

Sentence Repetition Task as a Measure of Language Dominance

Maria Andreou, Jacopo Torregrossa, and Christiane Bongartz

1. Introduction

Sentence Repetition Tasks (SRTs, henceforth) have been thoroughly adopted as assessment tools for speakers' language abilities. They are meant to tap into the linguistic knowledge underlying the processes of language comprehension and production. From the comprehension point of view, they require participants to process a heard sentence, decode it and reconstruct its meaning. From the production point of view, the repetition of the sentence involves lexical retrieval, grammatical encoding and phonological realization (see Klem et al., 2015 as a main reference).

SRTs have been extensively used in research on bilingual language acquisition. In particular, previous research has focused on the understanding of how variation in the performance on SRTs is affected by both child-internal (e.g., age of onset, cognitive maturity, cross-linguistic effects) and child-external (e.g., quantity and quality of input in the target language) factors (Chiat et al., 2013; Marinis & Armon-Lotem, 2015; Meir et al., 2015; Thordadottir & Brandecker, 2013).

However, to our knowledge, no study has used SRT as a measure of language dominance (cf. Treffers-Daller, 2019 on a similar observation). Dominance is a complex construct, which encompasses "a linguistic proficiency component, an external component (input), and a functional component (context of use)" (Montrul, 2015: 16; see also Deuchar & Muntz, 2003; Genesee, Nicoladis & Paradis, 1995).

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Several methodologies have been proposed to assess bilinguals' dominance. Treffers-Daller (2019) differentiates between direct measures of language dominance (related to bilinguals' lexical and morphosyntactic knowledge) and indirect measures (e.g., language exposure).

The former (direct measures) usually refer to a certain domain of language knowledge (e.g., vocabulary). Knowledge in this domain is tested in both languages (e.g., vocabulary in Language A and Language B, respectively), possibly using instruments that are comparable across the two languages. Finally, a difference score is calculated, by subtracting the score obtained in Language A from the score in Language B (Romaine, 1995 for an overview). The closer the difference score is to zero, the more balanced bilinguals are across their two languages. In the domain of vocabulary, other direct measures of dominance have been considered, such as lexical richness (or diversity). In a study on two groups of adult bilinguals (25 Dutch-French from Brussels and 24 French-English from Paris), Treffers-Daller (2011) assessed lexical richness based on narratives produced in both languages. Similar attempts have been made by Kupisch (2006), who measured dominance in terms of lexical growth as related to the production of nouns and verbs. In the domain of morpho-syntax, some authors have relied on Mean Length of Utterance (MLU) differentials (i.e., difference between MLU in Language A and Language B) – Yip and Mathews (2006). However, a number of criticisms has been expressed against this methodology. For example, it has been shown that it does not account for possible differences in morphological complexity between a bilingual's two languages (e.g., Döpke 1998). Other attempts involve the identification of the longest utterance produced by a child in a recording or transcript, or the total amount of utterances produced in a sample (cf. Cantone et al., 2008 for an overview).

Among the indirect measures of language dominance, researchers have relied on language-exposure variables, such as the amount of language input and output in Language A and Language B. These measures take into account language use in different contexts (family, school, after-school) and activities (conversational or literacy-related) over time (currently and in the past) – cf. Bedore et al., 2012; Caloi & Torregrossa, 2021; Torregrossa et al., 2019a; Torregrossa et al., 2021; Unsworth, 2016). In general, indirect measures correspond to the differential between a cumulative index of language exposure as calculated in Language A and Language B, respectively.

Assessing dominance in terms of performance on a SRT should involve calculating the difference between the score obtained by a bilingual in a SRT administered in Language A and Language B, respectively. However, syntactic structures are usually not comparable across a bilingual's two languages (Treffers-Daller, 2019 for a similar consideration), which renders this attempt particularly challenging. In recent years, researchers working within the biSLI COST Action project have designed SRTs which are comparable across languages, since they encompass the same types of structures (e.g., dislocations, subject and object relative clauses, etc.) – cf. Marinis & Armon-Lotem 2015 for an overview. It still remains unclear, however, to what extent, e.g., topicalizations

in Language A (e.g., English or German) can be compared to clitic left-dislocations in Language B (e.g., Greek or Italian).

Crucially, the languages involved in our study pattern alike in several syntactic phenomena (see 2.3.2). This will allow us to design two comparable versions of a SRT, one for Italian and one for Greek, and consider the difference score between the two tasks as a proxy for dominance. For the choice of the structures, we relied on the guidelines provided by the Bilingualism-DLD COST Action (Marinis & Armon-Lotem, 2015), including structures that vary with respect to the presence (vs. absence) of embedding or movement.

