

How Do High-Achieving Students Learn Languages Online? Language Learning Strategy Use Among University Students of Languages Other Than English

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Abstract

The impact of language learning strategy use on achievement has been extensively researched in the traditional foreign language (FL) classroom. However, little is known about this topic in the context of online learning. In addition, previous research has focused primarily on English as a foreign or second language. This study fills these gaps by investigating the use of language learning strategies by students taking beginner-level online courses in an FL other than English at a Swedish university. The study examined the extent to which students used language learning strategies, whether age was related to the use of language learning strategies, and whether language learning strategy use predicted FL achievement, here operationalized as receiving the highest final course grade. Participants ($n = 108$) aged 19–76 years ($M = 37.6$), completed the Strategy Inventory for Language Learning (Oxford, 1990). Three main findings emerged from the study. First, the students used metacognitive strategies most frequently, which could be explained by the fact that the online format requires great learner autonomy. Second, age was negatively but weakly related to the use of memory and affective strategies. Third, the use of cognitive strategies significantly increased the likelihood of FL achievement (by almost tenfold). Thus, this category of strategies appeared to be a strong predictor of achievement among the study participants.

Keywords: online learning; foreign language learning; language learning strategies; high-achieving students; languages other than English (LOTES); university

Introduction

Foreign language (FL) learning online has become increasingly common over the last decade (e.g., Lin et al., 2017), not least as a consequence of the Covid-19 pandemic. While there is some evidence to suggest that online language education is as effective as classroom language education (Blake et al., 2008; Despain, 2003; Ushida, 2005), there is also evidence to suggest that language courses are the most challenging of all subjects to study online (Cavanaugh, 2001) and that students' perceptions of online language courses are less positive than courses in other subjects (Oliver et al., 2012). Among the challenges related to FL studies online (as experienced by FL students) are the lack of interaction with the teacher (Maican & Cocoradă, 2021; Sun, 2014) and opportunities to collaborate and socialize with peers (e.g., Sun, 2014). The lack of opportunities for interaction may negatively affect students' motivation and attitudes (e.g., Hurd, 2005; Mohd Nor et al., 2012), and the online environment evokes

negative emotions for some students, including FL speaking anxiety, especially among lower-achieving FL students (Maican & Cocoradă, 2021). In addition, research has shown that it is common for online language students to struggle with time management, including following a schedule and studying regularly, arranging time to work collaboratively, ensuring one's engagement with the class, being self-regulated, staying self-motivated, and socializing (Sun, 2014). In sum, online learning requires a significant amount of learner autonomy (Lin et al., 2017). How do students go about their FL learning online? What strategies do they use? What strategies appear to promote achievement in the online FL learning context? Although the use of self-regulated strategies in the online learning context has been increasingly investigated (e.g., Barnard-Brak et al., 2010; Lin et al., 2017; Puzziferro, 2008), there are few studies that investigate what specific language learning strategies (LLS) students use in an online FL setting, and what LLS appear to promote achievement in online FL learning. This lack constitutes the research gap for the present study.

This study seeks to contribute insights into student behaviors related to FL learning online in a Swedish context, as online FL courses are increasingly common in Swedish universities. Insights into student study and learning behaviors and their links to performance are useful for practicing language teachers because these insights will better equip them to help students develop their study techniques.

The study has three aims. First, it aims to map out LLS use among FL online students in Sweden. Given that previous research has shown that LLS use varies with age, and that students who study FLs in Sweden typically vary widely in age (Engel, 2021), the second aim of the study is to investigate the relationship between age and LLS use in the sample. The third aim is to investigate the relationship between LLS use and FL achievement in online FL learning. The study focuses on languages other than English (LOTEs) and includes students enrolled in beginner-level FL classes during Fall 2021 at a major Swedish University. After a literature review, we will introduce the methodology, and present and discuss the findings.

