The Interaction of Variables Affecting Definitional Skills: Extending Previous Research on Word Definitions

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ABSTRACT

Background and Purpose. Given that definitional skills are closely related to literacy and reading comprehension, the purpose of this study was to extend the existing literature in definitional skills by empirically investigating the effect of new parameters that may affect word definitions and definitional types of content and form, such as grammatical categories, word structure, and semantic characteristics.

Methods. The sample consisted of 5152 recorded oral definitions produced by 322 individuals (pre-schoolers, school-age children, university students, and adults), who were asked to define 16 words orally. Definitions were transcribed and scored on a six-point scale along a continuum that reflects the developmental path of the definitions.

Results. The results indicated a significant interaction between grammatical category and word structure for content and form and also between word structure and semantic characteristics only for content. Furthermore, the grammatical category, word structure, and semantic characteristics were strongly associated with specific definitional types for content and form.

Implications. This paper broadens our knowledge on definitional skills and offers new insights into the variables that affect the production of definitions.

KEYWORDS

definitional skills, oral definition production, definition types, Greek Language

INTRODUCTION

Providing definitions, especially formal ones, is the ability to talk about word meanings which is strongly correlated to reading skills and school achievement (Anderson & Freebody, 1981; Snow Cancini, Gonzalez & Shriberg, 1989). It also guarantees depth in word knowledge and is a strong predictor of literacy skills, such as reading and writing, using books or the internet as a source of information, being familiar, producing and being able to find information in different genres and text types (descriptions, narrations, etc.) (Artuso, Palladino, Valentini & Belacchi, 2021, Snow et al., 1989). It may also play an active role in reading aloud (Nation & Cocksey, 2009).

However, special skills are required in order to formulate appropriate definitions even for words children or adults know

well. Thus, these skills do not necessarily coincide with word knowledge.

The definitional skills have been investigated so far in the fields of education, psycholinguistics, and speech-language pathology. Previous research focused on the impact of literacy and school achievement (Artuso et al., 2021; Marinellie, 2010; Snow et al., 1989; Thorndike, Hagen, & Sattler, 1986; Watson, 1985), the effect of developmental characteristics or language impairment (Dosi & Gavriilidou, 2020; Dosi, Gavriilidou & Dourou, 2021; Gutierrez-Clellen & DeCurtis, 1999; Marinellie & Johnson, 2002) and finally the effect of first and second language (El Euch, 2007) on definitional skills.

Definitional skills also depend on the academic achievement, the verbal ability, and the intellectual performance of school-age children and adolescents

(Nippold, 1995; Snow et al., 1989; Thorndike et al., 1986; Watson, 1985). On the other hand, formal word definitions demand an understanding of words, a vocabulary knowledge and, also, the ability to express that knowledge explicitly.

However, little is known about the effect of grammatical category, semantic characteristics, and word structure of words to be defined on definitional abilities and the types of definitions produced. Understanding the reasons why other children succeed and other fail in providing definitions of different types of words and how this affects their literacy and school achievement is crucial for preventing school failure. To brigde this gap, this study was designed to investigate how definitional abilities develop with respect to the above-mentioned variables.

LITERATURE REVIEW

Definitional Types of Content and Form

Definitions are combinations of informative contents and appropriate forms (Benelli, Belacchi, Gini & Lucangeli, 2006). More precisely, the canonical definitions should accomplish four formal (paraphrase, periphrastic form, phrasal autonomy and correct morpho-syntactic structure, and one content-related (semantic equivalence) requirements (Artuso et al., 2021).

The content of definitions refers to the strategies speakers employ in order to explain the meaning of a word; in other words, the semantics of definitions (Benelli, Arcuri & Marchesini 1988; Dourou, Gavriilidou & Markos, 2020; Gavriilidou, 2015; Marinellie & Johnson, 2002, 2004). These strategies include, among others, the following: (a) Functional definitions, which are a kind of informal definitions that build on the characteristics or properties that define the concept and describe what the item does or is used for (cutlery: we eat with it); (b) Descriptive definitions, which are definitions that describe the concept's perceptual appearance as in bicycle: it has a steering wheel, a saddle and two wheels; (c) Present state definitions, in which a person uses a situation to give a general reference to a particular place at a particular time, or to refer to what is happening to them as, for instance, in a question: what you are doing now; (d) Definition by Example, where different types of the concept are taken as examples, showing awareness of the aim of the message as directed to a receiver as in open-close: for example, I open the door and I close it; (e) Association/Result/Action. In this case the concept is associated with an event, a person, an experience or an action, or may mention the results that this concept brings (cheese-pie: my grandma's cheesepie); (f) Tautologic definitions, are erroneous definitions where the speakers repeat the same word twice (apple: it is an apple), or in case of compounds, they parse the concept in its components (sweet-sour: something that is

sweet and sour); (g) Definition by self-reference is another strategy used for defining words. It refers to the ability of a person to speak of or refer to themselves, that is, to have the kind of thought expressed by the first person nominative singular pronoun "I" (clever: I am clever); (h) Class non-specific definitions, where the concept is included in a wider category or related with the main elements but not with specific details (apple: a fruit); (i) Class specific definitions where a superordinate term to the concept is used (bicycle: it is a means of transport) or defining words by Synonyms is preferred (clever: intelligent); (j) Definitions by Combination are also possible. In this case speakers use a wider or a general category adding some extra characteristics (descriptive, functional etc.) of the concept (cheese-pie: an unhealthy food); (k) Aristotelian or Formal definitions are the most complete definitions where speakers use a superordinate term and the differentiating characteristics of the concept (question: it's a phrase that asks for answers).