The aim of this study is to validate SRTs as instruments for dominance assessment. In order to do so, we will show if the difference between the score obtained in the SRT in Language A and the one obtained in Language B correlates with more traditional methods for the assessment of dominance, i.e., lexical knowledge and language-exposure variables. Furthermore, we will show to what extent performance in different components of a SRT is sensitive to different language-exposure variables.

2. Method

2.1. Participants

The data are drawn from 38 (8-12 yrs mean age = 9.01, $SD = 0.98$) Greek-Italian bilingual children, who lived in Greece and attended an Italian immersion school. Children were tested in their vocabulary knowledge using an expressive vocabulary task in each language (both versions being adaptations of Renfrew, 1995) and in their language skills, by using two comparable SRTs (one in Greek and one in Italian). Furthermore, parents were administered questionnaires concerning participants' past and current language and literacy practices.

2.2. Questionnaire information and analysis

The parental questionnaires target children's exposure to Italian and Greek across different contexts over time: (i) between 0 and 3 years; (ii) 3 and 6 years; (iii) at 6 years (upon school entrance); (iv) current language use (i.e., language currently spoken with family members and friends and during after-school activities) – cf. Bongartz & Torregrossa (2020), Torregrossa & Bongartz (2018) and Torregrossa et al. (2021) for further details. For each of the four domains ((i)-(iv)), we calculated a score for each language, as the sum of the scores from the individual answers, as related to Greek or Italian, respectively. For answers stating that both languages were used in equal proportion, we split the associated scores between the two languages. All the language-specific scores were expressed in proportion (i.e., as the ratio between the language-specific score and the total score of the corresponding domain). Then, we derived a dominance score as the difference between the ratio obtained in Italian and the ratio obtained in Greek. A positive score indicates dominance in Italian, while a negative score reflects dominance in Greek. The closer the score is to zero, the more balanced the child

is in the corresponding module. Finally, we derived a cumulative index of language exposure as the sum of the difference scores obtained in the above-mentioned domains ((i)-(iv)) of the questionnaire. We will refer to this score as the Bilingual Index Score (BIS).

2.3. Experimental Tasks

2.3.1. Expressive Vocabulary Test

The expressive vocabulary tasks were an adaptation from the Renfrew task (1995). 50 black-and-white pictures of objects were included in each task and the children were required to name these objects. If the children did not guess the name of the object immediately, we provided a semantic cue first (using the same cues for all participants), followed by a phonemic cue. If the child was able to name the object without any help or with the help of a semantic cue, we gave 1 point to the corresponding item. As for the semantic cue, we wanted to make sure that a missing answer was not due to any difficulty in the recognition of the object in the picture. 0.5 points were given for items named after the phonemic cue. False responses or no responses were given 0 points.

2.3.2. Sentence Repetition Task

SRTs come in various versions (e.g. Cost Action IS0804, SASIT, WISC etc.). They usually include a set of sentences that the child has to listen and reproduce. These sentences are usually independent from each other (see Marinis & Armon-Lotem, 2015 for more details). Each sentence targets a different syntactic structure. For our study, we created a version of a SRT that contains a discourse dimension, whereby the sentences are connected to each other to create a short narrative. Thus, the repetition of the sentence contributes to the advancement of the story plot (cf. Torregrossa et al., 2019b for further details). We developed two comparable versions of a SRT (one for Italian and one for Greek). The two tasks target similar syntactic structures across the two languages. Furthermore, sentences are matched for number of words and syllables across the two tasks. The selection of the syntactic structures was based on the guidelines of the Bilingualism-DLD COST Action (Marinis & Armon-Lotem, 2015). We used structures that differ from each other along two dimensions, i.e., presence (vs. absence) of movement and embedding, respectively. In particular, the two SRTs included i) 6 SVO sentences, in which either a negation or an auxiliary/modal verb occurred; ii) 4 bi-clausal coordinated sentences; iii) 8 (finite and non-finite) complement clauses; iv) 4 adverbial clauses; v) 5 structures generated via movement (e.g., object wh-questions) and vi) 8 structures generated via movement and embedding (e.g., object relatives). Table 1 shows some target sentences, i.e., an adverbial clause and a complement clause, respectively.

The children were told that they would hear a fairytale about a beaver and an alien (Figure 1). In order to see all the pictures of this fairytale, they had to repeat the sentences that they were hearing from the headphones. Every time that they

repeated the sentence (regardless of whether the sentence was correct or not), they were shown the corresponding picture on the computer screen. Thus, the story plot advanced as the child was repeating the sentences.

