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The Role of Metacognitive Strategies Training in Foreign Language Learning: A Meta-Analysis Study

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ABSTRACT

Although learning a new language and acquiring a native language require the use of similar skills, the processes of learning a first and a second language are quite different from each other. Planning, monitoring and evaluation, which constitute the three processes of meta-cognitive strategies, ensure that the learner is active throughout the learning process. Using metacognitive strategies in foreign language education positively affects students' acquisition of language skills. While studies have examined the impact of metacognitive strategy training on foreign language learning, no comprehensive analysis currently exists to assess its overall effectiveness across these studies. In this study, research articles investigating the effect of metacognitive strategies training on students' foreign language learning in Turkey and across the world were compiled using meta-analysis method. The results of the analysis showed that metacognition strategies training had a strong effect on students' foreign language learning. As a result of the subgroup analysis, no significant difference was found between the effect sizes by language skills and study group. Within the scope of the research, it was suggested that students should be given training in metacognitive strategies while teaching a foreign language, that future studies should be conducted to examine the effects of metacognitive strategies training on speaking skills, and that future studies should include primary, secondary and high school students as samples.

Yabancı Dil Eğitiminde Üstbilişsel Stratejileri Eğitiminin Rolü: Bir Meta-analiz Çalışması

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ÖZET

Yeni bir dil öğrenilirken ana dil ile benzer beceriler kazanılsa da birinci ve ikinci dilin öğrenilme süreçleri birbirinden oldukça farklıdır. Birey ilk dili ailesinden ve yakın çevresinden doğal bir süreçte edinirken ikinci dili kendi iradesi ve çabasıyla öğrenir. Meta-bilişsel stratejilerin üç sürecini oluşturan planlama, izleme ve değerlendirme öğrenenin süreç boyunca aktif olmasını sağlamaktadır. Yabancı dil eğitiminde üst biliş stratejilerini kullanmak öğrencilerin dil becerilerini kazanmasını olumlu yönde etkilemektedir. Alanyazında üst biliş stratejileri eğitiminin öğrencilerin yabancı dili öğrenmesindeki etkisini inceleyen bir dizi araştırma yapılmıştır ancak tüm bu araştırmaları kapsayan ve strateji eğitiminin öğrencilerin yabancı dil öğrenimine etkisinin ne düzeyde olduğunu tespit eden bir çalışmaya rastlanamamıştır. Bu araştırmada Türkiye'de ve dünyada üst biliş stratejileri eğitiminin öğrencilerin yabancı dil öğrenmesine etkisini inceleyen çalışmalar meta-analiz yöntemiyle bir araya getirilmiştir. Yapılan analiz sonucunda üst biliş stratejileri eğitiminin öğrencilerin yabancı dil öğrenmesinde geniş düzeyde etkiye sahip olduğu görülmüştür. Yapılan alt grup analizleri sonucunda, dil becerilerine ve çalışma grubuna göre etki büyüklükleri arasında anlamlı farklılık tespit edilememiştir. Araştırma kapsamında yabancı dil eğitiminde meta bilişsel stratejilerin kullanılması, gelecekte meta biliş stratejileri eğitiminin konuşma becerileri üzerindeki etkisini inceleyen çalışmalar yapılması, gelecekte örneklem olarak ilkokul, ortaokul ve lise öğrencilerini içeren çalışmaların yapılması önerisinde bulunulmuştur.

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INTRODUCTION

Improving language skills has become a necessity rather than an option in order to keep up with the complex conditions imposed by time and to benefit from ıntercultural interaction (Ateş, 2023; Deniz & Çekici, 2023). Learning a foreign language refers to the process in which an individual makes sense of and internalizes another language after they acquire their mother tongue. Although similar skills are acquired while learning a new language, learning processes of the first and second languages differ from each other. An individual learns a second language after they start speaking and absorb information; in other words, is conscious while learning the second language (Suryantari, 2018). Being conscious in this process provides the opportunity to direct thoughts and produce solutions when faced with problems. Metacognition strategies, which allow individuals to be aware of the thinking process, are among the skills that should be possessed in a successful foreign language education (Alamri, 2019). According to Paris et al. (1983), metacognition skills constitute one of the important reasons for the differences among students' achievement levels while learning a language (Chon & Shin, 2019)

