



Task Effects in the Interpretation of Pronouns

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INTERPRETATION OF PRONOUNS

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Task effects in the interpretation of pronouns

For Peer Review

Abstract

Children acquiring a range of languages have difficulties in the interpretation of personal pronouns. Ongoing debates in the relevant literature concern the extent to which different pronoun types are subject to this phenomenon, as well as the role of methodology in relevant research. In this study, we use two different experimental tasks to examine the interpretation of pronominal elements in Greek, a language that has both strong pronouns and pronominal clitics. Results reveal a complete absence of problems in the interpretation of clitics irrespective of task. However, there were task effects in the comprehension of strong pronouns in both children and adults. Findings indicate that the phenomenon is intrinsically linked to the properties of the elements in question. Analysis of the task effects highlights how different methodological manipulations can shed light on different properties of the elements studied.

For Peer Review

1. Introduction

The interpretation of pronouns in typical and atypical populations has been the subject of extensive experimentation and intense debate in the last few decades, starting as early as the eighties (e.g. Jakubowicz, 1984; Solan, 1987; Wexler & Chien, 1985) up to now (e.g. Baauw, Zuckerman, Ruigendijk & Avrutin, 2011; Conroy, Takahashi, Lidz & Phillips, 2009; Elbourne, 2005, 2008). The crux of the matter has been the observed cross-linguistic difficulties in the interpretation of personal pronouns by typically developing children. Specifically, typically developing children up to around the age of six sometimes interpret personal pronouns reflexively in a variety of languages (Avrutin & Wexler, 1992; Baauw, 1999; Chien & Wexler, 1990; McDaniel, Cairns & Hsu, 1990; Philip & Coopmans, 1996; Thornton, 1990, among others). For example, children sometimes interpret a sentence such as (1) as *The princess is painting herself*. The phenomenon has been called the Delay of Principle B Effect (DPBE), and more recently, the Pronoun Interpretation Problem (PIP; Baauw *et al.*, 2011).

(1) PIP context:

The princess is painting her.

However, numerous studies on the acquisition of pronouns have provided results that appear to be inconsistent with each other (for detailed listings of studies and results see Conroy *et al.*, 2009). Following decades of research and dozens of relevant studies, the possibility that experimental design and choice of experimental

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3 materials and tasks may radically affect the results has become prominent, and
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5 methodology in the study of pronouns is now the subject of fierce debate (e.g. Baauw
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7 *et al.*, 2011; Conroy *et al.*, 2009; Elbourne, 2008; Hartman, Sudo & Wexler, 2012). In
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9 this disagreement, two factors affecting children's performance in relevant tasks
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11 emerge: a) pragmatic/task considerations (Conroy *et al.*, 2009), b) the type of
12
13 elements tested, with pronominal clitics possibly being exempt from the PIP (Hartman
14
15 *et al.*, 2012).
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19 In this study, we aim to explore the interplay of these factors by examining the
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21 interpretation of pronominal elements by Greek-speaking children and adults. The
22
23 choice of language is based on the fact that the few published studies examining the
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25 acquisition of Greek pronominal elements have revealed unexpected patterns in the
26
27 interpretation of these elements (Varlokosta, 2000, 2001a, 2002). We will argue that
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29 some of these patterns are linked to the categorical status and properties of the
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31 pronominal elements tested. By performing different methodological manipulations,
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33 we seek to unravel these patterns, while contributing to the ongoing debate on
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35 pronoun interpretation.
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43 **1.1. The PIP**

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48 The PIP, whereby children interpret object pronouns reflexively, has been shown to
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50 be active in a variety of languages, including English (Chien & Wexler, 1990),
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52 Russian (Avrutin & Wexler, 1992), Dutch (Philip & Coopmans, 1996), Icelandic
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54 (Sigurjónsdóttir & Hyams, 1992), etc. Even though the phenomenon was widely
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56 known for a long period of time as the Delay of Principle B Effect, it has not been
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3 attributed to children's lack of knowledge of Principle B of Binding Theory
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5 (Chomsky, 1981, 1986), the identification of object pronouns with local c-
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7 commanding antecedents constituting only an apparent violation of the Principle.
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10 However, results provided by different experimental studies testing pronoun
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12 interpretation in typically developing children show considerable inconsistency, with
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14 the acceptance rate of the anaphoric interpretation differing greatly across studies (for
15
16 a detailed list of studies and corresponding percentages see Conroy *et al.*, 2009).
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19 The acceptance of the anaphoric interpretation in children has been linked to
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21 the fact that local coreference is possible in adult language, in specific contexts, such
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23 as (2).
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27 (2) Everyone loves Christopher. John loves him, Mary loves him, even
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29 Christopher loves him.
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34 The link between cases of local coreference in adult language and PIP is in line with
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36 the theoretical approach which distinguishes pragmatic coreference from syntactic
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38 binding: according to Grodzinsky & Reinhart (1993), a pronoun can corefer with a
39
40 local antecedent if and only if the resulting interpretation would be distinguishable
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42 from a structure involving binding (Rule I, Grodzinsky & Reinhart, 1993). This is the
43
44 case in (2) above but not in (1), where adults reject the anaphoric reading. The co-
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46 reference exemplified in (2) is often called local accidental co-reference: the pronoun
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48 'him' and the noun 'Christopher' are not co-indexed in a bound-variable reading,
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50 where the pronoun receives its interpretation from its antecedent (3a), as this would
51
52 have been ruled out by Principle B. Instead, the pronoun and noun have different
53
54 indices (3b), and they happen to refer to the same entity.
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(3a) Christopher_i loves him_i (bound variable, ruled out by Principle B)

(3b) Christopher_i loves him_k (local accidental co-reference)

According to this view, the high percentages of anaphoric interpretations are a consequence of children's problems with the pragmatic rule that regulates coreference¹.

The theoretical account is in line with findings showing that children do not allow **anaphoric** interpretations of pronouns when the preceding noun is replaced with a quantificational antecedent as in (4) (Chien & Wexler, 1990).

(4) Every princess is painting her.

In what has been called 'quantificational asymmetry' (Elbourne, 2005), while children have difficulties interpreting sentences such as (1), they have no difficulties understanding examples with quantificational antecedents such as (4) above. The relevance of this finding lies in that **local** accidental co-reference is impossible with quantificational subjects, as quantifiers are not referential, thus supporting the view

¹ Note that there are different views on the type of problems children may have with coreference. An early attempt towards the interpretation of the phenomenon has been the suggestion that children lack a pragmatic principle that regulates local coreference, called Principle P (Chien & Wexler, 1990). A related account has attributed the phenomenon to children's processing limitations, which prevent them from applying Rule I (Grodzinsky & Reinhart, 1993). According to the latter view, Rule I places a burden on working memory, as it requires the simultaneous examination of two alternative interpretations. For populations with processing limitations, including typically developing children, this results in failure to apply the rule.

that children have no difficulties with binding (Principle B) and struggle instead with local accidental co-reference.

The link of PIP to local accidental coreference is also supported by findings on children's interpretation of pronominal clitics; relevant studies have shown high percentages of target responses, unlike studies examining stronger types of pronouns. For example, McKee (1992) examined thirty Italian-speaking children on the interpretation of Italian clitics using a TVJ task, and reports 85% target responses, in sharp contrast with 18% target responses on the interpretation of strong pronouns by sixty English-speaking children examined in the same study. Similar low percentages of anaphoric interpretations are reported for Spanish (Baauw et al., 1997), French (Hamann, Kowalski & Philip, 1997), and Greek clitics (Varlokosta, 2000, see section 1.3 below). This effect has been linked to the fact that local coreference, as in (3b) above, is impossible for clitics (5b) (Avrutin & Wexler, 1992; Conroy *et al.*, 2009). In the Greek examples below, the clitic and noun cannot refer to the same entity (example in (5a) after Varlokosta, 2001b).

(5) Local accidental coreference disallowed

a. O Yanis_i ton_j ide.

the John him_{CL} saw

'John saw him.'

b. Oloi agapane ton Petro. O Yanis ton agapai, i Maria ton agapai,
akoma ki o Petros ton agapai.

everyone loves the Peter. John him_{CL} loves, the Mary him_{CL} loves,

even the Peter him_{CL} loves

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3 'Everyone loves Peter. John loves him, Mary loves him, even Peter
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5 loves him.'
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10 Several related theoretical accounts of this observation have been proposed
11 (e.g. clitics need to establish a dependency with an antecedent through coindexation,
12 as they are referentially dependent, i.e., they cannot refer deictically, Avrutin &
13 Wexler (1992); or that they need to be bound in order to achieve specification for the
14 feature [human], Baauw *et al.* (1997)) but most accounts have in common the position
15 that the asymmetry between pronouns and clitics is linked to clitics being subject to
16 binding² and not to coreference (cf. McKee, 1992).
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25 Another factor that can be seen to affect results in experimental studies on
26 pronoun acquisition is experimental task and design. Already in early studies on the
27 subject in the nineties, the importance of experimental design was detected and a
28 number of conditions relevant studies should meet were suggested (Crain & Thornton,
29 1998). This was later systematically examined, with relevant controlled studies
30 eliciting different percentages of target responses depending on the task employed
31 (Baauw *et al.*, 2011) or on the methodological manipulations within the same task
32 (Conroy *et al.*, 2009). For example, Baauw *et al.* (2011) examined 20 Dutch-speaking
33 children aged 4;11 to 6;0 on their interpretation of pronouns using two different tasks
34 (Truth Value Judgment (TVJ) task and Picture Selection (PS) task) and found a
35 significant effect of task, such that children performed better when a PS task was
36 used. Conroy *et al.* (2009) tested three groups of English-speaking children in three
37 separate experiments using different versions of a TVJ task with stories; even though
38 results of the three experiments are not directly comparable, findings indicate that
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57 ² Note that clitics can also be bound in discourse (not only in syntax) (see Baauw *et al.*, 1997).
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changes in the story may affect children's performance, as the quantificational asymmetry appeared in only one of the three experiments.