Literature Review

Language Learning Strategies

LLS are “goal-directed actions for improving language proficiency or achievement, completing a task, or making learning more efficient, more effective, and easier” (Oxford, 2011, p. 167). LLS vary in nature: some strategies are used to better remember and process FL input, while others are used to help regulate emotions that arise during the FL learning process. Various ways of categorizing LLS have been proposed (O'Malley & Chamot, 1990; Oxford, 1990; Rubin, 1981), and here we draw on Oxford's (1990) taxonomy, which groups LLS strategies into two main categories, namely direct versus indirect strategies. Direct strategies entail a mental processing of the target language (TL) (Oxford, 1990, p. 37) and comprise memory strategies (i.e., storing and retrieving information from memory), cognitive strategies (i.e., trying to understand and produce new language), and compensation strategies (i.e., trying to compensate for gaps in TL knowledge) (Amerstorfer, 2018, pp. 499–500). The other main category, indirect strategies, does not necessarily involve direct processing of the TL but rather involves ways to “support and manage language learning” (Oxford, 1990, p. 135). Indirect strategies comprise metacognitive strategies, which “cater for the coordination of learning processes” (Amerstorfer, 2018, p. 500); affective strategies, which entail regulating motivation, emotion, and attitudes related to the learning process; and social strategies, which include finding support through interaction with others. To date, numerous studies have investigated

LLS use among language learners in various contexts and at various proficiency levels. Different methods have been used to assess strategy use among language learners, including questionnaires, interviews, and introspective methods, with the aim to understand learner behavior and ultimately help learners learn more efficiently. One of the most widely used self-report instruments to assess language learning strategy use is the Strategy Inventory for Language Learning (SILL) (Oxford, 1990), which will also be used in this study. In the review below, we focus on studies that have used one of the existing versions of the SILL so that direct comparison of previous findings to ours is feasible.

Language Learning Strategy Use in Online Foreign Language Learning

Few studies address LLS use in the context of online FL learning, but there is a study on distance FL learning which might be pertinent to the study of modern online courses. White (1995) compared strategy use in FL classroom learners ($n = 143$) with that of FL distance learners ($n = 274$) (who were self-instructed and did not receive organized teaching as did the classroom learners). Based on a questionnaire that drew on O'Malley and Chamot's (1990) classification of LLS (including cognitive, metacognitive, affective, and social strategies), White (1995) found that distance learners used metacognitive strategies to a larger extent than classroom learners, albeit they had fewer opportunities to use social strategies than did the classroom learners. Given the scarcity of research on LLS use by online FL students, we turn next to research on LLS use and FL learning in other learning contexts.

Language Learning Strategy Use and Foreign Language Achievement

A relatively large body of LLS research has investigated the relationship between strategy use and L2 learning outcome in a traditional classroom context. Early LLS research sought to identify strategies used by learners who were successful in their L2 learning process (Rubin, 1975; Stern, 1975; Naiman et al., 1996). According to Rubin's (1975) and Stern's (1975) descriptions, the "good language learner" is willing to communicate, experiment, practice, and revise; they self-monitor while using the TL; they search for meaning; and they seek to develop the TL into a system. Since then, a number of studies have investigated the relationship between general learning strategy use, or the use of LLS specifically, and L2 learning outcomes. These studies have included various learner populations and used a variety of proficiency indicators such as course grades (e.g., Mullins, 1992), proficiency tests or ratings (e.g., Mullins, 1992; Oxford & Ehrman, 1995; Rao, 2016) or subjective assessment methods (e.g., Oxford & Nyikos, 1989). Relationships have been found between learning strategies and FL proficiency among FL learners in various age groups and cultural contexts. This pattern also holds for studies that have used SILL to assess LLS use and its link to achievement among university students specifically, although, to a certain extent, different studies found different statistical effects for different strategy categories. For example, Park (1997) found significant relationships between all six LLS categories and scores on the TOEFL among 332 English FL students aged 19–29 in two Korean universities ($M = 23.1$). A multiple regression analysis revealed that cognitive and social strategies explained about 13 percent of the variance in the TOEFL scores.

