Patterns of Object and Action Naming in Cypriot Greek Children with SLI and WFDs

Maria Kambanaros and Kleanthes K. Grohmann
European University Cyprus and University of Cyprus

1. Introduction

Specific Language Impairment (SLI) is a severe limitation in language ability in the absence of other factors that typically accompany language problems, such as hearing impairment, low non-verbal IQ, or neurological damage (Leonard, 1998). SLI is the most common type of developmental language disorder and the most studied, for both practical and theoretical reasons (as highlighted in a number of contributions in Levy & Schaeffer, 2003, for example), with a high incidence affecting an estimated 5-7% of children (Tomblin et al., 1997), boys somewhat more than girls (Paul, 2001). However, concerning research at a local level, no study has been conducted on the prevalence of SLI in Greek Cypriot children; moreover, with respect to research at an international level, few studies specifically investigate SLI in preschool years. This study pursues both through an investigation of lexical access/word retrieval of verbs and nouns for Cypriot Greek preschooler who have been identified with a language impairment, be it ("potential") SLI or ("mere") word-finding difficulties (WFDs). The remainder of this introduction will provide more background, while sections 2, 3, and 4 will present the methodology, results, and discussion of the study, respectively.

At present, SLI is identified only on the basis of behavioral data and non-verbal IQ performance scores within the normal range. Language performance one to two standard deviations below peers is considered the critical cut-off level. While available for many languages, no standardized assessment tools exist, however, for the identification, screening, and diagnosis of SLI in the language under investigation in the present study, Cypriot Greek (CG), the variety of Modern Greek spoken in (the Republic of) Cyprus.

There is increasing evidence that language development depends on multiple underlying faculties that are distinctly specified genetically (Bishop et al., 2005) and the majority of children presenting with SLI have variable deficits in different components of the grammar (syntax, morphology, phonology) as well as other aspects of language, such as vocabulary. In addition, it has been documented that children with SLI are less accurate at naming pictures of common objects (nouns) than age-matched peers with typical language development (TLD). It is suggested that these lexical difficulties are related to a breakdown at the level of the word form, that is, children with SLI are unable to process this information successfully to retrieve the target word.

On the other hand, children with WFDs are described as having long delays in word retrieval, a large number of word substitutions and circumlocutions. To mention one of very few research studies on WFDs, Dockrell, Messer & George (2001) argued that WFDs do not occur in isolation from language disabilities, yet that they are not exclusively identified in populations with SLI. They suggest two accounts to explain the cause of WFDs, one in terms of a semantic deficit account and one in terms of a phonological deficit. As support for the phonological deficit account, it might be the case that the transfer of semantic information to the phonological system is impaired and that subsequently, phonological representations are more difficult to access. The authors also note that historically, English-speaking preschool children with SLI and WFDs have been characterized by their impoverished verbal morphology systems.

Nouns and verbs are highly variable in meaning. Verbs denote events, i.e. what happens to things, including actions, while nouns typically denote entities such as people, animals, and objects or concepts. Verbs appear semantically more complex, since verb processing requires an understanding of relational concepts — whereas nouns are usually non-relational and only need single object reference. Furthermore, a verb's central meaning is linked to two kinds of information: thematic role assignment and argument structure. The same verb often has multiple meanings when accompanied by different nouns making its underlying meaning less transparent compared to the noun.

So far, to our knowledge, no picture-naming study involving children with SLI has investigated the lexical category of verbs (actions) and compared performances with noun (objects) retrieval for the same children. Only one study has been found in the literature investigating lexical access of verbs in Greek-speaking children with SLI using picture description tasks (Stavrakaki, 2000). Children with SLI showed a lower overall correct performance than that of their age-matched peers on retrieving verbs and also less verb diversity. Stavrakaki interpreted her findings as indicative of impaired lexical verb retrieval but not of completely impaired lexical entries for verbs. The present study sets out to investigate potential action naming difficulties in Greek Cypriot children of all three groups (SLI, WFDs, and TLD).

Cypriot Greek (CG), the variety of the Greek language spoken in Cyprus and acquired as a first language by most local children prior to grade 1, is an under-described dialect. In addition, very little is known about the language acquisition process of children with TLD for CG. In order to identify SLI in CG, and compare children presenting with SLI as well as children with TLD, normative information on CG development needs to be established to create a relevant knowledge base. Standard Modern Greek (SMG) is the "high" variety used in schools (throughout the entire education system); CG is the "low" variety used almost exclusively in oral form and daily communication (i.e. informal contexts). Children usually come in touch with SMG when they enter primary school, but it might be more frequent among urban preschoolers, especially in Nicosia, the capital.