1.2. Greek pronouns

Greek is one of the languages that display two types of pronouns, one being strong (strong pronoun, example (6)), and one being deficient (pronominal clitic, example (7)).

(6) O Gufi skepase afton³.
the Goofy covered himPRON
'Goofy covered him.'

(7) O Gufi ton skepase.
the Goofy himCL covered
'Goofy covered him.'
(examples after Varlokosta, 2000).

The two pronoun types differ in a number of ways (see Mavrogiorgos, 2010; Varlokosta, 2002), which fit the cross-linguistically observed strong-deficient pronoun distinction (Cardinaletti & Starke, 1999a). For example, morphologically, deficient pronouns are reduced forms of strong pronouns (*ton* versus *afton*).

³ Greek examples are not given in strict phonetic or phonemic transcription; they are loosely transcribed to the extent that serves the purposes of the present study.

Moreover, of the two, only strong pronouns can occupy peripheral positions (8, 9) (examples after Varlokosta, 2002):

(8) Ine *ton/afton/ton Yani pu thavmazo. (cleft)
 is himCL/himPRON/the John that admire-1Sg
 ‘It is him/John I admire.’

(9) *Tin/aftin/ti Maria, tha tin do. (left dislocation)
 herCL/herPRON/the Mary will herCL see-1Sg
 ‘I will see her/Mary.’

In terms of coreference, Greek clitics follow the cross-linguistic pattern of disallowing coreference of the type discussed in section 1.1 (see 5 above) (Varlokosta 2001b, 2002). Interestingly, Greek strong pronouns, like clitics cross-linguistically, and unlike pronouns in other languages, also disallow local accidental coreference⁴. In

⁴ This observation has been linked to an important additional property that sets Greek strong pronouns apart from typical strong pronouns (in addition to resistance to local accidental coreference). Greek strong pronouns can refer to non-human entities (Varlokosta, 2000), despite a robust cross-linguistic generalisation (Cardinaletti & Starke, 1999b) that strong pronouns cannot have non-human referents. The only exceptions to this cross-linguistic generalisation, including Greek *afton*, have demonstrative morphology (Cardinaletti & Starke, 1999b). These properties give Greek *afton* membership to a special pronoun category, which consists of demonstrative pronouns that follow Principle B (B-demonstratives, Cardinaletti & Starke, 1999b). According to Cardinaletti & Starke (1999b), a language may have a demonstrative pronoun following Principle B instead of Principle C, if there is no corresponding personal pronoun in the language in question. These elements are used as strong pronouns (i.e., in contexts requiring strong pronouns), can take non-human referents, and resist local

the example below, the pronoun and noun cannot refer to the same entity (example after Varlokosta, 2001b).

(10) Local accidental coreference disallowed

O Yanis_i ide afton_j.

the John saw him_{PRON}

'John saw him.'

Moreover, whenever a clitic is possible, a strong pronoun cannot be selected in the same context, as is cross-linguistically the case (Cardinaletti & Starke, 1999a). For instance, the use of the strong pronoun in (6) above would not be felicitous in the same context as (7), which allows the use of a pronominal clitic. For (6) to be felicitous, a different context would be required (e.g., discourse requiring contrastive use of pronoun). This observation has been formalised in Cardinaletti and Starke's (1999a) pronoun minimality principle: if a language has stronger and weaker types of pronouns, then the most deficient form must be chosen if it can be chosen.

1.3. The (absence of) PIP in Greek

Existing studies on the acquisition of Greek pronominal elements indicate that Greek does not participate in the PIP (Varlokosta, 2000, 2001, 2002). Greek-speaking typically developing children do not allow an **anaphoric** interpretation of pronominal

accidental coreference. (Note that we continue referring to the element *afton* as strong pronoun throughout the manuscript, to avoid confusion).

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3 clitics, thus, following the cross-linguistically observed pattern⁵. Moreover, children
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5 do not appear to have problems in the interpretation of Greek strong pronouns either
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7 (Varlokosta, 2000, 2002). Results similar to those reported in Varlokosta (2000, 2002)
8
9 are reported in other studies of (bilingual) typically developing Greek-speaking
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11 children (Sanoudaki, 2004; Varlokosta & Dullaart, 2001).
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14 The absence of PIP in Greek clitics and strong pronouns has been linked to the
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16 ban on local accidental coreference with these elements, presented in section 1.2.
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18 (Varlokosta, 2001b, 2002).
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21 It has also been suggested that the fact that the experimental design in
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23 Varlokosta (2000) is one that better satisfies crucial experimental assumptions may
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25 have contributed to higher percentages of target responses in this study (Conroy *et al.*,
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27 2009). Varlokosta (2000) used a dynamic TVJ task, where the experimenter uses toys
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29 to act out a story before the child is invited to judge the truth value of a target
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31 sentence. As demonstrated by Conroy *et al.* (2009), the storyline is crucial in
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33 designing felicitous contexts for truth value judgments: both interpretations
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35 (anaphoric and deictic) must be considered at some point in the story, and context
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37 must ensure the accessibility of antecedents/referents. Failure to meet these
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43 ⁵ It is worth pointing out that several studies examining atypical Greek-speaking populations, such as
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45 children with Specific Language Impairment, have shown that the comprehension and production of
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47 these elements tend to pose difficulties to these populations (e.g. Chondrogianni, Marinis & Edwards,
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49 2010; Stavrakaki & van der Lely, 2010; Tsimpli & Stavrakaki, 1999; but see Manika, Varlokosta &
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51 Wexler, 2011; Varlokosta, 2002; Varlokosta, Konstantzou & Nerantzini, 2014; Varlokosta &
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53 Nerantzini, 2012, for opposite findings). This is in contrast with findings in other languages showing
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55 that although the production of these items in children with Specific Language Impairment is
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57 problematic, their comprehension is well preserved (e.g., French: Jakubowicz, Nash, Rigaut & Gérard,
58
59 1998).
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requirements may be the reason behind PIP-type findings (Conroy *et al.*, 2009). As Varlokosta (2000) is one of the studies that satisfied these assumptions, Conroy and colleagues suggest that children's improved performance in Greek elements may be due to the design of the study in question (although they also note that clitics may be immune to the PIP cross-linguistically).

Experimental findings regarding Greek strong pronouns are unexpected for a further reason: strong pronouns were tested and accepted by children in contexts where they were infelicitous. Recall that strong pronoun cannot be used if a clitic can be used in the same context (section 2.1.). The contexts where the Greek strong pronoun was used in Varlokosta (2000) and other similar studies (Sanoudaki, 2004; Varlokosta & Dullaart, 2001), were contexts where a pronominal clitic would have been possible (see examples 6 and 7). Note that in Varlokosta (2000) strong pronouns were also tested and accepted by children as appropriate in contexts where a clitic would not be allowed, as in (11) (strong pronoun as complement of a preposition).

- (11) O Gufi agorase se afton ena vivlio.
 the Goofy bought to himPRON a book
 'Goofy bought him a book.'
 (example after Varlokosta, 2000)

However, for examples 5 and 6, in all the above studies, the context against which test sentences were judged was identical for the strong pronoun condition and the clitic condition. Consequently, results reveal that children accepted as true sentences containing strong pronouns in positions where a clitic should have been selected instead.

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3 These results are in line with the concept of “pragmatic tolerance” in language
4 acquisition. A range of studies examining informativeness and implicature using
5 versions of the TVJ task (e.g. Guasti, Chierchia, Crain & Foppolo, 2005; Katsos &
6 Bishop, 2011) have shown that children are tolerant of pragmatic infelicity, accepting
7 as correct sentences which are not felicitous. For example, children tend to accept
8 underinformative sentences as correct: e.g., ‘He picked up some carrots’ when the
9 protagonist had picked up all of the carrots (Katsos & Bishop, 2011).
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18 A question that arises then is whether children in Varlokosta (2000) accepted
19 the infelicitous sentences as true because they do not detect the pragmatic infelicity,
20 or whether they detect the infelicity but, for some reason, choose to treat infelicitous
21 sentences as ‘true’. One way to examine this is the use of a different task to examine
22 the interpretation of these infelicitous sentences, such as the PS task. In this task,
23 children are presented with a sentence and asked to make a choice between two
24 pictures, in this case one consistent with a deictic interpretation, and one consistent
25 with an anaphoric interpretation. If children cannot detect the pragmatic violation,
26 then they would consistently choose a picture involving a deictic interpretation for the
27 infelicitous strong pronoun sentences. If, on the other hand, children are able to detect
28 the pragmatic violation, we may find inconsistency in the responses, as children
29 would be forced to make a choice when neither picture would be optimal as a
30 response.
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47 The present study aims at addressing these questions by examining the
48 interpretation of pronominal elements in Greek-speaking children and adults. Two
49 experiments are reported here: first, a picture TVJ task is administered to children and
50 adults. Second, a different group of children and adults are tested using a PS task.
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3 The version of the TVJ task used in this study will be a picture-based
4 paradigm, unlike Varlokosta's (2000) dynamic story-based TVJ task. This will allow
5 us to better address the question of whether clitics are indeed immune to the PIP, or
6 the results in Varlokosta (2000) are partly due to the storyline better satisfying
7 experimental assumptions, a suggestion made in passing by Conroy *et al.* (2009).
8 Unlike the dynamic TVJ task, where the context against which sentences will be
9 judged is actively manipulated by the researcher, the picture TVJ task creates minimal
10 context, as the only context provided are the pictures.

