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Lexical retrieval for nouns and verbs in typically developing bilectal children

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Abstract

Previous evidence shows that nouns are easier for many language users to retrieve than verbs, but scant research has been conducted with children in bilectal environments (where both standard and non-standard forms of a language are spoken). This study investigates object and action naming in children who are native speakers of a non-standard variety, Cypriot Greek (CG), but instructed scholastically in the official variety, Standard Modern Greek (SMG). Participants were typically developing Greek Cypriot preschoolers and early school-aged children who completed the Cypriot Object and Action Test (COAT). Results revealed a significant grammatical word class effect favoring nouns over verbs in Modern Greek, with a developmental change in the size of the noun–verb gap. Both age groups showed similar error patterns for both object and action targets. For action names, children produced more semantic descriptions or circumlocutions (e.g., *hitting the nail* for *hammering*), whereas omissions were the prominent error type for object names. The findings are discussed in relation to cross-linguistic evidence of grammatical word class differences using the picture naming paradigm for monolingual (pre)school-aged children.

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A close examination of how children with typical language development process and retrieve object names (for nouns) and action names (for verbs) in their spoken language is important, yet mostly overlooked in the psycholinguistic literature. Likewise, research on lexical disorders in children and, more specifically, developmental naming difficulties across languages is lacking as well – despite an increasing appreciation for the role of the lexicon in language development (Tomblin & Zhang, 2006), for the acquisition of literacy skills, including reading and writing (Messer, Dockrell, & Murphy, 2004), and for communication and psychosocial well-being (Tomblin, 2008).

There is ample cross-linguistic and cross-population evidence that nouns appear easier to retrieve compared to verbs for many different languages and for different groups of language users, including normal elderly adults (Druks et al., 2006) and young bilingual adults (e.g., Bogka et al., 2003). This holds for different clinical populations, such as children with word-finding difficulties and/or specific language impairment (Dockrell, Messer, & George, 2001; Kambanaros & Grohmann, 2010, 2011; Kambanaros, Psahoulia, & Mataragka, 2010) as well as for adults with acquired language disorders, both as a result of focal brain damage (such as aphasia; see studies reported in Kambanaros, 2009) and non-focal brain damage (such as dementia or schizophrenia; see e.g., Druks et al., 2006; Kambanaros, 2009; Kambanaros et al., 2010). While there is some evidence of exceptions (e.g., in 'verb-friendly' languages; see Kauschke, Lee, & Pae, 2007), the 'noun advantage' appears to hold widely.

Explanations for this cross-linguistic noun advantage in acquisition and impairment focus on a number of factors, including, for example, qualitative differences in the learning of nouns and verbs (with the latter more difficult to learn and remember), variability in verb and noun denotations (where verbs often have multiple meanings), and the complex relationship between verbs and nouns (e.g., instrumentality, name relation, transitivity). Methodological issues also play a role, such as input frequency, test construction, and participant selection. For cross-linguistic research purposes, the transparency of the noun–verb distinction and the saliency of nouns and verbs for each language are matters of consideration.

Lexical development for grammatical class words in bilinguals has rarely been studied. However, findings across multiple languages with different underlying structures suggest an early noun advantage across languages. Within their linguistic relativity hypothesis, Gentner and Boroditsky (2001) posit that noun semantics is relatively transparent compared to verb semantics, hence stable across different languages; in contrast, due to their polysemous nature, verbs are non-transparent (encoding information about the path, manner, or instrument). Thus, which aspects of an action are to be attended and lexicalized in a given language is a language-specific variable.

The present study considers bidialectal, or rather: bilectal, speakers of Modern Greek. Our primary objective is to profile lexical development of nouns and verbs in the

standard language, Standard Modern Greek (SMG). For Greek Cypriot children, who are all native speakers of an uncodified, non-standard variety, Cypriot Greek (CG), SMG is only instructed formally in the school setting rather than naturally acquired. We aimed to determine the possible contribution of language-specific vocabulary knowledge on grammatical word class retrieval, and to determine if naming abilities improve with age.

Previous action and object naming studies in typically developing children

Lexical access of verbs and nouns using picture naming in typically developing children is an under-researched topic. As listed in Table 1, only half a dozen studies targeting retrieval of both objects (i.e., nouns) and actions (i.e., verbs) using pictured stimuli in monolingual children without language impairment were found in our literature search.