SMG is a highly inflected (fusional) language, with a complex morphology (see e.g. Holton, Mackridge & Philippaki-Warburton, 1997). Morpho-phonological word forms are inflected according to *grammatical category*, for instance *kov-o* 'cut-1SG' is a verb and *psalid-i* 'scissors' a noun. Thus, nouns and verbs are differentiated by different suffixes, and they are also marked for phi-features (person, number, and, with nouns, gender); nouns are also obligatorily case-marked. Information about the grammatical category and about syntactic features (such as person, tense, and mood for verbs or gender and case for nouns) are prominent features in SMG as they must be accurately projected, marked, and expressed during single-word production. Verbs and nouns in SMG are considered of similar morphological complexity given that each word class respectively has several conjugational patterns. Nevertheless, SMG makes a fundamental distinction between nominals and verbs with an especially rich verbal morphology (Stephany, 1997: 185). In all these respects, the understudied CG patterns just like the well-known SMG grammar.

Naming a picture is considered a highly complex linguistic task but something that children at a young age are very adept at carrying out. When attempting to name a picture, there must be some activation of the concept corresponding to the picture (activated via picture processing mechanisms). The semantic representation of the particular lexical item then maps onto the corresponding stored representation of the sound of that word in the phonological output lexicon. Generally, this is a one-to-one mapping as the relationship between meaning and sound is arbitrary. Overall, the three types of representations that appear to play a role in word naming are semantic, phonological and lexical. Semantic representations refer to the meaning or referent of a word (e.g. "action done with scissors"). Phonological representations refer to individual sounds (e.g. /k/, /ʌ/, /t/). Lexical representations refer to whole-word forms (e.g. /kʌt/ for *cut*).

For grammatical encoding, the semantic and syntactic information of a lexical entry is needed, that is, its lemma information. In the case of an object name (e.g. *scissors*), a *noun lemma* is activated which specifies other grammatical information about the noun, such as plurality and grammatical gender for CG. In response to an action picture, a *verb lemma* is activated, specifying information about the verb's argument structure (the noun phrases that go with the verb to make it grammatically acceptable), tense, person, and number (Levelt, 1989). For example, the verb *cut* has two semantic arguments, an agent and a theme, and, being a transitive verb, takes one object. At the second stage of word retrieval, the lexeme or word form corresponding to the selected lemma is phonologically specified. Lexemes contain information about the phonology (number of syllables, prosody, segmentation) and morphology (verb/ noun inflections) of a word (Levelt, 1989). Problems with verb and/or nouns may arise at any stage in the process of lexical retrieval, i.e. lexical-semantic, lemma, lexeme or articulation. Different error patterns, in children (and adults), can give an indication of different levels of breakdown although errors may arise as a result of a

deficit at a number of different levels. Beyond reporting whether Greek Cypriot children with SLI and/or WFDs are less accurate than age-matched peers with TLD acquiring CG on naming pictures of objects and actions, the aims of this study are to:

(A1) look for any grammatical word class effects in naming performances of children with SLI and/or WFDs;

(A2) examine naming errors with reference to specific psycholinguistic models of lexical/word processing;

(A3) determine whether error types differentiate children with SLI and/or WFDs from peers with TLD;

(A4) determine effects of lexical/psycholinguistic variables on naming accuracies.

Next, we will introduce the methods employed in this study. The results with respect to aims (A1) to (A4) will be presented in section 3 and further discussed in section 4.

2. Methodology

Participants

Three groups of children participated in this study, balanced for all relevant aspects to the extent possible (since at least SLI, for example, is more prevalent in boys than girls, gender balance could not be upheld equally well for the three groups):

TLD thirty children with typical language development (15 girls and 15 boys), aged 6;0-6;11 years, with an average age of 6;3 — all children were recruited randomly from three public primary schools in the Nicosia district after approval from the Ministry of Education and upon written parental consent and no child was receiving speech and language therapy service

SLI seven children (2 girls and 5 boys), aged 6;4-11;0 years, with an average age of 8;10 — they were all diagnosed with (in the absence of standardized tests, potential) specific language impairment and recruited from speech-language therapists in private practices

WFD thirteen children (6 girls and 7 boys), aged 6;3-11;11 years, with an average age of 8;2 — they all had expressive language impairments, including word-finding difficulties and poor vocabulary development and were recruited from speech-language therapists working in public primary education schools

Subject selection criteria included:

- a Greek Cypriot, monolingual CG-speaking background
- no history of neurological, emotional, or behavioural problems
- no obvious learning difficulties (teacher report)
- no gross motor difficulties
- hearing and vision adequate for test purposes
- normal articulation
- normal performance on screening measures of non-verbal intelligence (or as reported by school psychologist)
- medium-high socio-economic status

Materials

The Greek Object and Action Test (GOAT) developed by Kambanaros (2003) was administered to assess retrieval of object and action names. For the present study, 84 colored photographs measuring 10x14cm in size were used, 42 depicting actions (verbs) and 42 objects (nouns). The GOAT was originally piloted on a group of twenty Greek monolingual adult speakers of SMG. Only items named with 80% accuracy or more were included in the test. (Subsequently, the GOAT was adapted to CG and piloted on CG-speaking adults as well as children with TLD.)

Object names are single, concrete inanimate nouns and include manipulated instruments such as garage tools, garden equipment, kitchen utensils, household items, office and personal implements, used for activities of daily living. Object names were not controlled for gender: 6 nouns were masculine, 15 feminine, and 21 neuter. This gender distribution is typical for SMG, but to the best of our knowledge, it also holds for CG (neuter > feminine > masculine), with the distance between feminine and masculine greater than that between neuter and feminine (Stephany, 1997: 188). All verbs were monotransitive with either simple internal word structures of the type [root + affix] or more complex ones of [root + affix + affix]. Actions were restricted to past stereotypical roles, that is, a woman is shown performing household activities (e.g. sweeping), for example, and a man is performing more "manly" duties (e.g. hammering). These stereotypical roles depicted in the pictures are deemed to be appropriate for this age and cultural group.

Also, colored photographs could facilitate children's naming abilities given that (for at least) object recognition and naming, accuracy is significantly improved by the use of color in target pictures (Rossion & Pourtois, 2004). All action names corresponded to either an instrumental verb (where an instrument is part of the action, e.g. cutting) or to a non-instrumental verb (e.g. climbing). All target nouns in object naming were also items in the noun comprehension task. All target verbs in action naming were also targets in the verb comprehension task.

Lemma frequencies for object and action names were calculated based on the printed word frequency count for SMG (Hatzigeorgiou et al., 2000); note that at this time, there are no word frequency data available for CG. A Mann-Whitney test revealed no significant difference between object and action lemmas ($z = –0.154$, $p = 0.878$). In addition, there was no significant difference in syllable length between object and action names either ($z = –0.610$, $p = 0.542$). Furthermore, object and action names were measured for key psycholinguistic variables, including age of acquisition (AoA), imageability, and picture complexity.

Table 1 provides a summary of the characteristics of items in each word class.

	Lemma frequency	*Syllable length*	*AoA*	*Imageability*	*Picture complexity*
Objects (Nouns)	40.91	2.88 (0.803 SD)	2.98 (0.76 SD)	6.49 (0.49 SD)	6.49 (0.28 SD)
Actions (Verbs)	40.11	2.95 (0.731 SD)	2.82 (0.58 SD)	6.42 (0.16 SD)	6.16 (0.67 SD)

Table 1: Characteristics of items in each word class

Procedure

The order of the task (comprehension or production) was counterbalanced across the children tested. The object and action tasks were presented in one session. Testing was conducted in a quiet room at the school. Each child was tested individually by the first author of this study, who was assisted by a CG-speaking speech and language therapist.

Comprehension

Children were asked to point to the correct photograph from a set comprising the target object or action, and the two semantic distracters for each target object or action. Each child was asked to point to the picture of the object or action matching the spoken word heard. Two examples were provided before testing. If children failed to point to the correct picture, they were corrected. Children who pointed to more than one photograph were told that only one picture was correct. The instructions were repeated for children who did not point to any pictures. No time limits were placed and self-correction was allowed. (Only once was the target word repeated upon request.) If further repetitions of the same word were required the answer was scored as incorrect.

Word production
Children were asked to name the object or action represented in the photograph in a single word. Action names were required in the third person singular. Two examples were provided before testing. The stimulus question(s) was repeated once for children who did not respond. If no response was given, the item was scored as incorrect. No time limits were placed and self-correction was allowed. Responses were recorded and transcribed verbatim by the first-named author and checked by the second.

3. Results

We now present the results in terms of accuracy by proceeding with a qualitative and regression analyses followed by a summary of the results, which should be seen with respect to the set aims (A1)-(A4). We will discuss these in section 4.

