A phonological assessment test for child Greek

Elena Babatsouli

Institute of Monolingual and Bilingual Speech, Chania, Greece

ABSTRACT
This article advances a clinical tool for assessing typical and atypical phonological development in children speaking standard Modern Greek or Hellenic (ISO 639.1, el). The proposed tool develops a comprehensive test that is archetypical of the standard idiom and of predominant dialectal variations and seeks to be readily available for logopedics and language researchers of child Greek anywhere. By utilising the constraint-based nonlinear theoretical framework, this Greek battery complements a larger study that utilises equivalent methodology in the evaluation of phonological acquisition of monolingual children with typical and protracted phonological development across several languages. As an example, the efficacy of the tool is tested by administering it to a monolingual Greek-speaking girl, aged 4;8, whose speech shows evidence of delay on different phonological levels when compared to known monolingual norms/data. The ultimate aim is a standardised test to help establish reliable quantitative norms/stages in child Greek development, as a benchmark for assessment and intervention of phonological delay and disorder.

Introduction
This study proposes an assessment tool of child phonological development in standard Modern Greek (el) (ISO 639.1, 2018), including predominant dialect characteristics, hereon Greek. The proposed procedures aim at evaluating the typically and atypically developing Greek speech of mono/multilingual children between 2;6 and 9;0 years, being representative of targeted Greek phonotactics and utilising the methodology of a larger crosslinguistic project (e.g. Bernhardt & Stemberger, 2017). Based on the Oxford English Dictionary (OED) definition, ‘test’ is ‘a procedure intended to establish the quality, performance, or reliability of something, especially before it is taken into widespread use’ (https://en.oxforddictionaries.com/definition/test). On these grounds, the study develops a test (the procedures) to be used in future cross-sectional phonological research on child developmental Greek and provides an illustration of how it is implemented. The reasons that have necessitated the establishment of such an assessment tool, the guiding theoretical underpinnings utilised as well as related review on Greek phonology and child phonological development/assessment, are described in the introduction. This is followed by a detailed description of the proposed test and its accompanying pilot implementation. This article continues with an analysis of the data and concludes with a deliberation on the efficacy of the proposed tool and future directions.
The constraint-based nonlinear child phonological development/assessment

Evaluation of phonological performance during development has customarily relied on theory. A generic theme in child phonological development concerns linearity (e.g. Chomsky & Halle, 1968; Prince & Smolensky, 2004) and nonlinearity, with nonlinearity signifying complexity that is multi-planar rather than linear/sequential (e.g. Bernhardt & Stemberger, 1998; Mohanan, 1992; Rice & Avery, 1995). Nonlinear phonological models rely on the tenet that autonomous phonological units (segments-syllable-foot-prosodic word) have underlying hierarchical representations, not directly observable, though related on different tiers from the phrase level (top) to features (bottom; e.g. Bérubé, Bernhardt, & Stemberger, 2015; Chen, Bernhardt, & Stemberger, 2016). Each hierarchical level is independent while also linked with several other levels in a geometrical hierarchy. The constraint-based nonlinear model acknowledges the lack of ‘a fully elaborated theory of learning of constraint rankings by young children’ (Bernhardt & Stemberger, 1998, p. 261–263), arguing that constraints rely on representational analyses alongside concurrent changes ‘as learning proceeds’ (258).

On the understanding that child phonology is rooted in not-fully transparent phenomena in physiology, perception, and cognitive processing, Bernhardt and Stemberger have been conducting a crosslinguistic project on the assessment of typical/protracted child phonological development. The project utilises a common methodology crosslinguistically in terms of sample characteristics, word list types, data collection procedures, transcription conventions, and data entry/analysis procedures, also accounting for major within-language dialectal discrepancies (e.g. Bernhardt & Stemberger, 2017; Bernhardt et al., forthcoming; Chen et al., 2016). Given challenges such as the availability of participants, time, and financial resources, the following languages are currently researched in the crosslinguistic project: Arabic (Kuwaiti), Asian (Japanese, Mandarin, and Tagalog), Farsi, First Nations/Canada (Ojibwe/Anishinaabemowin), Germanic (English, German, Icelandic, and Swedish), Romance (European Portuguese, Canadian, and standard French, Chilean and Granada Spanish), and South Slavic (Bulgarian, Slovenian). This article adds Greek to this list, adopting the ‘nonlinear’ stance as the theoretical framework for identifying the underlying representations intended to be evaluated with the proposed test and for the analysis of actual data. An account of Greek phonology characteristics and distribution data is provided next.

Greek phonology

Segments and clusters

Modern Greek is founded on a combination of linguistic influences from ancient Greek (AG; 800 BC–600 AD), koine (300 BC–300 AD), katharevousa (1800–1976), demotiki (1818–), scholarly blueprints, loans, and dialects that make for a hard to pinpoint fluidity. Thus, its phonology has a dynamic character that mixes separate phonological systems in terms of segmental inventory, phonotactics, and usage distributions (Setatos, 1974, in Greek).

Greek has a segmental inventory of 20 consonantal phonemes: /p b f v t d s z θ ð ʦ ʣ ml rt k g x γ/, 10 consonantal allophones: [c ɟ ç j ŋ (ŋp ŋb ŋt ŋv) ŋ (ŋk ŋg ŋx ŋγ) ŋ n ſ r l], and a typical five vowel system: /i e a o u/ that includes two falling diphthongs: ai [ai~aj] and oi [oi~oj] and five rising diphthongs /ii ie io iu ia/ that are along with /i e/ the context of palatalisation (→[C PAL, i, C PAL,e, C PAL,o, C PAL,u, C PAL,ie]) of preceding /k x g γ n l/ in
-allophonic complementary distribution. Among the allophones, \( r \rightarrow \text{[r]} \) is in free non-obligatory allophony and the rest in obligatory complementary distribution. The phonological structure of Greek segments is outlined in the Scan Form (pp. 5, 9, 10), provided as supplementary material, where all permitted consonant clusters and vowel combinations in stressed and unstressed syllables are also shown. Double consonants are found in Greek orthography (e.g. εμμονή /εμονι/ ‘obsession’), but geminates only exist in certain Greek varieties (e.g. Cypriot, south-eastern Aegean). The phonetics of Greek is increasingly represented in research (e.g. Nicolaidis, 2001; Nirginanaki, 2014; see Arvaniti, 2007; Botinis, 2011, for reviews/analyses).

The most common phonological processes productive in Greek are shown in Table 1; the majority are obligatory. Among these, palatalisation, for example, /k g x/ \( \rightarrow \) [c ξ] when /i e/ follow and voicing assimilation (e.g. σμίνος /σμίνος/ \( \rightarrow \) zminos] ‘flock’) are typical. Other predominant patterns include: (a) in phonologically similar consonantal sequences, the second segment changes (e.g. φθηνός /φθινός/ \( \rightarrow \) [fti nos] ‘cheap’); exceptions are sequences of constituent consonants (except s), sequences in scholarly words (e.g. πτωσή /πτοσή/ \( \rightarrow \) [ptosi] ‘fall’) and loans (e.g. τακτ /takt/ \( \rightarrow \) [tukt] ‘tact’), (b) similar consonants and complex sequences simplify, while hiatus within and across syllables/words tends to be interrupted in colloquial or dialectal speech.

An indicative estimate of the distribution of Greek phonemes/phones is given by Setatos (1974), based on a specific text rather than spontaneous usage for a token total

| Table 1. Major phonological processes in Greek. |
|-----------------------------------------------|
| **Consonants** | **Assimilation** | **Homorganic nasal** | **Rule (example)** | **Examples** |
| --- | --- | --- | --- | --- |
| Palatalisation | k \( \rightarrow \) [c] \( i \), e | | \( /k/ \rightarrow /[	ext{ci}]/ \) ‘gap’ |
| Voicing | C-voice \( \rightarrow \) C-voice | C-voice | \( /\text{sminos}/ \rightarrow /[	ext{zminos}]\) ‘flock’ |
| Stopping | C-stop \( \rightarrow \) C-stop | C-stop | \( /\text{xte}./ \rightarrow /[	ext{kti}.]\) ‘comb’ |
| Coalescence | k \( \rightarrow \) [Xvoice,cont] | k \( \rightarrow \) [Cvoice,cont] | \( /\text{rikste}/ \rightarrow /[	ext{rıkste}]\) ‘throw!’ |
| Deletion/elastic | CCC \( \rightarrow \) CCC | CCC \( \rightarrow \) CCC | \( /\text{ikste}/ \rightarrow /[	ext{ikste}]\) ‘blessing’ |
| Simplification | C\# B\#-C | C\# B\#-C | \( /\text{enkosmía}/ \rightarrow /[	ext{enkosmía}]\) ‘worldly’ |
| Vowels | Epenthesis (hiatus) | V.V-V.CV | V.V-V.CV | \( /\text{aeras}/ \rightarrow /[	ext{e\#eras}]\) ‘wind’ |
| Paragoge (hiatus) | V.V-V.CV.CV | V.V-V.CV.CV | \( /\text{tsai}/ \rightarrow /[	ext{ts\#e\#i}c\#]\) ‘tea’ (diminutive) |
| Approximation | VV \( \rightarrow \) CV | VV \( \rightarrow \) CV | \( /\text{yai\#arios}/ \rightarrow /[	ext{yai\#e\#iros}]\) ‘donkey’, |
| | | | \( /\text{fra\#ula}/ \rightarrow /[	ext{fre\#i\#e}]\) ‘strawberry’ |
| diphthongisation | V.V \( \rightarrow \) Vi | V.V \( \rightarrow \) Vi | \( /\text{ae\#os}/ \rightarrow /[	ext{a\#itos}/\rightarrow /[	ext{e\#itos}]\) ‘eagle’ |
| diphthongisation | CV.V \( \rightarrow \) CV.CV | CV.V \( \rightarrow \) CV.CV | \( /\text{e\#nea}/ \rightarrow /[	ext{e\#n\#a}]/ \rightarrow /[	ext{e\#e}]\) ‘nine’ |
| Coalescence | CCC \( \rightarrow \) CCC | CCC \( \rightarrow \) CCC | \( /\text{ka\#ia}/ \rightarrow /[	ext{ka\#i\#e}]\) ‘none’ |
| Vocalisation | CCC \( \rightarrow \) CCC | CCC \( \rightarrow \) CCC | \( /\text{pa\#a\#a}/ \rightarrow /[	ext{pe\#\#e\#i\#e}]\) ‘you are very late’ |
| Coarticulation | CVV \( \rightarrow \) CVV | CVV \( \rightarrow \) CVV | \( /\text{takto}\! / \rightarrow /[	ext{takto}\! /\) ‘they hear’ |
| Vowel lengthening | V.V \( \rightarrow \) V.V | V.V \( \rightarrow \) V.V | \( /\text{a\#i\#y\#a\#lo}/ \rightarrow /[	ext{a\#i\#y\#a\#lo}]\) ‘almond’ |
| Deletion | V.V \( \rightarrow \) V.V | V.V \( \rightarrow \) V.V | \( /\text{fish}/ \rightarrow /[	ext{fish}]\) ‘bring’ |
of 4151 phonemes (99.92%) and 4078 phones (99.87%). The frequency of vowels, phonemes (2023 tokens, 48.76%) versus phones (1975 tokens, 48.40%) in decreasing order is: a→e (14.98%, 15.12%), i (13.08%, 11.10%), o (9.20%, 9.09%), e→e (9%, 8.46%), and u (2.50%, 2.50%). The frequency of consonants, phonemes (2128 tokens, 51.16%) versus phones (2103 tokens, 51.47%) is: s (7.97%, 7.60%), t (7.90%, 7.72%), n (7.37%, 5.84%), r (4.43%, 4.51%), p (4.40%, 4.02%), k (4.23%, 2.40%), l (2.64%, 2.45%), m (2.45%, 3.01%), θ (1.78%, 1.07%), γ (1.78%, 1.05%), δ (1.56%, 1.59%), f (1.22%, 1.25%), x (1.05%, 1.27%), v (1.03%, 1.05%), z (0.74%, 1.27%), b (0.26%, 0.73%), d (0.21%, 0.53%), and g (0.14%, 0.22%). The frequency of the allophonic distribution of k→c (69 tokens), g→j (6), x→ç (22), γ→j (32), n→η (7) →η (14), and l→Δ (10) is: c (1.69%), j (0.78%), ç (0.53%), η (0.34%), Δ (0.24%), and j (0.14%).

