Linguistic and Cognitive Factors in Elicited Imitation Tasks: A Study with Mono- and Biliterate Greek-Albanian Bilingual Children

Ifigeneia Dosi, Despina Papadopoulou, and Ianthi Maria Tsimpli

1. Introduction

It is debated what exactly Elicited Imitation Tasks (EITs) measure; more specifically, it is not clear to what extent language ability and working memory capacity are involved. Some researchers note that language abilities are more prevalent in those tasks, since participants focus on the meaning of the sentence in order to retrieve it (DeKeyser, 2003; Ellis, 2005; Erlam, 2006). Furthermore, language proficiency affects task performance (Bley-Vroman & Chaudron, 1994; Munnich, Flynn & Martohardjono, 1994). On the other hand, there is a debate regarding the role of memory in EITs. Some studies argue that the contribution of memory, either working memory (WM) or short-term memory (STM) is critical for accurate performance (Alloway & Gathercole, 2005; Alloway, Gathercole, Willis & Adams, 2004). Others point out the involvement of further cognitive abilities, such as episodic buffer (Baddeley & Wilson, 2002) or metalinguistic awareness (Bialystok 1991). Few studies claim that EITs do not entail any linguistic processing and are based on rote memory capacity (Hamayan, Saegert, & Larudee, 1977), whereas there are also studies which do not find a correlation between EIT and WM tasks (Okura & Lonsdale, 2012). More recent studies demonstrate that both language abilities and cognitive skills are needed in EITs (Riches, 2012; Klem, Melby-Lervåg, Hagtvet, Lyster, Gustafsson & Hulme, 2015). To our knowledge, there are no studies that explored the role of other executive functions (i.e. updating) in the performance on EITs.

Literacy also seems to require executive control and working memory skills (Bialystok 2007; Bialystok & Cummins, 1991; Bialystok, Luk & Kwan, 2005).

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Biliteracy, namely literacy in the bilingual’s both languages, is a rather under-researched area. Some studies have found that biliteracy and/or educational setting enhance the bilinguals’ performance on cognitive tasks (Leikin, Schwartz, & Share, 2009; Marinis, Tsimili & Bongartz, submitted), but also some studies have detected the positive influence of biliteracy on the language as well the cognitive development of bilingual children (Cobo-Lewis, Pearson, Eilers, & Umbel, 2002; Oller & Eilers, 2002).

To address the aforementioned gaps in current literature, the present study aims (a) to explore the contribution of both simple (verbal WM) and more complex cognitive skills (i.e. updating) as well as language ability to performance in Elicited Imitation Tasks and (b) to detect the role of literacy, by examining Greek-Albanian bilingual children.

2. Elicited Imitation Tasks

EITs require imitation and corrected imitation of grammatical and ungrammatical sentences respectively (Munnich et al., 1994). According to Munnich and colleagues (1994) there is a substantial difference between the Grammaticality Judgment Tasks (GJTs) and EITs. The former focus on measurement of the speaker’s knowledge, whereas the latter elicit spoken language. Additionally, EITs depict the speaker’s interlanguage and thus any linguistic deficits. A long discussion has been going on regarding the sort of knowledge (implicit vs. explicit) that EITs test, based on their design (DeKeyser, 2003; Erlam, 2006; Norris & Ortega, 2000)\footnote{This issue will not be discussed any further, since it is beyond the scope of the present study.}. Most of the studies argue that EITs reflect language ability (Ellis, 2005; Erlam, 2006) rather than WM; so even though EIT and verbal WM tasks are correlated, they represent two distinct ways of measuring language processing capacity (MacDonald & Christiansen, 2002).