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21 The two experiments serve a dual purpose: first, to examine the acquisition of
22 pronouns by Greek-speaking children, and second, to investigate the processing of the
23 pragmatic infelicity in Greek-speaking children and adults when different tasks are
24 employed. By employing two different tasks in the examination of pronouns and
25 clitics in Greek child language, we seek to examine if both Greek clitics and pronouns
26 will elicit high percentages of target responses, as has been the case with familiar
27 tasks, or, alternatively, whether the cross-linguistic asymmetry between clitics and
28 strong pronouns in child language will be detected. Specifically, if Greek strong
29 pronouns indeed pattern with clitics in that they are both resistant to the PIP, then
30 there should be no asymmetry between clitics and strong pronouns in Greek child
31 language irrespective of task – we will be referring to this as the no-asymmetry
32 hypothesis. Alternatively, if children performed well with Greek pronouns in
33 Varlokosta (2000) only because experimental assumptions of the (TVJ) task were
34 met, then the cross-linguistically familiar asymmetry between clitics and strong
35 pronouns in child language (i.e. children experiencing problems with strong pronouns
36 but not clitics) may appear– this will be called the asymmetry hypothesis. Moreover,
37 the infelicity in strong pronoun conditions is explored by examining adult and child
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3 participants in both tasks (TVJ and PS task). As outlined above, the use of two
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5 separate tasks may allow us to establish whether children are able to detect the
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7 pragmatic violation or not, and if so, to detect different strategies in the processing of
8
9 infelicity. The two tasks will be described in detail in the methodology sections. Adult
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11 performance will serve as the basis for the interpretation of child performance.
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14 15 16 **2. Experiment 1**

17 18 19 **2.1. Participants**

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23 Twenty monolingual Greek children (eight boys, 12 girls; age range 4;02-6;01, mean
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25 age 5;03) were tested in two nurseries in Athens. All children were reported by school
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27 staff as having normal linguistic and cognitive development and no hearing
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29 difficulties or learning disabilities.
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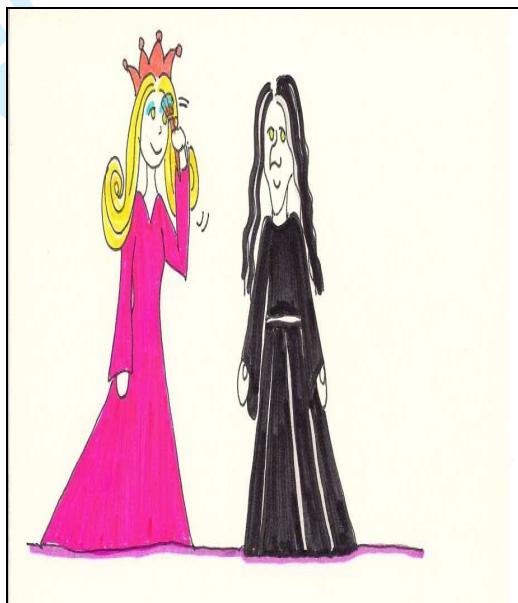
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33 Ten Greek-speaking adults (six male, four female; age range 22-65) were also
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35 tested in this experiment. Adult participants had been brought up in a monolingual
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37 Greek environment in the island of Crete, and had no symptoms or history of
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39 language impairment or learning disabilities.
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43 44 **2.2. Design and materials**

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48 A picture TVJ task (Wexler & Chien, 1985) was used in this study. In this task,
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50 participants are asked to judge whether a statement is true, based on accompanying
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52 picture stimuli⁶. Conditions and number of trials in the present experiment were based
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54 on Varlokosta (2000), which employed a dynamic TVJ task to test typically
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58 ⁶ This experimental paradigm is also known as picture verification task (Conroy *et al.*, 2009).
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3 developing Greek-speaking children. Visual stimulus consisted of a picture depicting
4 a person performing an action on oneself in the presence of another person (Figure 1)
5 or on the other person (Figure 2). The stimuli were based on materials developed
6 within COST (European Cooperation in Science and Technology) Action A33 'Cross-
7 linguistically Robust Stages of Children's Linguistic Performance' (COST Action
8 A33, 2006–2010).
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39 FIGURE 1. Example of the picture stimuli (pictures developed within COST Action
40 A33, 2006–2010)
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FIGURE 2. Example of the picture stimuli (pictures developed within COST Action A33, 2006–2010)

There were two test conditions (i.e. target answer ‘no’): one for clitics, and one for strong pronouns. For every test condition there was a corresponding control condition (target answer ‘yes’). An additional condition involving reflexive pronouns was included but is not reported here. There were four trials for each test and control condition. Four verbs were used: *pleno* ‘wash’, *chtenizo* ‘comb’, *vafó* ‘paint’, *ylifó* ‘lick’. Each of the four verbs was presented in all experimental conditions. In addition, a filler condition involving nouns only was included (target answer ‘no’, six trials; target answer ‘yes’, six trials). Sentences were arranged in two different orders. The first order was randomised, while the second one was the reverse. Presentation order was counterbalanced between participants. Two warm-up items were also included to familiarise participants with the procedure. Examples of the test and control conditions are given in Tables 1 and 2, respectively. The complete list of stimuli can be found in Appendix 1.

TABLE 1. Test conditions (Target answer “no”)

Condition	No of trials	Example
CL	4	I prigipisa ti vafi. the princess herCL is painting ‘The princess is painting her.’
PRON	4	O skilos γlifi afton. the dog is licking himPRON ‘The dog is licking it/him.’

TABLE 2. Control conditions (Target answer “yes”)

Condition	No of trials	Example
CL	4	I mama tin pleni. the mom herCL is washing ‘Mom is washing her.’
PRON	4	O nanos chtenizi afton. the dwarf is combing himPRON ‘The dwarf is combing him.’

Each test sentence was preceded by an introductory sentence, presenting the two characters. The first character in the introductory sentence was the one performing the action shown in the picture stimuli and described in the test sentence. For example:

(12a) Introductory sentence

Edo vlepume mia kamilopardali ke mia ajelada.

here we see a giraffe and a cow

1
2
3 'Here we see a giraffe and a cow.'
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7
8 (12b) Test sentence

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10 I kamilopardali ti γlifi.

11
12 the giraffe herCL is licking

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14 'The giraffe is licking it/her.'
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18 19 **2.3. Procedure**

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23 The experimenter first spent some time with the children in their classroom or in the
24
25 schoolyard, so as to become familiar to them. Then each child was tested individually
26
27 in a quiet room. Children were then presented with the experimental task. The
28
29 linguistic and the picture stimuli were presented simultaneously.
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32 During practice, participants were encouraged to look at the picture while
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34 listening to the sentence and answer 'yes or no'. Following practice, instructions were
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36 not repeated unless the child did not point to either picture. In such cases, the same
37
38 trial, including instructions, was repeated. The picture stimuli were presented on a
39
40 15.6'' computer screen, and the sentences were read aloud with neutral prosody by
41
42 the experimenter. The task was completed in one session, with short breaks of
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44 spontaneous discussion and playing in between, as and when needed. Child
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46 participants were tested in a quiet room in their school and adults in their home.
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51 52 **2.4. Results**

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Percentages of target responses for the child group are given in Figure 3, and for adults in Figure 4. As can be seen, performance was generally high in all conditions.

In the child group, percentages of target responses on the clitic conditions were 100% (control) and 90% (test), and on the pronoun conditions 91% (control) and 79% (test). In the adult group, percentages of target responses on the clitic conditions were 96% (control) and 100% (test), and on the pronoun conditions 95% (control) and 92% (test)⁷.

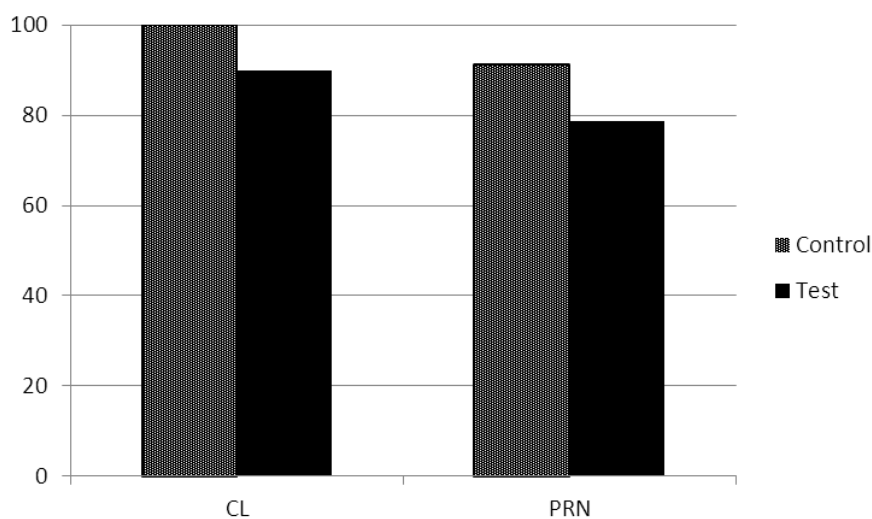


FIGURE 3. Percentage of target responses on each of the control and test conditions: clitic (CL) and strong pronoun (PRON). Child group.

⁷ On the reflexive conditions, adults gave target responses 100% of the time (control and test conditions), while the corresponding percentages for the child group were 96% and 99%, respectively.