While most studies controlled for age of acquisition and for word frequency of verbs and nouns, only Masterson, Druks, and Gallienne (2008) additionally controlled for word length and imageability of both pictured verbs and nouns. Results from these studies reveal language-specific trends: German children between the ages of 2;6 and 8;0 years found verbs significantly more difficult to retrieve than nouns, while younger (e.g., 3–4 years of age) but not necessarily older English children (5-year-olds) showed the same pattern. Cross-linguistic comparisons between German-, Korean-, Turkish-,[1] and English-speaking children revealed a higher accuracy for nouns overall (but with the difference larger for German-speaking children), and similar accuracy levels for verbs across children and languages.

However, no study has yet been conducted with children who acquire two closely related varieties. The diglossic situation of Cyprus (Newton, 1972) provides a clear example of such a context.

Modern Greek, with special reference to Cypriot Greek

Cypriot Greek (CG), the dialect of the Modern Greek language spoken in Cyprus and acquired as a first language by all Greek Cypriot children prior to schooling, is an underdescribed, uncodified linguistic variety. Very little is known about the language acquisition process of typically developing children and normative information on CG development still needs to be established in order to create a relevant knowledge base; for modest beginnings, basic background, and additional references, see e.g., Grohmann (2011), Grohmann et al. (2012), Grohmann and Leivada (2012). The official language of the Republic of Cyprus is Modern Greek, as in the Hellenic Republic (Greece), and linguistically, this is typically referred to as Standard Modern Greek (SMG), although the native language of Greek Cypriots is the local variety, CG, which is not standardized and differs from region to region.[2]

CG itself has undergone substantial changes over the centuries since many conquerors passed through Cyprus, and lexical borrowings stem from languages such as Arabic, Turkish, Italian, French, and English (Varella, 2006). The two varieties thus differ to a

Table 1. Cross-linguistic studies investigating action and object picture naming in typically developing monolingual children.

Study	Davidoff and Masterson (1996)	De Bleser and Kauschke (2003)	Kauschke and Stan (2004)	Kauschke and Ari (2005)	Kauschke, Lee, and Pae (2007)	Masterson, Druks, and Gallienne (2008)
Language	English: 'noun-friendly' (clear noun–verb distinction)	German: 'noun-friendly' (clear noun–verb distinction)	German and English monolinguals	German Turkish: 'verb-friendly' language' (less obvious noun–verb distinction)	German Turkish Korean: 'verb-friendly' language' (less obvious noun–verb distinction)	English
Number of items:						
Verbs	38		36	36	36	100
Nouns	19		36	36	36	100
Measurement:						
Accuracy	YES		YES	YES	YES	YES
Speed/RTs	NO		NO	NO	NO	YES (for 5-year olds only)
Psycholinguistic variables measured	Age of acquisition Transitivity Frequency	Age of acquisition Transitivity Name agreement		Name agreement	Age of acquisition Transitivity Frequency Name agreement Picturability (nouns) Animacy (nouns)	Age of acquisition Frequency Imageability Word length
Number of children	316	240	62 (31 for each language)	210	180	62
Chronological age	3;0–3;5 (37) 3;6–3;11 (49) 4;0–4;5 (77) 5;0–5;5 (76)	2;6–2;11 (30) 3;0–3;5 (30) 3;6–3;11 (30) 4;0–4;5 (30) 4;6–4;11 (30) 5;0–5;11 (30) 6;0–6;11 (30) 7;0–7;11 (30)	4–5 (9 per language) 5–6 (11 per lang.) 6–7 (11 per lang.)	3;0–3;11 (60 German, 20 Turkish) 4;0–4;11 (60 German, 20 Turkish) 5;0–5;11 (30 German, 20 Turkish)	3;0–3;11 (20 per language) 4;0–4;11 (20 per language) 5;0–5;11 (20 per language)	3-year-olds (30) 5-year-olds (32)
Results	N > V (intransitive verbs) N = V (transitive verbs)	N > V (across all age groups)	N > V (across all age groups for both languages)	N > V (for German and Turkish)	N > V (for German and Turkish across all ages) N > V (for Korean children aged 4;0–4;11, else: N = V)	N > V (for 3-year-olds) N = V (for 5-year-olds)

great extent from one another, although both are used on the island, leading to a linguistic situation of diglossia (in the sense of Ferguson, 1959; cf. Moschonas, 1996): SMG is the assumed sociolinguistically 'high' variety used in written communication (legal and administrative), in the media (though not exclusively in the more recent present), and in all formal contexts, including schooling (throughout the entire education system, at least by law); CG is the 'low' variety used largely in oral form and daily communication (informal contexts), but some texts can be found in increasing number (poetry, prose, plays, fairytales, and even newspaper commentaries). Other than through television programs, children typically come in touch with SMG formally when they enter public preprimary education.[3]