Even so, there is still dispute in literature about whether EITs imitation tasks are predominately measures of memory – either STM or WM – rather than measures of language ability. It is proposed, by part of the authors, that memory skills are required in order for a speaker to successfully complete an EIT (Alloway & Gathercole, 2005; Alloway et al., 2004; Conti-Ramsden, Botting, & Faragher, 2001). Baddeley and Wilson (2002) further note that not only STM and WM, but also the episodic buffer is involved in those tasks; by means of which information from short and long term memory interact. Nevertheless, some studies maintain that it is memory abilities, rather than language abilities, that are activated in EITs; hence speakers repeat sentences without any further processing being entailed (Hamayan et al., 1977).

Contradicting this opinion, other researchers argue that it is not the case of parroting (Munnich et al., 1994), since in EITs the speakers convert ungrammatical sentences to grammatical ones. Further adding to this direction,
Gass and Mackey (2007) note that EITs exceed parroting and pure repetition of stimuli, since all sentences presented are distilled via the speaker’s grammatical system. On the contrary, others claim that imitation is related to language proficiency; thus, the higher proficiency level, the more accurate imitation (Bley-Vroman & Chaudron, 1994). There are also studies, in which no correlation between EITs and WM abilities was detected (Okura & Lonsdale, 2012).

More recent work suggests that EITs involve both language (lexicon & syntax) and memory (WM & STM) abilities (Riches, 2012; a.o.). For example, Klem et al. (2015) found that EITs highly correlate with other measures of language ability, such as vocabulary and expressive grammar. In particular, the role of language proficiency is crucial to the performance on EIT, especially in the second language (Chaudron & Russell, 1990; Munnich et al., 1994; a.o.). Some researchers (Bley-Vroman & Chaudron, 1994; Munnich et al., 1994) indicate that the interaction is bidirectional and, hence, EITs can depict the speaker’s language proficiency level. Based on this line of reasoning, memory abilities are necessary in order to complete an EIT (Doughty & Long, 2003; Robinson, 2005). Therefore, both WM and STM are required in language production (Robinson, 2005) and also in more complex language processing (Bley-Vroman & Chaudron, 1994). Apart from WM and STM abilities, EITs also seem to require other cognitive skills such as metalinguistic awareness (Bialystok 1991); an issue not extensively researched.

3. (Bi-)Literacy

The initial definition of literacy referred to the ability to read and write (Juel, Griffith & Gough, 1986; Perfetti, 1985), although later it was further linked with more complex functions, such as text comprehension and metalinguistic awareness (Bialystok 1991; Sulzby 1989; Sulzby & Teale, 1991). Thus, first language literacy presupposes oracy and also requires further cognitive control (Bialystok 2007; Bialystok & Cummins, 1991; Bialystok et al., 2005).

In bilingualism, literacy issues can extend to both languages (Cummins, 1979) although research on biliteracy is scarce. Some studies have shown that biliterate bilinguals scored higher than their monoliterate peers in terms of their fluid intelligence skills (Leikin et al., 2009). Similar findings were also observed in other studies (Andreou, 2015; Dosi, 2016), where not only the role of biliteracy, but also the role of the educational setting was pointed out (Marinis et al., submitted). Hence, the bilinguals who attended a bilingual educational setting had higher cognitive skills compared to bilinguals who attended a monolingual setting. The contribution of a bilingual educational setting, on linguistic ability, was also highlighted in other studies (Cobo-Lewis et al., 2002; Oller & Eilers, 2002). Thus, both linguistic and cognitive abilities of bilingual children were found to benefit from a bilingual educational setting. Finally, in a
study by Tsimpli, Papadopoulou, Dosi, and Andreou (2015) the researchers found that bilingual children attending a bilingual educational setting and lagging behind in the vocabulary scores (in Greek), performed similarly to a bilingual group attending a monolingual educational setting in an EIT. This was attributed to the effect of the bilingual educational setting that seemed to have positively affected their fluid intelligence capacity.

4. The present study

The present study aims to combine both EITs and (bi-)literacy since they both seem to tap onto cognitive abilities. Research on the interaction of EIT and more complex executive functioning skills is sparse and so is research on the impact of (bi-)literacy on language abilities. The present study aims to address this gap. Our main goal is to identify the predictor variables for the EIT and the role of biliteracy in bilinguals’ performance on EITs. Our predictions are that both language ability and cognitive skills (simple and complex) will be required in the EIT, since it is a task of complex nature. Furthermore, we expect that biliteracy will positively affect the participants’ performance on the linguistic task.