Given that Greek orthography is largely transparent, the following frequency in decreasing order of Greek letters/phones may also be relevant: α/υ, ω/υ, ε/τ, σ/ς, v/n, η/i, υ/i, ρ/π, κ/k, μ/m, λ/l, ο/o, δ/δ, γ/γ, χ/θ, ι/γ, f→p, β/v, ξ/ks, ζ/z, and ψ/ps (letterfrequency.org/letter-frequency-by-language/Greek). Setatos (1974) treats /ts/ and /dz/ as clusters (for the debate on their phonemic status, see Malikouti-Drachman, 2001). There are no statistics on functional load (e.g. as discussed by Ingram, 1989) in Greek.

With regard to consonant clusters, Greek has a maximum of three consonants in onset position, but there are more CC types than CCC types. Clusters in coda: [ts dz ft vz st mb r d n s] ng ηks lt lf ls lm lk rt rs rd rt kl kt ks exist only in loans, for example, ταλκ /talk/ →[telk] ‘baby powder’, τανκς /tanks/→[tenks] ‘tanks’, and φιορδ /fiord/→[fiord]. A comprehensive list of Greek clusters in word-initial, medial-onset, and medial-across-syllables position (adapted from Setatos, 1974) can be found in the Scan Form (pp. 6–8), provided as supplementary material. The 40 most frequent consonant clusters/sequences in Greek and their percentages to the total number are given in Protopapas, Tzakosta, Chalamandaris, and Tsiakoulis (2012) as follows: st (18.5%), pr (8.6%), ks (5.9%), ft (4.5%), zm (3.1%), tr (2.8%), kr (2.3%), ps (2.1%), pl (2.1%), γγ (2.0%), kl (2.0%), xr (2.0%), δj (1.8%), βγ (1.6%), δr (1.6%), γr (1.6%), kl (1.5%), rj (1.5%), sc (1.3%), rc (1.3%), pt (1.2%), ym (1.1%), sc (1.1%), vl (1.0%), fθ (1.0%), sk (0.9%), rm (0.9%), mv (0.9%), sp (0.8%), sf (0.8%), mf (0.8%), nd (0.8%), rm (0.8%), xθ (0.8%), xn (0.7%), str (0.7%), γn (0.7%), rt (0.7%), fs (0.6%), and pç (0.6%).

**Syllables**

As a syllable-timed language, Greek is characterised by consecutive syllables of equal duration. Greek has closed syllables, but the tendency is for open ones (Holton, Mackridge, & Philippi-Warburton, 2002), where the word structure formula C_duration-3VC_duration-3C_duration-1 (Mennen & Okalidou, 2007, p. 400) predominantly holds. The rime in Greek may typically comprise a nucleus (#V #Vi, V#, iV#, V/, iV/, or syllabic consonant in exclamations) or a nucleus and mainly a singleton coda, that is, [f v z θ m n l r k ks x γ j] word-initially, word-medially (that includes δ), and overwhelming /s n/word-final, except in some archaic terms and #- [p b bl t ts dz s z s f st m n ng l t lf lm lk rt mn r d rt ks ks]. #- [p b t ts dz z f ft v vr st θ m mbr n nd ns ng l t lf ls lm lk r rt rs rd rt ks kl rt ks x γ j] in loans. Table 2 shows the distribution of Greek syllables per word position, as computed by Setatos (1974); tokens are shown in parentheses. CVCC, CCVC, and CVCCC appear in loans, while CiVC is an exclamation. The /i/ in targeted syllables like the last one, and elsewhere (e.g. CiV, CVi, CCiV, etc.) throughout the text and tables, refers to either the /i/ in falling diphthongs or to the context of the Greek
palatalisation rule, where a targeted /C/ followed by /i/ and another /V/ palatalises the consonant (see more in previous section on segments and clusters).

**Word structure**

Greek has a trochaic foot (Holton et al., 2002). Words are mostly disyllabic or multisyllabic (3–5 syllables or more, the longest being compounds); monosyllables are few in type, in common usage when they are function words, and include loans. Not all syllable combinations are possible in the permitted word structures with V, CV, CVC, CCV, CCVC, and VC being more common (see Scan Form (p. 3), provided as supplementary material). Among these, the most frequent word structures, as computed by Setatos (1974), are shown in Table 3 (those with over eight tokens for single- to three-syllable words and over two tokens for four-syllable words).

**Table 2.** The distribution of Greek syllables per word position*.

| σ type | 1-σ words | 2,3,4-σ words |
|--------|------------|---------------|
|        | #σ | % | #σ | % | #σ | % | Sum |
| V      | 1.14% (24) | 11.13% (233) | 0.52% (11) | 0.66% (14) | 13.47% (282) |
| Vi     | 10.80% (226) | 11.85% (248) | 15.48% (324) | 18.64% (390) | 56.78% (1188) |
| CiV    | 1.19% (25) | 0.57% (12) | 0.33% (7) | 1.48% (31) | 3.58% (75) |
| CiV    | 0.38% (8) | 4.64% (97) | 3.34% (70) | 2.77% (58) | 11.13% (233) |
| CiVC   | 0.09% (2) | 0.14% (3) | 0.14% (3) |
| CCV    | 0.04% (1) | 0.95% (20) | 0.04% (1) | 0.52% (11) | 1.57% (33) |
| CV     | 5.01% (105) | 1.67% (35) | 0.62% (13) | 4.30% (90) | 11.61% (243) |
| CCVC   | 0.09% (2) | 0.28% (6) | 0.38% (8) |
| CCCV   | 0.47% (10) | 0.09% (2) | 0.04% (1) | 0.57% (12) | 1.19% (25) |

*Adapted from Setatos (1974, in Greek).

**Table 3.** The distribution of most frequent word shapes in Greek*.

| σ # | % (tokens) | Word shape (# tokens) |
|-----|------------|----------------------|
| 1-σ | 39.16% (414) | CV (224), CVC (112), CV (26), V (24), CCVC (12), CCV (8) |
|     | 81.40% (337/414) | |
| 2-σ | 32.07% (339) | CV.CV (82), V.CV (72), CCV.CV (32), V.CVC (26), CVC.CV & CV.CVC (18), CV.CCV (11), V.CCV & CV.CIV (10), V.CVC & CCV.CCV (8) |
| 3-σ | 19.11% (202) | CV.CV.CV (41), V.CV.CV (30), CCV.CV.CV (16), V.CCV.CV (15), V.CV.CCV & CCV.CV.CV (9), V.CV.CVC (8) |
| 4-σ | 7.56% (80) | CV.CV.CV.CV (13), CCV.CV.CV.CV (5) |
|     | 5.56% (80) | CV.CCV.V & V.CV.CVC & CV.CV.CV.VC (3), CV.CV.CV.V & V.CV.CV & V.CV.CCV.V & V.CV.CV.CVC.V & CCV.CV.CV & CV.CV.CV.CV & CV.CV.CV.CVC.V & CV.CV.CV.CV & CV.CV.CV.CV (2) |
| 5-σ | 1.98% (21) | CCV.CV.CV.CV.CV (3), V.CV.CV.CV.CV.CV & CV.CV.CV.CV.CV & CCV.CV.CV.CV.CV (2) |
| 6-σ | 0.09% (1) | CCV.CV.CV.CV.CV (1) |

*Adapted from Setatos (1974, in Greek).
Stress
Greek has dynamic stress, primary and secondary, typically falling on the syllable nucleus (vowel-diphthong-syllabic consonant) of certain words in phrases/sentences. There are two basic rules: two consecutive syllables cannot be both stressed, and only a maximum of two unstressed syllables may follow the primary stress (Holton et al., 2002). Stress has a semantically contrastive function in Greek differentiating between otherwise identical words/phrases, for example, μιλιά/μίλια [miˈʎɐ /ˈmiʎɐ] ‘speech/miles’ and δεν είπε γιατί φεύγει [ðɛn ipɛ jat/iatı ˈfɛvɨj] ‘he didn’t say why/because he is leaving’. Secondary stress may have a contrastive function, but it is primarily optional. Greek also has enclitic stress in certain prosodic phrases, for example, το πρόσωπο της [to ‘pr.o.so.,po tis] ‘her face’.