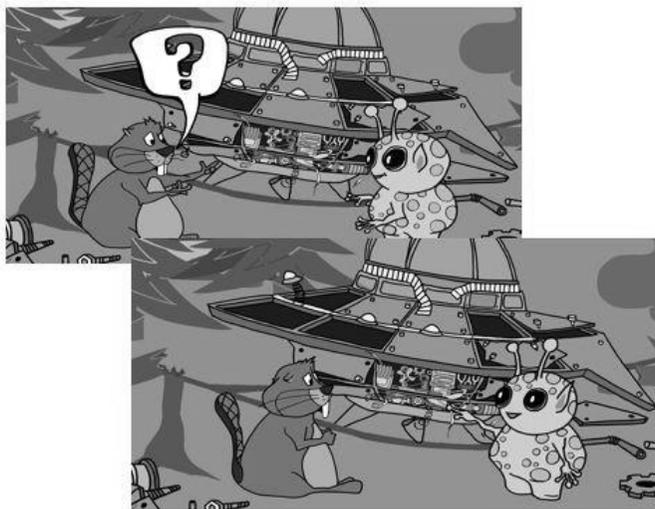


Figure 1. Two consecutive pictures from the SRT. The children first heard the pre-recorded sentence and then saw the corresponding picture.

For the analysis, we considered whether the child was able to reproduce the target structure, independently of changes in other parts of the sentence. We gave either 1 or 0 points. For each SRT, the maximum score was 35 points (cf. the above list of structures).

As mentioned in Section 1, we intend to investigate whether different components of the SRT are sensitive to different language-exposure variables, as extracted from the analysis of the questionnaires. In order to do so, we tentatively distinguished two types of structures, following the terminology proposed in Tsimpli (2014): narrowly-syntactic structures and structures at the syntax-discourse interface (see Table 1). In particular, we will consider here complement clauses as narrowly-syntactic structures (maximum score in each SRT: 8 points) and adverbial clauses as structures at the interface between syntax and discourse (maximum score in each SRT: 4 points) – Table 1. It should be pointed out that narrowly-syntactic structures tend to emerge early in first language acquisition (i.e., within the second year of life), while syntax-discourse interface structures are learnt later in life, since they involve the integration between syntax and discourse and are, thus, more complex (see Andreou 2021; Andreou & Tsimpli, 2020 on adverbial clauses; Schulz & Grimm, 2019 on the distinction between early vs. late structures, based on their acquisition timing). Because of their different acquisition timing, we expect these two types of structures to be sensitive

to different aspects of bilingual language exposure. While narrowly-syntactic phenomena should be more sensitive to home language history (given their early acquisition), syntax-discourse interface phenomena should be more vulnerable to measures of cumulative exposure across contexts over time.

Table 1. Two structures included in the two SRTs

Adverbial clauses (syntax-discourse interface structure)	<i>L'alieno è tanto triste perché non è riuscito a guidarla.</i> <i>O eksogiinos ine stenoxorimenos giati de bori na to odigisi.</i> [The alien is so sad because he could not drive it].
Complement clauses (narrowly syntactic structure)	<i>L'alieno gli dice che la navicella ha smesso di funzionare.</i> <i>O eksogiinos tou ipe oti to diastimoplio stamatisse na doulevi.</i> [The alien tells him that the spacecraft has stopped to work].

3. Results

3.1. Descriptive statistics

Table 2 reports the descriptive statistics for the scores obtained in the two vocabulary tests (in Greek and Italian, respectively) and their difference scores. Furthermore, it considers the difference scores related to the four domains of the questionnaire and the cumulative index of language exposure. Finally, it shows the descriptive statistics for the scores obtained in the SRT in Greek and Italian, respectively, their difference scores and the scores related to narrowly-syntactic phenomena and syntax-discourse interface phenomena in Greek and Italian and their difference scores.

Table 2. Descriptive statistics related to the vocabulary tasks, the SRTs and the language-exposure variables

Greek Vocabulary	35.5 (9.46) (min=9 max=45)
Italian Vocabulary	34.4 (6.41) (min=20 max=48)
Differential Score Vocabulary	-1.1 (12.46) (min=-17 max=38)
Differential Score 0-3	-.78 (0.46) (min=-1 max=1)
Differential Score 3-6	-.36 (0.60) (min=-1 max=1)