Other studies have found relationships between one or a few of the SILL categories and FL learning outcomes. In an Iranian university context, Taheri et al. (2019) found significant correlations between cognitive, compensation, and social strategies and language achievement as measured through a course-related test targeting vocabulary, grammar, and reading comprehension. The study included 188 university students aged 19–35. In another study,

Mullins (1992) found that compensation strategy use was moderately positively correlated with placement test scores and weakly to moderately positively correlated with GPA scores, and that affective strategies were weakly to moderately negatively correlated with entrance examination scores. The study included 110 students aged 18–22 (5 males and 105 females) majoring in English at a Thai university. Another example was given by Nisbet et al. (2005), who found that metacognitive strategies were correlated—although weakly—with TOEFL scores in a sample of 168 university students majoring in English in China. A multiple regression analysis found that metacognitive and affective strategies were significant predictors, the former being a positive predictor and the latter a negative predictor, but the two categories only accounted for 4 percent of the variation in TOEFL scores.

In their study, Oxford and Ehrman (1995) found a correlation—although a relatively small one—between cognitive strategies and language proficiency ratings among 268 adult language learners enrolled in an intensive FL program in the United States. Wu (2008) also found a relationship between cognitive strategies and EFL proficiency among 137 EFL students at a Chinese university, where English proficiency was assessed by a General English Proficiency Test including tests for reading, listening, speaking, and writing. Based on test scores, the students were placed in a high ($n = 49$) or low ($n = 88$) proficiency group. *T* tests revealed that, overall, the high-proficiency students used LLS more frequently than the low-proficiency students, and a multiple regression revealed that cognitive strategies significantly predicted EFL proficiency.

In sum, several studies have found relationships between LLS use and L2 learning in an FL learning context. At present, it is unclear to what extent this observation applies to FL learning in an online context.

The Relationship Between Age and Language Learning Strategy Use Among FL Learners

Several studies using SILL have found that LLS use differs between age groups. For example, Chen (2014) investigated the relationship between age and language learning strategy use among 1,023 students learning English as an FL in Taiwan, at various educational levels. The participants were distributed in the following age groups: 10–12 ($n = 250$), 13–15 ($n = 245$), 16–18 ($n = 249$), and 20–22 ($n = 279$). The analyses revealed significant relationships between age group and the use of compensation strategies, memory strategies, metacognitive strategies, and affective strategies. Chen (2014) found that students aged 10–12 used compensation strategies less often than students in the other age groups, and that the oldest students in the cohort (aged 20–22) used affective and social strategies more often than students in the other age groups. Age differences were also found by Peacock and Ho (2003), who compared LLS use among 1,006 students across different disciplines, all studying English for Academic Purposes, at a university in Hong Kong. The students were divided into two age groups: 18–22 ($n = 894$) and 23–39 ($n = 112$). They found that the older student group reported using memory, metacognitive, affective, and social strategies more frequently than the younger students. Observed links between age and LLS use are suggested to pertain to age-related differences in cognitive and affective maturation (e.g., Chen, 2014; Peacock & Ho, 2003).

Not all studies, however, have found significant age differences in LLS use. Griffiths (2003) investigated the relationships between gender, age, nationality, course level, and LLS use among 348 L2 English students aged 24–64 (74 percent in their twenties) in a private language school in New Zealand. Proficiency levels ranged from elementary to advanced. Griffiths

(2003) found that frequency of LLS use was related to course level, with higher-level students obtaining a higher overall mean frequency of LLS use than elementary-level students. The author then examined differences in LLS use according to age, sex, and nationality, and only found a statistically significant difference with respect to nationality, with European students reporting more frequent LLS use than other students.

In sum, there is some evidence that age relates to FL learners' strategy use, but the findings are inconsistent, and the research concerns the traditional classroom rather than the online learning context. The present study seeks to fill the above-mentioned gaps in knowledge about university students' online study and learning behaviors and the relationship of these behaviors to FL study outcomes. This study describes LLS use among FL students in an online learning environment and investigates the relationship between LLS use and online FL achievement. We address the following research questions:

1. With what frequency do FL beginner-level online university students report using different categories of language learning strategies?
2. To what extent is LLS use related to age?
3. To what extent does LLS use influence the likelihood of receiving the final grade A?

