THE EFFECT OF THE LANGUAGE OF THOUGHT ON PRIVATE SPEECH PRODUCTION

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Abstract

Investigations into the application of foreign language to mediate psychological activity have produced contradictory results. The present paper reports two experiments designed to examine the influence of L1 and L2 on cognitive regulation and private speech production. Results indicate the important role that L1 plays in cognitive reasoning of the participants. Advanced participants, however, had significantly better performance when they used L2 for mental activity. The language used for self-regulation though, did not seem to relate to the amount of private speech produced. More proficient participants, on the other hand, seemed to produce qualitatively different kinds of L2 private speech. These findings indicate that it is necessary to consider quality, not just quantity, when studying constructs such as cognitive regulation, private speech production and the relations between them. In addition, findings have important practical implications for both language learners and instructors in creating more constructive language learning environments.

Keywords: cognitive regulation, private speech, foreign language, sociocultural theory.

Sociocultural theory (SCT) was introduced into the field of second language acquisition (SLA) during the 1990s. SCT presented an ideology of learning which incorporates both the cognitive and social perspectives. In other words, human learning is believed to be a continuous reciprocal interaction of cognitive, behavioral and environmental factors (Ehrich, 2006). Hence, SCT provides a new ideology on the process of SLA, in which learners are prompted or required to think as well as speak in the target language, that is to say, language and thought should be closely connected with each other. The root for this connection lies in social communicative activities. The main concepts within the sociocultural framework include mediation, regulation, internalization, private speech, and the activity theory.

Vygotsky (1986) defined mediation as the setting up of connections in the brain from outside (1997, p.55, cited in Lantolf & Thorne, 2006, p. 60). Lantolf and Thorne (2006) considered mediation as the most important concept of SCT. All mental functioning is viewed as a mediated process which develops from external social interaction and goes ahead to internal psychological activity. Higher level cultural tools, such as artifacts, are the mediators in this process. Language, as one form of symbolic artifact, is believed to be the primary means of mediation (Lantolf, 2000; Vygotsky, 1986).

Another important theoretical construct proposed in SCT research is internalization. Internalization is defined as the process by which humans bring externally and socio-culturally formed mediating artifacts (such as language) into the act of thinking in order to gain control mental functions (Lantolf & Thorne, 2006). In addition, Ohta (2001) defined internalization as the process through which cultural artifacts take on a psychological function moving from interpsychological (between people) into the intrapsychological (within the individual) planes, through mechanisms, such as imitation. Signs, and in particular language, allow for the idealization of objective activity in the material world and for the objectification of subjective activity in the mental world (Lantolf & Thorne, 2006, p. 154).

In addition, social interaction in SCT is not only viewed as a two-way interaction, but also as a one-way interaction. In other words, a person may talk to himself within the learning process, hence the term private speech. Private speech is "typically defined, in contrast to social speech, as speech addressed to the self (not to others) for the purpose of self-regulation (rather than communication)" (Diaz, 1992, p. 62). In other words, when an individual uses private speech in verbal communication, s/he is not talking to another individual, but trying to control his/her own thoughts in that the speech helps mentally process task demands. For a researcher, this type of speech provides clues to such mental operations as focusing attention, planning, monitoring, self-motivating, pacing motor activity, etc., while performing specific tasks.

Studies on private speech (for example, Lantolf, 1997, 2003; Borer, 2006) led scholars to conclude that this phenomenon can in fact help in the L2 acquisition

process and that without private speech, language acquisition is less likely to occur. In fact, SCT considers the development of speech through both social communication and inner speech (higher level verbal thought), by which learners mediate and regulate their activities through their thoughts. The thoughts are in turn mediated by the semiotics of inner speech or what we have termed "language of thought". Of course, this is not to say that thinking does not occur without language, but rather that it is mediated by it and thus develops to a much higher level of complexity.