The concept of metacognition, first used by Flavell (1979), refers to being aware of and controlling one's own cognitive process, in other words, thinking about their thoughts. According to Flavell (1979), this process occurs in two stages: (1) metacognitive knowledge, and (2) metacognitive control. While metacognitive knowledge includes the knowledge that an individual has about metacognition,metacognitive control includes the organizing and directing the individual's thinking process. An individual with metacognitive skills has awareness of their thoughts, can direct and organize thoughts in line with a specific purpose. Combining metacognitive knowledge and metacognitive control process has led to the emergence of concept of metacognitive strategies. Metacognitive strategies are related to how a person thinks and learns (Ashman & Conway, 1993 as cited in Batang, 2015). These strategies are considered as high-level executive skills that utilize knowledge about cognitive processes and constitute an attempt to organize one's own learning through planning, monitoring and evaluation (Zhang & Seepho, 2013).

Metacognitive strategies are highly effective in helping individuals to be successful throughout their education and to acquire new skills. As Devin (1993) states, a successful student has sufficient knowledge about the nature of the cognitive task and metacognitive knowledge about which strategy to use to achieve cognitive goals (Karbalaei, 2011). O'Malley (1985) emphasizes the importance of strategy use by stating that students without metacognitive strategies essentially do not have the opportunity to review their progress, achievements and future situations (Coşkun, 2010). Students who lack the use of metacognitive strategies are not aware of their success or failure because they cannot plan their learning processes.

Metacognitive strategies enable the student to focus, plan, obtain resources, organize, coordinate, and evaluate the construction of L2 knowledge in language learning (Oxford, 2011 as cited in Osuji, 2017). According to Wenden (1998), learners with metacognitive abilities have the following advantages over those who are not aware of the role of metacognition in learning another language they are more strategic learners, their rate of progress in learning is higher, as well as the quality and speed of their cognitive engagement, they are confident in their ability to learn, they do not hesitate to seek help from peers, teachers or parents when necessary, they provide accurate assessments of why they are successful students, they reflect clearly on what went wrong when failure occurs during an activity, their tactics match the learning task and adjustments are made to reflect changing circumstances, they perceive themselves as continuous learners, metacognition enhances and enriches the learning experience, applying metacognitive strategies such as self-awareness and self-monitoring is to develop independent learners who can control their own learning and learn lifelong learning (Papaleontiou-Louca, 2008). 11. Metacognition enables self-monitoring, which is a step-by-step

evaluation process in the learning process. 12. Metacognition develops higher learning and problem solving skills (Damanik, 2019).

Individuals employing metacognitive strategies while learning language skills are aware of the learning process, encounter fewer problems than others, and can produce more effective solutions to the problems they encounter. Students who are less successful in learning a language sometimes use less strategies than others and do not know exactly which strategy to use where and how (Zhang & Guo, 2019). Studies show that better readers also have more metacognitive strategy knowledge and they are better strategy users (Batang, 2015). There are a number of studies showing that using metacognitive strategies improves individuals' reading (Çubukçu, 2008; Dabarera, Renandya, & Zhang, 2014), listening (Dousti & Abolfathiasl, 2013; Selamat & Sidhu, 2012;), writing (Pitenoee et al., 2017), and vocabulary acquisition (Damanik, 2019; Mahdavi, 2014;) skills. Although there are different studies examining the role of metacognitive strategies in students' language learning skills, no study in the literature that combines these studies and reaches a generalizable conclusion was found. This study determines to what extent metacognitive strategies are effective in students' foreign language learning. The problem statement and sub-problems of the research were as follows:

Research questions: To what extent does metacognitive strategies training in second language learning play a role in students' acquisition of language skills?

1. Does the effect of metacognitive strategies training in foreign language learning differ significantly by language skills?

2. Does the effect of metacognitive strategies training in foreign language learning differ significantly by study groups?

METHOD

Many studies have examined the effect of metacognitive strategies training on students' language learning skills. This study aimed to determine the effect level of metacognitive strategy training on students' acquisition of language skills, and the sources obtained as a result of the literature review were compiled using the meta-analysis method. Meta-analysis is the grouping of similar studies on a subject, theme or field of study under certain criteria and interpreting the quantitative findings of these studies by combining them (Dinçer, 2014).