4.1. Participants

Before we introduce the participants it is important to clarify how biliteracy is defined. In the present study, biliteracy is defined in terms of educational setting; whether it supports either both languages or just one.

For the present study fifty Greek-Albanian bilingual children and twenty five Greek monolinguals (control group) are tested. Half of the bilingual participants (N= 25) were biliterate bilinguals and the other half monoliterate bilinguals (N= 25). The age range of all groups was from eight to twelve years old (for the biliterate group, mean age: 10;8 years, range: 1;3; for the monoliterate group, mean age: 10;2 years, range: 1;2; for the control group, mean age: 10;2 years, range: 1;2). The country of residence of the biliterate group was Albania, whereas the monoliterate group and the monolinguals lived in Greece. Biliterate bilinguals attended a bilingual educational setting, where the participants are instructed in Albanian twenty three hours per week and in Greek fourteen to sixteen hours per week. The monoliterate bilingual group attended Greek state schools, where Albanian is not taught and Albanian is primarily an oral language for those children. With respect to the age of onset of the second language the biliterate bilinguals were predominately simultaneous bilinguals (N= 21) being exposed to the L2 from birth until the age of three. On the contrary, the majority of the monoliterate group consisted of late sequential bilinguals (N= 13) being exposed to the L2 after the age of four years.

Further information for the bilingual participants was obtained by means of a child questionnaire (Mattheoudakis, Chatzidaki & Maligkoudi, 2014). The main questions were stated with respect to four axes: (a) home language history,
(b) current language use, (c) early literacy practices and (d) current (bi-) literacy. *Home language history* refers to exposure to each language from birth until the age of schooling (i.e. until the age of six). *Current language use* refers to the language preferences for daily activities (i.e. memorizing phone numbers, calculating, telling the time or watching TV), oral interaction with family members and friends and the language that they feel they understand or speak better. *Early literacy practices* pertains to activities such as shared-book reading in preschool age. Finally, current (bi-) literacy entails questions regarding language preferences for writing (texting, emailing, writing cards or lists) and reading (book or comics reading, reading aloud, visiting websites, video gaming) and also questions about the language which they feel more comfortable with to read and write and language classes attended either in L1 and L2.

The results from the questionnaires reveal that, with respect to *home language history* and *current language use* until the age of six, biliterate bilinguals used both languages more often than monoliterate bilinguals ($t(48) = 2.806, p = .007$), whereas monoliterate bilinguals used only Albanian more often than biliterate bilinguals ($t(48) = -2.119, p = .039$). At the age of schooling the language preferences for the biliterate group have not changed; they prefer to use both languages more often than their monoliterate peers ($t(48) = 3.110, p = .004$). However, the language practice for the monoliterate group has changed in favor of Greek; thus monoliterate participants used only Greek more often than the biliterate participants ($t(48) = -5.249, p < .001$). With regard to *early* and *current literacy practices* the results are almost the same. Hence, until the age of six in the biliterate group shared-book reading activities were conducted equally in both languages more often compared to the monoliterate group ($t(48) = 2.750, p = .008$). After the age of six the literacy of the biliterate group was conducted either in both languages or mainly only in Albanian ($t(48) = 4.770, p < .001$ and $t(48) = 3.810, p < .001$, respectively); while the literacy of the monoliterate group was mainly in Greek ($t(48) = 6.919, p < .001$). Both results make sense if we consider that the biliterate group attends a bilingual education setting in Albania while the monoliterate group attends a Greek state school in Greece.

Summarizing the main points of the bilingual's profile, the biliterate group mainly used both languages from birth until the age of testing. They were simultaneous bilinguals and attended a bilingual educational setting in Albania. The monoliterate bilinguals were mainly late sequential bilinguals. They predominately used Albanian until the age of schooling, but at the school age they changed their preference by using Greek, since they live in Greece and attend Greek monolingual state schools.