Yet, one complex issue in SCT research, according to Lantolf (2006), is whether or not L2 can be applied by late adult language learners to mediate the psychological activity. This line of research has produced contradictory results. Working in an EFL context, for instance, Ushakova (1994) found that L2 was just used for social communication and was not used to mediate thinking. However, other studies, mainly conducted in ESL contexts, led to the conclusion that when faced with difficulties in a task, language learners externalize their private speech in L2 to mediate and organize their speech, (Appel & Lantolf, 1994; Lantolf & Frawley, 1985; McCafferty, 1994; Centeno-Cortes & Jimemez-Jimenez, 2004). In general, it is suggested that due to the psychological status of the L2, its speakers experience problems sustaining L2 private speech, while successfully completing the assigned tasks (Lantolf, 2006). However, as observed by Lantolf (2006):

One of the shortcomings of the existing research is that none of the studies to date established conditions whereby the same speakers are intentionally encouraged to use their L1 and L2 in separate tasks. To answer the question of L2 mediation of mental activity with confidence, procedures must be incorporated into future research that promotes this possibility. (p. 74)

In line with the issues mentioned, the present study was an attempt to examine experimentally how different languages (L1 or L2) can act as mediators for mental activity. To this end, participants were intentionally encouraged to use L1 and L2 in different tasks to see whether they were able to successfully complete the tasks. The study also examined the possible relationship between the language of thought and the amount of adult foreign language private speech production across proficiency levels.

The present study tries to explore the following questions: First, how do intermediate and advanced foreign language learners complete the problem-solving task when different languages (L1 or L2) are deployed as mediators of mental activity? To be more specific, the questions raised here are: Does the use of L2 (English) for cognitive regulation lead to successful task completion? and, Does the use of the participant's L1 (Persian) for cognitive regulation lead to successful task completion?

Secondly, the present study also tries to clarify if there is a significant difference in the successful task completion between the L1 and L2 task conditions at the intermediate level, and if there is a significant difference in the successful task completion between the L1 and L2

task conditions at the advanced level.

Thirdly, the present study explores whether using different languages (L1 or L2) as mediators for mental activity influences the amount of private speech externalized by adult foreign language learners. More specifically, it tries to find out the total number of the episodes of L1 private speech when participants are instructed to use L1 for cognitive regulation, and to find out the total number of the episodes of L2 private speech when participants are instructed to use L2 for cognitive regulation, and whether the participants produce qualitatively different types of private speech in terms of content.

METHOD
Participants
Sixty adults from the community of students and instructors of two major universities in Shiraz (Farhangian and Shiraz Universities) volunteered to participate in this study. The participants were native speakers of Persian who had learned English solely in the institutional settings of the EFL context of Iran, with no experience of living or studying in any English speaking country.

Materials
The nature of the task that participants were dealing with was solving riddles. These context-based riddles were basically metaphorical statements that called for a holistic understanding of the relations between sentences in order to come up with the correct answer. Reading and repeating as well as manipulating the information and self-explanation were expected to be some of the main activities involved in understanding sentential relationships. Riddles were presented in two booklets, one for each condition. All participants were audio-recorded, while performing the assigned tasks. They were allowed to consult their monolingual or bilingual (English to Persian) dictionaries in this process. Participants individually sat for the test for 30 minutes.

Procedure
Data were gathered with each participant sitting alone in a private room provided with a highly sensitive MP3 voice recorder. Participants were given a booklet. At the beginning of the session, each participant was instructed to read the first page of the booklet, where the experiment was described. Two conditions were described in the booklet (appendix A):

1. L1 for cognitive regulation: Participants were told that they were presented with a number of riddles in English and that they should use L1 (Persian) in dealing with the task. They were told to concentrate on the task and use Persian in thinking, while trying to come up with the correct answer.
2. L2 for cognitive regulation: Participants were told that they were presented with a number of riddles in English and that they should use L2

(English) in dealing with the task. They were told to concentrate on the task and use English in thinking, while trying to come up with the correct answer.

Results from data transcription made it clear that the researcher was successful in the intentional inducement of L1 and L2 in dealing with different tasks.

Data analysis
Following the sociocultural framework, according to Sonmez (2011), the data analysis procedure includes transcription, organization, coding, and interpretive analysis. The data analysis procedure in the present study, therefore, followed the same systematic procedure. As the first step, collected data (audio files in MP3 format) were transcribed following the conversation analysis (CA) conventions (appendix B). Utterance was selected as the unit of analysis, following the sociocultural theoretical approach towards data analysis (McCafferty, 2000; 2002). Utterance is usually defined as a sequence of words within a single person's turn at talk that falls under a single intonation contour. Utterances may be words, phrases or sentences or any form of speech (Feigenbaum, 1992; Richards and Schmidt, 2002).