Table 1 shows the descriptive statistical values of the studies included in the meta-analysis.

Table 1.

The Descriptive Statistical Values of the Studies Included in the Meta-Analysis

		Frequency (f)	**Percent (%)**
Publication Year	2000-2010	3	14.28%
	2010-2015	11	52.38%
	2016-2020	7	33.33%
Publication Type	Thesis	1	4.76%
	Article	20	95.23%
Educational Level	Primary school	1	4.76%
	Middle school	2	9.52%
	Secondary School	-	-
	University	18	85.71%

	1-3 weeks	1	4.76%
	3-5 weeks	6	28.57%
Implementation	6-8 weeks	6	28.57%
Period	8-10 weeks	2	9.52%
	More than10 weeks	5	23.80%
	Unspecified	1	4.76%
	Reading	11	52.38%
	Listening	7	33.33%
Language Skill	Speaking	-	-
	Writing	2	9.52%
	Vocabulary	1	4.76%

As seen in Table 1, studies examining the effect of metacognitive strategies education on language learning skills were mostly conducted between 2010 and 2015. The least studies were carried out between 2000 and 2010. A significant part of these studies were performed with university students (85%). The duration of the studies varied between 3–5 (28%) and 6–8 weeks (28%). The shortest implementation period was 1–3 weeks (4%) and the longest was more than 10 weeks (23%). The implementation period was not specified in 4% of the studies. It was found that most of these studies (52%) aimed to improve reading skills, and no study aimed to improve speaking (0%) skills using metacognitive strategies.

Research Instruments and Processes

A five-step process was followed to conduct a comprehensive review of the studies examining the effect of metacognitive strategies training in second language learning. First, in the first review, it was seen that the first study on metacognition strategies training was published in 2009. Google Scholar, CoHE, National Thesis Centre (YÖK), ERIC, Proquest, WOS databases were searched to find studies published in peer-reviewed journals between 2009 and 2020. In the review process, the words "metacognition", "metacognition strategies training", "metacognition strategies training and reading", "metacognition strategies and speaking", "metacognition strategies and writing", "metacognition strategies and listening" and their Turkish equivalence were used as keywords. At the end of the research, 160 studies were reached. In order to include these studies in the meta-analysis, they were checked in term of these criteria: (a) whether they included metacognitive strategy training in second language learning, and b) whether they used sample size, arithmetic mean, standard deviation, and *t* or *p* values in their analyses. The reason for determining these criteria is the necessity of having these data in order to conduct meta-analysis (Sur, 2022). Studies meeting these criteria were recorded in the coding key. The total sample size of the studies included in the meta-analysis consisted of 1,415 participants. The review showed that 25 studies met the criteria for inclusion in the meta-analysis and 32 data from 25 studies were included in the analysis. Some studies had to take two or more data from each study. Since Pei and Suwanthep (2019) worked with more than one group, 2 data from their study, 3 data from the study of Mehrdad, Ahghar, and Ahghar (2012), and because Nguyen and Trinh (2011) and Takallou (2011) provided different metacognition strategy training to the groups, more than one data from their studies were included in the meta-analysis. However, four studies were found to cause publication bias during the analysis process, therefore, five data from these studies had to be excluded from the analysis. A total of 27 data obtained from 21 studies were used in the meta-analysis to determine the role of metacognitive strategies training in students' language learning skills.

Data Analysis

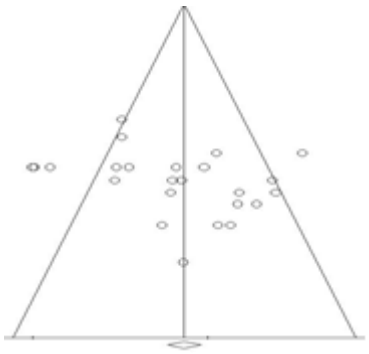
Code lists were created in order to ensure the reliability of the study. These lists included the name of the study, sample sizes, arithmetic mean and standard deviation values, type of the study, and

the language skill that was aimed to be developed. While creating code lists, a second researcher was consulted and two different charts were prepared. Three studies that led to disagreement between the researchers were re-examined and recorded in the coding key when they reached a consensus.