Previous research has demonstrated that, with age, the content of definitions of words progresses from functional and concrete to more abstract and conventional (Anglin, 1977; Benelli et al., 1988; Dourou et al., 2020; Gavriilidou, 2015; Nippold, Hegel, Sohlberg & Schwarz, 1999; Watson, 1985;). No previous research has investigated so far how definitional types for content change according to the grammatical categories, semantic characteristics, and word structure of the words to be defined. However, the form of definitions refers to the syntactic patterns speakers use in order to shape the meaning of a word. Five (5) are the main definitional types regarding form (Dourou, et al., 2020; Gavriilidou, 2015; Marinellie, 2010; Marinellie & Johnson, 2002, 2004): (a) Nonverbal definitions, which are definitions where the speaker does not define the concept because it is unknown to him. There are no verbal responses, and gestures or tautologies may be used (apple: they show it); (b) Single word or Article + Word. In this case, speakers use only one word to define the concept with or without an article (cutlery: kitchen). Sometimes, speakers use only one simple sentence to define the concept, without any dependent clauses (cheese-pie: we eat it) (Definition with a Phrase, Clause or Simple Sentence); (c) Definitions with Transitional form where they use generic terms as "something" or "a thing" plus a modifying clause to define the concept (cheese-pie: something that has cheese inside); (d) Partially formal definitions where a superordinate term is used; however, without a complete syntactic form (question: it's a phrase with a question mark); (e) Formal definitions where speakers use a superordinate term and the differentiating characteristics of the concept (question: it's a phrase that asks for answers or information). In a more recent research, Belacchi & Benelli (2017) forwarded the idea of a definitional scale including five consecutive definitional levels; each level adds a new morpho-syntactic property, from single word definitions to the prototypical Aristotelian form, which ensures the appropriate expression of semantic contents.

Similarly to definitional types for content, types for form develop from the late preschool to the early school-age years. With increasing age, definitions develop from simple syntactic structure into Aristotelian form (Kurland & Snow, 1997). The results of previous research agree with more recent studies. More specifically, the category 'Phrase/Simple Clause' is the most frequent type of definition for pre-schoolers and elementary students, while for junior and senior high school students, university students and adults with university education (Dourou, 2019) the most preferred type is the 'Partially Aristotelian form'. According to the study of Marinellie and Johnson (2002), the use of Transitional form increases until 9-10 years old and then decreases. The most recent study by Dourou et al. (2020) found that the most common type of definition in form is the 'Phrase/Simple Clause', followed by the 'Partial Aristotelian definition'. The categories 'Transitional Form' and 'One Word or Article + Word' are placed in the mid-preferences while the Aristotelian form is the least preferred type. However, there is a gap in literature concerning how definitional types for content and form may vary depending on the grammatical categories, semantic characteristics, and word structure of the words to be defined.

The effect of grammatical categories on word definitions and definitional types

Grammatical category affects both the definitional ability and the definitional types chosen by the speakers. Previous research has shown that nouns receive higher scores in definitional tasks compared to verbs and adjectives. Huttenlocher and Lui (1979), respectively, insisted that the use of superordinate terms is less clear in verbs than in nouns. In the same line, Gentner (1982) and Miller (1991) suggested that verbs are difficult to define because they refer to activities, motion, changes of state, relations and all these reasons have an effect on the complexity of verbal definition production, while according to Graesser, Hopkinson & Schmid (1987), Gertner (1982) and Markman (1989) adjectives and verbs are dependent on nouns. Thus, definition skills for verbs and adjectives are less predictable and develop much later than noun definition skills (Johnson & Anglin 1995). Markowitz and Franz (1988) found that verb and adjective definitions are more variable in form than noun definitions, but verbs may have a conventional or a typical definitional form similar to nouns (migrate means moving from one place to another depending on the seasons). Johnson and Anglin (1995) examined the ability of elementary school children (aged 6 to 8) to define verbs and they came to the conclusion that verbs, compared to nouns, were more difficult to define because it was difficult to find a superordinate term, possibly due to the non-hierarchical structure of children's mental vocabulary. Marinellie and Johnson (2004) asked 30 Elementary students to define 10 nouns and 10 verbs and their findings showed no significant difference between nominal and verbal definitions with respect to

content. On the other hand, their results revealed that form scores for nouns were significantly higher than those for verbs. Gavriilidou (2015) asked fifty-two (52) preschoolers to define sixteen (16) words (nouns, verbs and adjectives). The study found evidence that preschoolers had higher scores for nouns than for adjectives and verbs, while adjectives received higher scores compared to abstract nouns and verbs. To account for such differences, the author maintained that this may happen because, contrary to verbs which express change of state, mode, action, purpose, causality and usually lack a hierarchical structure, nouns are referential anchors, fact that facilitates the use of a hyperonymic term useful for their definition. Finally, Dourou (2019) examined the definitional ability of different age groups (preschoolers, lower vs. upper elementary students, Junior vs. Senior High school students and Low educated vs. Highly educated adults) and found evidence that all the above groups provided better definitions for nouns than for verbs and adjectives.