Greek dialects
Representative work on Greek dialectal phonology may be found in Trudgill (2003) and references therein; for Cypriot Greek, see Newton (1972), Taxitari, Kambanaros, Floros, and Grohmann (2017). Standard Greek has mostly been furnished by the Peloponnesian and Ionian varieties. Among the six main dialectal features from elsewhere, only velar fronting in a following /iV/ context is found in all varieties. Northern varieties features that are intermittently productive in the standard are: /n l/ palatalisation in the context of following /i/, for example, πανί /paˈɲi/ → [pɐˈɲi] ‘cloth’ and άλλη /ˈali/ → [ˈaʎi] ‘other’, and stop pre-nazalisation (/b d g/ → (/b d g)), for example, λάμπα /ˈlaba/ → [ˈlɐbɐ] ‘lamp’ and αβοκάντο /avocado/ → [ɐvokɐndo]. Occasionally, geminates (Cyprus, south-east), for example, άμμος /ˈamos/ → [ɐmːos] ‘sand’; /i u/ deletion in unstressed syllables (north), for example, κορίτσι /koˈɾi.tsi/ → [koˈɾi.tSO] ‘girl’; and vowel deletions in hiatus, for example, από εδώ /aˈpo eˈdo/ → [ɐpɛˈdo] ‘this way’ may also be present.

Phonological development and assessment in Greek
Greek child phonological development has been investigated in single-case and cross-sectional studies (e.g. Kappa, 2002; PAL: Panhellenic Association of Logopaedics, 1995; see Mennen & Okalidou, 2007, for review). More recent work includes studies on monolinguals (Athanasopoulou, 2018; Gazani, 2009; Papathanasiou, Dimitrakopoulou, Ntaountaki, & Vasiliou, 2012; Piterou, 2015), biletals (Piterou & Armostis, 2016; Petinou & Theodorou, 2017), bilinguals (Antoniou, Best, Tyler, & Kroos, 2010; Babatsouli, 2017; Babatsouli & Nicoladis, 2019), and child speech impairment (Geronikou & Rees, 2015).

The only available test of Greek phonological acquisition for preschool children is the Test of Phonetic and Phonological Development that the Panhellenic Association of Logopedics (PAL, 1995, in Greek) designed, and carried out from 1989 to 1992, eliciting picture-naming data of 101 words from 300 children, aged 2;6–6;0, in Athens. The words elicited are in groups of 70 and 31 types each, of which 30 and 14, respectively, are intended for preliminary assessment. Regarding picture use, only two sketched scenes are shown at home/a playground. Results in PAL (1995) provide normative data and are widely cited (Babatsouli, 2017; 2018; Babatsouli & Nicoladis, 2019; Mennen & Okalidou, 2007; Papathanasiou et al., 2012, etc.). PAL (1995) is not published but officially accessible to registered PAL logopedics, so their word list will be discussed here only as
pertinent. In order to provide a test accessible to phonologists/logopedists/SLPs anywhere and fill in gaps in the PAL test, the following test was constructed.

**Method**

**The Greek test**

The clinical tool for phonological elicitation and analysis proposed here is named Phonological Assessment for Greek (PAel), that is, PAel, and targets the typically and atypically developing Greek speech of mono/multilingual children between 2;6 and 9;0 years. A single-word and narrative elicitation technique is used, adopting the methodology of the crosslinguistic project across 17 languages undertaken by Bernhardt, Stemberger, and colleagues (see introduction). With regard to the experimental design, PAel utilises the single case (multiple baseline) design. PAel comprises 150 content words (mostly nouns/adjectives) divided into two parts: a SCREENER: 50 words intended for preliminary/basic assessment (Tables 4 and 5), EXTENDED: 100 words for assessing more advanced phonological skills (Tables 6–8), and a two-part narrative/story built on SCREENER/EXTENDED lists that broadens further the list’s phonotactic representation.

The PAel word list was constructed to include variable representative phonotactic contexts of the Greek inventory, also accounting for underlying nonlinear interactions. Greek phonotactics are represented (a) in imageable words, familiar to children; (b) accounting for distribution frequencies: common words, marked/unmarked segments, various prosodic contexts, syllable types (structure/stress), and word structures/lengths (e.g. bilabials vs. fricatives, more /s/ than /g/, more CV than CCCV); (c) in cumulative

| Word shape | # Orthographic | Phonemic | Phonetic | Gloss |
|------------|----------------|----------|----------|-------|
| CVC        | 1 γκολ          | 'gol     | 'gol     | goal  |
| CCV        | 1 μπλε          | 'ble     | 'ble     | blue  |
| V.CCV      | 1 αυτιά         | i.'ftia  | e.'ftce  | ears  |
| V.CVC      | 1 ήλιος         | i.'lios  | i.'kos   | sun   |
| CV         | 2 ζώα τάδα      | 'zo.a 'ba.i | zo.e 'be.i | animals tea |
| CV.CV      | 5 γκάζι         | 'ga.zi   | ge.zi    | accelerator |
|            | μούτη νταντά     | 'm.it da. 'da | m.it de. 'de | nose nanny |
|            | ρούζ χαλί       | 'r.i.zi x'li | 'r.i.zi x'e. 'li | rice carpet |
| CV.CV      | 1 μαίμου        | mai. mu  | mej. mu  | monkey |
| CV.CVC     | 2 πάγος σάκος   | pa.'gos 'sa.kos | pe.'gos 'se.kos | ice sack |
| CV.CCV     | 4 δέντρο κούκλα | de.'dro 'k.u.'la | de.'dro 'ku.kle | tree doll |
| CV.CVC     | 1 πάρκο         | par.'ko  | per.'ko  | park |
| CV.CVC     | 1 τίγρης        | 'ti.'yris | 'ti.'yris | tiger |
| CVV        | 1 πρώι         | pro.'i   | pro.'i   | morning |
| CCV.CV     | 5 γλώσσα γκρίζο | 'glo.s.'a 'gri.zo | 'glo.'se 'gri.zo | tongue grey |
|            | μπράτσο τρένο   | 'bra.'to 'tre.no | 'bre. 'to 'tre.no | arm train |
|            | ψάρι         | 'psa.'ri | 'ps.e.'ri | fish |
| CCV.CV     | 1 κλειδία       | kl.'dia  | kl.'de   | keys  |
| CVV        | 1 πίστα         | 'pia.ta | 'pce.te  | dishes |
| CV.CVC     | 1 φιάγκος       | 'fio.'gos | 'fio.'gos | bow |
| CCV.CV     | 1 γύνερει       | 'yber.ni | 'yber.ni | scratches |
| CCV.CCV    | 1 ξύστρα        | 'ksi.'stra | 'ksi.'stre | sharpener |
Table 5. Greek screener (PAel): multisyllabic (19 words).

| Word shape | Orthographic | Phonemic | Phonetic | Gloss |
|------------|--------------|----------|----------|-------|
| CV.CV.V | ρολόι | ro.ˈlo.i | ro.ˈlo.i | clock |
| CV.CV.CV | θάλασσα | θα.ˈla.sα | θe.ˈle.sa | sea |
|            | καλάθι | ka.ˈla.thi | ke.ˈle.thi | basket |
|            | κεφάλι | ke.ˈfa.li | ce.ˈfe.li | head |
|            | λουλούδι | lu.ˈlu.dι | lu.ˈlu.dι | flower |
|            | μπαλόνι | ba.ˈlo.ni | be.ˈlo.ni | balloon |
|            | παπούτσι | pa.ˈpu.tsι | pe.ˈpu.tsι | shoe |
|            | γχόλια | xe.ˈlo.na | ce.ˈlo.ne | turtle |
| CV.CV.CV | νεράδα | ne.ˈra.dα | ne.ˈre.j.de | fairy |
| CV.CV.CCCV | θησαυρός | θι.sa.ˈvros | θi.se.ˈvros | treasure |
| CV.CV.CV | βιβλίο | vi.ˈvli.o | vi.ˈvli.o | book |
| CV.CV.CV | δασκάλα | da.ˈska.lα | de.ˈske.le | teacher |
| CV.CV.CV | βάτραχος | vɐ.trɐ.xos | vɐ.tre.xos | frog |
| CV.CV.CV | φορτηγό | for.ti.ˈyo | for.ti.ˈyo | truck |
| V.CV.CV.CVC | ελέφαντας | e.ˈle.fa.das | e.ˈle.fe.des | elephant |
| V.CV.CV.CCV | ευχαρίστω | ef.xa.ɾi.ˈsto | ef.xe.ɾi.ˈsto | thanks |
| V.CV.CV.V | εργαλεία | er.ga.ˈla | er.ge.ˈle | tools |
| CV.CV.CCCV | γενέτθια | ge.ˈne الفلι.ʔa | je.ˈne. флι.ʔe | birthday |
| CCCV.CV.CV.CV.CVC | απροθυσίαμπλος | stru.θo.ˈka.mi.los | stru.θo.ˈke.mi.los | ostrich |

Phonotactic and distributional analysis

Sixty-seven words in PAel are common in adult speech (www.1000mostcommonwords.com), 65 are child vocabulary/everyday terms/animals, and 18 (5 verbs) are purposefully added because they broaden represented phonotactics. Word shapes and targeted/generated depictions in International Phonetic Alphabet (IPA) are shown in Tables 4–8; more new types that include function (mono/bi/multisyllabic) words are supplemented in the narrative (1001 word total), alongside a depiction of phonetic/dialectal variation (see Appendix).