Materials and Methods

Research Context

The study took place at a major Swedish university during the autumn term of 2021 and involved two FL departments. In the autumn semester 2021, most teaching and examinations were being carried out online as a consequence of the Covid-19 pandemic, as the Swedish government had called on all institutions of higher education to switch to distance teaching. In light of the advantages that online teaching offered (e.g., accessibility, especially for evening students), nearly half of the courses (9 out of 20) under investigation in this study had been converted to online courses. In other words, they had been advertised as online courses and would have been given online regardless of the pandemic situation. The remaining courses (11 out of 20) had planned as in-person and on campus but were nevertheless offered online as a consequence of the restrictions due to the pandemic.

Data Collection Procedure

Data were collected at the end of the autumn semester 2021 through a web-based survey (see Material) that was distributed to beginner-level classes in ten different FLs (see Table 1). The first author visited each class, informed the students about the study, and invited them to participate. We decided to distribute the survey *after* the final exams took place, since some students may "cram" lesson material during the days before the exam and therefore not know the full spectrum of the LLS they used during their language studies. Before filling out the survey, participants were informed about the general purpose of the study and the conditions for participating. Informed consent was obtained from all subjects involved in the study. In addition, the students were informed that they had the chance of winning a gift card from a department store. When giving their consent to participate in the study, participants also consented to the authors accessing their final course grades. The survey took between 10 and 20 minutes to fill out.

Participants

The participants were students enrolled in a beginner-level FL course in the fall semester of 2021. In total, 118 students out of 779 completed the survey. The response rate was thus 15.1%, which is relatively low compared to other studies that include online students (cf., e.g., 29% in Lin et al., 2017). Of the 118 who answered the survey, ten respondents were subsequently excluded from the data analysis: five had reported having the TL as their first language; two could not be identified in the university's student administration system; two did not participate in any examination; one was discovered to have been simultaneously enrolled in a higher-level course in the same FL. The vast majority reported having Swedish as their L1 ($n = 90$) and some respondents indicated several L1s. Despite these being beginner-level classes in the respective target FLs, 74 students reported having learned the TL before, either in school or autonomously. We initially planned on excluding students who were "false beginners" to assure homogeneity in terms of proficiency. However, when we understood that these students constituted the majority of the sample (68.5%), we decided to include them to assure ecological validity. We acknowledge that previously acquired skills may skew the results. Therefore, we include "previous experience of the target language" as an extraneous variable in the analysis (see Data Analysis). As Table 1 indicates, the demographics and final grades of the study sample are comparable to those of the student population as a whole. The 108 participants had a mean age of 37.6 years ($SD = 16.1$, range 19–76 years). The age of the participants was positively skewed with a median age of 31 years. The mean age of the student population as a whole ($n = 779$) was 33.1 years ($SD = 12.8$; range 18–84; $Md = 29$).

Depending on the course, full-time students received on average 5 to 9 hours of teaching per week, while part-time students received 2 to 4 hours per week. Although the specific course structures varied for the specific languages, most courses have modules for grammar and vocabulary, and written and spoken production.

(Table 1 will follow on next page.)

Table 1

Comparison of the Characteristics of the Study Participants and the Whole Student Group (Gender, Age, Language Studied, Study Pace, and Course Grades)

Background information and course grades	Participants (total = 108)		Whole student group (total = 779)	
	<i>n</i>	%	<i>n</i>	%
Gender				
Female	72	66.7	474	60.8
Male	34	31.5	305	39.2
Other	1 ^a	0.9	– ^b	–
Do not want to reveal	2	1.9	– ^b	–
Age				
18–20	8	7.4	58	7.4
21–30	45	41.7	388	49.8
31–40	16	14.8	175	22.5
41–50	12	11.1	59	7.6
51–60	13	12.0	57	7.3
61–70	10	9.3	33	4.2
71+	4	3.7	9	1.2
Language studied				
Czech	3	2.8	28	3.6
Dutch	2	1.9	13	1.7
Finnish	12	11.1	114	14.6
French	24	22.2	160	20.5
German	22	20.4	159	20.4
Italian	20	18.5	106	13.6
Polish	1	0.9	45	5.8
Portuguese	2	1.9	22	2.8
Russian	17	15.7	87	11.2
Spanish	5	4.6	45	5.8
Study pace				
full-time (parts A and B)	20	18.5	197	25.3
part-time (part A)	67	62.0	496	63.7
part-time (part B)	21	19.4	86	11.0
Course grade^c				
A	35	32.4	118	31.6
B	30	27.8	122	32.7
C	26	24.1	106	28.4
D	5	4.6	27	7.2
E	0	0	0	0
Students without a final grade	12	11.1	406 ^d	52.1