Modern Greek (both SMG and CG) is a highly inflected, fusional language with a complex morphology (Holton, Mackridge, & Philippaki-Warburton, 1997).[4] With respect to grammatical aspects of immediate relevance, morphophonological word forms are inflected according to grammatical category; for instance, *kov-o* 'cut-1.SG.PRES' is a verb (transl. 'I cut') and *psalid-i* 'scissor-NOM.SG.NEUT' a noun (transl. 'scissors'). Thus, nouns and verbs are differentiated (by and large, unambiguously) through different suffixes, marked for phi-features (person, number, gender) but also tense, aspect, and mood (verbs) or case (nouns). Since Modern Greek has lost the infinitive, the verb form inflected for first person singular present tense is used as the citation form; nominal citation forms are nominative singular inflected nouns marked for gender.

Information about the grammatical category and about morphosyntactic features is a prominent aspect of Modern Greek, since each of these must be accurately projected, marked, and expressed during single-word production; the appropriate affix must be added to the root/stem to form a grammatical word, unlike English. Verbs and nouns in Modern Greek are considered of similar morphological complexity given that each word class respectively has several conjugational patterns. Nevertheless, Modern Greek makes a fundamental distinction between nominal and verbal lexical items, and it possesses an especially rich verbal morphology (Holton et al., 1997; Stephany, 1997).

All the same, given that Modern Greek has a regular and transparent verb morphology and is also a null subject language, one could hypothesize that it may fall into the 'verb-friendly' language category, as apparently Turkish or Korean do (Kauschke et al., 2007). This is an aspect that has not entered the discussion or received research attention for any developmental work of Modern Greek, be it SMG or CG. It therefore constitutes one step towards building a solid knowledge base of Modern Greek first language acquisition, and at the same time provides insights into bilectal acquisition with special emphasis on the linguistic context of Cyprus.

The picture naming paradigm

The many attempts to disentangle the processes underlying verb–noun differences have relied on words that can be pictured, such as concrete objects and unambiguous actions. Several investigators have argued that picture naming tasks favor the production of nouns, since nouns represent objects that are easily pictured (e.g., Davidoff & Masterson, 1996). Note, however, that verb–noun dissociations were also found when video-taped stimuli of actions and objects were used instead of pictures (Bird, Howard, & Franklin,

2003; Davidoff & Masterson, 1996). For grammatical encoding, the semantic and syntactic information of a lexical entry is needed, that is, the 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 Modern Greek, for example. In response to an action picture, a verb lemma is activated, specifying at least information about the verb's argument structure, tense, person, and number (see Levelt, 1989). 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 of a word (number of syllables, prosody, segmentation) and its morphology (verbal and nominal inflections).

The present study

The present study focuses on the lexical development of verbs and nouns in an understudied bilectal population. It samples a wide age range of typically developing children between the ages of 3 and 6 years. One way to investigate action and object word retrieval is to devise a language-specific measure of verb and noun access. Hence, two sets of pictures were developed in SMG, with plausible CG alternatives for some items, in order to compare the development of (picture) naming for nouns and verbs.

While formal differences between CG and SMG abound on the phonetic, phonological, morphological, and syntactic side (see section above on Modern Greek), these are irrelevant for single-word naming. The relevant aspects of the two grammars are constant: Both are highly inflected linguistic varieties in which all word forms need to be properly inflected, through the most basic structure of [stem + affix (+ affix)]. Of course, individual lexical items vary between the two varieties, but these are controlled for in this study.

The specific aims of the present study are two-fold: (1) to investigate potential grammatical word class effects for object and/or action names by Greek Cypriot children (e.g., N < V or V < N or V = N); and (2) to explore the effects of age on lexical access for nouns and verbs. By doing so, we will examine naming errors with reference to existing models of naming.