To ascertain how representative PAel is of targeted Greek, a distributional analysis of the word list phonotactics is undertaken next in terms of phones, consonant clusters, word shapes, stress patterns, and syllable types per word position. First, there is a parallel between Setatos’ (1974) results on Greek (el) and PAel’s frequency of vocalic phones to all phones (Table 9) in the following decreasing order: ɛ (el: 15%, PAel: 130/874: 15%), i (11%, 103/874: 12%), o (9%, 84/874: 10%), e (8%, 39/874: 4%), and u (3%, 18/874: 2%). Although there are no computations for targeted Greek phones by word position in
Table 6. Greek extended list (PAel): monosyllabic/bisyllabic words (55).

| Word shape | # | Orthographic | Phonemic | Phonetic | Gloss |
|------------|---|--------------|----------|----------|-------|
| CVC        | 2 | φως ροζ      | 'fɔs 'roz| light pink |
| V.CCV      | 3 | σκληρό μπροστάˈ | e.'vro 'ksi| egg six |
| V.CCV.CCV  | 1 | άσπρος τυρί νεό' | e.'pros tli.'ne.' ro| cheese water |
| CV.CV      | 7 | ζώνη κάστρα ' | zo.ni tli.' ne.' ro| belt |
| CV.GV      | 1 | μαγό μπλούζα ' | ma.'yio ke.'bi.a| swimsuit |
| CV.GV      | 2 | πάπα κάμπια' | pa.pia ke.'bie | duck |
| CIV.GV     | 1 | γυαλί κάμπια' | gia.'lia ke.'bie | glasses |
| CV.CVC     | 1 | γέρος μπλούζα' | je.'ros ke.'bi.a | old man |
| CV.CCV     | 3 | μαύρη λίμνη' | ma.vri 'li.mni me.'vri 'li.mni | black lake |
| CV.CVC     | 1 | κάτοικος κάστρα' | ka.'pros ke.'stre | castles |
| CV.CVC     | 1 | κάτσαρα βάρκα' | ka.'stra ke.'kre | boat |
| CCV         | 2 | κλαίει πλοίο | kle.i 'plo.o | crying ship |
| CCV         | 1 | κρέας φιτάνι | kre.as fte.'ana | meat |
| CCV.CV     | 17 | βγαίνει βλέπει' | 'v'eni 'vle.pi | exits |
|            |    | βροχή βραδύτα | vro.'zi vro.'zi | rain |
|            |    | μπλούζα | blu.za vle.pi | sees |
|            |    | αβώνυρσι | svu.'ra vze 'ru | blouse |
|            |    | στόμα σφυρί | sto.ma fre.'xi | spinning top |
|            |    | σχήμα φτιάχνει' | 'sk.i.ma fte.'xni | remove rope |
|            |    | χαμός χαμός | x'am.'o x'am.'o | shape rope |
|            |    | χνώδι | xnu.'di xte.'ne | comb |
|          |    | χτένα | xte.ma fte.'ra | wings fluff |
|            |    | φιλόδια | flu.'dia flu.'de | fruit peels |
|            |    | δρόμος | dr.o.'mos dr.o.'mos | road |
|            |    | βράχος | bro.nos bro.nos | throne |
|            |    | οξύλος | os.'los os.'los | dog |
|            |    | χρυσός | xri.'sos xri.'sos | gold |
|            |    | μπροστά | bro.'sta bro.'ste | head |
|            |    | φιλάνθρωπος | fte.xni fte.xni | makes |
|            |    | φράκτης | fra.xtis fre.xtis | fence |
|            |    | σκιάρο | skil.'ro skil.'ro | hard |
|            |    | σπιρασί | 'spro.xni spro.xni | pushes |

Setatos (1974), the distribution of PAel vowels appears in this order: word-medial (236/374: 63%) > word-final (124/374: 33%) > word-initial (14/374: 4%).

A comparison of singleton consonant distribution shows that PAel (Table 10) also reflects targeted language distributions (cf. Setatos, 1974) for phones: s (el: 8%, PAel: 12%), t (8%, 32/277: 7%), n (6%, 23/277: 8%), r (5%, 33/277: 12%), p (4%, 14/277: 5%), k (2%, 12/277: 4%), l (2%, 23/277: 8%), m (3%, 14/277: 5%), θ (1%, 6/277: 2%), γ (1%, 5/277: 2%), δ (2%, 12/277: 4%), f (1%, 12/277: 4%), x (1%, 6/277: 2%), v (1%, 6/277: 2%), z (1%, 13/277: 5%), b (0.7%, 1/277: 0.3%), d (0.5%, 7/277: 2.5%), and g (0.2%, 7/277: 2.5%) and
Table 7. Greek extended list (PAel): trisyllabic words (36).

| Word shape | # | Orthographic | Phonetic | Phonetic | Gloss |
|------------|---|--------------|----------|----------|-------|
| V.CV.CV | 1 | αγούρια | a. gu.ria | e. gur.je | cucumbers |
| V.CV.CV | 1 | αδέρφια | a. der.fi | e. der.fxe | siblings |
| V.CV.CV | 1 | ακίδα | a. kri.da | e. kri.de | grasshopper |
| CV.CV.CV | 5 | νυστάτα | do. ma.ta | do. me.te | tomato |
| CV.CV.CV | 1 | φεγγάρι | fe. ga.ri | fe. ga.ri | moon |
| CV.CV.CV | 1 | σύννεφο | 'si.ne.ofo | 'si.ne.ofo | cloud |
| CV.CV.CV | 2 | γατάκι | ya. 'ta.ki | ye. 'te.ci | kitten |
| CV.CV.CV | 2 | δισβασί | dja. va.zi | dje. 've.zi | is reading |
| CV.CV.CV | 1 | λιοντάρι | lio.'da.ri | lo. de.ri | lion |
| CV.CV.CV | 1 | δέλφια | del. 'fi.ni | del. 'fi.ni | dolphin |
| CV.CV.CV | 1 | θόρυβος | 'tho. ri.vos | 'tho. ri.vos | noise |
| CV.CV.CV | 1 | γάιδαρος | 'yai.da.ros | 'yai.de.ros | donkey |
| CV.CV.CV | 2 | τουτούθρα | tou li.thra | tou. li.thre | slide |
| CV.CV.CV | 2 | φάντασμα | 'fa.da.sma | fe.de.zme | ghost |
| CV.CV.CV | 2 | γοροφέτα | go. fre.ta | go. fre.te | wafer |
| CV.CV.CV | 2 | κίτρινο | 'ki.tri.no | 'ci.tri.no | yellow |
| CV.CV.CV | 2 | ζωγραφιά | zo.yra. fi.a | zo.yre. fxe | rawing |
| CV.CV.CV | 5 | γραφείο | gra fie.o | gra fi.o | office |
| CV.CV.CV | 8 | πράσινο | 'pra.si.no | pre.si.no | green |
| CV.CV.CV | 2 | τραπέζι | tra. 'pe.zi | tre. 'pe.zi | table |
| CV.CV.CV | 2 | ντερέται | 'dre.pe.te | 'dre.pe.te | is shy |
| CV.CV.CV | 2 | κρεβάτι | kre. va.ti | kre. ve.ti | bed |
| CV.CV.CV | 2 | φλητάνι | plie. dza.ni | pli. dzhe.ni | cup |
| CV.CV.CV | 2 | χατανά | xta. po.ði | xte. po.ði | octopus |
| CV.CV.CV | 2 | κρυμμάτα | kre.mma.ta | kre.me.te | colours |
| CV.CV.CV | 2 | γρανά | gra. si.bi | yre. 'si.bi | grass |
| CV.CV.CV | 2 | σταφύλια | sta. filia | ste. fi.xe | grapes |
| CV.CV.CV | 1 | φρυγανιά | fri. ya. 'ni.a | fri.ye.'ne | toast |
| CV.CV.CV | 1 | σφυρί | sf. ri.xtra | sf. ri.xtre | whistle (m) |
| CV.CV.CV | 1 | στρογγυλός | stro. gi.'los | stro.ji.los | round |

Table 8. Greek extended list (PAel): multisyllabic (9 words).

| Word shape | # | Orthographic | Phonetic | Phonetic | Gloss |
|------------|---|--------------|----------|----------|-------|
| V.CV.CV.CV | 2 | ποδόλατο | po. 'di.la.to | po. 'di.le.to | bicycle |
| V.CV.CV.CV | 1 | σοκολάτα | so.co.'la.ta | so.co.'le.to | chocolate |
| CVC.CV.CV.CV | 1 | θερμόμετρο | ther. 'mo.me.tro | ther. 'mo.me.tro | thermometer |
| CVC.CV.CV.CV | 2 | γλυκούτσορα | gli.fki.'tsu.ro | gli.fki.'tsu.ro | lollipop |
| CVC.CV.CV.CV | 1 | χριστιανός | xri.sti.an.o | xri.ste.an.o | kaze |

allophones: c (el: 1.7%, PAel: 5/277: 1.8%), j (0.8%, 5/277: 1.8%), ç (0.5%, 4/277: 1.4%), k (0.2%, 4/277: 1.4%), p (0.2%, 1/277: 0.3%), and ÿ (0.1%, 1/277: 0.3%).

Differences lie in that PAel has more z, l, r tokens and fewer p, t, k tokens. Based on PAel computations (see Table 10), there are more singleton consonants: (a) at word-medial/syllable-onset (WM α-I) 59.5% (165/277) > word-initially (WI) 25.6% (71/277) >
word-finally (WF) 9.3% (26/277) > at word-medial/syllable-coda (WM σ-F) 5.4% (15/277), and (b) in terms of manner: fricatives (101/277: 36%) > stops (66/277: 23.8%) > liquids (60/277: 21.6%) > nasals (38/277: 13.7%) > affricates (9/277: 3.2%) > glides (3/277: 1%). The phonological mean length of utterance (PMLU; Ingram, 2002; Ingram & Ingram, 2001) of the PAel word list is calculated to be: PMLU = (2C + V)/150 = (2 × 500 + 374) = 1374/150 = 9.16.

It is notable that computations for targeted Greek consonants (Setatos, 1974) include cluster members, but there are no computations on cluster distributions per se. The distribution of consonant clusters in PAel is discussed next. Consonant clusters in PAel (Tables 11 and 12) are classified according to C₁(PLACE)/C₂(MANNER) but differentiate C₁(ANY)C₂ (sonorant) (CSOn) and sClusters (sCs), as follows: CSOn (53/99: 54%) > sStop (12/99: 12%) > LabFric (11/99: 11%) > sFric (7/99: 7%) > DorStop (6/99: 6%) > DorFric (3/99: 3%) > LabStop (3/99: 3%). CSON distribution (CSOn divided by all CCs), shown separately in Table 12 due to space limitations, is as follows: CRHOTIC (32/99: 32%) > CLATERAL (13/99: 13%) > CNASAL (8/99: 8%).