Within the coding process, the first step was to index the language of the utterances based on whether it was English or Persian. This was done by indexing L1 for Persian and L2 for English in the coding process. Secondly, the identified instances of private speech were coded in terms of form, content, and function based on the private speech coding manual (Winsler, Fernyhough, McClaren & Way, 2005) as well as earlier literature on private speech (Ohta, 2002; Sonmez, 2011). This was practiced through a coding scheme developed by the researchers based on the previous literature.

The qualitative analysis mentioned above was complemented by a frequency count of the utterances. In other words, the researchers counted the number of the episodes of private speech per condition. The amount of private speech produced by participants following each condition was determined first. Following this, the relationship between the language of the task and successful task completion, language of the task,

proficiency level and the amount of private speech production were analyzed using proper statistical analyses.

Design
The present study adopted a repeated measure design, in which all treatments were given to different individuals in different orders. According to Mackey and Gass (2005), the basic characteristic of a repeated measures design (also known as within-group design) is that multiple measurements come from each participant (p. 150).

RESULTS AND DISCUSSION
The results are presented in three parts. First, the role of L1 and L2 in cognitive regulation of the participants is discussed. This is examined through analyzing the relationship between the language of thought and successful task completion. Second, a comparison is made between the language of thought and the frequency of the private speech produced. Finally, the content of the private speech is qualitatively analyzed and discussed with regard to four conditions (advanced learners using L1 for cognitive regulation, advanced learners using L2 for cognitive regulation, intermediate learners using L1 for cognitive regulation, and intermediate learners using L2 for cognitive regulation).

Language of thought and task completion
Table 1 shows the number of correct responses provided by the participants regarding each language condition. It can be seen that the use of L1 for mental functioning has led to relatively more correct responses.

Table1. Language of thought and successful task completion

Condition	Number of correct responses
L1 advanced	168
L1 intermediate	187
L2 advanced	114
L2 intermediate	89

Table 2. Paired samples tests to compare participants' Use of L1 or L2 for mental activity

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Dev	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	L1inter-L2inter	2.03333	.96431	.96431	1.67326	2.39341	11.549	29	.000
Pair 2	L1advncd - L2advncd	.76667	1.19434	1.19434	.320694	1.21264	3.516	29	.001

To make sure that the difference in successful task completion is statistically significant, two matched t-tests were run separately for intermediate and advanced groups with regard to each language condition. The

analyses revealed that both intermediate and advanced students had significantly better performance solving the riddles when they used L1 in their mental activity.

As the Table 2 shows, the resulting significance

Table 3. Independent samples tests to compare participants using L1 or L2 for mental activity

Levene's Test for Equality of Variances		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
									95% Confidence Interval of the Difference	
Score 1	Equal variances assumed	3.296	.075	.883	58	.381	.33333	.37763	-.42258	1.08924
	Equal variances not assumed			.883	53.800	.381	.33333	.37763	-.42384	1.09050
Score 2	Equal variances assumed	.000	.983	-2.558	58	.013	-.93333	.36494	-1.66384	-.20283-
	Equal variances not assumed			-2.558	57.816	.013	-.93333	.36494	-1.66389	.20278

levels are 0.00 and 0.001, which are both smaller than .05. Therefore, the null hypothesis was rejected, suggesting the differential effects of applying L1 and L2 as mediators of mental activity on successful task completion among both intermediate and advanced participants. In other words, both intermediate and advanced participants who were led to use L1 in thinking were more successful in coming up with correct answers than those who were led to apply L2 for mental functioning.

Subsequently, in order to compare the performance of intermediate participants with that of the advanced ones, two independent sample t-tests were also run (see Table 3).

As shown in Table 4, Frequency counts seem to suggest that the language of thought does not relate to the amount of the private speech that participants produced, and there is no consistent influence between the two proficiency levels. However, we limit the analysis to

frequency counts in this section, as the use of inferential statistics is discouraged in analyzing private speech (Frawley & Lantolf, 1985; Diaz & Berk, 1992).