Accuracy

All three groups of children (TLD, SLI, WFDs) scored ceiling, or close to, on the noun and verb comprehension tasks. Therefore, the results of two subtests of the GOAT are reported in the present study: object/noun naming and action/verb naming. The percentages of correct responses were calculated for object and action names as provided by all children. A summary of the results is given in Table 2 according to picture type.

	SLI	*WFD*	*TLD*
Object names	67%	71%	77%
Actions names	68%	61%	72%

Table 2: Correct production percentages for object and action names

Overall, children with TLD and those with WFDs — but not the children with SLI — demonstrated a grammatical word class effect, with object names significantly easier to retrieve than action names for both groups. A one-way analysis of variance (ANOVA), carried out on the results from object naming performances between the three groups, revealed a statistically significant difference between the children with TLD and those with SLI — with the latter showing significantly more difficulties retrieving object names compared to peers with TLD. In contrast, the children with WFDs were significantly worse at retrieving action names compared to the group of children with TLD.

Qualitative analysis

Errors made by the children for object and action names were classified into (i) semantic errors, (ii) grammatical word class substitutions, (iii) omission errors ("don't know" responses), (iv) visual errors, and (v) unrelated responses.

Semantic errors were further divided into semantic types and semantic descriptions or circumlocutions. The latter involved describing the target action/object concept using more than one word (e.g., 'hitting the nail' for *hammering*). Semantic errors included coordinate (e.g., 'comb' for *brush*), superordinate (e.g., 'tool' for *hammer*), and associative errors (e.g., 'bucket' for *mop*), all semantically-related single lexical labels for the target word. Noun-to-verb substitutions (word-class errors) were those in which the action name was provided instead of the object name, or vice-versa (e.g. instead of *sweeping*, 'broom' was produced). Visual errors included responses where there is no semantic relationship between the child's response and the target object/action word (e.g. *(nail) file* > 'knife'). Unrelated responses included real-word responses lacking a relation-ship, of any form, with the target word.

Table 3 gives the percentages of errors in each category for object and action names.

	SLI		*WFD*		*TLD*	
	object	action	object	action	object	action
semantic error (single)	8.0%	6.2%	12.6%	16.3%	8.2%	5.4%
semantic description	3.8%	16.0%	2.0%	14.8%	3.4%	17.5%
word class	0.89%	0.6%	0.18%	—	1.0%	—
omissions ("don't know")	17.8%	8.9%	1.7%	6.2%	8.7%	3.4%
visual	1.5%	—	1.1%	—	0.95%	0.15%
unrelated	—	—	0.36%	0.73%	0.87%	0.79%

Table 3: Mean percentages of errors for object and action names

Interestingly enough, the qualitative analysis of errors revealed different error patterns for object and action names. Overall, there was a higher rate of omissions (the "don't know" responses) for object names, in contrast to greater semantic description or circumlocution errors for action names.

A one-way ANOVA carried out between the groups yielded the following three main results:

(R1) Children with WFDs made significantly more semantic errors on object names than children with TLD.

(R2) Children with WFDs made significantly more semantic errors for action names compared to both children with TLD and children with SLI.

(R3) Children with SLI made significantly more omission errors than children with TLD for object names.

Regression analyses

Regression analyses were conducted with the object and action naming responses in relation to lemma frequency, rated AoA, rated imageability, syllable length, and rated picture complexity. Overall, there was a significant effect of AoA on object and action name retrieval, with more errors on words in both classes that were acquired at a later age. The fact that there were fewer errors with words earlier acquired supports findings from previous studies (cf. Masterson et al., 2008). There was no effect of syllable length for either object or action naming. Moreover, no other psycholinguistic variable had a significant effect on action naming accuracies.

We can now summarize our results as follows:

(S1) All three groups showed an effect of AoA, word imageability, and picture complexity.

(S2) None of the three groups showed an effect of syllable length.

(S3) Only the children with TLD showed a frequency effect; object naming by the children with SLI and WFDs was not affected by the frequency of a given item.

(S4) AoA had a significant effect on retrieving action names for all three groups.

(S5) Word imageability and picture complexity significantly affected action naming for the children with SLI and WFDs.

(S6) Word frequency had no effect.

(S7) The children with TLD and the children with SLI had similar error types for action (semantic descriptions) and object names (omissions/"don't know").

4. Discussion

The present study investigated object and action picture naming accuracy in three groups of CG-speaking children: six-year-olds with TLD, children with SLI, and children with WFDs in a highly inflected language (CG, which patterns morpho-syntactically for all items tested just as SMG).