Methods

Participants

Fifty children participated in the study, divided into two groups: 20 preschoolers (12 boys, 8 girls) between the ages of 3 and 5 (mean age 54.2 months, SD 5.97), and 30 first-graders (15 boys, 15 girls) aged 6 years (mean age 77.69 months, SD 3.16). All children were recruited randomly from three public kindergartens and primary schools within the Nicosia district after approval from the Ministry of Education and Culture and upon written parental consent. No child was receiving speech and language therapy services. All children were born in Cyprus to Greek Cypriot parents, and no child was multilingual, that is, exposed to a non-Greek language at home or instructed in a language other than Modern Greek at any time at school.

Parents' level of education was based on existing measures of educational attainment adapted for Cyprus from the European Social Survey (2010). This resulted in a seven-point

scale (with 0 = no education, 1 = primary education, 2 = high school education, 3 = completion of lyceum, 4 = diploma, 5 = bachelor degree, 6 = graduate degree, 7 = PhD). Overall, maternal education levels ranged from 1 to 6 with 46.7% at level 5. Paternal education levels ranged from 3 to 7, with 60% at level 5. Detailed information about the participants and parent level of education is presented in Table 2.

Materials

A modified version of the Greek Object and Action Test (GOAT), originally developed by Kambanaros (2003) for SMG–English bilingual populations, was administered to assess retrieval of object and action names. Object and action pictures were colored photographs measuring 10 × 14 cm in size and were professionally photographed in a studio. For the present study, words with a mean age of acquisition greater than 6 were removed, since the mean age of the school-aged participants was 6;3. None of the participants was able to identify the verb *kurðizi* (κουρδίζει) 'winding (a watch)'; thus it was not studied further. The original GOAT had 42 items in each category (nouns and verbs); the adapted Cypriot Object and Action Test (COAT) used here consisted of 35 nouns and 39 verbs.

Object names are single, concrete, inanimate nouns and include manipulated instruments such as garage tools, garden equipment, kitchen utensils, household items, and office and personal implements used for activities of daily living. Object names were not controlled for gender; 5 nouns were masculine, 14 feminine, and 16 neuter. This gender distribution is typical for Modern Greek (neuter > feminine > masculine), with the distance between feminine and masculine being greater than that between neuter and feminine (Stephany, 1997: 188). All verbs were monotransitive actions with either simple internal word structures of [root + affix] or slightly more complex ones with a second affix. Actions were restricted to stereotypical roles, that is, a woman is shown performing household activities (e.g., *sweeping*) and a man is performing more masculine duties (e.g., *hammering*). Durkin and Nugent (1998) found that preschool children have strong gender stereotypes for adult activities. 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).

Table 2. Participant characteristics.

	Preschoolers (*n* = 20)	First-graders (*n* = 30)
Age in months	54.20 (SD 5.97)	77.69 (SD 3.16)
Gender	60% males	50% males
Maternal education (mean)	3.95	4.50
Paternal education (mean)	4.05	4.50
Instruction in Greek	5 hours/day (25 hours/week)	6 hours/day (30 hours/week)
Home language	Cypriot Greek	Cypriot Greek

Key: maternal/paternal education: 3 = completion of lyceum, 4 = diploma, 5 = bachelor degree.

All action names corresponded either to an instrumental verb (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, as were all target verbs in action naming for 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). A Mann-Whitney test revealed no significant difference between object and action lemmas ($z = -0.22$, $p = .82$). In addition, there was no significant difference in syllable length between object and action names ($z = -0.61$, $p = .54$). Furthermore, object and action names were measured for key psycholinguistic variables, including age of acquisition (AoA), imageability, and picture complexity. The estimated AoA was obtained from 25 Greek Cypriot adult speakers of Modern Greek (between the ages of 19 and 30 years), following the procedure proposed by Gilhooly and Logie (1980):[5] Participants were asked to estimate the age they first came into contact with a given word, in either verbal or written form, on a seven-point scale (with 1 representing 0–2 years of age, 2 being 3–4 years of age, etc., up to 7 representing 13 years of age and older).

For word imageability, 20 adult volunteers (between the ages of 18 and 25 years, all CG-speaking students at the University of Cyprus) were asked to rate the ease with which they could arouse a mental image of the concept referred to by the (written) word. Ratings were performed on an eight-point scale (with 0 = impossible, 1 = least imageable, up to 7 = most imageable), in line with Paivio, Yuille, and Madigan (1968). Picture complexity ratings were collected from a second group of 20 adult participants (between the ages of 19 and 23 years, all CG-speaking students at the University of Cyprus) following instructions from Snodgrass and Vanderwart (1980): Participants were asked to rate on a seven-point scale the ease with which they could recognize the item/action in the picture (with 1 = least ease, up to 7 = most ease).