Notes. ^aOne participant identified with both the *Female* and *Other* categories, which explains why the total number of cases under Gender is 109 instead of 108 as in the rest of the table. ^bThe gender of the whole student group was deduced from the students' social security numbers. ^cStudents receive a final grade only if they have received a passing grade in all modules included in the course. ^dFailure to receive a grade is usually due to course dropout.

Material

The study used two data sources, namely an online survey and course grades. The online survey included a biographic section that elicited information about the participants' gender (*male, female, other, do not want to report*), first language(s), additional language(s), and previous experience with the TL. Here, the respondents were also asked to report how much effort they perceived to have expended to learn the TL during the course, on a scale from 1 (*no effort*) to 7 (*great effort*). This section was followed by the 50-item version of SILL (Version 7.0) (Oxford, 1989), where the respondents reported their LLS use. SILL was deemed adequate for the purposes of the study because it assesses overall LLS use rather than LLS related to specific language domains, such as grammar or vocabulary. SILL comprises 50 5-point Likert-scale items distributed over six subscales (see Table 2) that correspond to the dimensions of Oxford's model described above. Response options ranged from 1 to 5 (1 = *never or almost never true of me*, 2 = *usually not true of me*, 3 = *somewhat true of me*, 4 = *usually true of me*, and 5 = *always or almost always true of me*). Following recommendations (see Amerstorfer, 2018, p. 505), and upon having received permission from the author of the questionnaire (Oxford, 1989), the original SILL was translated from English to Swedish. A translation was made separately by the first author and one of her colleagues, a researcher in educational psychology. They are both L1 speakers of Swedish and highly proficient in English. The separate translations were compared and discussed. As also recommended (Amerstorfer, 2018, p. 505), the instrument was adjusted "to fit specific research demands". The adjustments concerned replacing each mention of "English" with the TL in question, meaning that we created one version of the SILL for each of the ten TLs.

Table 2

Categorization of Strategies in SILL

Direct strategies	Memory strategies	Part A	Remembering more effectively
	Cognitive strategies	Part B	Using all your mental processes
	Compensation strategies	Part C	Compensating for missing knowledge
Indirect strategies		Part D	Organizing and evaluating your learning
	Metacognitive strategies		
	Affective strategies	Part E	Managing your emotions
	Social strategies	Part F	Learning with others

Note. Table adapted from Amerstorfer (2018, p. 500).

FL achievement was operationalized as the student's final course grade and these were accessed through the university's student administration system. At the end of the semester, the student is assigned a final course grade, which represents a weighted mean based on the grades obtained in each module. The course grades range from E to A. E and above correspond to "pass", with varying levels (A being the highest grade). A final grade is calculated only if students receive a passing grade in each module of the course; if they do not, they do not receive a final grade.

Data Analysis

The survey data were exported to SPSS software version 28. To respond to the first RQ (i.e., With what frequency do FL beginner-level online university students report using different categories of language learning strategies?) we used descriptive statistics. We calculated an average for each individual LLS. Then, we calculated an average for each of the six strategy categories by adding up and dividing by the number of statements in the given category. Finally, we calculated an overall average of strategy use by adding up values reported for each strategy and dividing by 50. When interpreting the data, we use Oxford's (1990) key, where Likert-response values between 1.0 and 2.4 are interpreted as low frequency of LLS use, 2.5–3.4 as medium frequency, and 3.5–5.0 as high frequency.