Differential Score at 6	-.23 (0.55) (min=-1 max=1)
Differential Score Current Language Use	-.17 (0.46) (min=-.78 max=.89)
BIS	-.23 (1.79) (min=-2.93 max=3.39)
Greek SRT	30.60 (2.52) (min=16 max=33)
Italian SRT	28.32 (2.69) (min=18 max=30)
Differential Score SRT	-1.47 (3.24) (min=-8 max=6)
narrowly-syntactic structures Greek	7.50 (0.86) (min=5 max=8)
narrowly-syntactic structures Italian	7.26 (0.94) (min=4 max=8)
syntax-discourse interface structures Greek	3.94 (0.23) (min=3 max=4)
syntax-discourse interface structures Italian	3.65 (0.58) (min=2 max=4)
Differential Score narrowly- syntactic structures	-.23 (1.28) (min=-4 max=3)
Differential Score syntax-discourse interface structures	-.28 (0.65) (min=-2 max=1)

Concerning children's vocabulary and grammatical abilities, the results show that our group seems to achieve a slightly better performance in Greek as compared to Italian. Regarding the language-exposure measures (differential scores 0-3, 3-6 and 6 and current language use, as well as BIS) we also observe that our group appears to be more dominant in Greek, which is expected since Greek is the majority language.

3.2. Analyses

The first step of our analysis consists in validating SRT as a measure of language dominance. To do so, we ran two linear regression models (using the *lm* function in R). The first model concerns the relationship between the difference scores in SRT and vocabulary. The analysis shows that the difference scores in vocabulary explain almost 30% of the variation in the difference scores in the SRT ($F(1,36) = 15.23$, $R^2 = .28$, $p < .001$) – Figure 2. The second model concerns the relationship between the difference scores in SRT and BIS (the sum of the partial difference scores corresponding to the different domains of the questionnaire; see Section 2.2). Also in this case, we found a significant relationship ($F(1,36) = 5.46$, $R^2 = .11$, $p = .02$) – Figure 3. However, the amount of variance explained by vocabulary ($R^2 = .28$) is greater than the one explained by BIS ($R^2 = .11$).

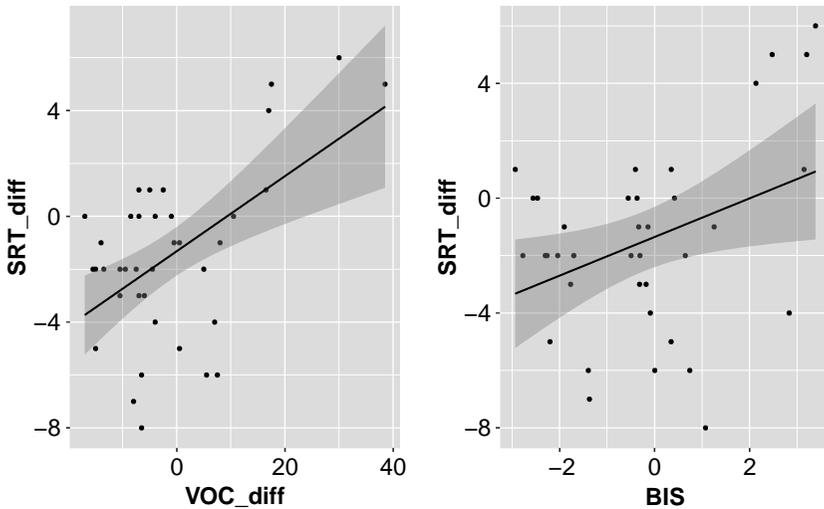


Figure 2 (on the left). Linear regression line related to the relationship between difference scores in vocabulary and SRT

Figure 3 (on the right). Linear regression line related to the relationship between BIS and difference scores in SRT

The second step of the analysis consists in understanding whether there is a relationship between the difference scores of the different components of the SRT (narrowly-syntactic vs. syntax-discourse interface phenomena) and the difference scores of the different domains of the questionnaire. To do so, we ran different regression models with the difference scores related to the accurate production of narrowly-syntactic phenomena (i.e., complement clauses) or syntax-discourse interface phenomena (i.e., adverbial clauses) as outcome variable and each

language-exposure variable in turn as predictor. In particular, we considered the following language-exposure variables: (i) difference score in the age range 0-3, (ii) difference score in the age range 3-6, (iii) difference score at the age of 6 and (iv) difference score in current language use.

We found that variation in the difference scores related to the production of complement clauses is significantly predicted both by the difference scores in language exposure between 0 and 3 ($F(1,34) = 5.67, R^2 = .12, p = .02$) and the difference scores in language exposure at the age of 6 ($F(1,35) = 6.49, R^2 = .13, p = .02$). Figure 4 relates to the former regression (concerning language exposure between 0 and 3). In contrast, variation in the difference scores related to the production of adverbial clauses is significantly predicted only by the difference scores in current language use ($F(1,35) = 4.28, R^2 = .12, p = .04$). This is shown in Figure 5.