As stated before, the grammatical category also affects the definitional types provided during the definitional tasks. The study by McGhee-Bidlack (1991), who studied the way that adults define nouns, claimed - contrary to the findings of other research on children's definitions - that the majority of adults used superordinate terms for nominal definitions. In addition, most adults' definitions of nouns agree with the conventional form (an X is a Y that Z). Benelli et al. (2006) examined a sample of 280 children aged 6 to 12 and she found that nouns are mostly defined by introducing superordinate terms, whereas adjectives and verbs can also be defined by introducing synonyms. Marinellie and Chan (2006) observed that definitions of verbs produced by children at the age of 4 often include relationships and associations (*find*: you are happy when you find something), synonyms (*leave*: go) and verbs with a broad meaning in intransitive phrases (circulate: to move). Gavriilidou (2015) showed that preschoolers tend to give more functional definitions related to a particular event, person or place. The different types of definitions depend on the category to which a noun belongs (concrete/common/local/abstract nouns). The study also found that the most common definitional types for verbs were functional and definitions by example, while for adjectival definitions the most common types were descriptive and functional. As the author claimed, this finding can be justified because adjectives refer to the aesthetic properties of concrete objects or persons. Gandia (2016), showed that elementary school students expressed semantic content of nominal definitions through a synonym, descriptive characteristics, or through the function. Dourou (2019), examined the definitional ability of 50 Junior High school students and claimed that they had shown high performance in defining nominal definitions, both in content and form. The majority of the study participants used a combination of definitions and the class specific category, while the Partial Aristotelian form and the Aristotelian form were the most common types of their productions, with repect to syntax. The study also found that

the most common definitional types for verbs by Junior High school students was Tautology and Synonym, and the Phrase/Simple Clause definition with regard to form. In the same study, a majority of Senior High school students tended to prefer the Tautology for defining verbs and Phrase/ Simple Clause definition, with regard to form. Dourou (2019) also concluded that highly educated adults preferred to define verbs using a class specific term and characteristics of the concept in content, while low educated adults showed a clear preference for Association/Result/Action. similarly, in form, highly educated adults preferred to define verbs with Partial Aristotelian form, while low educated adults with Phrase/Simple Clause.

Even though the effect of grammatical category on the production of definitions has been extensively studied, no previous research investigated the possible interaction of grammatical categories with other variables when speakers produce definitions nor how this interaction affects the definitional types chosen by the speakers.

The Effect of Morphological Structure on Word Definitions and Definitional Types

Simple/Derived and Compound Words

Words in Greek can be simple (e.g. *milo 'apple'*), derived (e.g. *xorevo 'dance'*), or compound (e.g. *iʎovasilema 'sunrise'*). According to the typology of Ralli (2005; 2013), there are four main categories of compounds: a) Stem+linking vowel+stem+inflection (e.g. kian+o+kran+os 'blue helmet'), b) stem+linking vowel+word (e.g. melan+o+doxio 'inkpot'), c) Word+stem+inflection (e.g. kato+sendon+o 'undersheet'), d) Word+word (e.g. ksana+pezo 'replay'). The two first categories are more productive while the other two are minor and usually less productive.

Greek also favors derivation (through affixation), mainly with suffixes to form nouns (xoreftis 'dancer', kalosini 'goodness'), verbs (xorevo 'dance', skoupizo 'wipe') and adjectives (melodikos 'melodic', melanxolikos 'melancholic') but also prefixes to form nouns (kataθesi 'deposition'), verbs (anavalo 'postpone') or adjectives (aoratos 'invisible').

Compounding is "one of the richest sources of word formation in everyday language and scientific terminology" (Ralli, 2005). Simple compounds are acquired early by children with typical development (Nicoladis, 2006). Compound acquisition seems to play a major role in vocabulary development. Children primarily treat compound words as single words, and then gradually become aware that they consist of two parts connected with a meaning relation between them. Children's knowledge of the meaning of compounds starts to develop from the preschool years and is affected by a series of factors such as the size of the compound family or the relation between the head and the modifier (Krott & Nicoladis, 2005; Nicoladis & Krott, 2007).

When it comes to derivation, on the other hand, previous research showed that typically developing children start to acquire derivation at an older age compared to inflectional morphology (Clark, 1998), and that they start using it productively at a later age. Marshall and Van Der Lely (2007:72) explain that this happens because "derivational suffixes are more irregular and constrained, and the form-to-meaning is not always predictable". According to Clark (1998), the acquisition of derivational affixes depends on frequency, semantic opacity, allomorphy and the presence or not of irregularities.

As a matter of fact, to define derived or compound words "children must learn to identify regularities in the relations between forms and meanings" (Clark & Berman, 1984; 1987) but also make assumptions about the contribution of each word part to the whole meaning of the word. Following the acquisitional principles of Clark (1981) and Clark & Hecht (1982), children's definitions may be facilitated if the derived or compound words to be defined are characterized by semantic transparency (known elements with one-to-one matches of meaning and form), formal simplicity (the less a word form changes the simpler it is), conventionality (for certain meanings a conventional word formation device exists) and productivity (some word formation devices are more productive than others in specific languages).