To respond to RQ2 (i.e., To what extent is LLS use related to age?) and RQ3 (i.e., To what extent does LLS use influence the likelihood of receiving the final grade A?), we used inferential statistics. Specifically, we ran Spearman's rho correlations to investigate the relationship between age and LLS use (RQ2), and a binary logistic regression analysis to investigate the impact of LLS use on the likelihood of achievement (RQ3). The binary outcome criteria included the two following categories: (1) course grade A versus (0) B or lower (i.e., B, C, D, E), or no final grade. Given that the Cronbach's alpha values for the LLS categories A and E were under the recommended threshold of .7 for good internal consistency (see Table 3), we decided to exclude them from the regression analysis. In addition to the four LLS categories that constitute independent variables, we decided to also include the extraneous variables gender, previous experience with the TL, and expended effort, given that they may have an effect on achievement. First, we confirmed that the data met the assumptions for the analysis. The number of participants allowed for a model with a maximum of seven predictors (counting 15 participants per predictor). Although one outlier was identified for Category B, it did not distort the data and was therefore retained in the data file. The multicollinearity assumption was also met, since the independent variables were not too highly correlated (less than .7). In addition, the Tolerance value was not too small (i.e., above .1), and the Variance Inflation Factor was not too large (i.e., less than 10). The predictors could therefore all potentially be retained.

Chi-square tests showed that gender and previous experience with the TL were related to the dependent variable. A Mann–Whitney test revealed that the level of expended effort also differed between A students and B-or-lower students. Although none of the analyses reached statistical significance, we included these extraneous variables in the regression model.

Table 3

Description of the Study's Variables

Variable	Part	Cronbach's α
Memory strategies	A	.55
Cognitive strategies	B	.70
Compensation strategies	C	.74
Metacognitive strategies	D	.80
Affective strategies	E	.58
Social strategies	F	.75

Note. Part = section of the SILL questionnaire.

Results

Language Learning Strategy Use

The participants reported using one category with a high frequency, namely metacognitive strategies (Table 4). The other five categories were used with a medium frequency, with the most frequent being cognitive strategies, followed in order by social strategies, compensation strategies, memory strategies, and affective strategies.

Table 4
Descriptive Statistics for Study Variables

Variable	Part	<i>M</i>	<i>SD</i>	Min.	Max.	<i>f</i> _{LLS}
Memory strategies	A	2.73	0.56	1.33	4.00	Medium
Cognitive strategies	B	3.33	0.52	1.86	4.50	Medium
Compensation strategies	C	3.11	0.73	1.33	5.00	Medium
Metacognitive strategies	D	3.51	0.67	2.00	4.89	High
Affective strategies	E	2.68	0.68	1.00	4.00	Medium
Social strategies	F	3.24	0.81	1.33	4.83	Medium

Note. *N* = 108. Part = section of the SILL questionnaire; *f*_{LLS} = frequency of LLS use, according to Oxford's (1990) guidelines.

The relationship Between Age and Language Learning Strategy Use

The analyses yielded weak, negative correlations between age and LLS use (Table 5). Only the correlations between age and memory strategies, and between age and affective strategies, were statistically significant.

Table 5
Results From Spearman's Correlation Analysis Measuring the Relationship Between Age and the LLS Use

Variables	<i>r</i> _s	<i>p</i>	95% CI (2-tailed)	
			Lower	Upper
Age–memory strategies (A)	–.24	.011	–.42	–.05
Age–cognitive strategies (B)	–.08	.387	–.27	.11
Age–compensation strategies (C)	–.07	.462	–.26	.12
Age–metacognitive strategies (D)	–.08	.439	–.27	.12

Age–affective strategies (E)	-.19	.043	-.38	-.00
Age–social strategies (F)	-.17	.087	-.35	.03

The Relationship Between Language Learning Strategy Use and Achievement

The model presented in Table 6 was statistically significant ($\chi^2(7, n = 105) = 25.38, p < .001$), which means that it could distinguish between students with the grade A and those with grades B or lower. Depending on the measurement used, the model explained between 21.5% (Cox & Snell R Square) and 30.0% (Nagelkerke R Square) of the variance of grade level. The only variables to make a unique statistically significant contribution to the model were cognitive strategies (Category B) and social strategies (Category F). The use of cognitive strategies had an odds ratio of 9.58, which indicates that the participants were nearly ten times more likely to receive the grade A for every additional point on the Likert scale measuring the use of cognitive strategies while controlling for all other factors in the model. The social strategies (Category F) had an odds ratio of 0.35, indicating that the use of social strategies was associated with a reduction in the likelihood of receiving the grade A. For any additional point on the social strategies Likert scale, the odds that the participants would receive an A would be 0.35 times lower.