The publication bias of this meta-analysis study was examined using a funnel scatter plot, Orwin's Safe N calculation, and Egger's regression test. The funnel scatter plot showing the publication bias of the studies examining the effect of metacognitive strategies training on students' language learning is shown in Figure 1:

Figure 1.

Funnel Scatter Plot of the Effect of Metacognitive Strategies Training on Students' Foreign Language Learning Skills



When there is no publication bias, studies are symmetrically distributed on both sides of the overall effect size vertical line, whereas if there is publication bias, the distribution is concentrated on one side of the line. In addition, it is possible to argue that there is a potential publication bias if the studies are concentrated in the lower corner of the triangle (Borenstein et al., 2009). In this study, the overall effect size is distributed symmetrically on both sides of the vertical line.

Table 2.

Results of Publication Bias Analysis

Bias Status	
z value for the reviewed studies	17,702
p-value for the reviewed studies	0.00
Alpha	0.05
Direction	2
z value for Alpha	1.95
The number of reviewed studies	27
FSN	2176
Tau	0.22
z Value for Tau	1.66
p value (tailed)	0.04
p value (tailed)	0.09
Standard error	2.24

95% lower limit (1-tailed)	-1.34
95% upper limit (1-tailed)	7.91
t value	1.46
sd	25
p value (tailed)	0.07
p value (tailed)	0.15

Orwin's Safe N calculation is used to calculate the number of studies that may be missing in meta- analysis (Borenstein et al., 2009). As a result of the analysis, the number of studies required to eliminate significance was calculated as 2,176. It was impossible to reach 2,176 studies examining the effect of metacognition strategies in foreign language education in order to eliminate significance ($p > .05$). The funnel plot and Orwin's Safe N calculation showed no publication bias in the study. In addition, the result of Egger's test was not significant ($p > .05$), which also confirmed that there was no publication bias in the meta-analysis.

In the analysis of the data, first, it should be decided which standard scores will be converted from the values obtained from the studies. The values collected from the difference-based studies are used by transforming them into one of the Cohen's d, Hedges' g and Glass Δ effect size values (Borenstein et al., 2009). Among these values, the Cohen's d formula is more appropriate for studies with a sample size of larger than 20 (Lipsey & Wilson, 2001 as cited in Çırak et. al., 2018). The sample size of 21 studies analyzed in this study was more than 20. Therefore, the values collected from the studies were converted into Cohen's d value and then used. The effect size was calculated using Cohen's d coefficient, the standardized mean difference method. According to this method, -.15 ≤ effect size (g or d) < .15 is insignificant, .15 ≤ effect size (g or d) < .40 is small, .40 ≤ effect size (g or d) < .75 is moderate, .75 ≤ effect size (g or d) < 1.10 is large, 1.10 ≤ effect size (g or d) < 1.45 is very large, and 1.45 ≤ effect size (g or d) is excellent (Dinçer, 2014: 33).

Table 3.

Heterogeneity of the Studies Included in the Meta-Analysis

Model	*n*	Mean Effect Size	*z*	Standard error	For Effect size 95% Confidence Interval Lower Limit	Upper Limit	*Q*	sd	I2	*p*
Stable	27	0.86	17.43	0.05	0.76	0.96	119.5	26	78.2	0.00

A heterogeneity test was conducted to calculate the overall effect and to select the model that would be used. The *Q* value and *p* value were 240.504 and 0.00, respectively. Since the *Q* value was 40.11 in the $\chi 2$ critical value range table for 26 degrees of freedom (df) and 95% significance level, it was concluded that the studies were heterogeneous. In the I2 analysis, the fact that the values are 25% and around, 50% and around and 75% and around indicate a low-, a medium-, and a high-level of heterogeneity, respectively. The I2 value, which was determined as 78% in the current study, indicates a high level of heterogeneity (Cooper et al., 2009). Since the effect sizes were distributed heterogeneously, the random effects model was used as the analysis model, and the overall effect size was calculated as 0.90 within the limits of 0.69 and 0.96 (the overall effect size was calculated as 0.90 –within the limits of 0.76 and 0.96 based on the fixed-effect model).