Dourou (2019) showed that the participants in her study provided better definitions in simple than in compound words. This is justified because the words in her study belong to the basic vocabulary of the students and demonstrate higher frequency than non-basic words. Moreover, her sample used *Associations or Result / Action* for defining simple words (xorevo '*dance*': get tired) and *Tautologies* for compounds (aspromavros 'black and white': black and white). A significant effect of education level (highly educated adults) on the definition of simple/derived words was also observed. More specifically, adults with university education had higher scores in the definition of simple/derived words and compound words than adults without university education. This is also depicted in the types of definitions chosen by both groups. Adults with high education preferred to define simple/derived and compound words combining a superordinate term with functional and descriptive characteristics of words or using a synonym, while low educated adults preferred Associations or Result / Action for defining simple words and Tautologies for compounds.

No previous research has investigated how morphological structure interacts with other variables during word definition productions and how this interaction affects the definitional types chosen by the speakers.

The Effect of Semantic Characteristics on Word Definitions and Definitional Types

Concrete vs. Abstract Nouns

Not only the grammatical categories of words affect the content and form of definitions but also the level of abstraction of the noun to be defined (Dourou, 2019; Gandia, 2016; Johnson & Anglin, 1995; McGhee-Bidlack, 1991; Nippold et al., 1999; Sadoski, Kealy, Goetz & Paivio, 1997). Three age groups (ages 10, 14, and 18) had higher performances on concrete nouns than abstract nouns in the study of McGhee-Bidlack (1991). Whereas the definitions of concrete nouns were based mainly on their superordinate terms and characteristics, abstract nouns were defined in terms of their characteristics, with their category terms often excluded. A gradual improvement in abstract definitions was observed with age but even at the age of 18, definitions of abstract nouns were far less formal, due to lacking the appropriate superordinate term. The ability of 96 children (aged 6 to 10) to define concrete and abstract nouns was investigated by Johnson & Anglin (1995). They found that definitions of concrete nouns were more precise due to their superordinate and subordinate connections with other nouns. In line with the results of other studies, they concluded that the hyperonyms of abstract nouns (e.g., "feeling for the concept of love",) are language skills, which have not yet been developed in lower elementary school students. For concrete nouns, the inclusion of a superordinate term is a skill that develops after the age of 7, when students tend to use an IS A-structure (*apple* is a round and red fruit) in form (syntactic structure) of definitions.

Sadoski, Kealy, Goetz & Paivio (1997) asked graduate students to produce written definitions for concrete and abstract nouns using computers. The results concerned the quality of definitions as well as the use of strategies and showed that when participants gave definitions of concrete nouns, they started earlier and wrote longer and higher quality definitions. In contrast, definitions of abstract nouns included more words in order to convey the abstract meaning.

Nippold et al. (1999) asked students (12 to 23 years old) to produce definitions of low frequency abstract nouns (e.g., burden, humility) that were presented in a random order. Findings showed that in abstract concepts, adults also encountered difficulties. Although the responses improved with age, only 58% of the oldest group responses were awarded full credit. The researchers concluded that the definitions of abstract nouns cannot be complete and precise until late adolescence.

In Gavriilidou (2015), preschoolers had higher scores when they defined concrete nouns compared to abstract ones. Furthermore, the students provided class-specific (e.g. ap-

ple: a fruit) or functional definitions for concrete nouns and erroneous or descriptive definitions for abstract ones. The author concluded that it is very difficult for students in early childhood to define abstract concepts because they have not developed the appropriate skills yet. This ability is a process that develops gradually from pre-adolescent and adolescent years to adulthood. Dourou (2019) found a gradual improvement in the definitions of abstract nouns with age. More specifically, from the last grades of elementary school, students are better at definitions of abstract nouns because they start to develop definitional skills for abstract entities. According to the content of definitions, the most frequent type of concrete noun definition was *Class-specific category*, while the most frequent type of abstract noun definition was *Association/Result and Action*. In terms of form, both for concrete and abstract nouns, the largest percentage of the sample provided definitions with the *Partial Aristotelian form*. It should be noted that most studies that investigated so far how the abstract/concrete distinction affects the production of definitions only take into account nouns. However, more recent research (Belacchi & Benelli, 2017) also investigated the effect of concreteness / abstractness on verb and adjective definitions.

To our knowledge, no previous study has investigated the effect of semantic characteristics on both content and form of definitions from preschool age to adulthood nor the possible interaction with the grammatical category that a word belongs to. Considering the privileged association of nouns with punctual concepts and that of adjectives and verbs with relational concepts and also that relational concepts are closely related to abstractness (Strik Lievers, Bolognesi & Winter, 2021), in this study, we opted to investigate the effect of concreteness / abstractness only on definitions of nouns.

Aims and Hypotheses

Taking into consideration previous gaps in the literature as indicated in the review, the general purpose of the present study was to extend the existing knowledge on the production of definitions by investigating new parameters that may affect definitions such as the effect of grammatical categories, word structure and semantic characteristics on definitional skills and definition types of content and form.

The first aim was to investigate the effect of grammatical categories (nouns, verb, adjectives) on word definitions and definitional type, both in content and form. Based on previous literature (Gavriilidou, 2015; Marinellie & Johnson, 2003, 2004), we expected that the utterances children produce for nouns, verbs and adjectives would differ. Specifically, and consistently with the literature on the effects of the grammatical categories of words on definitional skills (Dourou, 2019; Gavriilidou, 2015; Johnson & Anglin, 1995; Markowitz & Franz, 1988; McGhee-Bidlack, 1991; Nippold et al., 1999), we assumed that nouns would be better defined, compared

to adjectives and verbs, and would contain more hyperonyms and more precise and formal semantic content, compared to verbal and adjectival definitions. This hypothesis is based on the assumption that children, during the school years, have more practice in defining nouns than verbs and adjectives. On the other hand, we assumed that verbs and adjectives would be more difficult due to their non-hierarchical structure and would not contain relative clauses, such as nouns. An analogous development was also expected in form of nominal definitions.