### 4.2. Materials and procedure

All participants were tested with two screening tasks in order to identify their verbal and non-verbal abilities. Thus, the children’s verbal abilities were detected by a standardized Greek expressive vocabulary task (Vogindroukas,
Protopapas & Sideridis, 2009). The bilinguals were also tested in their verbal abilities in Albanian via a non-standardized expressive vocabulary task (Kapia & Kananaj, 2013). The participants’ non-verbal abilities, i.e. fluid intelligence, were measured by means of a non-verbal intelligence task (Raven, Raven & Court, 1998), in order to verify that all children have normal or above normal non-verbal intelligence. Additionally, all participants were tested for their updating skills, by means of a two back digit task and for their verbal working memory capacity, via a digit backwards task. Finally, an EIT, namely a sentence repetition and correction task in Greek, was administered.

**Updating Task**

The updating task, based on the N-back digit task (introduced by Kirchner, 1958), was adapted to a two back digit version. N-back tasks are assumed to measure standard “executive” working memory (Kane, Conway, Miura & Colflesh, 2007). The task was designed in *E-prime II* (Psychology Software Tools, Inc., Pittsburgh, PA, USA). The procedure was the following: the participant is shown a sequence of digits (2, 5, 7, 8), each presented one by one for 500 ms, followed by a blank 2,500 ms inter-stimulus interval. The participants were instructed to press the “J” on the keyboard if the current digit displayed was identical to the one introduced two steps back or refrain from pressing any key if the digit presented was not identical. A warm-up session with a block of twenty stimuli was provided. After the practice session the participant could go back to the instructions and repeat the practice block one more time if something was not clear or alternatively could continue with the main test block. We should mention that none of our participants underwent this session for a second time. The main test block consisting of sixty stimuli was introduced. Twenty of them were the accurate responses (*correct hits*) and the other forty were the inaccurate responses (*false hits*). To score the participant’s performance we transformed both correct and false hits into percentages. For instance, if a participant had thirteen out of twenty correct hits, he received a 65% score for the correct hits and if he had presses ten times the “J” in cases where he should not have pressed any key, in other words if he has ten out of forty false hits he received a 25% score. The final score resulted from subtracting false from correct hits. In the aforementioned example the final score was 40%.

**Verbal Working Memory Task**

In the digit backwards task verbal working memory is tested. The child listens to a series of digits and is required to recall them in backward order. As Alloway and colleagues (Alloway, Gathercole, Willis & Adams 2004, Alloway, Rajendran & Archibald, 2009) note the task is more demanding than a serial digit recall, since the participant further processes the information given in order

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2 A non-standardized test was provided since it was the only expressive vocabulary available in Albanian.
to say them backwards. The task entails six blocks and each block has six trails. The memory load increases as the procedure goes further; thus the first block consists of two digits and the last block of seven digits. The total score of the task was 36. There was a warm up session before the main test process. With respect to scoring, there should have been four minimum correct recalls within each block; so, if the participant made three errors within a block, the task would not continue.

**Elicited Imitation Task**

The EIT was an offline sentence repetition and correction task (designed by Dosi, 2016), which was administered as a PowerPoint presentation. All sentences were taped and auditory presented. The target sentences were between 18 and 23 syllables in length (mean length 18.4 syllables) and the fillers were between 16 and 21 syllables in length (mean length 19.1 syllables). The conditions under investigation were (a) grammatical aspect in Greek (perfective, imperfective), (b) lexical aspect (the categories of activities, states and semelfactive verbs; three verbs per category) and (c) the PPs (*for/ in X time*)\(^3\). The target sentences were thirty-six; an equal number of fillers was also provided. All in all the sentences given were seventy-two, administered in two sessions; in each session target-sentences and fillers are mixed in equal numbers. Example (1) illustrates the state verb “love” in all conditions investigated. In the following example half of the sentences were grammatical (examples 1a and 1d) and half were ungrammatical (examples 1b and 1c). In order to ensure the grammaticality and acceptability of the sentences we ran a piloting study with twenty adults. The results have revealed that twenty-one of the sentences given were grammatical and fifteen were ungrammatical. These scores formed the baseline to judge the children’s utterances.