FINDINGS

The forest plot showing the effect of metacognition strategies training on students' language learning skills is presented in Figure 2 and the findings regarding the effect size values are presented in Table 4:

Figure 2.

Forest Plot of the Effect of Metacognitive Strategies Training on Students'

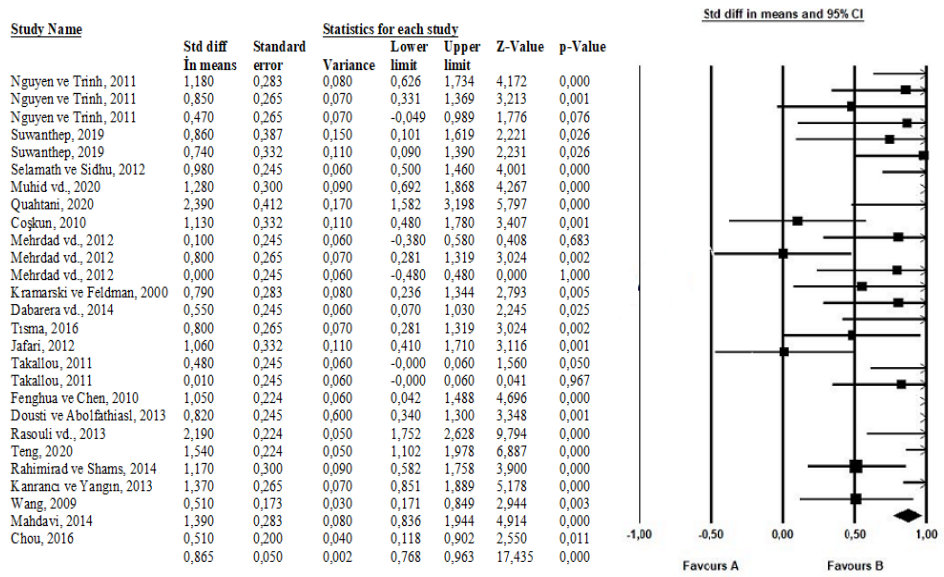


Table 4.

The Effect of Metacognitive Strategies Training on Students' Language Learning Skills

	S	*n*	ES_{mean}	*p*	*z*	S_{error}	ES_{lower}	ES_{upper}
Gender	27	1,415	0.90	0.00	8.41	0.10	0.69	1.11

Looking at Table 4 and the forest plot, it is seen that the effect size value of metacognition strategies training on students' acquiring language skills is (0.90) with a standard error of (0.10). When the calculated effect value is evaluated together with the forest plot, metacognition strategy training has a large effect on students' acquiring language skills.

Within the scope of the research, groups were compared to determine the source of heterogeneity. The extent to which the students were affected by metacognitive strategy training by language skills (listening, reading, speaking, writing and vocabulary teaching) and the study group was examined using Analogue ANOVA analysis. The results are present in Table 5:

Table 5.

Subgroup Analysis Results According to Random Effects Model

	Variable	*N*	Effect Size	St. Deviation	95% confidence interval Lower Limit	95% confidence interval Upper Limit	sd	.05 Confidence Level χ	Q_S	*p*
	Reading	16	0.659	0.066	0.530-0.788					
	Listening	8	1.060	0.090	0.883-1.237		3	10.16	7.102	0.6
Language	Writing	2	1.295	0.158	0.985-1.605					

Skill	Vocabulary	1	1.390	0.283	0.836-1.944				
Study Group	Primary school	1	0,550	0,245	0,070-1,030	2	8.68	2.38	0.3
	Middle school	2	1.089	0.290	0.520-1.657				
	Secondary School	-	-	-	-				
	University	24	-0.910	0.119	0.677-1.143				

Table 5 shows that the effect sizes by language skills were 0.659 for reading, 1.060 for listening, 1.295 for writing, and 1.390 for vocabulary. However, the variance between studies by language skills was not statistically significant ($p > .05$). The effect sizes were determined as 0.550 for primary school, 1.089 for secondary school, and 0.910 for university by the study groups. The variance between studies by the study groups was not statistically significant ($p > .05$).