The second aim was to study the effects of word structure (simple words, derivatives, and compounds) on word definitions and definitional types, both in content and form, in order to make predictions about the most conventional word formation device in Greek by grammatical category.

The third aim was to examine the effect of semantic characteristics (concrete and abstract words) in content and form of definitions. Taking into consideration previous literature on the effect of concreteness and abstraction on definitional skills (Gavriilidou, 2015; McGhee-Bidlack, 1991; Nippold, et al., 1999), we expected that concrete words would be defined easier than abstract ones. We predicted that the participants would define concrete nouns using a superordinate term (Johnson & Anglin, 1995), both in content and form, while abstract nouns would be defined with association and phrase/simple clause (Nippold et al., 1999).

METHODS

Participants

The study sample comprised 5152 recorded oral definitions classified for content and form (see Table 1 and 2 respectively) produced by a non-random sample of 322 individuals (140 males (43%) and 182 females (57%) of different age groups, from preschoolers to adults.

Assessments and Measures

The definition task included sixteen (16) words, of which eight (8) were nouns, four (4) verbs and four (4) adjectives. Eight (8) of them were compounds (4 nouns, 2 adjectives and 2 verbs) all constructed following the most frequent pattern of compounding in Greek: Stem+linking vowel+stem+inflection. For a detailed presentation of the procedure of word selection for the definition task see Dourou, et al. (2020). Effort was made to include semantically transparent and formally simple derivatives and compounds. The sixteen (16) words that were chosen were checked for their frequency and are depicted in Table 2.

The questionnaire was administered orally by the third author to each participant individually. It was deemed necessary to orally administer the instrument since the preschoolers included in the sample had not yet developed writing ability. Furthermore, oral administration minimized the risk of copying a definition through the internet or from a dictionary (electronic or printed).

The eight (8) nouns were interspersed with the four (4) verbs and four (4) adjectives in random order, and each participant was randomly assigned to an order. Following the research protocol of Marinellie & Johnson (2002, 2004), for nouns the investigator asked the usual question employed by teachers in Greek schools to elicit nominal definitions: Ti ine X; 'What is X?'. As this is the common practice in classroom, children could understand that they were asked to define a word from the grammatical class of 'noun'. The use of a natural prompt for nouns would maximize the chance that children would interpret as nouns common words with multiple meanings. In accordance with Marinellie & Johnson (2004), for each verb or adjective, on the other hand, the investigator asked children the usual question for eliciting verbal or adjectival definitions in Greek schools: Ti simeni X; 'What does X mean?'. The use of this natural prompt maximized the chances that the child would interpret these

Table 1

Distribution of subjects across gender and age groups

Age groups	Gender		Mean	Age Range	N
	M	F	Age	[Min, Max]	
Preschoolers	16	17	5.08	[5.00-5.70]	33
Lower Elementary	21	15	7.40	[6.00-8.20]	36
Upper Elementary	16	19	10.82	[8.80-12.1]	35
Junior High students	17	18	13.19	[12.0-14.4]	35
Senior High students	23	27	16.01	[15.0-17.2]	50
University students	24	59	21.41	[19.0-24.6]	83
Adults	23	27	57.40	[32.0-68.4]	50
Total	140	182	18.75	[5.00-68.4]	322

Table 2

Definitional Task Grouped per Word Categories

	Items	Grammatical Category	Semantic characteristics	Mode of Construction
Words from Textbooks of the Modern Greek Language of Elementary School	erotisi 'question'	Noun	Abstract	Derivative
	taksiði 'journey'	Noun	Abstract	Simple
	iʎovasilema 'sunset' 'sunrise'	Noun	Abstract	Compound
	makrozoia 'longevity'	Noun	Abstract	Compound
	tiropita 'cheese pie'	Noun	Concrete	Compound
	maçeropiruno 'cutlery'	Noun	Concrete	Compound
	aspromavros 'blackand white'	Adjective		Compound
	γlikoksinos 'sweet and sour'	Adjective	N/A	Compound
	aniγoklino 'open and close'	Verb		Compound
	siγotrayuðo 'hum'	Verb		Compound
Words from Gavrii-lidou's research (2015)	milo 'apple'	Noun	Concrete	Simple
	poðilato 'bicycle'	Noun	Concrete	Simple
	eksipnos 'intelligent'	Adjective		Simple
	astios 'funny'	Adjective	N/A	Derivative
	ðjavazo 'read'	Verb		Simple
	xorevo 'dance'	Verb		Derivative

words as verbs. Data collection lasted two months (October-December 2018). The study was approved by the Ethics Committee of the Department of Greek of Democritus University of Thrace. As children are involved in the study written consent was obtained from the legal guardians.

Data Scoring

Even though, a number of studies have shown the usefulness of a single coding system that jointly considers form and content (Benelli et al., 2006; Belacchi & Benelli, 2017; Artuso, et al., 2022), since form and content do not always change together and in the same ways (Johnson & Anglin, 1995; Litowitz, 1977; Wehren, DeLisi & Arnold, 1981;), for the needs of the present study we opted to investigate them separately and for that reason we adopted the scoring methodology of Marinellie & Johnson (2002, 2004) (as adapted in Dourou, 2019 and Gavriilidou, 2015).