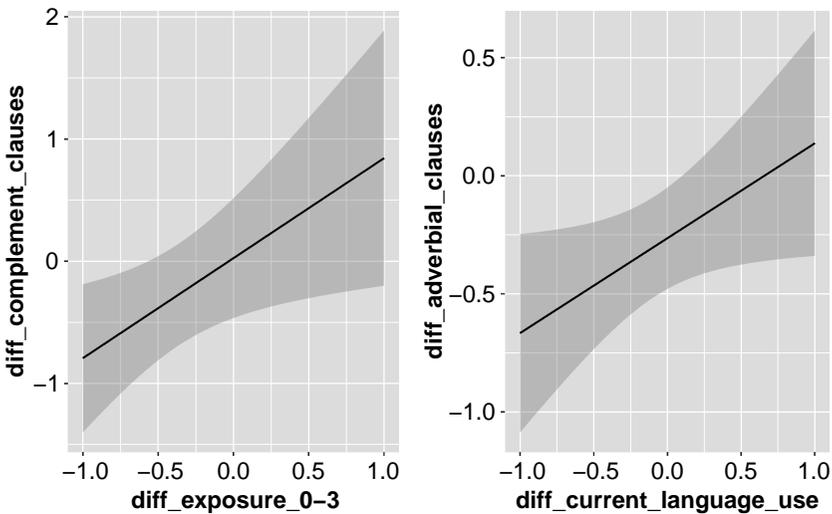


Figure 4 (on the left). Linear regression line related to the relationship between difference scores in language exposure between 0 and 3 years and difference scores in the production of correct complement clauses

Figure 5 (on the right). Linear regression line related to the relationship between difference scores in current language use and difference scores in the production of correct adverbial clauses

4. Discussion

SRTs have been used extensively to assess bilingual children's language abilities (Andreou et al., 2020; Andreou et al., 2021; Meier et al., 2015). However, no study to our knowledge has used SRT as an instrument to assess dominance

among bilingual children. As we mentioned in Section 1, this is mainly due to the difficulty of designing SRTs which are comparable across languages: The same type of structure may exhibit a different degree of complexity across two languages. In this paper, we considered two languages, Greek and Italian, which exhibit a very similar behavior, as far as the syntactic phenomena included in the SRTs are concerned. This may be one of the reasons why in our study, SRT seems to emerge as a reliable measure of dominance. This conclusion is based on the observation that the difference scores in SRT correlate with more established measures of dominance (i.e., difference in vocabulary scores and language-exposure variables).

We also noticed that the regression between the difference scores related to SRT and vocabulary, respectively, is stronger than the one between difference scores in SRT and the Bilingual Index Score (as the sum of the partial difference scores corresponding to the different domains of our questionnaires). This is because BIS is intended here as a cumulative index, which takes into account several contexts of language exposure across the lifespan. Different structures of a SRT may be sensitive to different language-exposure variables. Indeed, we showed that variation in the difference scores related to the production of complement clauses across the two languages is predicted by the difference in language exposure from birth to 3 years. In other words, the more dominant in Italian was the input in the age range between 0 and 3 years, the greater was the number of correctly produced complement clauses in Italian as compared to Greek (and *vice versa*). The same holds true also for the regression between the differential scores of the production of complement clauses and the difference in language exposure at the age of 6. In contrast, the difference scores related to the production of adverbial clauses is sensitive only to the difference in current language use.

The relationship between the difference scores in the production of complement clauses and the difference in language exposure from birth to 3 years complies with Tsimpli's (2014) hypothesis that language competence related to narrowly-syntactic phenomena is sensitive to language-history measures. However, the observed relationship with measures of later language exposure (at the age of 6) is not predicted by the theory. We suggest that overall, children's ability to produce complement clauses is an early acquired phenomenon and, hence, sensitive to language-history measures. However, the acquisition of some aspects of complementation (such as the choice of the right complementizer in Italian non-finite clauses) may emerge later. The observation of the relationship between the difference scores in the production of adverbial clauses and the difference in current language use is also in line with Tsimpli's idea that the acquisition of syntax-discourse interface phenomena is sensitive to cumulative measures of language exposure and use across the lifespan.

Finally, we would like to point out that other measures of language dominance (like vocabulary) do not allow for this fine-grained analysis of the relationship between language dominance and different components of language exposure.

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Proceedings of the 45th annual Boston University Conference on Language Development

edited by Danielle Dionne
and Lee-Ann Vidal Covas

Cascadilla Press Somerville, MA 2021

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ISSN 1080-692X
ISBN 978-1-57473-067-8 (2 volume set, paperback)

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