(1) (a) To korítsi aýápise to ayóri se líya leptá
    the girl loved-PERF.3SG the boy in few minutes.
    “The girl loved the boy in few minutes.”

(b) *To korítsi aýápise to ayóri ja xrónia
    the girl loved-PERF.3SG the boy for years
    “*The girl loved the boy for years.”

(c) *To korítsi aýapúse to ayóri se líga leptá
    the girl loved-IMPF.3SG the boy in few minutes.
    “*The girl was loving the boy in few minutes.”

(d) To korítsi aýapúse to ayóri ja polá xrónia.
    the girl loved-IMPF.3SG the boy for many years
    “The girl loved the boy for many years.”

\(^3\) However, our focus is on the total scores of the task. We will not discuss any further the aforementioned conditions, since they are beyond the scope of this study.
During the task the child listens to each sentence and either repeats it as presented if grammatical or repeats it corrected if ungrammatical. For instance in the aforementioned example we expected that the child will repeat sentences 1a and 1d as given and correct sentences 1c and 1d turning them into sentences like 1a and 1d. There was a practice session, so that the participants became familiar with the procedure. The participants listened to the stories via headphones and their responses were recorded.

Only the experimental sentences have been included in the scores. If the sentence produced by the child was grammatical he received 1 point; whereas if the sentence was ungrammatical he received 0 points. Any substitutions or omissions did not receive negative marking as long as the utterance was grammatical and acceptable. The total score of both sessions was 36.

5. Results

This section is divided into three parts; in the first we present the results from the screening tasks; in the second the participants’ scores on the cognitive tasks are displayed; and finally, in the last part the results of the linguistic task (EIT) are outlined.

5.1. Screening tasks

In the Greek vocabulary task the results reveal that there is a group effect \(F(2,72)= 25.971, \ p< .001\). The results of the Bonferroni post hoc test have shown that monolinguals outperformed both monoliterate and biliterate groups \(p= .002\) and \(p< .001\). Moreover, the monoliterate bilinguals scored higher than the biliterate ones \(p= .002\). In the Albanian vocabulary task, biliterate bilinguals did better than their monoliterate peers \(F(1,48)= 15.777, \ p< .001\). With respect to the non-verbal intelligence, no significant differences between the groups were attested \(F(2,72)= 3.270, \ p= .07\), which implies that the groups were comparable with respect to fluid intelligence. Table 1 depicts participants’ performance with respect to verbal and non-verbal abilities in the screening tasks.

Table 1. Participants’ performance on screening tasks

<table>
<thead>
<tr>
<th></th>
<th>Biliterate BLs</th>
<th>Monoliterate BLs</th>
<th>Monolinguals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voc. Scores (in Greek) %</td>
<td>62.4 (SD: 16.4)</td>
<td>75 (SD: 12.9)</td>
<td>88 (SD: 6)</td>
</tr>
<tr>
<td>Voc. Scores (in Alb.) %</td>
<td>75.4 (SD: 8.8)</td>
<td>59.6 (SD: 18)</td>
<td>---</td>
</tr>
<tr>
<td>Non-verbal IQ %</td>
<td>76.4 (SD: 11.2)</td>
<td>72.8 (SD: 11.3)</td>
<td>76.9 (SD: 11.8)</td>
</tr>
</tbody>
</table>
5.2. Cognitive tasks

Updating task

In the 2-back digit task, differences among groups were attested \((F(2,72)=\ 4.946, \ p= .010)\). The Bonferroni’s post hoc tests have shown that biliterate bilinguals scored higher than monoliterate bilinguals \((p= .013)\) and marginally higher than monolinguals \((p= .055)\), while no differences were found between the monoliterate group and the monolinguals \((p= 1)\).