Content

Comparing to the scoring of Marinellie & Johnson, (2002), four additional types of definitions (Present state, Tautology, Self-reference, Lexicographic definition) were added to the classification of definitions which emerged from the

responses of the participants. Examples of content scoring are displayed in Table 3. Definitions were scored on a six-point scale along a continuum, from a minimum of 0 to a maximum of 5, to be consistent with a developmental progression suggested in previous literature. Low-level responses were *Function*, *Description*, *Present state*, *Example*, *Association* and *Tautology*. Mid-level responses were *Relation*, *Class non-specific*, *Class specific* and *Synonym*. High-level responses included *Combination I* and *II*, *Lexicographic definition* and *Aristotelian definition*.

Form

Examples of form scoring are displayed in Table 4. Definitions were also scored on a six-point scale along a continuum, to be consistent with a developmental progression suggested by the literature on definition. This scoring scheme was used in a study of the definitional skill of school-age children with specific language impairment (Marinellie & Johnson, 2002). Form categories included: *Nonverbal*; *Single Word or Article + Word*; *Phrase*, *Clause*, or *Simple Sentence*; *Transitional*; *Partial Aristotelian*; and *Aristotelian*. The highest possible form score for any participant was 80 points (16 words per participant, with a maximum of 5 points per word).

Table 3

Scoring Scheme used for the Content Categories

Content category	Example	Score
Error	milo [apple : ice-cream]	0
Function	tiropita [cheese pie: you eat it]	1
Description	milo [apple: red and round]	1
Present state	erotisi [question: what you are asking right now]	1
Example	aniyoklino [open and close: for example, open and close the door]	1
Association /Result /Action	diavazo [read: history]	1
Tautology	ylikoksinos [sweet-sour: sweet and sour]	1
Relation-Self-reference	eksipnos [intelligent: that's me]	2
Class non-specific	poðilato [bicycle: a thing]	2
Class specific	milo [apple: fruit]	3
Synonym	eksipnos [intelligent: clever]	3
Combination I	milo [apple: a thing that is red and round]	4
Combination II	poðilato [bicycle: means of transport with a steering wheel, saddle and pedal]	5
Lexicographic definition	diavazo [read: look at the words and understand their meaning]	5
Aristotelian definition	erotisi [question: a clause that asks for answers]	5

Table 4

Scoring Scheme used for the Form Categories

Form Category	Example	Score
Nonverbal	Participant demonstrates use of object or points to object	0
Single Word or Article + Word	iʎovasilema [sunrise: evening]	1
Phrase, Clause or Simple Sentence	milo [apple: we eat it]	2
Transitional form (use of "something" or "thing" plus modifying clause)	erotisi [question: something that calls for answers]	3
Partial Aristotelian form	milo [apple: a fruit]	4
Aristotelian form	poðilato [bicycle: means of transport with a steering wheel, saddle, pedal and without motor]	5

Reliability

Content and Form

Interrater reliability of content coding was evaluated for all responses given by 64 participants. This refers to 20% of the data (1024 definitions). Identically coded responses were considered an agreement. The two raters were the first author and a PhD student of the Department of Greek Philology of the Democritus University of Thrace. The investigator's grade was blinded. The percentage of agreement was calculated by dividing the number of responses coded identically by the total number of coded responses (1024 definitions). For the content of the responses, 908 common responses were recorded indicating an inter-rater agreement of 88.6%.

Inter-rater reliability of form coding was evaluated for all responses in the same way as content coding. For the form of the responses, 952 common responses were recorded indicating an inter-rater agreement of 92.9%.

Data Analysis

To investigate the effect of grammatical categories (noun, adjective, verb) and word structure (simple, compound, derivative) on content and form of definitions (scores between 0 and 5), a two-way MANOVA was conducted, followed by univariate ANOVAs with Tukey's HSD post-hoc test. Since the distinction concrete/abstract is relevant for nouns only, to investigate the effect of semantic characteristics and word structure on content and form of noun definitions another

two-way MANOVA was conducted. The assumptions of normality, linearity, homogeneity of variances and covariances were met in both cases. MANOVAs were conducted with IBM SPSS Statistics 23.0.

Correspondence Analysis – CA (Greenacre, 2007) was employed to investigate the associations between grammatical categories, word structure and semantic characteristics, and the definitional types of form and content. Specifically, CA was applied to (a) the contingency table formed by the combined categories of grammatical, semantic and word structure (e.g., noun/abstract/derived, noun/abstract/simple, etc.) and the six definitional types of form and (b) the contingency table formed by the combined categories described in the previous point and thirteen out of the fifteen definitional types of content. Present state definitions and definitions by self-reference were omitted due to low number of cases (see Table 1). To display the CA results, the contribution biplot scaling was used to facilitate interpretation (Greenacre, 2013). In the contribution biplot, the combined categories are displayed as points on a two-dimensional map, where the distances between them are spatially interpretable. The definitional types are displayed as vectors or biplot axes on the same map. The length of a biplot axis indicates the importance or contribution of the corresponding definitional type to the solution; biplot axes lying close to (or far from) the origin contribute little (or considerable) to the solution. Moreover, the perpendicular projection of a point (combined category) on a biplot axis (definitional type), approximates the frequency of the corresponding definitional type for that category. CA was applied with the package factoextra (Kassambara & Mundt, 2020) in R 4.0.0.