CONCLUSION and DISCUSSION

This study investigated the effect of metacognition strategies on students' acquiring language skills in foreign language education using the meta-analysis method. The result of the analysis carried out with 27 data obtained from 21 studies showed that metacognitive strategies training had a large effect on students' language learning skills. In addition, the strategy training given in the language education process has a positive effect on students' strategy use and learning. Individuals who learn metacognitive strategies and begin to use them effectively gain significant advantages over those who cannot use these strategies while learning a new language.

As Vandergrift states, students with high metacognitive awareness find the best ways to apply and reinforce what they have learned and perform much better than others in processing and retaining new information (Ghapanchi & Taheryan, 2012). A person may have sufficient knowledge of vocabulary and grammar; however, if they cannot use them appropriately at the right time and place, they cannot gain from what they have learned. It is the metacognitive knowledge that enables learners to adapt what they have learned to new situations. According to Oxford and Crookall (1988), the use of appropriate strategies improves students' independence, self-direction and learner autonomy, which are crucial for students to sustain their lifelong learning efforts. This allows them to be responsible for their own learning (Nguyen & Trinh, 2011: 16). Planning, monitoring and evaluation, which constitute the three processes of meta-cognitive strategies, prevent the learning process from occurring spontaneously and ensure that the learner is active throughout the process. The use of strategies in learning a new language allows one to set goals, identify difficulties in learning reading, listening, speaking and writing skills, assess the extent to which skills have been learned, select appropriate methods, check their suitability and modify these methods when necessary, and correct mistakes. Individuals who take responsibility for their own learning can manage the learning process, process and store the information they have learned through repetition and practice.

One who is able to use the metacognition strategy makes connections between their previous knowledge and new knowledge while learning a second language and repeats the information until they learn it. Repetition is the most effective way of learning knowledge and making it permanent. Combining new knowledge with previously acquired knowledge and synthesizing it helps learners understand and make sense of it. When learning a new language, comprehension and interpretation activities ensure that information is retrieved from long memory when necessary. Metacognitive strategies play an important role not only in making sense of the knowledge but also in monitoring the

learner's own learning. A student who has a strategy can plan and organize the learning process while learning a new language, monitor whether the processes are running regularly, change the applications that do not yield results when necessary, and keep their mind awake while performing these processes (Cemiloğlu & Ogur, 2016). In this case, it is seen that the use of strategy is an important factor in overcoming the difficulties that students may encounter in the foreign language learning process and in facilitating the learning process.

Within the scope of this study, it was examined whether the studies examining the effect of metacognitive strategies training on students' foreign language learning showed significant differences by language skills and research group. Accordingly, a homogeneity test was conducted to determine whether there was a significant difference between effect sizes by language skills, and it was found that the difference between groups was not significant (QS = 7.10, p > .05). Similarly, a homogeneity test was performed to determine whether there was a significant difference between the effect sizes by the study groups, and no significant difference was found (QS = 2.38, p > .05). Most of the studies (f = 24) examining the effect of metacognitive strategies training on students' ability to learn a foreign language were conducted with university students. The lack of studies examining the role of metacognition strategy training in high school students' foreign language learning and the low number of studies investigating the role of metacognition strategy training in primary and secondary school students' foreign language learning are important gaps in the literature.

SUGGESTIONS

1. Providing students with metacognitive strategies training while teaching them foreign language education is extremely necessary for the efficiency of the learning process.

2. The effects of metacognition strategies training on reading, listening and writing skills have been examined in the studies; however, no study addressing the effect of this training on speaking skills was found. In the future, studies examining the effect of metacognitive strategies training on speaking skills should be conducted.

3. Studies examining the effect of metacognitive strategies training on students' foreign language learning selected only university students for the study groups; therefore, future studies including primary, middle and high school students as samples should be conducted.

Ethical Statement

Ethics committee approval was not obtained because data from previously published studies were used in the study. Ethical principles and rules were followed throughout the study. The studies from which the data received within the scope of meta-analysis are shown in Appendix 1.

Author Contributions
Research Design (CRediT 1) Author 1 (%100)
Data Collection (CRediT 2) Author 1 (%00)
Research - Data analysis - Validation (CRediT 3-4-6-11) Author 1 (%00)
Writing the Article (CRediT 12-13) Author 1 (%00)
Revision and Improvement of the Text (CRediT 14)

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