Table 6

Results From the Binary Logistic Regression Analysis Assessing the Impact of LLS Use, Gender, Previous Experience, and Expended Effort on the Likelihood of Obtaining the Grade A

Variable	B	SE	Wald	p	Odds Ratio	95% CI for Odds Ratio	
						Lower	Upper
Cognitive strategies (B)	2.26	0.74	9.36	.002	9.58	2.25	40.76
Compensation strategies (C)	-0.29	0.40	0.52	.469	0.75	0.34	1.64
Metacognitive strategies (D)	0.64	0.52	1.51	.220	1.90	0.68	5.31
Social strategies (F)	-1.04	0.40	6.61	.010	0.35	0.16	0.78
Gender	0.99	0.58	2.97	.085	2.70	0.87	8.37
Previous experience	0.96	0.56	2.96	.086	2.62	0.87	7.83
Expended effort	0.07	0.19	0.15	.700	1.08	0.74	1.57
Constant	-7.87	2.31	11.63	.001	0.00		

Note. Df = 1.

Discussion

The survey-based study mapped out LLS use by distributing SILL (Oxford, 1990) to Swedish university students taking FL courses online, and investigated the relationship between LLS use and achievement, operationalized as obtaining the highest possible grade (A).

First, we found that the students made frequent use of metacognitive strategies, and relatively frequent use of the other five strategy categories. Metacognitive strategies include organizing

one's studies, creating study habits, reviewing and repeating course material, setting goals, and evaluating one's performance. It is interesting to consider the findings in light of White's (1995) observation that distance learners used metacognitive strategies more frequently than classroom learners. As argued by several scholars, the online format requires a large amount of learner autonomy (e.g., Lin et al., 2017), and frequent use of metacognitive strategies may be a response to such study and learning conditions. Furthermore, it is interesting to observe that affective strategies were reported to be the least frequently used. Affective strategies include regulating one's motivation and emotions related to language learning and use. Since previous studies have found that the online learning format has the potential to evoke negative emotions (Maican & Cocoradă, 2021) and affect motivation and attitudes negatively (e.g., Hurd, 2005; Mohd Nor et al., 2012; Sun, 2014), it seems like the online learning context could spur the need for emotional and motivation regulation. Therefore, it is somewhat surprising that the students did not report using affective strategies to a larger extent.

Second, we found that age was not highly correlated with LLS use, although there were a couple of weak, negative significant correlations between age and memory strategies, and age and affective strategies. This means that, to a relatively minor extent, the older the student, the less frequent the use of memory strategies or affective strategies. Contrary to our study, Griffiths (2003), whose study sample had a similar age range and relatively similar age distribution to this study, found no effects for age. The students in her study had a wider proficiency range, which may explain the different results, because it is possible that students might use different sets of strategies at different stages of their proficiency development. Other studies have also found links between age and LLS use (e.g., Chen, 2014; Peacock & Ho, 2003), although the samples in those studies had narrower and lower age spans than our study sample, and therefore a direct comparison cannot be made.

Although the observed correlations are not strong, these are interesting findings, and, at least with respect to memory strategies, somewhat surprising. The age in the study sample ranged from 19 to 76. Given that cognitive capacities including the capacity to learn new material are believed to gradually decrease with age, including memory capacities (for an overview, see, e.g., Pfenninger & Singleton, 2019), one could have expected that the use of memory strategies would increase as a function of age. With respect to affective strategies, a negative correlation is, however, less surprising, because emotional stability tends to increase with age (see, e.g., an overview by Helion et al., 2019), which may imply that the language learning process is less emotionally charged for older adult learners than it is younger adult learners. The findings related to the memory and affective LLS categories should however be interpreted with caution given the relatively low reliability levels of these sub-scales.