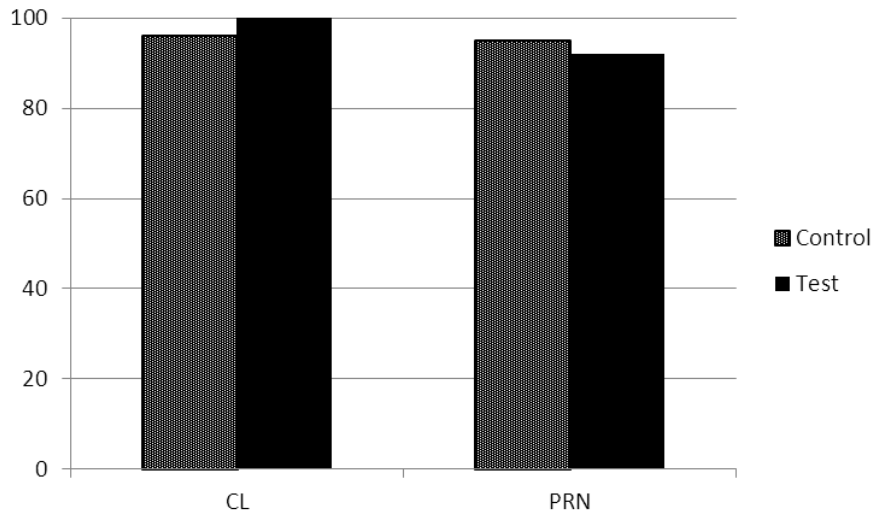


FIGURE 4. Percentage of target responses on each of the control and test conditions: clitic (CL) and strong pronoun (PRON). Adult group.

Statistical analysis of the child data showed no significant difference between test and control conditions for clitics ($z=2.271$, $p=.023$, $r=0.359$) and for strong pronouns ($z=1.533$, $p=.125$, $r=0.242$), and no difference between clitics and pronouns for control conditions ($z=2.121$, $p=.034$, $r=0.335$) and for test conditions ($z=1.634$, $p=.102$, $r=0.258$) (Wilcoxon signed rank tests, significance level set at $p<.012$ to control for Type I error).

Similarly, for the adult data, all comparisons remained below significance (clitics control versus clitics test: $z=1.0$, $p=.317$, $r=-0.224$; pronouns control versus pronouns test: $z=.447$, $p=.655$, $r=0.1$; clitics control versus pronouns control: $z=0.577$, $p=.564$, $r=0.129$; clitics test versus pronouns test: $z=1.732$, $p=.083$, $r=0.387$) (Wilcoxon signed rank tests, significance level set at $p<.012$).

A between group analysis showed no statistically significant difference between the child and the adult group in any condition (clitics control $p=.681$, clitics test $p=.198$, pronoun control $p=.812$, pronouns test $p=.422$, Mann-Whitney U test).

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3 Overall, no differences were detected in any of the between- and within-group
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5 comparisons.
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8 9 10 **2.5. Interim discussion**

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14 This experiment examined the interpretation of pronominal clitics and strong
15 pronouns in monolingual Greek-speaking children and adults using a picture TVJ
16 task. Children accepted a deictic interpretation and rejected an anaphoric
17 interpretation of clitics and strong pronouns, thus, replicating findings of studies using
18 a dynamic TVJ task with Greek-speaking children (Varlokosta, 2000).
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26 The present experiment, by including adults, provided a model against which
27 children's responses could be evaluated, especially with regard to the interpretation of
28 strong pronouns. Similarly to children, adults accepted a deictic interpretation (and
29 rejected an anaphoric interpretation) of strong pronouns. Before attempting to analyse
30 these results and their implications for the existence of infelicity in experimental
31 sentences, we report on a second experiment, which examines the interpretation of
32 pronouns in both children and adults using a task that has not been previously
33 employed to assess strong pronouns in Greek-speaking populations.
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48 **3. Experiment 2**

49 **3.1. Participants**

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55 Nineteen monolingual Greek children (nine boys, ten girls; age range 4;05-6;03, mean
56 age 5;04) were tested in this experiment. Four more children were excluded because
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3 they did not understand the experimental task or they did not manage to complete the
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5 tests. The children were tested in three nurseries in Iraklio, in the Greek island of
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7 Crete. All children were reported by school staff as having normal linguistic and
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9 cognitive development, and no hearing difficulties or learning disabilities. A cut-off
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11 point of seven correct responses out of nine in the control condition (see section 3.2
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13 below) had been pre-determined as an additional measure for the selection of child
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15 participants. All children who managed to complete the tests satisfied this criterion.
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19 Eighteen adults (thirteen women, five men; age range 23-67), who had not
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21 participated in Experiment 1, were also tested in this experiment. All adult
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23 participants were raised in a monolingual Greek environment in Crete and had no
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25 symptoms or history of language impairment, or learning disabilities.
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28 29 **3.2. Design and materials**

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34 A manual Picture Selection task was used in this study. The PS task has been used to
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36 examine children's interpretation of a wide range of (morphosyntactic) contrasts, such
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38 as the distinction between affirmative and negative (Fraser, Bellugi & Brown, 1963),
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40 the use of determiners (Katz, Baker & McNamara, 1974), etc. The PS task has also
41
42 been used in research on binding by Wexler and Chien (1985), Deutsch, Koster &
43
44 Koster (1986), Baauw *et al.* (2011), Varlokosta & Nerantzini (2012).
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48 Participants listened to sentences and were asked to choose one of two pictures
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50 for each sentence by pointing to it with their finger. Within each picture pair, one
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52 picture depicted a person performing an action on somebody else, while the other
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54 picture presented the same person performing the same action on themselves in the
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presence of the other person (see Figure 5). As in the previous experiment, the stimuli were based on materials developed within COST Action A33 (2006-2010).

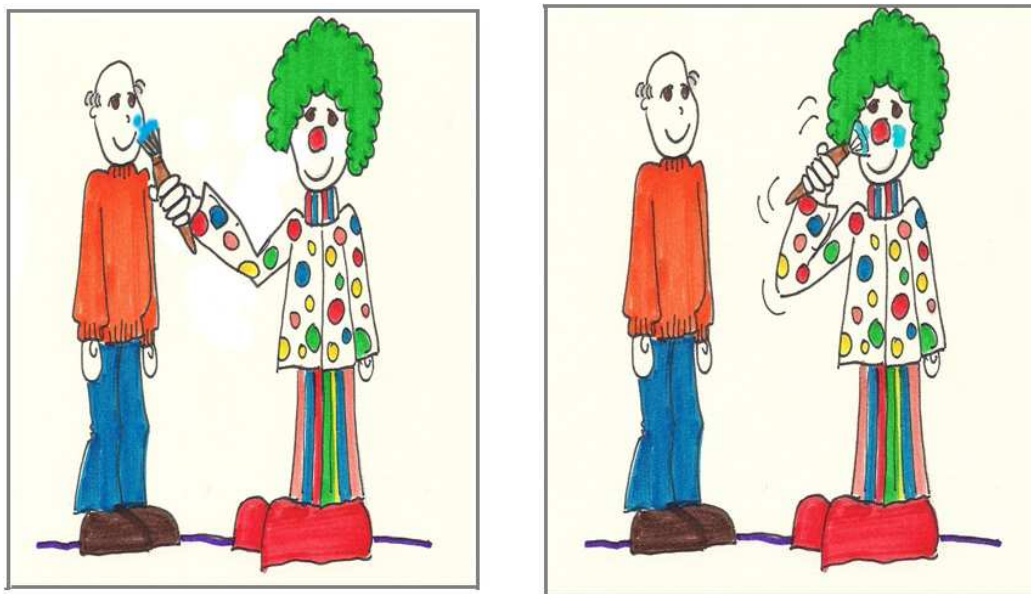


FIGURE 5. Example of the picture stimuli (pictures developed within COST Action A33, 2006-2010)

There were two test conditions: clitic (CL), and strong pronoun (PRON), and one control condition, involving nouns only (CNTRL). Two further conditions involving reflexive pronouns were also included but are not reported here. There were nine trials for each condition. An example for each condition is given in Table 3.

TABLE 3. Experimental conditions

Condition	No of trials	Example
CL	9	O prigipas ton skepazi. the prince himCL is covering 'The prince is covering him.'

PRON	9	I mama skupizi aftin. the mum is drying herPRON 'Mum is drying her.'
CNTRL	9	I magisa chtenizi ti vasilisa. the witch is combing the queen 'The witch is combing the queen.'

Nine verbs were used: *pleno* 'wash', *chtenizo* 'comb', *vafo* 'paint', *ylifo* 'lick', *skupizo* 'dry', *skepazo* 'cover', *agaliazo* 'hug', *agizo* 'touch', *zoğrafizo* 'draw'. Each of the nine verbs was presented in all test conditions as well as in the control condition. One further verb, *vrecho* 'soak', was used to create two practice items. Five picture fillers were included. The pictures were drawings of novel animals, and they were included to renew the participants' interest in the task.

As in experiment 1, sentences were arranged in two different orders. The first randomised order can be seen in Appendix 2. Each test sentence was preceded by an introductory sentence, presenting the two characters, as described for experiment 1 (section 2.3). For example:

(13a) Introductory sentence

Edo vlepume ena prigipa ki ena nano.

here we see a prince and a dwarf

'Here we see a prince and a dwarf.'