![Figure 1. Participants’ performance (in percentages) on the updating task](image)

Verbal working memory task

In the working memory task differences among groups were also manifested \((F(2,72)= 4.843, \ p= .011)\). The post hoc Bonferroni tests have shown that the monoliterate bilinguals performed significantly lower than the biliterate bilinguals and the monolinguals \((p= .043 \text{ and } p= .017, \text{ respectively})\), whereas no differences were found between the biliterate bilinguals and the monolinguals \((p= 1)\). Table 2 further exemplifies the scores of the participants on the working memory task.

![Table 2. Participants’ performance (in raw numbers) on the verbal working memory task](table)

<table>
<thead>
<tr>
<th></th>
<th>Biliterate BLs</th>
<th>Monoliterate BLs</th>
<th>Monolinguals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit backwards</td>
<td>16.9</td>
<td>13.1</td>
<td>17.4</td>
</tr>
<tr>
<td>task</td>
<td>(SD: 5.7)</td>
<td>(SD: 3.6)</td>
<td>(SD: 6.2)</td>
</tr>
</tbody>
</table>
5.3. Elicited Imitation Task

Group differences were also found in the EIT ($F(2,72)= 14.943, p< .001$). Post hoc tests (Bonferroni) have shown that monolinguals outperformed both bilingual groups (for biliterate group, $p<.001$; and for the monoliterate group, $p= .001$); however, no differences were attested between the two bilingual groups ($p= .5$). Figure 2 illustrates the groups’ performance on task.

![Figure 2. Participants’ performance (in percentages) on the EIT](image)

Trying to further explain the participants’ performance we ran linear stepwise regression analyses different for bi- and monolingual participants, since the factors that affect their performance differ. Hence, for the bilingual groups we set, as independent variables, the updating scores ($r= .450, p= .001$), the chronological age of the participants ($r= .333, p= .018$), vocabulary scores in Greek ($r= .318, p= .025$) and home language history in Greek (the use of Greek language up to the age of six; $r= .314, p= .026$). The outcome of the analysis has shown that the main predictor variables are updating scores and vocabulary scores in Greek ($R^2= .348, F(1,47)= 10.433, p= .002; \beta= .501, p< .001; \beta= .384, p= .002$, respectively). For the monolingual group we set as independent variables non-verbal intelligence test ($r= .710, p< .001$) and age of the participants ($r= .598, p= .001$), working memory scores ($r= .532, p= .003$) and updating scores ($r= .508, p= .005$). The results have shown that the main predictors are only non-verbal intelligence test and chronological age ($R^2= .601, F(1,22)= 5.294, p= .031; \beta= .553, p= .001; \beta= .348, p= .031$, respectively). Since the predictor variables are different in the monolingual and the bilingual groups, we further focused on the two bilingual groups’ performance.

Finding the updating scores as the main predictor variable we performed an ANCOVA setting the updating scores as covariate. A main effect of updating
skills was found ($F(1,50)= 13.279$, $p= .001$, $η^2= .220$). After controlling for updating scores the results show that the monoliterate group outperformed the biliterate one ($p= .003$), in contrast to the results of the previous one-way ANOVA analysis, where no differences between the two groups have been detected.

6. Summary & Discussion

The present study aims to explore the interaction between linguistic and cognitive factors in EITs and to identify the role of (bi-)literacy in EITs’ performance. For the aforementioned purposes two groups of Greek-Albanian bilinguals were tested, either having literacy in one language or in both languages. The results have shown that the two groups differ in terms of vocabulary knowledge. In the non-verbal intelligence task no differences were found between the groups. In the cognitive tasks, both in the updating and verbal working memory task, the biliterate group outperformed the monoliterate participants (similar to Dosi, 2016; Leikin et al., 2009; Marinis et al. submitted). In addition, the biliterate group marginally surpassed the monolingual group in the updating task, but no differences were found in the working memory task. Interestingly, our monolingual group scored high in the WM task (similar to Dosi, 2016). Furthermore, the monolingual group performed better than the monolingual bilinguals in the working memory task but not in the updating task. These differences may be affected by the participants’ socioeconomic status, which requires further investigation.