Third, a binary logistic regression analysis revealed that cognitive strategies and social strategies were significantly related to achievement (memory and affective strategies were excluded from the model because their internal consistency was not satisfactory). It was found that cognitive strategy use increased the likelihood of receiving the grade A by almost ten times for every additional point on the 5-point Likert scale. We consider this to be a large effect, although the study should ideally be replicated in a similar sample and learning context. A few previous studies have also observed a relationship between cognitive strategies and achievement, although these studies operationalized achievement in different ways and include students in various educational and cultural contexts (Oxford & Ehrman, 1995; Park 1997; Taheri et al., 2019; Wu, 2008). It is nevertheless interesting that the finding is repeated in this sample. Cognitive strategies involve direct processing of the TL, such as looking for meaning, looking for patterns and similarities to one's first language(s), note-taking, revising learned

material, repeating new words, practicing sounds, and exposing oneself to the TL. Such actions, routines, and processes thus appear to have promoted FL achievement in the sample of online students. This result is not very surprising, given the emphasis that SLA scholars put on TL exposure, repetition, and practice for language learning to take place (see, e.g., DeKeyser, 2007; Ellis, 2002; Suzuki et al., 2019). This study should thus ideally be replicated in a similar sample and context, but also in other FL student populations and online learning contexts, in order to draw more robust conclusions.

The other strategy category found to be significantly related to achievement in the sample was social strategies, although the effect was smaller than it was for cognitive strategies. Contrary to Park (1997), the analysis revealed that the relationship was negative: that is to say, a more frequent use of social strategies was linked to a smaller likelihood of obtaining final grade A. It is possible that FL learning at this initial stage is promoted by individual learning, that is, learning that involves individual cognitive processes rather than collaborative learning.

In contrast to some earlier studies, we did not find any effects for other strategy categories included in the model, such as metacognitive strategies (cf. Nisbet et al., 2005; Park (1997) or compensation strategies (Mullins, 1992; Taheri et al., 2019). As pointed out by other researchers, it is possible that differences in findings pertain to the outcome measure used in a study (e.g., Takeuchi et al., 2007). Possibly, as other researchers have argued, it may not only be a question of frequency of strategy use, but also an ability to flexibly adapt one's strategy use to a given situation (cf. Cohen, 1998; Gu, 2002; Takeuchi et al., 2007). The differences in findings may also be explained by differences in age and gender distributions between the studies' samples. Our study included students at a generally lower proficiency level (i.e., beginner-level students) than the above-mentioned studies, which may also partly explain differences in findings; in other words, different stages in the learning process may call for different strategies.

This study has certain limitations. Although the study sample reflected the characteristics of the student population as a whole, the response rate for the web-based survey was relatively low. The generalizability of the findings is therefore limited. In addition, based on low Cronbach's alpha coefficients, memory and affective strategies were excluded from the binary logistic regression model, and therefore it is unclear to what extent these LLS categories affected FL achievement. In addition, the taxonomy proposed by Oxford (1990) and used in this study suffers the drawback of having a certain conceptual overlap across the LLS categories, something which has been recognized by its author (Oxford, 2017). Furthermore, in this study, achievement was operationalized as obtaining a grade A, meaning that we do not know what kind of LLS use increases the likelihood of, for example, obtaining a passing grade. Future studies could use other cut-off points for achievement or use other outcome measurements that are relevant to students. Lastly, the study is limited to quantitative and self-reported data. It is impossible to know to what extent students' self-reported behavior reflects actual behavior. Future studies could adopt qualitative methods, including for example observation and interview methods, to gain further insights into the study and LLS used by online students.

The study has certain implications for teaching which relate to the link between LLS use and study performance. It was found that while metacognitive strategies were the most frequently used, their use did not predict achievement. On the other hand, cognitive strategies were less frequently used, but their use was the strongest predictor of achievement. These findings would need to be replicated before formulating definitive pedagogical implications (on the importance

of replication studies in SLA, see, e.g., Porte & McManus, 2019), but the study indicates that students could be helped by increasingly using cognitive LLS when studying FLs online.

To conclude, the study contributes insights into adult FL students' learning behaviors in an online learning context and shows how these relate to FL achievement in an online formal learning context—a frequent learning context in the wake of the pandemic.

Disclosure Statement

The authors have no competing interests to declare.

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