 encounters		5 encounters		
	Mean	SD	Mean	SD	Mean	SD	
Test 1	8.53	3.75	13.29	5.77	15.99	8.08	.000
Test 2	2.02	1.44	7.88	5.30	11.97	4.41	.002

In all tests, the number of participants was 24 in group one (one encounter: 12 female and 12 male), 27 in group II (three encounters: 15 female and 12 male) and 25 in group III (five encounters: 12 female and 13 male). The Mean refers to the average score of participants. 24 words were tested so the maximum score was 24.

In the 2014 and 2015 study, female students recalled more words than male students, if they rehearsed words five times (see Table 2) in five of the six tests. The only statistically significant result was the 2015 group that used an expanded interval. In that group, female students recalled significantly more words than male students on the immediate post-test. The effect size for that difference was calculated (using Means and Standard Deviations for independent groups) at 0.2163 which is considered a small effect. Interestingly, the 2014 study showed that when rehearsing words once or three times, male students recalled more words than female students in the immediate post-test. However, those differences were not significant. Furthermore, those male students recalled fewer words than the female students on the four-week delayed post-test.

In 2014, the number of participants was 24 in group one (one encounter: 12 female and 12 male), 27 in group II (three encounters: 15 female and 12 male) and 25 in group III (five encounters: 12 female and 13 male). In 2015, the number of participants in the expanded group was 50 (24 female and 26 male participants) and in the uniform group 48 (25 female and 23 male). In 2014 and 2015, 24 words were tested.

A further statistical analysis using ANOVA showed that in both, the 2014 and 2015 study, the differences between test 1 and test 2 for both, female and male students, were significant when rehearsing the words five times. All six p values were p .000: female students 2014 test 1 Mean 16.66, SD 7.42 vs test 2 Mean 12.16, SD 4.79, as well as 2015 test 1 expanded Mean 16.30, SD 3.34 vs test 2 Mean 11.86, SD 4.05 as well as test 1 uniform Mean 13.28, SD 4.41 vs test 2 Mean 11.01, SD 4.96; male students 2014 test 1 Mean 14.65, SD 8.24 vs test 2 Mean 11.83, SD 3.63, as well as 2015 expanded test 1 Mean 14.65, SD 4.07 vs test 2 Mean 10.34, SD 3.23,

A further analysis of the performance of the female students (see Table 4) as well as the male students (see Table 5) using paired sample t-tests showed that in the 2015 study female students recalled significantly more emotional words in test 2 than non-emotional words if they had used the expanded interval. In the 2014 study, those particular results were not statistically significantly different.

Table 4

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those of male students in both studies five out of six times (three immediate and three delayed post-tests). However, only once, on the immediate post-test using the expanded interval, differences were statistically significant. This indicates that overall the stimulation by estrogen to the neurotransmitter serotonin did not make a significant difference in lexical processing. An explanation might be that the stimulation was not sufficient to make such a difference.

The results confirmed that both, female and male students, recall more words when the expanded interval is used on short-term gains but then forget more words when tested weeks later relatively to when the uniform interval is used. In previous studies (Schuetze & Weimer-Stuckmann, 2011; Schuetze, 2015), the effect that the uniform group had higher recall rates in the long-run was shown in delayed post-tests of eight weeks or more. Furthermore, the results showed that the rate of forgetting was similar for female and male students: differences between the immediate and the delayed post-test were statistically significant for both, male and female students.

The second part of the first research question was, if recall rates by female students are particularly high when processing words associated with emotion. There was only one significant difference when female students recalled emotional vs non-emotional words which was in the 2015 expanded group who rehearsed the words five times on the delayed post-test. It indicates that that particular group forgot fewer emotional than non-emotional words within the time span of four weeks. The other groups who rehearsed the words five times also showed that effect but differences were not statistically significant.

The second research question was if words associated with emotion were fast-tracked. The short answer is no. Although all tests showed that participants did recall more words associated with emotion than words not associated with emotion, differences were minimal. A possible explanation is that the sensory information that is fed through the cortices to the Hippocampus when processing words to long-term memory (Amaral et al., 1992; Gluck & Meyers, 2011; Milner et al., 1998) was not heightened enough to create a higher dose of a neurotransmitter. However, there was one interesting result. The 2015 group (male and female students grouped together) that used the expanded interval five times recalled significantly more emotional than non-emotional words on the delayed post-tests. This was the same group where female students recalled significantly more words than male students on the immediate post-tests. It might be an indication that for female students higher estrogen levels paired with the heightened activation of emotional words can lead to higher recall rates. However, more tests are needed

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