As noted in section 1 above, Modern Greek (whether CG or SMG) is a highly inflected language where nouns and verbs are clearly differentiated on the basis of inflectional suffixes. Furthermore, this is only the second study in the literature, after the recent research by Masterson et al. (2008), to control for a range of variables that might affect picture naming performance in children with TLD, such as frequency, word length, imageability, AoA, and picture complexity. With this background, we set four aims for our investigation, listed at the end of section 1 as (A1) to (A4).

As a first tangible answer for aim (A3), drawing on the results (R1) to (R3) and summaries (S1) to (S7) from section 3 right above, performances of children with WFDs on object and action naming can be differentiated from children with TLD and children with SLI based on error type: They make significantly more semantic errors on both word types (cf. (R1) and (R2)), while children with SLI made more omission errors for object names than children with TLD (R3). The children with TLD and the children with SLI had similar error types for both object and action naming (S7). These results also address aim (A1) to some extent.

In addition, and pursuing (A1) further, children with WFDs also showed a grammatical class effect: Action names are significantly more difficult to produce than object names plus same error type for verbs and nouns. No effect, however, was found for word frequency or syllable length (S6 and S2), that is, variables that operate at the level of the form (apart from object naming in children with TLD, S3); to tackle aim (A2), we will briefly address this below with reference to specific psycho-linguistic models of (lexical) word processing.

Moreover, with respect to aim (A4), object and action naming was affected by the same variables (AoA, word imageability, and picture complexity) for both children with SLI and those with WFDs (S4 and S5). For the children with TLD, AoA affected action naming (S4), and all variables affected object naming (S1).

Let us sum up the results from this study then. Generally, children with SLI are less accurate in (object and action) naming than the (younger) children with TLD, but interestingly, error type alone cannot differentiate the two groups. We interpret this result to strongly suggest that children with SLI are delayed — but *not atypical*. The fact that the children with SLI also showed no grammatical-class effect fully supports our initial hypothesis that CG children with SLI would show an undifferentiated grammatical class dissociation.

Why, then, are action names more difficult for children with TLD and children with WFDs? We suggest that the factors mentioned above already all play a role:

(i) naming actions involves different processes to the naming of objects,

(ii) verbs are acquired later,

(iii) verbs are semantically more complex, and

(iv) verbs are grammatically more complex.

The reason why we don't find such a for the children with SLI is the general delay in acquiring words these children present; in addition, individual lexical items are poorly differentiated in their semantic-lexical representations and these representations may not be well organized. The larger point to make, which one might want to pursue further, is this: Inaccuracies in naming, and perhaps even word-finding problems in general, may vary with the pattern of language deficit.

Let us close with some methodological issues that arose throughout this study. First, standard and standardized testing for SLI inclusion criteria (including non-language specific measures) are not available in CG for preschool and school-aged children. Second, hearing was screened as within the normal limits, but this is not adequate to detect "subtle" auditory processing deficits. Note also that neither the amount of speech and language therapy individual children (may) have received at the time of testing or the exact subtype of (SLI) disorder (e.g., grammatical versus phonological) were not taken into consideration. As unfortunate as this may be, it is a flaw that underlies the majority of studies on SLI, certainly in the linguistic literature, and it might be a factor that wants to be controlled for more carefully in future investigations, independent of the language(s) the research is carried out in. Certainly the first of these points is currently being prepared as part of a new research project (Gen-CHILD, 2010-12), for which all research results will be documented extensively in order to shed some light on the issues raised in the second point.

Within a psycholinguistic framework, whether following work based on Levelt (1989) or Caramazza (1997), to name two prominent models, we suggest that spoken action and object naming difficulties for children acquiring CG with SLI (and WFDs) arise from a moderate impairment of lexical/morpho-phonological representations or access to them as is evident by the large number of omissions. We noted that semantic errors arose when the target word node was relatively unavailable, and consequently, semantically related words were activated and produced instead. Both error types imply that the level of breakdown is at the second stage of the two-stage naming process in the model of Levelt (1989), for example, that is, at the level of the lexeme or word form. Our results support previous research conducted in English (see section 1) that children with SLI have a lexical access deficit that is not differentiated by words belonging to different classes (e.g. verbs/nouns).

Overall, children with SLI have a general delay in acquiring new words. In contrast, children with WFDs demonstrated a word class effect with action names more difficult to produce than action names. It appears that WFD children have significantly more impoverished semantic representations for action names compared to object names We support the premise that children with WFDs have more problems building up a complex set of representations for verbs compared to nouns. It is possible, that action naming places more and different demands on the language processor than object naming. Future investigations of action and object naming in child clinical populations and across different languages could be especially valuable.

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