AoA, imageability, and picture complexity scores were determined for each word item by averaging ratings over all participants. Table 3 provides a summary of the characteristics of items in each word class. All test items with number of syllables, frequency ratings, rated AoA, rated imageability, and rated picture complexity values can be obtained from the authors.

Procedure

The object and action picture naming 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, a certified speech and language therapist. The order of the task (comprehension or production) was counterbalanced across the children, and the same 74 pictures were used for both tasks. For the comprehension task, children were asked to point to the correct photograph (e.g., 'Show me X') from a set comprising the target object or action and two potential semantic distracters. For example, if the target word was 'broom', then 'mop' and 'rake' served as semantic distracters. Overall, school-aged children's comprehension on the picture (pointing) identification task of the COAT was 100%. For the preschoolers, it ranged from 85% to 100%.

For the production task, children were asked to name the object or action represented in the photograph in a single word (one-word target response). Action names were required in the third person singular (in response to a question like 'What is X doing?').

Table 3. Characteristics of the revised version of GOAT (= COAT).

	Objects – 35 nouns (SD)	Actions – 39 verbs (SD)	Mann-Whitney U	*z*
Lemma frequency	0.01 (0.02)	0.01 (0.02)	630.0	−0.57
Syllable length	2.89 (0.83)	2.92 (0.74)	648.5	−0.40
Age of acquisition	2.77 (0.56)	2.73 (0.48)	645.5	−0.40
Imageability	6.59 (0.33)	6.43 (0.17)	310.0*	−4.05*
Picture complexity	6.57 (0.25)	6.19 (0.67)	439.0*	−2.64*

*Difference significant at .01 level.

Two examples were provided before testing. The stimulus question was repeated once for children who did not respond. Responses were counted in either variety, given that (1) 24% of the test items had CG alternatives and (2) the differences were not controlled for or analyzed as such. We thus do not investigate potential bilingualism in this study but simply focus on the bilectal child's mastery of grammatical class vocabulary in Modern Greek. 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 author and checked by the second author.

Results

Accuracy

The results of two subtests of the COAT are reported in detail: object naming (i.e., producing single-word nouns) and action naming (i.e., producing single-word verbs). The percentage of correct responses was calculated for object and action names. The mean percentage correct on object names was 68.3% (SD 29.1) and on action names 62.4% (SD 33.2) for preschoolers. For first-graders, the mean percentage correct on object names was 85.1% (SD 21.8) and on action names 77.4% (SD 28.6). The children in both groups performed better on nouns than on verbs; object names appear to be easier than action names. Statistical comparisons between the percent correct scores of nouns versus verbs using the Wilcoxon signed rank test were significant in the early school age group ($z = -3.55$, $p < .001$) and in the preschoolers' sample ($z = -2.50$, $p = .01$).

Qualitative analysis

Errors made for object and action names were classified into semantic errors, grammatical word class substitutions, omissions ('I don't know'-responses or no answer), phonological errors, visual errors, unrelated responses, or other. A summary of the error types is given in Table 4.

Table 4. Error types in percentages for object and action picture naming accuracies in SMG for typically developing Greek Cypriot children.

Type of error	Preschoolers		First-graders	
	Object lemmas	Action lemmas	Object lemmas	Action lemmas
Semantic error	6.86	11.15	5.05	5.04
Semantic description	4.00	17.95	2.10	14.27
Omissions (incl.'Don't know')	15.00	6.80	5.14	2.31
Grammatical word class	0.29	0.26	0.95	0.00
Unrelated response	0.57	0.26	0.67	0.26
Visual error	4.57	0.90	1.05	0.17
Phonological error	0.29	0.13	0.00	0.00
Other error	0.14	0.13	0.00	0.51

Semantic errors were divided into either semantic types involving a one-word substitution or semantic circumlocutions (the following word errors from the children's responses are used as examples). The latter involved describing the target action/object concept using more than one word (e.g., *drilling* → 'working with the drill' or *(paint) brush* → 'that which you paint with') and, in the case of verbs, a general-all-purpose verb (GAP) construction (e.g., *building* → 'making a house'). Semantic errors included coordinate (e.g., *rake* → 'broom'), superordinate (e.g., *mopping* → 'cleaning'), and associative errors (e.g., *envelope* → 'paper'), all semantically related, single lexical labels for the target word.