In the EIT no differences were observed between the two bilingual groups; however, both groups scored lower than the monolingual group, as expected. The main predictor variables for the bilinguals were found to be updating skills and vocabulary scores in Greek. A further analysis has shown that controlling the results for the updating scores differences between the two groups arise, with the monoliterate group outperforming the biliterate one. From the aforementioned results EIT seems to be a measure of both executive functions and language abilities, since updating and vocabulary scores were found to be the main predictors (similar to Bley-Vroman & Chaudron, 1994; Klem et al. 2015; Riches, 2012). Working memory scores were not found to affect the bilinguals’ performance on the EIT contrary to other studies which found that working memory skills affect participants’ performance on those tasks (MacDonald & Christiansen, 2002; Riches, 2012; but similar to Tsimpli et al., 2015). The present results suggest that more complex working memory skills, i.e. updating skills, rather than simple memory skills are required in such a demanding linguistic task. Interestingly, although working memory abilities do not seem to correlate with EIT in bilinguals, in monolinguals a correlation between the two tasks was obtained. However, the correlation was not so strong as to be a predictor variable of the EIT. Additionally, it is important to highlight that the predictor variables were found to be different for bilinguals and monolinguals. On the one hand, updating skills and vocabulary knowledge seem
to explain the bilingual participants’ performance and on the other hand fluid intelligence and participants’ age were found to be the predictor variables for the monolinguals’ performance. Therefore, we assume that different factors underlie and affect bilinguals’ and monolinguals’ performance. Nevertheless, the issue remains open for further research.

Another interesting issue is the cognitive “advantage” of bilinguals in both the updating and the working memory tasks found only in the biliterate group. The results indicate that biliteracy and not just bilingualism seems to boost participants’ performance on cognitive tasks. The differences between the two groups could be a result of bilingual educational setting that equally supports both languages and thus has boosted the cognitive flexibility and further developed the cognitive abilities of the participants (similar to Dosi, 2016; Marinis et al., submitted; Tsimpli et al. 2015). The issue of socio-economic status may affect the results in cognitive tasks, since the biliterate group, which attends a private educational setting, outperformed the monoliterate group, which attends state school. However, in the present study it was not taken into account and the issue remains open for further discussion.

The cognitive “advantage” mentioned above seems to aid the accurate performance in the EIT, since the biliterate bilinguals scored similarly to the monoliterate bilinguals, although they lag behind in the vocabulary scores in Greek. Thus, biliterate bilinguals seem to benefit from their higher updating skills in their performance in a demanding linguistic task, such as the EIT (similar to Tsimpli et al., 2015). Continuing on this line of reasoning, we conclude that biliteracy improves bilinguals’ performance on the EIT, since their high updating skills aid them to exhibit good performance on a challenging linguistic task. In the opposite direction the low updating skills of the monoliterate bilinguals seem to keep them from scoring high in a linguistic task, although their vocabulary knowledge is high. The argument is further supported if we consider that after we controlled the two groups for their updating skills the monoliterate group outperformed the biliterate one. We observed that the language proficiency effect arises after controlling for executive functions. Thus, as expected, the monoliterate group that lives in Greece and uses Greek predominately in their everyday lives and in literacy practices scores higher than the biliterate group that lives in Albania and uses less Greek compared to their monoliterate peers.

In a nutshell, the results of the present study show that EITs reflect language ability and more complex working memory, i.e. updating, rather than verbal working memory. Furthermore, updating skills were found to be affected by biliteracy, not bilingualism itself. Additionally, biliteracy seems to positively affect not only the cognitive abilities of the bilingual participants but also their overall language abilities, despite the fact that they lag behind in vocabulary knowledge.
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