Among the CCs permitted in Greek (see Scan Form (pp. 6–8), provided as supplementary material), the following are not tested in the PAel word list (a) WI CCs: pn, vό, mn, mn, tm, sθ, zb, zm, θl, θc, kn, xl, gl, γn, which occur in formal or less common terms, like πνοή [pnoi] ‘breath’, βδέλλα [vδελε] ‘leech’, κνήμη [knimi] ‘leg’, γκλίτσα [glitsa] ‘crook’; (b) WM syllable-onset: pt, kt(~xt), ps, bj(~mbj), bn(~mbn), tn, tm, dm(=~dm), kn, km, xn, pl, pr, bl(~mbl), br(~mbbr), gr(~mgr), ft(~pθ), ft(~θf), fk, sp, sc, xt(~xt), θθ, sf, sθ, sc, sx, zv, zγ, θc, xθ(~xt), γδ θn, γn, fl, ζr, xl, γl, xr, mn. Also, among the WM across-syllable clusters permitted in Greek (see Scan Form (pp. 6–8), provided as supplementary material), the following are tested in the PAel word list: f.x, f.f, r.f, r.t, r.m, r.k, x.tr, and r.y. Furthermore, PAel tests the following three-member clusters (CCCs): WI: #ftɕ (1 token), #spr (1), #str (2), #skl (1), and WM: .ftɕ. (1), spr. (1), str (2). Among the few non-tested (full list, Scan Form (pp. 6–8), provided as supplementary material), are CCCs in uncommon words, σπλήνα [spleen], σκνίπα [sknipa] ‘gnat’, and σκράπας [skrapes] ‘ignorant’ (loan).

A comparison of word shapes in targeted Greek (el) with those in PAel shows that single-syllable (1-σ) and five-syllable (5-σ) words are less common in Greek phonotactics, while multisyllabic (2,3,4,5-σ) words are in decreasing frequency from shorter to longer length: el 2-σ 32.07%, 3-σ 19.11%, 4-σ 7.56%, 5-σ 1.98% (Table 2) versus PAel 2-σ 54.6% (82/150), 3-σ 33.3% (59/150), 4-σ 6.6% (10/150), 5-σ: 2.6% (4/150) (Table 13), though numbers for related categories are not directly comparable. Notably, monosyllabic distribution in Greek is higher than in the list (39.16% vs. 2.6% (4/150)), because it is predominantly function words that Setatos (1974) includes in his counts; incorporating the PAel narrative would balance this divergence but it is beyond the scope here. PAel comprises the most frequent Greek word shapes (cf. Tables 2 (results in bold below) and 13), involving further complexity to enhance the test’s gauging potential. This holds across categories as for, for example, 2-σ: CV.CV→CCV.CV→CCVC. CCV & CCVC.CV, V.CV→V.CV/V.CC→V.CCV→V.CCCV; 3-σ: CV.CV.CV→CV. CCV.CV→CCV.CV.CV→CCVC. CCV, V.CV→V.CV.GV→V.CCV→V.CVC. CCV, and 4-σ: CV.CV.CV.CV→CCV.CV.CV.CV, CC.V, CCV.CV→CCV.CV.CV.CV.CV, CCV.CV.CV→CCV.CV.CV.CV.CV.CC. Different word lengths are utilised in PAel to permit comparisons across diverse length, stress, and phonotactic contexts. For instance, at least one CV token is elicited in word-initial/medial/ final, stressed and unstressed positions.
To the author’s knowledge, no distributional analysis exists of Greek stress patterns. Table 13 documents a preference for trochee, typical of Greek, and an overall balance across stress-pattern groups, very likely characteristic of targeted speech: more Su (types 20/tokens 57) than uS (12/25) in disyllables, more uSu (13/35) than Suu (8/11) than uuS (4/4) in trisyllables, more uSuu (5/5) than uuSu (3/3) than uuuS (2/2) in four-syllable words, and a predominant uuSuu (4/4) for five-syllable words. Enclitic stress is represented only in the narrative. Comparing next the distribution of syllables per word position between the targeted language (Table 2) and PAel (Table 14), we see similar patterns across syllable types, for example, predominant VC word-initially/finally than word-medially, more CV word-finally than word-medially/initially, more CCV word-initially than word-medially than word-finally, CCV mostly word-finally, more CVC word-finally than initially than medially, and so on. Thus, PAel syllable distributions largely epitomise targeted Greek. Infrequent syllable types under-represented in Table 2 are also infrequent in PAel; the earlier comment on monosyllables holds here also.

Comparing with PAL (1995)
Forty-six words in PAel inadvertently coincide with words in PAL; also, PAL and PAel test 34 common word shapes. Six out of seven PAL word shapes are indirectly represented in PAel as part of a more complex shape, for example, CV.CV.CV.CV (ποδήλατο [po.ði.lɐ.to] ‘bicycle’) but not V.CV.CV.CV (αγελάδα [ɐ.ʝɛ.ʝ.ɐ.ð] ‘cow’). Only two PAL word shapes are omitted in PAel: V.CV.CV.CV and V.CV.CV.CV.CV.V, though similar PAel structures are V.CCCV, V.CV.GIV, V.CV.CV.CV, VC.CV.CV.V, and V.CV.CV.CVC. However, PAel introduces 30 new word shapes to include monosyllables (e.g. μπλέ [blɛ] ‘blue’) and added syllable/word-shape complexity (e.g. άσπρος [ˈɐ.ʃprɔs] ‘white’, φτιάχνει / ´ftia.xni / ´[ftsɛ.xni] ‘makes’, στρουθοκάμηλος [stru.θo.ˈkɐ.mi.los] ‘ostrich’). Nineteen word-initial and 14 word-medial CC types are commonly targeted in both tests, as well as #str, #ftç and word-medial .ftç. PAel introduces word-initial: #pt, #pl, #pr, #br, #bl, #dr, #ft, #fθ, #fr, #fc, #vl, #vγ, #vj, #st, #sc, #zv, #dј, #mp, #xn, #xr, #gr, #vð, and #kt; word-medial onsets: .pn, .fr, .vr, .str, .spr, .st, .sk, .θl, .dј, .ks, .kr, .γr; across-syllables: .fχ, .fç, .vð, .r, .r.fç; and word-initial CCCs: #spr, #skl and word-medial onsets: .spr, .str. Finally, new words in the PAel narrative both

### Table 9. Distribution of PAel vowels (Vs).

| Vs | FRONT | CENTRE | BACK | Sum |
|----|-------|--------|------|-----|
| i  | 1     | 4      | 8    | 14  |
| e  | 56    | 33     | 76   | 236 |
| o  | 46    | 2      | 46   | 124 |
| u  | 103   | 39     | 130  | 374 |

### Table 10. Distribution of PAel singleton consonants.

| Cs | p | b | t | k | c | g | j | f | v | θ | δ | s | z | x | į | j | l | λ | r | w | sum |
|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WI | 61 | 22 | 52 | 30 | 43 | 4 | 3 | 3 | 4 | 3 | 2 | 3 | 3 | 2 | 4 | 3 | 0 | 2 | 1 | 4 | 0 | 0 | 71 |
| WM | 80 | 15 | 75 | 34 | 76 | 8 | 6 | 8 | 2 | 2 | 3 | 2 | 3 | 1 | 3 | 10 | 19 | 19 | 3 | 20 | 0 | 0 | 165 |
| WF | 00 | 00 | 00 | 00 | 10 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 9 | 3 | 0 | 15 |
| WM | 00 | 00 | 00 | 00 | 00 | 0 | 0 | 0 | 0 | 23 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 26 |
| Sum| 14 | 19 | 72 | 57 | 12 | 6 | 6 | 12 | 32 | 13 | 6 | 4 | 5 | 5 | 4 | 5 | 14 | 23 | 1 | 23 | 4 | 33 | 0 | 277 |
Table 11. Distribution of PAel two-member clusters: ALL.

| CCs | LabSTOP | LabFRIC | ConFRIC | DorSTOP | DorFRIC | CSON | sSTOP | sFRIC | Sum |
|-----|---------|---------|---------|---------|---------|------|-------|-------|-----|
|     | pt      | ft      | ps      | fθ      | fc      | vð   | vj    | vγ    |     |
| WI  | 1       | 1       | 1       | 1       | 1       | 0    | 1     | 1     | 1   |
| WM  | 0       | 1       | 0       | 2       | 1       | 0    | 1     | 0     | 1   |
| Sum | 1       | 2       | 1       | 3       | 1       | 1   | 2     | 1     | 60  |
|     |         |         |         |         |         |      |       |       | 99  |
### Table 12. Distribution of PAel two-member clusters: CSON.

| CSON | CNASAL | CLATERAL | CRHOTIC |
|------|--------|----------|---------|
| CCs  | pn     | zm       | mn      | mn     |
| WI   | 0      | 0        | 1       | 1      |
| WM   | 1      | 1        | 1       | 0      |
| Sum  | 1      | 1        | 1       | 1      |

### Table 13. Distribution of PAel syllable types and stress patterns.

| Word shapes (# types/tokens) | % Word shapes (tokens/total) |
|------------------------------|------------------------------|
| 1-σ (2/4) 'CVC(3), 'CCV      | 2.7% (4/150)                 |
| 2-σ (34/82) V.'CCV(2), V.'CCIV, V.'CV.CV(2), V.'CV.CCIV, V.'CV.CV(2), V.'CV.CV.CV(2), V.'CV.CV.CV(2) | 55% (82/150)                 |
| 3-σ (26/50) V.'CV.CV.CV, V.'CV.CV.CV(2), V.'CV.CV.CV, V.'CV.CVC.CV, V.'CV.CV.CV(2), V.'CV.CV.CV(2), V.'CV.CV.CV(2) | 33% (50/150)                 |
| 4-σ (10/10) V.CV.CV.CV.CV, V.CV.CV.CV, V.CV.CV.CV, V.CV.CV.CV, V.CV.CV.CV, V.CV.CV.CV, V.CV.CV.CV, V.CV.CV.CV | 6.7% (10/150)               |
| 5-σ (3/4) CCV.CV.CV.CV.CV (1), V.CV.CV.CV.CV, V.CV.CV.CV.CV, V.CV.CV.CV.CV, V.CV.CV.CV.CV | 2.7% (3/150)                |

### Table 14. The distribution of PAel syllables per word position.

| σ type | 1-σ words | 2,3,4,5-σ words | #σ | 2,3,4,5-σ | #σ | Sum |
|--------|-----------|-----------------|----|-----------|----|-----|
| V      | 3.4% (13) | 0.5% (2)        | 3.9% (15) | 7.9% (30) |
| VC     | 15% (58)  | 17% (66)        | 21% (80)  | 54% (204)|
| CiV    | 10.0% (4) | 0.3% (1)        | 2.4% (9)  | 3.4% (13) |
| CIV    | 0.5% (2)  | 0.3% (1)        | 0.3% (1)  | 0.8% (3) |
| CCVC   | 0.8% (3)  | 2.1% (8)        | 0.5% (2)  | 4.5% (17) |
| CVC    | 0.3% (1)  | 14% (53)        | 3.1% (12) | 4.5% (17) |
| CCCV   | 0.5% (2)  | 0.3% (1)        | 0.5% (2)  | 0.8% (3) |
| CCCVC  | 1.0% (4)  | 0.5% (2)        | 0.8% (3)  | 1.6% (6)  |
| Sum    | 1.0% (4)  | 39% (147)       | 22% (83)  | 39% (147) | 381 |
match (e.g. πόρτα [ˈpoɾ.ɾa] ‘door’) and expand PAL (e.g. αμύγδαλα [ˈa.mì.ʝð.ɾa] ‘almonds’), but again detailed analysis of the narrative is beyond the scope here.