Phonological errors included words that share the same onset and number of syllables with the target word. Noun-to-verb substitutions were those where the action name was provided instead of the object name or vice versa (e.g., *iron* → 'ironing'). Visual errors included responses where there is no semantic relationship between the child's response and the target object/action word but an overall visual similarity (e.g., *scales* → 'clock'). Unrelated responses included real-word responses lacking a relationship of any form with the target word (e.g., *tie* → 'globe'). The 'other error' category included errors that could not be classified in the above (e.g., gestures).

Error types

Table 4 lists the percentages of incorrect responses, including the various types of errors made by both groups of children.

It was thus more likely for pre- and early school-aged children to get an object name correct than an action name. For the latter, semantic errors were identified in both types of word classes with the same percentage, whereas preschoolers made more semantic errors for action as compared to object names. For both groups, a semantic description or circumlocution error was more likely to occur with verbs rather than nouns, while it was more common for children to make an omission error ('I don't know') to object rather than action pictures. All other error types were very uncommon and will thus not be discussed further.

In sum, both groups shared the same error patterns for verbs and nouns: there was a higher rate of omissions ('I don't know'-responses) for object names in contrast to greater semantic description or circumlocution errors for action names. As expected, the preschool children made more word-retrieval errors than their older peers.

Regressions for predicting test performance

Performance on the lemmas was modeled using the following psycholinguistic variables: mean AoA, imageability, picture complexity, and frequency of the lemma. Multiple linear regressions were run for object and action lemmas separately. The multiple regression results for the two models predicting performance on object and action lemmas based on the early school age group appear in Table 5 (similar results were obtained from the preschoolers' data.).

This can be interpreted as a positive finding for the COAT, since ratings about the ease of arousing a mental image of a concept and the ease of recognizing the lemma as well as the frequency of appearance of the lemma for the 35 object and 39 action words used did not influence children's naming.

Discussion

The present study investigated object and action picture naming accuracy in Greek Cypriot pre- and early school-aged children. To the best of our knowledge, this is the first off-line developmental study to (1) report differences in naming pictures of objects and actions in children who are bilectal and (2) explore grammatical class differences in a highly inflected language in children without language impairment. Modern Greek is a language where, somewhat simplifying matters, nouns and verbs are differentiated on the basis of inflectional suffixes, so proficient children with typical language development should have no difficulties accessing words for output based on semantic and syntactic information made available using the picture naming paradigm.

The results from the present study show that the children under investigation report significantly higher accuracies in the naming of nouns over verbs. The presence of a

Table 5. Multiple regression coefficients for predicting number of correct responses for object and action lemmas.

Predictors	Regression coefficients for object lemmas (N_1 = 35)		Regression coefficients for action lemmas (N_2 = 39)	
	Unstandardized	Standardized	Unstandardized	Standardized
Constant	−5.99	–	45.90	–
Mean AoA	−5.20*	−.45*	−10.37*	−.57*
Word imageability	3.00	.15	−1.23	−.02
Picture complexity	3.92	.15	2.24	.18
Frequency	43.81	.16	−41.64	−.08

*Coefficient significant at .01.

grammatical word class effect in favor of nouns for our bilectal Greek children is similar to the results reported for German- (De Bleser & Kauschke, 2003; Kauschke & Ari, 2005; Kauschke et al., 2007; Kauschke & Stan, 2004), Turkish- (Kauschke & Ari, 2005; Kauschke et al., 2007), Korean- (Kauschke et al., 2007), and English-speaking children (Davidoff & Masterson, 1996; Kauschke & Stan, 2004), particularly toddlers (Masterson et al., 2008). This finding of a significant effect of word class across languages suggests that naming action pictures is inherently more difficult than naming object pictures for typically developing children between 3 and 7 years of age cross-linguistically.

Moreover, given the similar results between highly inflected languages (here, Modern Greek, but German, Korean, and Turkish as well) and a minimally inflected language (such as English), word class effects are strong evidence for the hypothesis that grammatical category is an organizing principle shared across languages irrespective of language family. Greater cross-linguistic variability for verbs than for nouns (relational relativity, according to structural characteristics of the languages) and developmental patterns in lexical acquisition are areas for further investigation. This is needed across many more languages before any sound conclusions can be forwarded (see Gentner, 2006). In addition, the finding also gives rise to the possibility that nouns might predominate in (early) word learning of Modern Greek bilectal speakers, but more research is warranted.