(13b) Test sentence

O prigipas ton skepazi.

the prince himCL is covering

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3 'The prince is covering him.'
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9 10 3.3. Procedure

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13 The picture pairs were shown side by side on a 15.6'' computer screen, and the
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15 linguistic stimuli were presented by the experimenter with neutral prosody.
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18 During practice, the experimenter asked the participant to 'show [her] which
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20 picture matches this' (i.e. the sentence). As in experiment 1, instructions were not
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22 given in trials following practice, except for cases when the child did not point to
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24 either picture. All remaining aspects of the procedure were identical to those
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26 described in section 2.3 for experiment 1.
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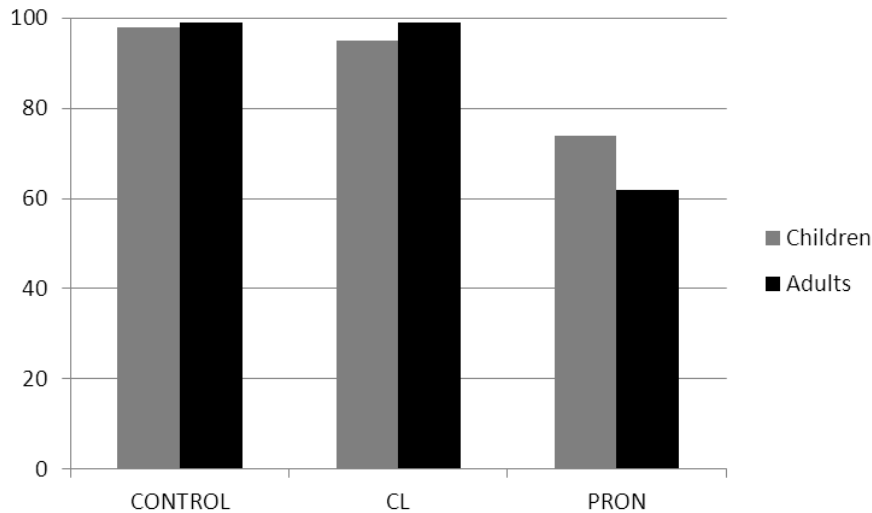
31 3.4. Results

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35 Figure 6 shows the percentage of target responses for the child and adult groups for
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37 each condition.
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40 Responses of the child group on the control and clitic conditions were at
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42 ceiling (98% and 95%, respectively), while the strong pronoun condition presented a
43
44 lower percentage (74%)⁸. Statistical testing revealed a significant difference between
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46 different conditions in children's performance $p < .001$ (Friedman test). *Post-hoc*
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48 analysis with Wilcoxon Signed-Rank Tests was conducted with a Bonferroni
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50 correction applied, resulting in a significance level set at $p < .017$. Tests showed a
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55 ⁸ Responses on the reflexive condition were at ceiling (95% target). In the adult group, the percentage
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57 for reflexives was 100%.
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3 statistically significant difference between children's performance at the control
4 condition and their performance at the strong pronoun condition ($p<.001$), as well as
5 between the clitic and strong pronoun conditions ($p=.002$). A comparison between the
6 control condition and the clitic condition was below significance ($p=.206$).
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FIGURE 6. Percentage of target responses for the child and adult group on each condition; control (CONTROL), clitic (CL), and strong pronoun (PRON).

For the adult group, results reveal almost 100% target responses in all conditions apart from the strong pronoun condition, which had 62% target responses. There was a statistically significant difference between different conditions in adults' performance $p<.001$ (Friedman test). As before, *post-hoc* analysis with Wilcoxon Signed-Rank Tests was conducted with a Bonferroni correction applied, resulting in a significance level set at $p<.017$. The strong pronoun condition differed significantly from both remaining conditions (control versus strong pronoun $p=.001$, clitic versus strong pronoun $p=.001$), while the comparison between the control condition and clitic condition was not significant ($p=1$).

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3 Finally, in a comparison between children's and adults' performance, using
4 Mann-Whitney U test, no statistically significant difference was detected in any of the
5 conditions tested.
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10 Overall, testing confirmed that children's performance was lower at the strong
11 pronoun condition, while it did not differ from adult performance, which was also low
12 at the strong pronoun condition.
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20 21 **4. Discussion** 22 23

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25 Our findings show that Greek pronouns are not subject to PIP. Greek-speaking
26 children respond in an adult-like fashion in tests examining their interpretation of both
27 strong pronouns and pronominal clitics. Moreover, experimental manipulations did
28 not seem to influence children's adult-like behaviour, as children consistently gave
29 adult-like responses irrespective of the experimental task employed.
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37 However, our experimental results indicated that children as well as adults
38 often assign an anaphoric reading to the strong pronoun when a PS task is employed
39 (Experiment 2). This was not the case in the picture TVJ task (Experiment 1), when
40 either children or adults are tested, as both populations accepted only a deictic
41 interpretation for the strong pronoun.
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48 Note that the detected difference between Greek clitics and pronouns cannot
49 be linked to the clitic-pronoun asymmetry hypothesis in language acquisition.
50 According to the asymmetry hypothesis, children have difficulties in establishing the
51 adult interpretation for strong pronouns (but not clitics), occasionally interpreting
52 them as reflexive elements. In contrast, our results indicate that children have adult-
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3 like interpretations for both elements, following adults in occasionally assigning
4 **anaphoric** interpretations to strong pronouns when tested with a PS task.
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7 Consequently, the results of experiment 2 (PS task) cannot be straightforwardly
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9 employed to support either hypothesis on the relationship between clitics and
10
11 pronouns in child language (asymmetry or no-asymmetry).
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14 **The asymmetry between clitics and strong pronouns detected in both child and**
15
16 **adult groups is linked instead to the infelicity of strong pronoun sentences, and reveals**
17
18 **different effects of infelicity on performance depending on the task.** Recall (section
19
20 1.3) that experimental sentences containing Greek strong pronouns employed in the
21
22 acquisition literature are infelicitous. A pronominal clitic could, and, thus, should be
23
24 used in the relevant context, instead of the strong pronoun. The sentences in question
25
26 contain a minimality principle violation (Cardinaletti & Starke, 1999b). **Our**
27
28 **experimental results indicate that this violation influences performance in both**
29
30 **children and adults when a PS task is used, but not when a picture TVJ task is used.**
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34 **The failure to detect any effect of the minimality violation in the results of the**
35
36 **picture TVJ task is in line with findings from the field of experimental pragmatics**
37
38 **showing tolerance to pragmatic infelicity when a TVJ task is used (Katsos & Bishop,**
39
40 **2011, see section 1.3 above)⁹.** It appears that participants in the TVJ task simply
41
42 assign a Principle B abiding (i.e. **deictic**) interpretation to strong pronoun sentences
43
44 and evaluate this against the events (or picture), accepting the sentence as true (or
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46 rejecting this as false) depending on the picture, irrespective of any minimality
47
48 violations.
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52 In contrast, in the PS task, responses appear to violate Principle B around one
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54 third of the time. We argue that this violation of the syntactic principle is only
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57 ⁹ We are grateful to the anonymous reviewers for their helpful suggestions regarding task differences.
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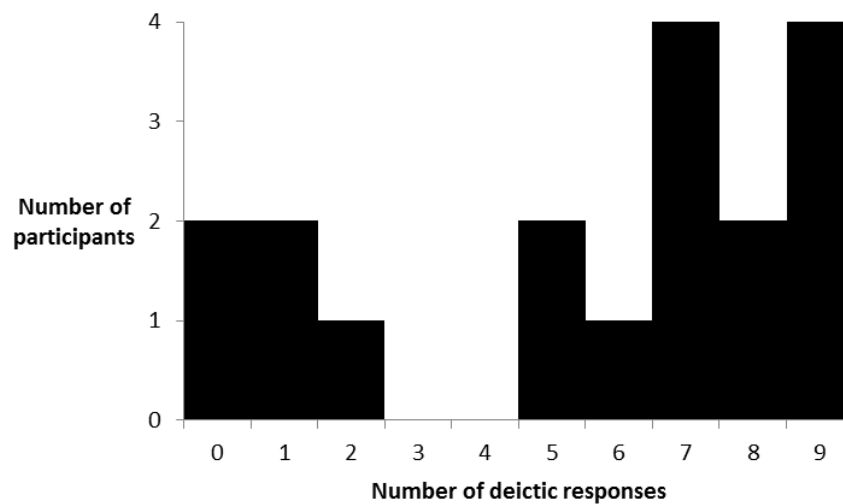
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3 apparent, indicating instead a strategy applied to resolve a conflict between different
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5 grammatical requirements. In this task, the two pictures presented forced participants
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7 to consider two alternative interpretations for the sentence, one anaphoric and one
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9 **deictic**. We suggest that participants, facing a choice between two interpretations, one
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11 violating Principle B (**anaphoric** interpretation) and the other violating pronoun
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13 minimality (**deictic** interpretation), followed one of the following two strategies. The
14
15 majority of child and adult participants (74% and 62%, respectively) selected the
16
17 picture consistent with the deictic interpretation, choosing to ignore or amend the
18
19 violation of minimality by replacing the strong pronoun with a clitic. Several of our
20
21 adult participants who chose this strategy repeated the test sentence aloud substituting
22
23 the clitic for the pronoun, while some performed clitic doubling (14), which would
24
25 also be allowed in this context.
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- 32 (14) O kloun ton vafi ton papu.
33
34 the clown himCL is painting the grandpa
35
36 ‘The clown is painting grandpa.’
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41 Some of the participants chose instead to amend the sentence in a way that allows an
42
43 **anaphoric** interpretation, by adding (often aloud, while pointing to the relevant
44
45 picture) the element ‘ton idhio’, which allows the sentence to take an **anaphoric**
46
47 interpretation.
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49
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- 51 (15) O kloun vafi afton ton idhio.
52
53 the clown is painting himPRON the same
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56 ‘The clown is painting him himself.’
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5 The claim that participants followed two distinct strategies for the resolution of the
6 conflict in the strong pronoun condition is also supported by the distribution of their
7 responses in the relevant condition. The histogram of deictic responses for the adult
8 group (Figure 7), showing how many adults gave 1, 2, 3, etc. non-anaphoric
9 responses, reveals a pattern that resembles a bimodal distribution, rather than a
10 binomial distribution. If participants were answering uniformly and randomly, we
11 would expect to see a binomial distribution with one mode at four or five. What we
12 see instead is a concentration of responses at the two edges (with a preference for the
13 right edge) and a dip at the centre, indicating the presence of two distinct groups, one
14 of which prefers the anaphoric interpretation, while the other prefers the deictic one.
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46 FIGURE 7. Histogram of **deictic** responses in the strong pronoun condition, PS task,
47 adults.
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52 A similar albeit weaker trend can be observed in the corresponding histogram of the
53 child group (Figure 8).
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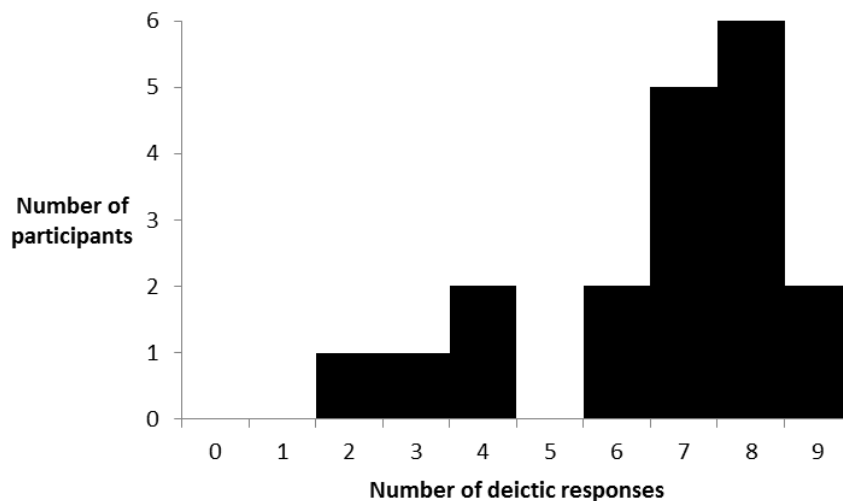