PAel has the potential to stand for PAL, also improving it to address limitations in terms of: (a) monosyllabic content words with singleton/clusters (Tables 4 and 6), (b) more cluster types/contexts and more word shapes/lengths, (c) more content words that extend prosodic contexts for singletons/clusters, (d) representing the phonotactic distributions of targeted Greek, (e) a complementary narrative to contextualise words providing alternative IPA renditions (formal/informal/dialectal) that include variable stress types, and adding over 200 new words, of which about half are verbs, as well as, several non-imageable ones (i.e. function words) whose phonotactics are not representable in word lists, and (e) colour images for each test word. Furthermore, narrative illustration is part of the procedures.

The pilot test

This section describes the elicitation, transcription, and phonological analysis methods used in pilot-testing PAel.

Elicitation method

The girl recruited for the pilot test, a monolingual Greek speaker aged 4;8, is the only child of middle-class parents living near Athens (Greece) and has no history of speech-language impairment, communication difficulties, or any known sensory, cognitive, anatomical conditions. On a social visit, the investigator/author (a phonetically trained native-Greek speaker) noticed inconsistency in the child’s speech given her age and asked permission to test the child’s phonological skill. Following parental consent, the investigator sat with the child in a quiet, informal setting and encouraged the child to teach Greek to a doll. Immediately taking to operating the pc-run slide show by pushing a button, the child subsequently named the pictures (printed picture cards and a puppet may also be used). In a single session, both the SCREENER and EXTENDED lists were administered in this order lasting 8 and 32 min, respectively, with a few minutes break between. An OLYMPUS VN-712PC was used for audio-recording the session. Running speech samples were also collected as part of a familiarisation session prior to administering the test, and afterwards during a free play session, but are not included in the analysis here.

Methods for phonetic and phonological analysis

The data retrieved from the WMA audios were transcribed in IPA by the investigator. Using language analysis software for numerical computations is necessary for large data-sets (e.g. PHON: Rose & MacWhinney, 2014; CLAN: MacWhinney, 2000) but not so in this study. For transcription consensus purposes, two native-Greek phoneticians were

Table 15. The child’s singleton consonant adult-like match (%).

|       | STOP | FRIC | AFFR | NAS | LIQ | GLI |
|-------|------|------|------|-----|-----|-----|
| pb    | 100  | 100  | 93   | 100 | 96  | 100 |
| bt    | 100  | 100  | 97   | 100 | 96  | 100 |
| dk    | 100  | 100  | 96   | 100 | 97  | 100 |
| kc    | 100  | 100  | 99   | 100 | 97  | 100 |
| gk    | 100  | 100  | 99   | 100 | 97  | 100 |
| fj    | 100  | 100  | 99   | 100 | 97  | 100 |
| ft    | 100  | 100  | 99   | 100 | 97  | 100 |
| f θ   | 100  | 100  | 99   | 100 | 97  | 100 |
| f δ   | 100  | 100  | 99   | 100 | 97  | 100 |
| f s   | 100  | 100  | 99   | 100 | 97  | 100 |
| f z   | 100  | 100  | 99   | 100 | 97  | 100 |
| f č   | 100  | 100  | 99   | 100 | 97  | 100 |
| f ĵ   | 100  | 100  | 99   | 100 | 97  | 100 |
| f ts  | 100  | 100  | 99   | 100 | 97  | 100 |
| f dz  | 100  | 100  | 99   | 100 | 97  | 100 |
| f m   | 100  | 100  | 99   | 100 | 97  | 100 |
| f n   | 100  | 100  | 99   | 100 | 97  | 100 |
| f l   | 100  | 100  | 99   | 100 | 97  | 100 |
| f ɬɾ | 100  | 100  | 99   | 100 | 97  | 100 |
| f j   | 100  | 100  | 99   | 100 | 97  | 100 |
consulted and a couple of disagreements (on vocalic epenthesis; [j] vs. [ʝ]) between the three were resolved by verifying correct renditions in Praat (Boersma & Weenink, 2018). Based on the results, a nonlinear phonological analysis scan (Bernhardt & Stemberger, 2000; see discussion at phonodevelopment.sites.olt.ubc.ca) modified for Greek (Scan Form, provided as supplementary material) was completed. The Greek scan (form) summarises Greek phonotactics in terms of word structure (p.3), segments and features (pp. 4, 9), and consonantal clusters/sequences (p.6–8). It is a comprehensive index and easy to fill in (or just highlight) client evidence-based information. The scan includes a preview section for establishing strengths/weaknesses (p.2) and a conclusive summary page (p.11). A Greek translation of the scan is also freely available: at http://phonodevelopment.sites.olt.ubc.ca.

Results and discussion

The child spontaneously produced the words except εργαλεία /εγγαλα/ ‘tools’, βιβλίο /βιβλι/ ‘book’, γατάκι /ɣαττι/ ‘kitten’, φιόγκος /φιόγκο/ ‘bow’, τζατζίκι /τζατζι/ ‘tzatziki’, πλοίο /πλιο/ ‘ship’, φιλυτζάνι /φιλυτζι/ ‘cup’, στρουθοκάμηλος /στρουθοκαμιλο/ ‘ostrich’, and γλειφιτζούρι /γλειφιτζι/ ‘lollipop’. Instead, she produced diminutive γατούλα /ɣατούλα/ ‘cat’ for γατάκι /ɣαττι/; καράβι /καραβι/ ‘large boat’ for πλοίο /πλιο/, and κορδέλα /κορδελα/ ‘ribbon’ for φιόγκος /φιόγκο/ Having not recognised the picture of an opened book, she attempted βιβλίο /βιβλι/ when an actual book was shown to her. Also, she produced the plural of γλειφιτζούρι /γλειφιτζι/ seeing two lollipops in the picture. She had difficulty with εργαλεία /εγγαλα/, στρουθοκάμηλος /στρουθοκαμιλο/, and φιόγκος /φιόγκο/ being less familiar with the terms. These were subsequently attempted, prompted by sentence and phonetic cues. The original pictures for book/lollipop were replaced by unambiguous versions.

The child’s phonology in comparison to published norms or studies

There is evidence of strength and weakness in the child’s phonology investigated next in terms of whole-word match, PMLU, phonological word proximity (PWP; e.g. Ingram, 2002), singleton match, cluster proximity, common/uncommon phonological patterns, and word-shape match. An analysis of the SCREEN data reflects patterns also found in the EXTENDED list productions, so data are discussed collectively. Forty-four words, representing all word lengths, were produced target-like resulting in a low whole-word match of 29% (44/150): three 1-σ (75%), twenty-five 2-σ (30%), twelve 3-σ (25%), two 4-σ (20%), and two 5-σ (50%) words. The child’s mismatches were mostly in 2–4σ words. There were no stress errors. Her produced PMLU was 7.72 and the mean PWP (produced PMLU/targeted PMLU; Ingram, 2002) 0.84; no normative data exist for comparison. Vowel errors occurred only in diphthong monophthongisation of /ai/ [a], and a single instance of: στρογγυλός /στρογγυλο/ ‘round’ (see Scan Form (p. 10), provided as supplementary material); vowels are typically acquired by respective monolinguals by 4;0 (see Mennen & Okalidou, 2007), though few mismatches are also expected. Also, cross-syllable hiatus was intercepted by weak syllable deletion: αερόστατο /αεροστατο/ [v:lo.sta.to] ‘hot-air balloon’.
Remaining mismatches involved consonants that, in turn, affected word-shape matches (see Scan Form (pp. 2–4), provided as supplementary material). The proportion of consonant correct (PCC: Shriberg, Austin, Lewis, McSweeney, & Wilson, 1997) was 72% (see Scan Form (p. 1), provided as supplementary material), below the 75% acquisition criterion suggested by Cazden (1968), Olswang and Bain (1985), PAL (1995), and so on. Table 15 presents the mean of single consonant matches. Among the non-acquired consonants: l (60%), r (14%), x (21%), ñ (55%), and g (29%), ts, dz, κ, and j were not produced at all (also see Scan Form (p. 5), provided as supplementary material). The rest were below expectations as based on PAL (1995) and other studies (see Mennen & Okalidou, 2007): l (3;6–4;0), x (3;0–3;6), ñ (3;0–3;6), g (2;6–3;0), except r (5;6–6;0). Interestingly, a Greek–English bilingual girl acquired r by age 4;0 (Babatsouli & Gut, 2012). Respective normative age ranges of acquisition of this child’s non-produced sounds are 4;6–5;0 (ts, dz), 4;0–4;6 (κ), and 2;6–3;0 (j); [ts] is in the phonetic inventory by 3;7 and [dz], [κ] by 4;1 (see Mennen & Okalidou, 2007). A Greek–English bilingual showed 68% target-like [ts] at age 2;7 (Babatsouli, forthcoming). Palatals are consistently produced by three 2- to 3-year-old children (Athanasopoulou, 2018). Mixing substitutions of targeted sounds is another sign of a developing phonology, as in this child that produced /t{l}→[j], when /t{l}→[l] and /κ{l}→[j] (e.g. γέροκ/τεροσ/→[γερός] ‘old man’).