Our results also revealed a developmental change in the size of the noun–verb gap. Especially our younger participants, the preschool group (3- to 5-year-olds), demonstrated a larger noun–verb difference than the older group of first-graders (between 6 and 7 years of age). This suggests that, as they grow older, children begin to resolve processing dilemmas related to the underlying semantic and conceptual differences between nouns and verbs.

Processing differences were explored in relation to the different kinds of errors made by children when naming actions and objects on the picture naming task. Critical properties of the picture stimuli known to influence accuracy in naming such as word frequency, age of acquisition, imageability, and visual complexity were controlled for. Age of acquisition (AoA) was the most robust predictor of children's naming accuracies for both action and object words; in contrast, imageability, picture complexity, and lemma frequency were not. Our findings with regard to AoA are in tune with the data reported for the English-speaking school-aged children in Masterson et al.'s (2008) study.

The picture naming paradigm taps into children's ability to form a representation of the word form and link it to the representation of its meaning or referent independent of vocabulary acquisition (Davidoff & Masterson, 1996). Overall, we explored three types of naming errors among 3- to 5-year-olds and 6-year-olds: (a) semantic errors (which included coordinate, superordinate, and associative errors) and semantic descriptions/circumlocutions (which included GAP verb constructions); (b) omission errors (i.e., 'I don't know'), and (c) visual errors (which included misperceptions such as calling a set of *kitchen scales* a *clock*). The preschoolers had a higher percentage of all three error types than the first-graders: 40% semantic errors for the 3- to 5-year-olds compared to 26% for the 6-year-olds; 22% omissions for the 3- to 5-year-olds compared to 9.5% for the 6-year-olds; and 5.5% visual errors for the 3- to 5-year-olds compared to 1.2% for the 6-year-olds.

With regard to word class differences, younger and older children showed similar error patterns for both object and action targets. The preschoolers had a higher percentage of

omission errors for object names (15%) than the first-graders (5%) followed by semantic errors (nearly 7%). The latter had a similar percentage of semantic errors for object names as omissions. Both groups had a higher percentage of semantic description errors for action names (18% for the preschoolers and 14% for the first-graders).

Our results for object names support the findings of Masterson et al. (2008) for English children aged 5 and over, whereas our findings for action names are in line with a previous study on early school-aged English children (Davidoff & Masterson, 1996) and the studies involving German and Turkish children (Kauschke & Ari, 2005; Kauschke et al., 2007). However, there were exceptions in the error patterns for action and object pictures between the groups. The younger children had more than double the number of semantic coordinate errors for action words (8.9%) compared to the first-graders (4.0%) and more visual errors on object names (4.6%) compared to their older peers (1.0%). The latter is attributed to one test item, the picture of a kitchen scale (ζυγαριά/*zygaria*), which the majority of the children in the younger group mislabeled as a clock (ρολόι/*roloi*).

In the present study, we define *word retrieval* as selection of the target word form, that is, the point at which *scissors* is the most active in the lexicon and is selected is the point at which *scissors* has been successfully retrieved. If a word cannot be retrieved from the lexicon, then one possibility is that there is no response (the case for object name errors in the present study) or that the child circumlocutes or describes, giving an indication of the target meaning (the case for action name errors in the present study). Our children had relatively unimpaired comprehension for the same action and object names indicating no semantic impairment for the verbs and nouns attested. We therefore claim, following Levelt (1989), that the underlying cause of their word-retrieval difficulties based on the error types for action and object words, and in light of very good comprehension for both word types, lies with the links connecting semantics to the phonological output lexicon.

For verbs, even a simple action involves several components (such as agent, intention, direction, manner of movement, instrument, patient, and result) and may well be part of a coordinated series of actions (e.g., sweeping is part of pushing a broom). As such, several (instrumental) verbs can often be mapped onto another verb (e.g., *sweeping, mopping*, and *raking* could all be mapped onto a generic verb like *cleaning*), each emphasizing a different subset of components or a different part of the series. Children's semantic descriptions or circumlocutions of target verbs included a description of one or more components of the action involved (e.g., *raking* → 'sweeping the garden', *hammering* → 'hitting the nail with a hammer', *stirring* → 'mixing the food with a spoon'), giving an indication of the target meaning.