Table 4. Language of thought and the frequency of private speech

Condition	Number of participants	Frequency of private speech
L1 advanced	30	327
L1 intermediate	30	474
L2 advanced	30	379
L2 intermediate	30	447

The content of the private speech produced:
It is important to qualitatively analyze the kinds of the produced private speech to see whether there are any differences among the four conditions. Table 5 presents

Table 5. Types of private speech produced in four conditions

Content	L1 advanced	L2 advanced	L1 intermediate	L2 intermediate
1. Reading aloud	21 (3.9%)	173 (26.65%)	38 (5.98%)	229 (33.72%)
2. Literal translation	187 (34.95%)	2 (0.3%)	218 (34.33%)	3 (0.44%)
3. Repetition	15 (2.80 %)	55 (8.47%)	108 (17%)	210 (30.92%)
4. Self directed questions	73 (13.64 %)	104 (16.2%)	56 (8.81%)	31 (4.56%)
5. Self explanations	124 (23.17%)	174 (26.81%)	78 (12.28%)	66 (9.72%)
6. Reviwing	77 (14.39%)	91 (14.02%)	75 (11.81%)	63 (9.27%)
7. Affective markers	14 (2.61%)	19 (2.92%)	11 (1.7%)	6 (0.88%)
8. Fillers	19 (3.55%)	27 (4.16%)	14 (2.2%)37	12 (1.76%)
9. Metalanguage	5 (.93%)	4 (0.61%)	(5.82%)	59 (8.68%)
Total	535	649	635	679

Table 6. Chi-Square tests to compare the types of private speech

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1067.497[a]	24	.000
Likelihood Ratio	1243.509	24	.000
Linear-by-Linear Association	16.545	1	.000
N of Valid Cases	2498		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.71.

the results of this analysis. To make a comparison among the four groups with regard to their production of different types of private speech, a chi-square test was run. These results are presented in, as the Table 6 manifests, test results gave a statistical value of 1067.497 with 24 degrees of freedom, which showed that there was a statistically significant difference between the four conditions in terms of the different types of private speech produced. This is to say that participants produced qualitatively different types of private speech in each condition. In the following section, the four conditions are compared through examples of the private speech produced.

Advanced learners using L1 for cognitive activity
Based on the requirements of the task, advanced learners produced a considerable number of private speeches in the form of literal translation in order to come to an understanding of the riddles:
1) Az xoda bozorgtare (.) Az sheitun ham sheituntare. (.) Pooldara MIXANESH faghira DARANESH (.) "It is greater than God(.) and more evil than the devil. (.) The poor HAVE it the rich NEED it(.)"

2) Midoe va rah nemire = hichvaght harf nemizane(.) "Runs and doesn't walk = never talks(.)"
The next noticeable feature of the advanced participants thinking in L1 is the high number of self-explanations they used. What is interesting is that a lot of these self-explanations follow the syntactic rules of Persian, while making use of English Lexicon, as in 4:

3) Hamishe gorosnast? Das bezani(.) hmmm
"Always hungry? If you touch(.) hmmm"

4) End of time and space ke E hast: Surround every place ham aval akharesh E hast dige: Pas mishe the letter E.
"The end of time and space is the letter E: Surround every place too begins and ends with E: So the answer is the letter E."
Reviewing and self-directed questions are the next items occurring most in private speech of advanced students:
5) bebin tu xune chi hast intori?
Is there something like this at home?

Affective markers and fillers occurred less frequently. However, the lowest number of private

speech produced by advanced participants was metalanguage, which is not surprising since these participants were highly competent users of the foreign language. In fact, there were only five cases where these participants resorted to metalanguage:

6) TART dige yani chi xoda?
"For God's sake what does TART mean?"

Advanced learners using L2 for cognitive activity
Compared with the previous section and in an attempt to comply with the instructions of the task, advanced learners in this section have made more use of reading aloud than literal translation to gain control over the task. In some cases, they repeated the questions several times to come to more accurate comprehension:
7. (Reads the question) what comes once in a minute, twice in a moment but not once in a thousand years? (.) What comes once in a minute (.) twice in a moment (.) but not once in a thousand years? Mmm! once in a minute (.) twice in a moment (.) but not once in a thousand years?