Her mismatches (Table 16) are accounted by universal developmental processes (e.g. Beers, 1995; Grunwell, 1981; PAL, 1995) leading to typical developmental mismatches (Bernhardt & Stemberger, 1998; Mennen & Okalidou, 2007; PAL, 1995). Some intermittent errors in acquired consonants also involved prototypical processes (e.g. stopping, voicing). Table 16 details these processes and errors with examples. The presence of the following processes attests to a possible phonological delay: prevocalic voicing and stopping (disappearing by 2;6), fronting of velars (by 3;0), and assimilation (by 3;6) (Beers, 1995; PAL, 1995). Her featural weaknesses on Manner: [LIQUID], [AFFRICATE], and Place: [DORSAL] in the acquisition of singletons (see Scan Form

| Table 16. The child’s singleton consonant mismatches |
|-----------------------------------------------------|
| **Singleton consonant mismatches**                   |
| **Deaffrication**                                    |
| /ts/→[s z] /tei/-[sei] ‘tea’, /tsiBre/-[zuviθe] ‘slide’ |
| /dz/→[s z] /dzi/-[dzi] ‘fireplace’                   |
| **Delateralisation**                                 |
| /κ/→[j] /ka/-[ka] ‘glasses’                          |
| **Lateralisation**                                   |
| /r/-[l] /roz/-[lo] ‘pink’, /nervo/→[nelo] ‘water’    |
| **Stopping**                                        |
| /x/-[k] /vetexos/-[vetekos] ‘frog’                   |
| /c/-[c] /ci/-[ci] ‘hand’                             |
| /j/-[j] /jeros/-[jesos] ‘old man’                    |
| **Frication**                                       |
| /g/-[y] /gofrete/-[yofete] ‘wafer’                   |
| /j/-[j] /strojilos/-[tζilos] ‘round’                  |
| **Voicing/devoicing**                               |
| /t/-[d] /tiri/-[di] ‘cheese’                         |
| /ts/-[z] /tsiBre/-[zuviθe] ‘slide’                   |
| /g/-[k] /egujje/-[ekujje] ‘cucumbers’                |
| **Deletion**                                        |
| /κ/1 t/-[θ] /kos/-[ϰos] ‘sun’                        |
| /σkilo/→[skilo] ‘school’                             |
| /εxeristos/-[exeristos] ‘thanks’                     |
| **Assimilation**                                    |
| [LATERAL] /fegeri/-[feleli] ‘moon’                    |
| [FRICATIVE] /jeros/-[jesos] ‘old man’                 |
| [NASAL] /lmni/-[nimni] ‘lake’, /nervo/→[neno] ‘water’, /nereide/-[neneide] ‘fairy’ |
Table 17. The patterns of the child’s consonant cluster mismatches.

| Consonant Cluster Mismatches |
|-------------------------------|
| **Reduction**                |
| /LIQUID/                     |
| /CLATERAL→ C                |
| /CRHOTIC→ C                 |
| /FRICATIVE/                 |
| /NASAL/                     |
| /DORSAL/                    |
| /CC/                        |
| /sC→ s, C                   |
| /DORSALSTOP/                |
| /CC→C                       |
| /sSTOPLIQ/                  |
| /sSTOPLATERAL→ sSTOP        |
| /sSTOPROOT→ sSTOP, STOP     |
| /FRICTOPFric/               |
| /Deletion/                  |
| /LIQUID/                    |
| /pt/→ [pVI]                 |
| /kl/→ [kVI]                 |
| /Vowel epenthesis/          |
| /LIQUID/                    |

9), provided as supplementary material) are also the main sources of cluster mismatches.

Table 17 shows the rules in the child’s consonant cluster mismatches which involve mainly reduction but also deletion and vowel epenthesis. For a recent review of patterns in typical and atypical development of clusters crosslinguistically, see Babatsouli and Sotiropoulos (2018). The targeted CCs involving [LIQUID] reduced to [-LIQUID], and those involving [DORSAL] were generally reduced to either member; an exception was γλώσσα /ylosa/ → [losa] ‘tongue’. When one member was [FRICATIVE], then the child’s reduction followed Pater and Barlow’s (2003) axiom, that is, if a segment of a given sonority is retained instead of the fricative, then all segments of lesser sonority are retained rather than the fricative. Thus, because /xn/ → [n], then /xt/ → [t, k]; an exception was: /peximi/ → [exeni] ‘s/he makes’. Her targeted CCC sSTOPLIQ, also reduced to [-LIQUID], that is, to an sSTOP or to a STOP. Her targeted CCC FRICTOPFric, /ftç/ reduced to [ç], deleting the STOP. When CC /ftç/ was targeted, it was either kept or reduced to [f]. Besides reduction, there was one occurrence of deletion, /xt/ → [x], and two occurrences of vowel epenthesis, /pt/ → [pVI] and /kl/ → [kVI], all involving [LIQUID].

The child’s proportions of adult-like cluster productions were WI CCs 30% (23/60), WM CCs 46% (18/39), and CCCs 0% (0/9). Most mismatches were in CSON, with their adult-like proportions being WI 6% (2/32) and WM 19% (4/21). Her adult-like productions containing CSON were μπλέ [ble], κούκλα [kukla], μουάζουν [mazoun], φάντασμα [fandzima], καπνόσ [kapnos], and λίμνη [limni]. Notably, CSON mismatches occurred when C was [DORSAL]. Excluding CSON, adult-like CCs were WI 75% (21/28) and WM 78% (14/18). A measure for cluster proximity (MCP, Babatsouli & Sotiropoulos, 2018), proposed recently, distinguishes between different CC productions giving credit to various non-adult-like productions; so, one adult-like cluster member scores 25%, two adult-like members with vowel epenthesis score 62.5%, and CC production with one member substituted: 87.5%. The child’s MCP is 56% (WI) and 64% (WM). Compared to norms, she shows delay in acquiring STOPSon and [xn] (see
Mennen & Okalidou, 2007) and in FrICLAT compared to a Greek–English bilingual girl’s acquisition by age 4;0 (Babatsouli, 2018).

As a result of weaknesses on the featural and prosodic level, the child’s word shapes were also affected (see Scan Form (pp. 3–4), provided as supplementary material); an instance of an added-syllable is λιοντάρι /ʎo.ˈ da.ɾi/. Instances of weak syllable deletion were φάντασμα /ˈfada.zma/ [ˈfe.desɔ] ‘ghost’, ευχαριστώ /ef.xa.ɾi.'sto/ [ɔ.xxr.ɔi.'sto] ‘thanks’, αερόστατο /a.e.'ro.sta.to/ [e.ɔ.'lo.sta.to], a process typically disappearing in Greek by 3;6 (PAL, 1995). Conversely, word complexity was also evidenced to affect featural and prosodic acquisition, as follows in (a) non-production of word-medial/syllable-coda (WM σ-F): δελφίνι /delfini/ [de.ʃi.ɾi] ‘dolphin’, (b) WF coda deletion: ελέφαντας /elefadas/ [elef.ʃi.ɾi] ‘elephant’, (c) regression when markedness constraints (featural/prosodic) combine: χρυσός /xrisos/ [ɔɾisɔs] (CC deletion), /strojilos/ [ʃi.ɾi.ɔs] ‘round’ ([st] acquired elsewhere), σφυρί /sfiri/ [ʃi.ɾi] ‘hammer’ ([sf] production deletes singleton), δελφίνι /delfini/ [de.ʃi.ɾi] ‘dolphin’, τσουλήθρα /tsu.ɾiθɾa/ [zu.ɾiθɾa] ‘slide’ ([θ], [l] substituted here though typically acquired as singletons).

Consequently, though the child’s phonology showed evidence of acquisition and ongoing development in some respects, the nonlinear phonological analysis above demonstrated that significant aspects of her speech (e.g. a low whole-word match, not meeting expected developmental norms, regression in complex words, etc.) suggest phonological delay. This is further supported by evidence in the child’s spontaneous speech samples (not analysed), indicating regression with increased utterance length and complexity.

Limitations and future research

The study contributes to the crosslinguistic pool of phonological assessment procedures by adding a battery for the Greek language. The data (and its analysis) of the single participant also add to the pool of cross-linguistic data. Future work should address limitations of this pilot investigation. First, there is a need for further support of the efficacy of the word list for comprehensive phonological assessment by administering it to more children. Second, a large cross-sectional study on typically developing children would permit test standardisation and the establishment of detailed quantitative norms lacking in the literature; results in PAL (1995) are mostly qualitative reporting acquisition by relating the proportion of children within an age group, rather than level of acquisition per se. Such norms would establish reliable guidelines for assessing delay/disorder. Future development of the tool should also include (a) testing the efficacy of the narrative to permit comparisons between spontaneous and word-elicited data; (b) child multi-/bilingual speakers of Greek; the proposed tool has the potential to evaluate second-language speakers of Greek, too; and (c) studies focusing on protracted phonological development and child speech disorder; these would highlight any modifications needed for a dependable phonological assessment battery by further evaluating the validity and efficacy of the proposed test.
Conclusions

The study has proposed a tool for the phonological assessment of developmental child Greek (PAel) in typical and clinical contexts, comprising of a word list and narrative. Being child appropriate, the test aimed to represent Greek phonotactics in terms of features, segments, sequences, syllables, word shapes, and stress patterns in as many/variable contexts as possible, advancing the methodology of an existing but largely inaccessible battery. The proposed tool has also innovatively addressed adherence to the statistical properties of the language and dialectal variation in a Greek battery. Due to space limitations, only the word list was administered and analysed here to determine its efficacy and gauging potential. Analysis of a monolingual Greek girl’s elicited data at age 4;8 demonstrates that this clinical test has the potential to comprehensively assess strengths and weaknesses during phonological development, also diagnosing phonological protraction. More children’s data elicited using PAel will address limitations of this study by further elucidating the tool’s strengths and weaknesses. Data analysis was performed within the constraint-based nonlinear theoretical framework illuminating the interplay of underlying hierarchical representations. Future goals comprise studies on more children to include multilingual and delayed/disordered populations, test standardisation, and establishment of norms on a quantitative basis to be used as dependable evaluation assessment and intervention of phonological delay/disorder.

Author’s note

The assessment tools are available free of charge through the website phonodevelopment.sites.olt.ubc.ca (or by contacting the author) along with tutorials on nonlinear phonological analysis and examples of therapy activities.