FIGURE 8. Histogram of deictic responses in the strong pronoun condition, PS task, children.

The patterns observed in these histograms are consistent with the existence of two distinct strategies in the participants' responses.

Note that the suggested analysis involves an extra-linguistic strategy applied in order to conform to task demands. It is not suggested here that participants sometimes construct a linguistic representation of the sentence which involves an anaphoric interpretation of the strong pronoun in the experimental sentence, as this is not possible in Greek. Instead, the strategy reflects task pressures to settle in one of two choices when neither is suitable.¹⁰ As this is the first study to reveal such effects, further theoretical and empirical research, including the use of different tasks to test the interpretation of felicitous and infelicitous pronoun sentences, will shed more light on the mechanisms involved.

Our results suggest that children have knowledge of binding and pragmatic conditions of pronoun interpretation. In the pronoun literature, our findings are in line

¹⁰ We thank an anonymous reviewer for his input regarding the nature of the mechanisms in question.

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3 with the increasing awareness that children interpret personal pronouns in an adult-
4 like fashion from very early on: results of a recent study combining a PS task and
5 online methods (eye-tracking) indicate that children start to identify the correct
6 referent of Dutch pronouns at the age of four (Bergmann *et al.*, 2012).
7
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10
11 It is worth noting here an apparent paradox arising in the juxtaposition of the
12 present study with the pronoun literature, notably the Conroy *et al.* (2009) results: on
13 the one hand, it is argued here that pragmatic tolerance leads children to accept
14 (otherwise true) infelicitous strong pronoun sentences in TVJ tasks. On the other
15 hand, Conroy *et al.*'s (2009) analysis holds that the PIP is primarily due to children
16 rejecting (otherwise true) infelicitous sentences (in TVJ tasks). However, we argue
17 that this inconsistency is only superficial: in the latter case the term infelicity is
18 mostly linked to insufficient accessibility of relevant antecedents, possibly creating a
19 processing difficulty. In the present case, as in similar studies of informativeness and
20 implicature, no accessibility/processing issue arises (although processing
21 considerations may also be relevant in certain cases in informativeness tasks
22 (Pouscoulous, Noveck, Politzer & Bastide, 2007)): infelicity relates to the violation of
23 pragmatic conditions (minimality, in this case), which children (as well as adults)
24 seem to tolerate. The combined results of the two tasks in the present study show that
25 children have sophisticated knowledge of pragmatic conditions. This is in line with
26 recent evidence in the experimental pragmatics literature, showing that children's
27 response to infelicity in tasks testing informativeness and implicature is not due to
28 lack of pragmatic competence (Katsos & Bishop, 2011). Evidence for pragmatic
29 tolerance has been found in several studies, examining various aspects of pragmatic
30 infelicity. For example, Robinson & Whittaker (1985) report that children are able to
31 detect ambiguity even though they respond as if they had not detected it. In some
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3 cases, children are found to be more tolerant than adults ([Guasti et al., 2005](#)),
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5 although in the present case children responded in an adult-like fashion.
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7 The present study focused on Greek, but the methodological issues that were
8
9 raised can be implemented in the study of other languages: for example, future
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11 research could seek to replicate findings in relation to minimality violations in other
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13 languages that have more than one personal pronoun type. Crucially, future (and
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15 existing) studies of the PIP can now be evaluated under a new light. Current findings,
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17 and experience from the sophisticated experimental pragmatics literature tell us that
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19 designs that do not meet all felicity conditions need not be dismissed as flawed: such
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21 tasks are useful in providing information about children's understanding of and access
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23 to pragmatic conditions. Manipulations of context and combinations of different tasks
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25 can help shed light on how children (and adults) (mis)interpret pronouns and why,
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27 even when they have the necessary syntactic and pragmatic competence.
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32 33 5. Conclusion

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35 The present study examined the comprehension of pronouns in Greek-speaking
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37 children and adults. In line with cross-linguistic findings, results show that
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39 pronominal clitics do not present problems to typically developing children,
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41 irrespective of task choice. At the same time, our findings highlight the significance
42
43 of task selection by revealing that responses in children and adults showed sensitivity
44
45 to certain properties of the elements tested when one task (PS task) was employed, but
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47 less so when a different task (picture TVJ task) was used. These effects were linked to
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49 the interplay of experimental task with infelicity in pronoun type selected, in the first
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51 study to examine strategies in dealing with this type of infelicity.
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Appendix 1

Truth Value Judgment Task- Order 1	
Linguistic Stimulus	Condition
Warm-up	
Edo vlepume enan elefanda ki enan andra. O elefandas vrehi ton andra. here we see an elephant and a man. the elephant is soaking the man 'Here we see an elephant and a man. The elephant is soaking the man.'	NounControl
Edo vlepume ena mago ki ena papu. O papus pleni ta pjata. here we see a wizard and a grandfather. the grandfather is washing the dishes 'Here we see a wizard and a grandfather. The grandfather is washing the dishes'.	NounTest
Experimental sentences	
Edo vlepume ena skilo ki enan elefanda. O skilos glifi ton eafto tu. here we see a dog and an elephant. the dog is licking himself 'Here we see a dog and an elephant. The dog is licking himself.'	RefIControl
Edo vlepume mia mama ke mia jaja. I mama pleni aftin. here we see a mom and a grandma. the mom is washing herPRON 'Here we see a mom and a grandma. The mom is washing her.'	PronControl
Edo vlepume ena prigipa ki ena baba. O prigipas kathete. here we see a prince and a dad. the prince is sitting 'Here we see a prince and a dad. The prince is sitting.'	NounTest
Edo vlepume ena vasilias ki ena mago. O vasilias ton pleni. here we see a king and a wizard. the king himCL is washing 'Here we see a king and a wizard. The king is washing him.'	ClTest
Edo vlepume mia kamilopardali ke mia ajelada. I kamilopardali glifi aftin. here we see a giraffe and a cow. the giraffe is licking herPRON 'Here we see a giraffe and a cow. The giraffe is licking it/her.'	PronControl
Edo vlepume ena nano ki ena prigipa. O nanos kimate. here we see a dwarf and a prince. the dwarf is sleeping 'Here we see a dwarf and a prince. The dwarf is sleeping.'	NounTtest
Edo vlepume ena nano ki ena prigipa. O nanos chtenizi afton.	PronControl