Furthermore, children relied on the use of GAP verbs (e.g., *make, do, put*), producing structures such as 'making food' for *cooking* or 'putting glue' for *gluing*. We suggest that the (over)use of GAP verbs by typically developing children is a compensatory strategy when unable to access semantically complex verbs from long-term memory (see Grohmann & Leivada, in press; Kambanaros & Grohmann, forthcoming; Stavrakaki, 2000). Also, repeated encounters with high-frequency, generic GAP verbs may result in the formation of stronger representations in the mental lexicon, making them more accessible. Obviously, the large number of semantic description errors for action names reflects the particular challenges in naming verbs, given that there are too many ways to

interpret them (Gentner, 2006). On the other hand, recent research has shown that typically developing children may have difficulties deactivating semantic competitors due to poor (not yet adult-like) inhibitory processing (Huang & Snedeker, 2011).

Alternatively, the picture of an object (e.g., a broom) will activate the stored concept or meaning associated with *broom* in the semantic system as a set of semantic features which might include [has a handle], [is held in the hand], [has bristles], and [used for sweeping]. These semantic features in turn activate stored lexical knowledge. As such, [has handle] will be true of *mop* and *rake*, so all these words will be activated. However, *broom* will be the most frequently activated item in the phonological output lexicon, as only *broom* will be activated by all four features, while *mop* and *rake* will be activated only by a subset of features. As the most active item in the lexicon, *broom* will therefore be selected. Given the large number of omissions for object words (i.e., nouns) in our study, we assume the unavailability of the target or a semantic substitute may reflect a delay in the individuation of certain nouns (e.g., tools, garden implements) as part of children's stored lexico-semantic system (perhaps not yet acquired).

In general, the different types of errors reported for nouns and verbs in typically developing pre- and early school-aged children could reflect representation differences underlying the two classes, including the differing linguistic levels of processing. Furthermore, plausible explanations for the divergent category-specific error patterns across languages could be related to (1) language-specific properties of the languages under investigation, (2) methodological issues inherent to the picture naming task (such as the absence of measurements on key variables known to affect the processing of pictures) or the quality/clarity of the pictured noun and verb stimuli (e.g., black and white sketches versus colored photographs), and (3) the selection of the actual test items, i.e., subcategories within each category (e.g., intransitive versus transitive verbs or biological nouns versus artifacts).

To conclude, this first study investigating action and object naming in the standard language of typically developing children who are bilectal revealed a word class effect favoring nouns over verbs in Modern Greek. Yet, the tendency for verbs to be handled in more diverse ways by Greek Cypriot children than nouns supports the universal, non-language-specific semantic-conceptual account that verbs connect to the world very differently from (concrete) nouns, and that verb meanings across languages are more linguistically shaped than (concrete) noun meanings regardless of language and cultural contexts.

Overall, the findings of the present study have a number of implications for researchers and educators alike in Cyprus and beyond. First, they provide indices of processing which may aid in understanding the nature of language processing in the standard language of bilectal children. Second, we can build on the current results to provide normative data on lexical access for nouns and verbs. Finally, the COAT can potentially serve as a diagnostic tool for bilectal children with developmental naming disorders.

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Notes

1. A significant advantage for nouns compared to verbs was found only for children aged between 4;0 and 4;11.
2. According to Tsiplakou, Papapavlou, Pavlou, and Katsoyannou (2006), a standardized form of CG is emerging in the Nicosia area; see also Arvaniti (2006) for further discussion of Standard Cypriot. The rich literature on the topic is synthesized by Rowe and Grohmann (2011), who also suggest the term 'bilectal' for Greek Cypriot speakers.
3. The results of a pilot study on clitic placement, one major morphosyntactic difference between CG and SMG, are reported in Grohmann (2011), which also presents an initial formulation of the Socio-syntax of Development Hypothesis; see Grohmann et al. (2012) and Grohmann and Leivada (2012) for more, as well as a host of ongoing research carried out by the Cyprus Acquisition Team.
4. When the distinction between SMG and CG does not play a role, we simply refer to the varieties and their properties as Modern Greek.
5. Our methodology follows what is reported extensively in this area. Please note that empirical evidence for AoA such as based on the MacArthur-Bates Communicative Development Inventory (CDI; cf. Fenson et al., 1994), for example, is not yet available for either SMG or CG. However, the first- and second-named authors have recently been awarded the CDI rights to devise (1) a CG version of the CDI and (2) a 'bilingual' CG–SMG version for research purposes within COST Action IS0804. Also, the COAT photographs are currently being rated across 23 languages for familiarity and name agreement as part of the COST Action IS0804.

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