RESULTS

The Effect of Grammatical Categories and Word Structure on Content and Form of Definitions

The results of two-way MANOVA, with two independent variables – grammatical categories and word structure – and two dependent variables – content and form of definition scores, indicated a statistically significant interaction effect between grammatical category and word structure on the combined dependent variables, $F(6, 10286) = 54.746$, $p < .001$, Wilks' $\Lambda = .939$, partial $\eta2 = .031$. Follow up univariate two-way ANOVAs showed a statistically significant interaction effect between grammatical categories and word structure for both content, $F(3, 5144) = 64.576$, $p < .001$, partial $\eta2 = .036$, and form scores, $F(3, 5144) = 30.613$, $p < .001$, partial $\eta2 = .018$. As such, simple main effects analyses were conducted for both types of scores.

With regard to content definition scores, there were statistically significant differences between word structure cate-

gories for nouns, $F(2, 5144) = 39.276$, $p < .001$, partial $\eta2 = .015$, verbs, $F(2, 5144) = 46.397$, $p < .001$, partial $\eta2 = .018$ and adjectives, $F(1, 5144) = 77.15$, $p < .001$, partial $\eta2 = .015$. The mean content definition scores for simple, compound and derived nouns were 3.09, 2.98 and 2.18, respectively. Simple nouns were significantly better defined than derived nouns, .91, 95% CI [.66, 1.16], $p < .001$ and compound nouns were significantly better defined than derived nouns, .80, 95% CI [.55, 1.04], $p < .001$. The mean difference between simple and compound nouns was not statistically significant, .11, 95% CI [−.05, .28], $p = .32$. The mean content definition scores for simple, compound and derived verbs were 1.95, 1.68 and 2.74, respectively. Derived verbs were significantly better defined than simple verbs, .80, 95% CI [.40, 1.10], $p < .001$ and compound verbs, 1.06, 95% CI [80, 1.33], $p < .001$. The mean difference between simple and compound verbs was not statistically significant, .27, 95% CI [−.02, .47], $p = .06$. Last, the mean content definition scores for simple and compound adjectives were 2.55 and 1.76, respectively. Simple adjectives were significantly better defined than compound adjectives, .80, 95% CI [.62, .97], $p < .001$. The estimated marginal means and confidence intervals of content definition scores for grammatical categories and word structure are shown in Figure 1.

With regard to form definition scores, there were statistically significant differences between word structure categories for nouns, $F(2, 5144) = 41.716$, $p < .001$, partial $\eta2 = .016$, verbs, $F(2, 5144) = 29.527$, $p < .001$, partial $\eta2 = .011$, but not for adjectives, $F(1, 5144) = .63$, $p = .427$. The mean form definition scores for simple, compound and derived nouns were 3.42, 3.01 and 2.78, respectively. Simple nouns were significantly better defined than compound nouns, .34, 95% CI [.22, .46], $p < .001$ and derived nouns, .64, 95% CI [.45, .82], $p < .001$, and compound nouns were significantly better defined than derived nouns, .29, 95% CI [.12, .47], $p < .001$. The mean form definition scores for simple, compound and derived verbs were 2.73, 2.27 and 2.83, respectively. Simple and derived verbs received significantly better scores than compound verbs, .46, 95% CI [.26, .65], $p < .001$ and .56, 95% CI [.36, .75], $p < .001$, respectively. The mean difference between simple and derived verbs was not statistically significant, .10, 95% CI [-32, .13], $p = .82$. The estimated marginal means and confidence intervals of form definition scores for grammatical categories and word structure are shown in Figure 2.

The Effect of Semantic Characteristics and Word Structure on Content and Form of Definitions

A second two-way MANOVA was run with word structure and semantic characteristics as independent variables and content and form of noun definition scores as dependent variables. There was a statistically significant interaction effect between grammatical category and word structure on