Like their performance in the L1 condition, these participants mostly engaged in self-explanations, self-directed questions, and reviewing in English. They seemed to have no difficulty conducting their reasoning activity in English. This finding is not congruent with that of Centeno-Cortes and Jimenez (2004). However, this may be attributed to the difference in the nature of the questions these researchers asked as well as the difference between advanced learners of English and Spanish as a foreign language. Moreover, these participants easily uttered fillers and affective markers in English; for example:

8. You take more and you fall behind (.) well! What the hell!

9. Round and round below the ground Ok, Ok, so (.)

Intermediate learners using L1 for cognitive activity
The first noticeable feature of the private speech produced by these participants compared with their more advanced counterparts is the significantly higher numbers of reading aloud, literal translation, and especially repetition. This may not come as a surprise since intermediate students had more difficulty

struggling with the language. The following excerpt is a case in point:

10. (Literally translates the question) Kesi ke dorosesh mikone mifrushatesh. Kesi ke mixare hichvaght estefadash nemikone. Kesi ke estefade mikone nemidune ke hast (.) (Repeats himself) Kesi ke dorosesh mikone mifrushatesh. Kesi ke mixare hichvaght estefadash nemikone. Kesi ke estefade mikone nemidune ke hast (.)

"(Literally translates the question) the person who makes it sells it. The person who buys it never uses it. The person who uses it doesn't know they are (.) (Repeats himself) the person who makes it sells it. The person who buys it never uses it. The person who uses it doesn't know they are (.)"

The intermediate learners' language problem is also manifested in the higher amounts of metalanguage that appeared in their private speech:

11. Snared yani chi dige (.) snared?
    "What does snared mean (.) snared?"

12. Vaghti roast beshe – mani roast (.)
    "When it roasts – Look up roast (.)"

Intermediate learners using L2 for cognitive activity
The task for these participants seemed to be the most challenging. This was manifested in the noticeably higher instances of reading aloud and repetition that appeared in their private speech compared to their advanced counterparts. In addition, they engaged in higher amounts of metalanguage. as some words were unfamiliar to them, and they had to refer to their dictionaries several times. This was also manifest in the affective remarks they made:

13. (Reads aloud) Toss me out of the window you'll find a grieving wife (.) what is to grieve (.) Leave it. It's OVER (.)

However, they produced far less self-explanations and self-directed questions than the advanced participants. In other words, conducting reasoning in English seemed to be a challenging and difficult task for these participants.

CONCLUSION
Existing research on the meditational role of native versus foreign language and how it relates to private speech production is scarce and has come up with unclear findings. The present study attended to a methodological problem with the prior research and established conditions whereby the same foreign language learners were intentionally encouraged to use their L1 and L2 private speech in separate tasks. Results showed that adult foreign language learners (both intermediate and advanced) had significantly better performance on tests

when they applied L1 to mediate their mental activity, and they faced problems when they were prohibited to use L1. This finding can be explained through Anton and Dicamilla's (1998) proposition that the principled use of learners' first language in solving the problems that arise while performing written tasks can improve performance. This is because it can provide scaffolding for tasks which is also advocated in Vygotskian sociocultural theory. Language of thought, however, had no significant impact on the amount of private speech they produced and no consistent influence across the two proficiency levels under study.

A crucial feature of this study was the qualitative analysis of the content of the L2 private speech that was produced. Private speech can be distinguished in terms of qualitatively different types, such as reading aloud, repetition, reviewing, and self-explanations. If we had concentrated solely on the overall amount of private speech in the study, results might have been misleading. In fact, results from the quantitative analyses suggest that different languages mediating mental activity have no influence on the amount of private speech produced. However, further analyses revealed that using L2 for mental functioning made the advanced learners produce qualitatively different types of private speech than their intermediate level counterparts. Thus, it is quite essential to consider quality, not just quantity, when studying constructs, such as cognitive functioning, private speech production, and the relations between them.

Finally, we need to keep in mind that the frequency of the occurrence of private speech may be dependent on many other personal factors, such as different personality types, learning styles, and strategies, as well as the type of the task we ask the learners to do. Future research is needed to consider these issues and attempt to determine the amount of influence of such factors. Intelligence as well as language aptitude, for example, can explain part of the variance among the participants, but it is not clear whether or not it has sufficient explanatory potential for different performance among the participants. The same is true about the long list of affect variables (motivation, attitude, self-esteem, anxiety, willingness to participate, etc.). These personal factors and how they relate to learner involvement in the production of private speech are areas of research which should be considered with regard to both their short-term and long-term influence. It is therefore possible to use other research designs (longitudinal case studies of language classrooms, for instance) to make such attempts possible.

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