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a dwarf and a prince. the dwarf is combing himPRON</p> <p>‘Here we see a dwarf and a prince. The dwarf is combing him.’</p>	
	<p>Edo vlepume ena skilo ki enan elefanda. O skilos ton glifi.</p> <p>here we see a dog and an elephant. the dog himCL is licking</p> <p>‘Here we see a dog and an elephant. The dog is licking him.’</p>	ClControl
	<p>Edo vlepume mia prigipisa ke mia magisa. I prigipisa vafi ton eafto tis.</p> <p>here we see a princess and a witch. the princess is painting herself</p> <p>‘Here we see a princess and a witch. The princess is painting herself.’</p>	RefITest
	<p>Edo vlepume ena baba ki enan papu. O papus forai ble panteloni.</p> <p>here we see a dad and a granddad. the granddad is wearing blue trousers</p> <p>‘Here we see a dad and a granddad. The granddad is wearing blue trousers.’</p>	NounControl
	<p>Edo vlepume mia magisa ke mia horeftria. I magisa chtenizi aftin.</p> <p>here we see a witch and a dancer. the witch is combing herPRON</p> <p>‘Here we see a witch and a dancer. The witch is combing her.’</p>	PronTest
	<p>Edo vlepume ena baba ki ena papu. O babas forai paputsia.</p> <p>here we see a dad and a grandpa. the dad is wearing shoes</p> <p>‘Here we see a dad and a grandpa. The dad is wearing shoes.’</p>	NounControl
	<p>Edo vlepume mia kamilopardali ke mia ajelada. I kamilopardali glifi ton eafto tis.</p> <p>here we see a giraffe and a cow. the giraffe is licking herself</p> <p>‘Here we see a giraffe and a cow. The giraffe is licking itself.’</p>	RefITest
	<p>Edo vlepume mia mama ke mia jaja. I mama pleni ton eafto tis.</p> <p>here we see a mom and a grandma. the mom is washing herself</p> <p>‘Here we see a mom and a grandma. The mom is washing herself.’</p>	RefITest
	<p>Edo vlepume mia majisa ke mia horeftria. I magisa tin chtenizi.</p> <p>here we see a witch and a dancer. the witch herCL is combing</p> <p>‘Here we see a witch and a dancer. The witch is combing her.’</p>	ClControl
	<p>Edo vlepume ena prigipa ki enan andra. O andras stekete.</p> <p>here we see a prince and a man. the man is standing</p> <p>‘Here we see a prince and a man. The man is standing.’</p>	NounControl
	<p>Edo vlepume enan vasilias ki ena mago. O valisias pleni ton eafto tu.</p> <p>here we see a king and a wizard. the king is washing himself</p> <p>‘Here we see a king and a wizard. The king is washing himself.’</p>	RefIControl
	<p>Edo vlepume mia mama ke mia jaja. I mama forai kapelo.</p>	NounTest

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a mom and a grandma. the mom is wearing a hat 'Here we see a mom and a grandma. The mom is wearing a hat.'</p> <p>Edo vlepume ena nano ki enan prigipa. O nanos ton chtenizi. here we see a dwarf and a prince. the dwarf himCL is combing 'Here we see a dwarf and a prince. The dwarf is combing him.'</p> <p>Edo vlepume mia neraida ke mia prigipisa. I neraida kratai ti miti tis. here we see a fairy and a princess. the fairy is holding her nose 'Here we see a fairy and a princess. The fairy is holding her nose.'</p> <p>Edo vlepume ena kloun ki ena papu. O kloun vafi ton eafto tu. here we see a clown and a grandpa. the clown is painting himself 'Here we see a clown and a grandpa. The clown is painting himself.'</p> <p>Edo vlepume ena vasilisa ke ena mago. O vasilisa grafi ston ipologisti. here we see a kind and a wizard. the king is writing at the computer 'Here we see a kind and a wizard. The king is writing at the computer.'</p> <p>Edo vlepume mia magisa ke mia horeftria. I magisa chtenizi ton eafto tis. here we see a witch and a dancer. the witch is combing herself 'Here we see a witch and a dancer. The witch is combing herself.'</p> <p>Edo vlepume ena kloun ki ena papu. O kloun ton vafi. here we see a clown and a grandpa. the clown himCL is painting 'Here we see a clown and a grandpa. The clown is painting him.'</p> <p>Edo vlepume mia vasilisa ke mia horeftria. I vasilisa pezi kithara. here we see a queen and a dancer. the queen is playing guitar 'Here we see a queen and a dancer. The queen is playing the guitar.'</p> <p>Edo vlepume ena skilo ki enan elefanda. O skilos glifi afton. here we see a dog and an elephant. the dog is licking himPRON 'Here we see a dog and an elephant. The dog is licking it/him'.</p> <p>Edo vlepume mia kamilopardali ke mia ajelada. I kamilopardali ti glifi. here we see a giraffe and a cow. the giraffe herCL is licking 'Here we see a giraffe and a cow. The giraffe is licking it/her.'</p> <p>Edo vlepume ana papu ki ena pirosvesti. O pirosvestis forai kranos. here we see a grandpa and a fireman. the fireman is wearing helmet 'Here we see a grandpa and a fireman. The fireman is wearing a helmet.'</p> <p>Edo vlepume mia jaja ke mia horeftria. I jaja diavazi efimerida.</p>	<p></p> <p>CITest</p> <p>NounTest</p> <p>RefControl</p> <p>NounTest</p> <p>RefTest</p> <p>CIControl</p> <p>NounControl</p> <p>PronTest</p> <p>CITest</p> <p>NounControl</p> <p>NounTest</p>
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a grandma and a dancer. the grandma is reading newspaper</p> <p>‘Here we see a grandma and a dancer. The grandma is reading a newspaper.’</p>	
	<p>Edo vlepume mia prigipisa ke mia magisa. I prigipisa vafi aftin.</p> <p>here we see a princess and a witch. The princess is painting herPRON</p> <p>‘Here we see a princess and a witch. The princess is painting her.’</p>	PronTest
	<p>Edo vlepume ena vasilias ki ena mago. O vasilias pleni afton.</p> <p>here we see a king and a wizard. the king is washing himPRON</p> <p>‘Here we see a king and a wizard. The king is washing him.’</p>	PronTest
	<p>Edo vlepume mia mama ke mia jaja. I mama tin pleni.</p> <p>here we see a mom and a grandma. The mom herCL is washing</p> <p>‘Here we see a mom and a grandma. Mom is washing her.’</p>	ClControl
	<p>Edo vlepume ena mago ki ena vasilias. O magos ton zografizi.</p> <p>here we see a wizard and a king. the wizard himCL is drawing</p> <p>‘Here we see a wizard and a king. The wizard is drawing him.’</p>	NounControl
	<p>Edo vlepume mia prigipisa ke mia magisa. I prigipisa ti vafi.</p> <p>here we see a princess and a witch. the princess herCL is painting</p> <p>‘Here we see a princess and a witch. The princess is painting her.’</p>	ClTest
	<p>Edo vlepume ena kloun ki ena papu. O kloun vafi afton.</p> <p>here we see a clown and a grandpa. the clown is painting himPRON</p> <p>‘Here we see a clown and a grandpa. The clown is painting him’.</p>	PronControl
	<p>Edo vlepume ena nano ki enan prigipa. O nanos chtenizi ton eafto tu.</p> <p>here we see a dwarf and a prince. the dwarf is combing himself</p> <p>‘Here we see a dwarf and a prince. The dwarf is combing himself.’</p>	ReflControl

Appendix 2

Picture Selection Task. Order 1	
Linguistic Stimulus	Condition
Warm-up	
Edo vlepume enan elefanda ki enan andra. O elefandas ton vrexu. here we see an elephant and a man. the elephant himCL is soaking 'Here we see an elephant and a man. The elephant is soaking him.'	Cl
Edo vlepume ena elefanda ki enan andra. O elefandas vrexu ton eafto tu. here we see an elephant and a man. the elephant is soaking himself 'Here we see an elephant and a man. The elephant is soaking itself/himself.'	Refl
Experimental sentences	
Edo vlepume ena baba ki ena papu. O babas skupizi ton eafto tu. here we see a dad and a grandpa. the dad is drying himself 'Here we see a dad and a grandpa. The dad is drying himself.'	Refl
Edo vlepume mia prigipisa ke mia magisa. I prigipisa vafi ti magisa. here we see a princess and a witch. the princess is painting the witch 'Here we see a princess and a witch. The princess is painting the witch.'	Noun
Edo vlepume mia jaja ke mia magisa. I jaja tin agizi. here we see a grandma and a witch. the grandma is herCL touching 'Here we see a grandma and a witch. The grandma is touching her.'	Cl
Edo vlepume ena prigipa ki ena nano. O prigipas skepazi ton nano. here we see a prince and a dwarf. the prince is covering the dwarf 'Here we see a prince and a dwarf. The prince is covering the dwarf.'	Noun
Edo vlepume ena mago ki ena vasilia. O magos zografizi ton eafto tu. here we see a wizard and a king. the wizard is drawing himself 'Here we see a wizard and a king. The wizard is drawing himself.'	Refl
Edo vlepume ena vasilia ki ena mago. O vasilia dipla sto mago pleni ton eafto tu. here we see a witch and a wizard. the king next to the wizard is washing himself 'Here we see a witch and a wizard. The king next to the wizard is washing himself.'	Refl2
Edo vlepume mia neraida ke mia prigipisa. I neraisa skepazi ton eafto tis. here we see a witch and a prince. the witch is covering the prince 'Here we see a witch and a prince. The witch is covering the prince.'	Refl