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ORCID

Elena Babatsouli http://orcid.org/0000-0003-3010-986X

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Ο Αννά, φάει, το γλυκό, το φλιτζάνι ζεστό, τον τσάι, το ρύζι, την παράξενη φθορά, το χειροτέρι, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξενη φθορά, την παράξεن
Ε. ΒΑΒΑΤΣΟΥΛΗ

«Είμαι εύτοιχος!» είπε στην νταντά της, η οποία στο μεταξύ είχε βάλει γυαλιά για να βλέπει και έφαγε στον υπολογιστή πάνω στο θρανίο να βρει συναγερμό για μαγευτικά χταπόδια με κολοκύθια, αγγούρια και ντομάτα. Ήθελε να ετοιμάσει κάτι ιδιαίτερο για τα γενέθλιά της Άννας, εκτός από κρέας και ζαμπέτα. «Αννά, μην ξεχάσεις πως σε λίγο θα έχεις το κύριο Γρηγόρης», της είπε η νταντά. Αυτός ήταν ένας γέρος γείτονας εξήντα έξι χρόνων που ζούσε στο διπλανό κτίριο. Ήταν, παλιάς, καλός φίλος του παππού αφού είχαν πάει πεντή χρονιά από το ίδιο παιχνιδιστήμιο. Είχε υποσχέθηκε πως θα εφέρει στην Άννα μια μπάνια και ένα μαγικό βατάκι που το κούνας με το χέρι και γίνεται σφυρί. Στα νύκτα του, ο κύριος Γρηγόρης ταξιδεύει και αυτός, όπως οι γονείς της, πότε με βάρκα και πότε με πλοίο. Κάποιες φορές πίγκα στα μακρινά μέρη με κάστρα πάνω στους λόφους, στα οποία μπορούσε κανείς να πλησιάσει μόνο με γάιδαρο. Η Άννα διασκέδασε με τις ιστορίες που της είχε, χωρίς να ντρέπεται. Κοιτάξε πιατικά έξω από το παράθυρο να δεις και έρχεται, άλλα ο δρόμος ήταν αδειός. Μόνο ο καπνός φαινόταν να πετάγεται σαν σόμπα από το τζατζίκι και ο άσπρος φράχτης της ανθίζει, καλυμμένος με κάτι σαν χονδροί που πέφτουν από το δέντρο. Ήταν φθινόπωρο.

«Μα το θρόφος είναι αυτός» ρώτησε την νταντά της, άλλα εκείνη είχε, από όπου, βγει από το δωμάτιο. Γύρισε και τι να δει; Μέσα από τις σελίδες του αγαπημένου της βιβλίου έπεταχτήκαν όλα τα γενέθλια της Άννας, όλοι μαζί και μαζί κάτω από το ίδιο κατέκλυμα, ένα ελεύθερο, ένα λιοντάρι, ένα γατάκι και μια ακρίδα. «Τα μάθετε τα νέα;» μιλούσε σαν να ήταν παιδάκι, «έδωμε ένα δελφινί να βγαίνει από τη λίμνη. Έβρει κανείς να στρώνει φορτίο για να το διώξουμε στη θάλασσα; Εδώ κινδυνούσε από εξήρος ή και να πνιγεί». Η Άννα πάντα ήθελε να βοηθήσει τους άλλους και, αμέσως, προσφέρθηκε να δανειστεί την πικριά της ή το αυτοκίνητό της νταντάς. Τα ζώα έστειλαν αμέσως μηνύμα στην ομάδα διάσωσης και μετά γιόρτασαν τα γενέθλια της Άννας όλοι μαζί, σαν αδέρφια. Αν θέλει το πιστεύετε, άλλο το χονδρωτό γατάκι έφαγε το μεγαλύτερο κομμάτι της τουρτάς με τις φράουλες και τα αμύγδαλα.

Η Άννα πέρασε υπέροχα εκείνη την ημέρα, τόσο που θα ήταν ένας μικρός της. Σαν την Άννα των Αγγέλων, ήξερε να φτιάχνει τη μέρα της και, επίσης, που λίγη φαντασία μπορεί να σε πάει από το άλφα στο ωμέγα. (total FULL: 1,001 words)

Adult surface production in IPA

Phonetic variation, i.e. informal/running speech is in parenthesis; dialectal speech is shown in IPA preceded by an astiskus (*); The symbol #. marks the end of a sentence.

SHORT

'mi.u (mпу) fo,'ve ce 'en:n, ce,'ro ('ce.ne 'ϊε,ro) 'kr.to u,'po 'e.ne 'pref.ko, to me.ye.lι.te,'ro ('me.ye.xi.te,'ro) 'dr.(')δρο tis 'po:lis ('πολις) 'πιρ.cej 'e.ne 'spi,t'i ('spit) pu 'e.me,ze ('pu.me,ze) me 'fet.ni ('fet,ni) # se 'v,f'to (su,fto) 'zu.se 'e.ne ko.'ri.ti.'ni mi te 'yi,ve dr.'(d) 'dr.tis # α. be.'(9) bus ce i (ci) me'mu tis 'e.li.pi:n se 'e.ne ('se.ne) me.kri.no tu.'ski.'di sti 'θε,le,sn# to pe.'di i 'ce 'mi,te ('mпу) 'ki.ku.kl 'o.mor,ni ('o.mor,ni) sen ne.'re,i.du (se ne.'re,i.du) n'te 'lis 'e.li.pi:nu tu 'e.f'ti (tu.'fi:ct#) τυ Κου 've.lυ.'se (τη. (9)гуνυ.λυ.'se) 'pe.'(dr,nu) 'zi tis 'me.se 'se 'e.ne ('se,ne) kn.'le,thi ('kle,th) je.'ti te 'hi.mi.zε ti 'de.'skε. ιν pu 'v.e.plε ('pu.v.e.plε) 'πο to (n.p'to) κρε.'ve,ti ti 'tis ('κρε.'ve,ti'tis) τα 'kso υ,po 'po (τu.p'to) 'φυ,mi ('dzem) ne 'εε,cte (τη.νε,ce,te) 'κρ,be pro,i me to 'tr,ne,co ce ne 'fe,vji ('fe,vji) 'ερ,γε νι ti 'ni.xt# e,ri.pi, mo.'nu,se ne me.ye,'lo,si ('me.ye.'lo,s) ce ne 'pvi ce e.'ci,nι (ce.'ci,nι) ('ce.'ci,nι) sto sxo.li.o. si 'ne.xn o.'sto.so 'εp.e,ze me to 've,pi,'me,mo (te,ve,pi,'me,mo) n'ti. 'vi.lo, u 'i,ten (pu.ten) sen 'at,le.'(n)des#, to τυ Βλιο, i 'ce sto e.'so koi.fο.'lo 'e.ne lu.'dι (lu.'lud) ce 'me,se i.ko.'ni.zo. ('d) 'dun po,le 'zo,v, 'o.pos 'mi,ν (mпу) stru.'θo, 'kr,mi,los ('εν,νι 've,tν.xos, 'mi,i ('μπυ) ti,νις, 'μι,ν (μπυ) mi,ni.mu.'(mυ) 'μυ (μπυ) ce.'lo,ne, ci 'ne,nis ('ce,ne,s) τε.'ni.stο, 'δρ,νι κο 'e.pe,ze ('pu.pe,ze) po.'do,sf.r,ro ce 'eve,ze ('ce.'ve,ze) ce.'(9) gol#.
She liked dressing the doll in a pink swimsuit, but today she chose a fuzzy dress with a black belt. It looked like a ghost on the lollipop, a wafer, a chocolate, and a lot of guests. It was her birthday, after all!

On the contrary, she was dreaming of a big party inside daddy’s house. She was hungry to eat the toast, the egg, the yellow cheese, and the spinach pie that were stacked in front of her. As she was eating, she noticed that, next to her shoe on the carpet, there were some fruit peels and plenty of rice, and that they had taken a strange shape. They looked somewhat like a manger. As she was having breakfast, she noticed that, next to her shoe on the carpet, there were some fruit peels and plenty of rice, and that they had taken a strange shape. They looked somewhat like a manger.

Preparations come little by little. Anna, leave the gifts next to the fireplace and finish your breakfast!” the nanny told her. Anna had put a thermometer in her mouth the night before to see if she had fever and, now, she wasn’t so hungry to eat the toast, the egg, the yellow cheese, and the spinach pie that were stacked in front of her. She wasn’t a fool to change her mind. Neither did she like to express her feelings by crying. On the contrary, she was dreaming of a big party inside daddy’s study with colours, candy, a green lollipop, a wafer, a chocolate, and a lot of guests. It was her birthday, after all!

Preparations come first, though. She liked dressing the doll in a pink swimsuit, but today she chose a fuzzy dress with a black belt.
that matched its curly hair. Afterwards, she brought several decorations and toys out of the handicrafts bag and used a rope to hang them high over the light: a moon, a cloud, a kite, a hot air balloon, and a duck with spread-out wings. They all looked like they were going down a slide and were picture-perfect.

“We are ready!” she told her nanny, who had put on her reading glasses in the meantime and, sitting at the desk, was browsing the internet for an octopus-in-tomato or zucchini and cucumbers recipe. She wanted to prepare something special for Anna’s birthday, besides meat and tzatziki.

“Anna, don’t forget that Mr. Gregory is coming in a short while” the nanny told her. He was an old neighbour, a sixty-six year old, who lived in the adjacent building. He used to be grandpa’s good friend, since they both got their degree from the same university. He had promised to bring Anna a ball and a magic wand that becomes a hammer when shaken by hand. In his youth, Mr. Gregory travelled a lot, like her parents, sometimes by boat and sometimes by ship. On and off, he would go to distant places with castles on top of the hills, where one could only reach riding a donkey. Anna enjoyed listening to the stories he told her, without being shy. She hastily looked outside the window to see if he was coming, but the street was empty. Only the smoke could be seen like a spinning top from the fireplace and the white fence in the yard, covered by something like fuzz that was falling from the tree. It was autumn.

“What is this noise?” she asked her nanny, but she had long gone out of the room. She turned the other way, and what a surprise! Out of the pages of her favorite book, there appeared all the animals mentioned before, and many more along with them, such as an ugly dog, an elephant, a lion, a kitten and a grasshopper. “Have you heard the news?” they were saying like they were children “we saw a dolphin come out of the lake! Does anyone know how to push heavy load so we can send it away to the sea? It’s in danger from enemies here or it might drown.” Anna always wanted to help others, and she immediately offered to lend her bike or nanny’s car. The animals, however, at once sent a message to the rescue team and, afterwards, they all celebrated Anna’s birthday together, like siblings. Believe it if you want: the fuzzy kitty ate the largest piece of the strawberry-almond cake!

Anna had a wonderful time that day; so much so that it would stay in her memory. Like Anne of Green Gables, she knew how to make her day. She also knew that a little imagination can take one from alpha to omega.