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a fairy and a princess. the fairy is covering herself 'Here we see a fairy and a princess. The fairy is covering herself.'</p> <p>Edo vlepume mia magisa ke mia horeftria. I magisa chtenizi ton eafto tis.</p> <p>here we see a witch and a dancer. the witch is combing herself 'Here we see a witch and a dancer. The witch is combing herself.'</p> <p>Edo vlepume mia kamilopardali ke mia ajelada. I kamilopardali ti glifi.</p> <p>here we see a giraffe and a cow. the giraffe is herCL licking 'Here we see a giraffe and a cow. The giraffe is licking it/her'</p> <p>Edo vlepume ena skilo ki ena elefanda. O skilos dipla ston elefanda glifi ton eafto tu.</p> <p>here we see a dog and an elephant. the dog next to the elephant is licking itself/himself 'Here we see a dog and an elephant. The dog next to the elephant is licking itself/hiself.'</p> <p>Edo vlepume mia vasilisa ke mia magisa. I vasilisa zografizi aftin.</p> <p>here we see a queen and a witch. the queen is drawing herPRON 'Here we see a queen and a witch. The queen is drawing her.'</p> <p>Edo vlepume mia mama ke mia jaja. I mama tin pleni.</p> <p>here we see a mom and a grandma. the mom is herCL washing 'Here we see a mom and a grandma. The mom is washing her.'</p> <p>Edo vlepume ena papu ki ena pirosvesti. O papus agaliazi afton.</p> <p>here we see a grandpa and a fireman. the grandpa is hugging himPRON 'Here we see a grandpa and a fireman. The grandpa is hugging him.'</p> <p>Edo vlepume mia mama ke mia jaja. I mama skupizi aftin.</p> <p>here we see a mom and a grandma. the mom is drying herPRON 'Here we see a mom and a grandma. The mom is drying her.'</p> <p>Edo vlepume ena prigipa ki ena nano. O prigipas ton skepazi.</p> <p>here we see a prince and a dwarf. the prince himCL is covering 'Here we see a prince and a dwarf. The prince is covering him.'</p> <p>Edo vlepume mia magisa ke mia horeftria. I magisa chtenizi ti horeftria.</p> <p>here we see a witch and a dancer. the witch is combing the dancer 'Here we see a witch and a dancer. The witch is combing the dancer.'</p> <p>Edo vlepume miaprigipisa ke mia magisa. I prigipisa ti vafi.</p> <p>here we see a princess and a witch. the princess herCL is painting 'Here we see a princess and a witch. The princess is painting her.'</p> <p>Edo vlepume mia mama ke mia jaja. I mama pleni ti jaja.</p>	<p></p> <p>Refl</p> <p></p> <p>Cl</p> <p>Refl2</p> <p></p> <p>Pron</p> <p>Cl</p> <p>Pron</p> <p>Pron</p> <p>Cl</p> <p>Cl</p> <p>Noun</p> <p>Cl</p> <p>Noun</p>
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a mom and a grandma. the mom is washing the grandma</p> <p>‘Here we see a mom and a grandma. The mom is washing the grandma.’</p>	
	<p>Edo vlepume ena prigipa ki ena nano. O prigipas dipla sto nano skepazi ton eafto tu.</p> <p>here we see a prince and a dwarf. the prince next to the dwarf is covering himself</p> <p>‘Here we see a prince and a dwarf. The prince next to the dwarf is covering himself.’</p>	Refl2
	<p>Edo vlepume mia jaja ke mia horeftria. I jaja agkaliazi ton eafto tis.</p> <p>here we see a grandma and a dancer. the grandma is covering herself</p> <p>‘Here we see a grandma and a dancer. The grandma is covering herself.’</p>	Refl
	<p>Edo vlepume ena baba ki ena papu. O babas ton skupizi.</p> <p>here we see a dad and a grandpa. the dad himCL is drying</p> <p>‘Here we see a dad and a grandpa. The dad is drying him.’</p>	Cl
	<p>Edo vlepume mia neraida ke mia prigipisa. I neraida skepazi aftin.</p> <p>here we see a fairy and a princess. the fairy is covering herPRON</p> <p>‘Here we see a fairy and a princess. The fairy is covering her.’</p>	Pron
	<p>Edo vlepume mia magisa ke mia horeftria. I magisa ti htenizi.</p> <p>here we see a witch and a dancer. the witch herCL is combing</p> <p>‘Here we see a witch and a dancer. The witch is combing her.’</p>	Cl
	<p>Edo vlepume ena papu ki ena pirosvesti. O papus ton agaliazi.</p> <p>here we see a grandpa and a fireman. the grandpa himCL is hugging</p> <p>‘Here we see a grandpa and a fireman. The grandpa is hugging him.’</p>	Cl
	<p>Edo vlepume ena skilo ki ena elefanda. O skilos glifi ton elefanda.</p> <p>here we see a dog and an elephant. the dog is licking the elephant</p> <p>‘Here we see a dog and an elephant. The dog is licking the elephant.’</p>	Noun
	<p>Edo vlepume ena kloun ki ena papu. O kloun vafi ton eafto tu.</p> <p>here we see a clown and a grandpa. the clown is painting himself</p> <p>‘Here we see a clown and a grandpa. The clown is painting himself.’</p>	Refl
	<p>Edo vlepume mia neraisa ke mia vasilisa. I neradia agizi aftin.</p> <p>here we see a fairy and a queen. the fairy is touching herPRON</p> <p>‘Here we see a fairy and a queen. The fairy is touching her.’</p>	Pron
	<p>Edo vlepume ena nano ki ena prigipa. O nanos dipla ston prigipa htenizi ton eafto tu.</p> <p>here we see a dwarf and a prince. the dwarf next to the prince is combing himself</p> <p>‘Here we see a dwarf and a prince. The dwarf next to the prince is combing himself’.</p>	Refl2
	<p>Edo vlepume mia kamilopardali ke mia ajelada. I kamilopardali glifi aftin.</p>	Pron

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a giraffe and a cow. the giraffe is licking herPRON ‘Here we see a giraffe and a cow. The giraffe is licking it/her.’</p> <p>Edo vlepume ena mago ki ena vasilia. O magos zografizi ton vasilia. here we see a wizard and a king. the wizard is painting the king ‘Here we see a wizard and a king. The wizard is painting the king.’</p> <p>Edo vlepume ena baba ki ena papu. O babas skupizi ton papu. here we see a dad and a grandpa. the dad is drying the grandpa ‘Here we see a dad and a grandpa. The dad is drying the grandpa.’</p> <p>Edo vlepume mia neraida ke mia vasilisa. I neraida agizi ton eafto tis. here we see a fairy and a queen. the fairy is touching herself ‘Here we see a fairy and a queen. The fairy is touching herself.’</p> <p>Edo vlepume ena kloun ki ena papu. O kloun vafi afton. here we see a clown and a grandpa. the clown is painting himPRON ‘Here we see a clown and a grandpa. The clown is painting him.’</p> <p>Edo vlepume mia jaja ke mia horeftria. I jaja dipla sti horeftria agaliazi ton eafto tis. here we see a grandma and a dancer. the grandma next to the dancer is hugging herself ‘Here we see a grandma and a dancer. The grandma next to the dancer is hugging herself.’</p> <p>Edo vlepume mia vasilisa ke mia magisa. I vasilisa dipla sti magisa zografizi ton eafto tis. here we see a queen and a witch. the queen next to the witch is drawing herself ‘Here we see a queen and a witch. The queen next to the witch is drawing herself.’</p> <p>Edo vlepume mia mama ke mia jaja, I mama dipla sti jaja skupizi ton eafto tis. here we see a mom and a grandma. the mom next to the grandma is drying herself ‘Here we see a mom and a grandma. The mom next to the grandma is drying herself.’</p> <p>Edo vlepume ena nano ki ena prigipa. O nanos htenizi afton. here we see a dwarf and a prince. the dwarf is combing himPRON ‘Here we see a dwarf and a prince. The dwarf is combing him.’</p> <p>Edo vlepume ena skilo ki ena elefanda. O skilos glifi ton eafto tu. here we see a dog and an elephant. the dog is licking himself ‘Here we see a dog and an elephant. The dog is licking itself/himself.’</p> <p>Edo vlepume mia mama ke mia jaja. I mama pleni aftin. here we see a mom and a grandma. the mom is washing herPRON ‘Here we see a mom and a grandma. The mom is washing her.’</p> <p>Edo vlepume ena papu ki ena pirosvesti. O papus agaliazi ton pirosvesti.</p>	<p></p> <p>Noun</p> <p>Noun</p> <p>Refl</p> <p>Pron</p> <p>Refl2</p> <p>Refl2</p> <p>Refl2</p> <p>Pron</p> <p>Refl</p> <p>Pron</p> <p>Noun</p>
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>here we see a grandpa and a fireman. The grandpa is hugging the fireman</p> <p>‘Here we see a grandpa and a fireman. Grandpa is hugging the fireman.’</p>	
	<p>Edo vlepume mia jaja ke mia magisa. I jaja dipla sti magisa agizi ton eafto tis.</p> <p>here we see a grandma and a witch. the grandma next to the witch is touching herself</p> <p>‘Here we see a grandma and a witch. The grandma next to the witch is touching herself.’</p>	Refl2
	<p>Edo vlepume ena vasilias ki ena mago. O vasilias pleni ton eafto tu.</p> <p>here we see a king and a wizard. the king is washing himself</p> <p>‘Here we see a king and a wizard. The king is washing himself.’</p>	Refl
	<p>Edo vlepume mia neraida ke mia vasilisa. I neraisa agizi ti vasilisa.</p> <p>here we see a fairy and a queen. the fairy is touching the queen</p> <p>‘Here we see a fairy and a queen. The fairy is touching the queen.’</p>	Noun
	<p>Edo vlepume mia prigipisa ke mia magisa. I prigipisa dipla sti magisa vafi ton eafto tis.</p> <p>here we see a princess and a witch. the princess next to the witch is painting herself</p> <p>‘Here we see a princess and a witch. The princess next to the witch is painting herself.’</p>	Refl2
	<p>Edo vlepume ena mago ki ena vasilias. O magos ton zografizi.</p> <p>here we see a wizard and a king. the wizard himCL is drawing</p> <p>‘Here we see a wizard and a king. The wizard is drawing him.’</p>	Cl