Figure 1

Estimated Marginal Means of Content Score by Grammatical Category and Word Structure. Error Bars represent 95% Confidence Intervals.
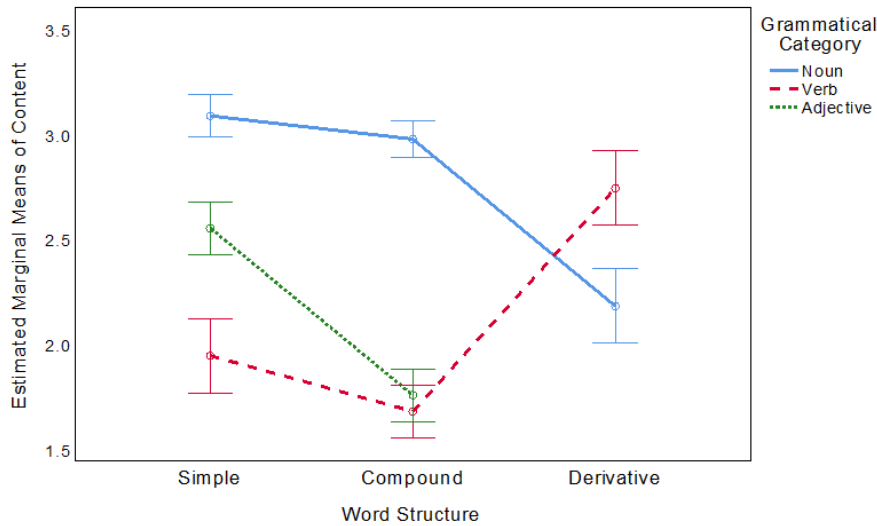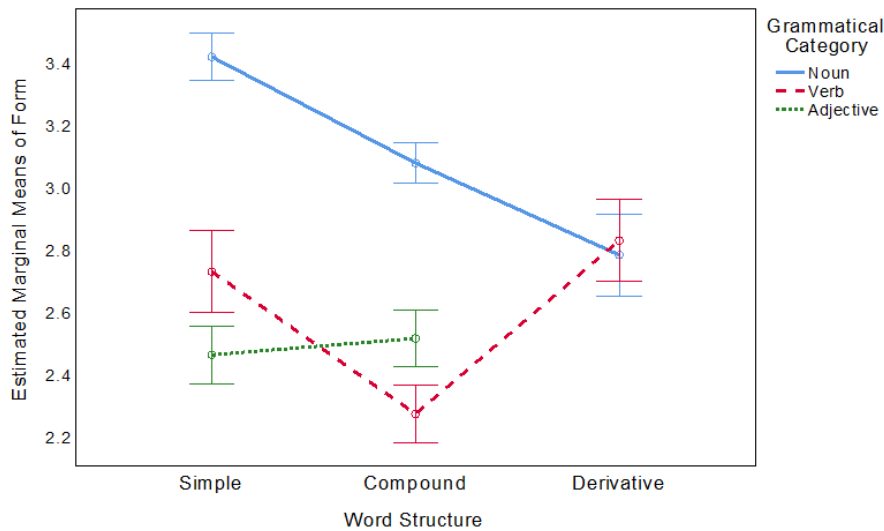

Figure 2

Estimated Marginal Means of Form Score by Grammatical Category and Word Structure. Error Bars Represent 95% Confidence Intervals.

the combined dependent variables, $F_{(2, 2570)} = 25.164$, $p < .001$, Wilks' $\Lambda = .981$, partial $\eta2 = .019$. Follow up univariate two-way ANOVAs showed a statistically significant interaction effect between grammatical categories and word structure for content scores, $F_{(1, 2571)} = 87.566$, $p < .001$, partial $\eta2 = .012$, but not for form scores, $F_{(1, 2571)} = .261$, $p < .001$. As such, a simple main effects analysis was conducted for content scores only.

With regard to content definition scores, there were statistically significant differences between semantic characteristics for simple nouns, $F_{(1, 2571)} = 43.071$, $p < .001$, partial $\eta2 = .016$, but not for compound nouns, $F_{(1, 2571)} = .729$, $p = .393$ (note that there were no concrete derived nouns). The mean content definition scores for simple concrete and simple abstract nouns were 3.34 and 2.59, respectively. Simple concrete nouns were significantly better defined than simple abstract nouns, .74, 95% CI [.52, .97], $p < .001$. Abstract

derived nouns were the most difficult category of nouns to define. The estimated marginal means and confidence intervals of content definition scores by word structure and semantic categories are shown in Figure 3.

With regard to form definition scores, the main effects of semantic characteristics, $F_{(1, 2571)} = 174.251$, $p < .001$, partial $\eta 2 = .063$ and word structure, $F_{(2, 2571)} = 7.264$, $p = .001$, partial $\eta 2 = .006$, were statistically significant. The mean form scores for concrete and abstract nouns were 3.55 and 2.80, respectively. Concrete nouns were significantly better defined than abstract nouns, .75, 95% CI [.65, .85], $p < .001$, independently of the word structure. The estimated marginal means and confidence intervals of form definition scores by word structure and semantic categories are shown in Figure 4.

Associations between Grammatical Categories, Word Structure, and Semantic Characteristics with Types of Definitions

Figures 5a and 5b show the main results of Correspondence Analysis on the contribution biplots of the first and second principal axes. These maps allow us to examine and reveal the associations between grammatical categories, word structure, and semantic characteristics (as combined categories) and the definitional types of form and content.

With regard to form, the first principal axis explained 52.6% of the total inertia (or variance in the data) and the second principal axis explained 36.1% (hence 88.7% in total); none of the remaining three principal axes explained more than 7%. This suggests that a two-dimensional CA solution gives a good approximation of the data. The origin of the map (0,0) represents the average profile of definition preference. Along the first principal axis, simple and compound concrete nouns (NounConcSimp, NounConcComp) tend to be associated with the Partially Aristotelian form and the Aristotelian form (ParArstl5, Arstl6). On the other hand, these are the least common types of definitions for abstract derived nouns (NounAbsDeriv) and compound adjectives (AdjComp). Along the second principal axis, simple adjectives (AdjSimple) are strongly associated with the Transitional form (Trans4), whereas compound verbs (VerbComp) are strongly associated with definitions with a Phrase, Clause or Simple Sentence (PhrsClsSimSent3).

With regard to content, the first principal axis explained 35% of the total inertia and the second, third and fourth axes explained 29.1%, 14.5% and 11.2%, respectively (hence 90% in total). None of the remaining five principal axes explained more than 6%, suggesting that a four-dimensional CA solution best explains the data. In Figure 5b, we plot the first two principal axes, but the third and fourth axes were also inspected. Along the first principal axis compound verbs and compound adjectives (VerbComp, AdjComp) tend to be associated with Tautologic (Tau7) and Example (Exmpl5) definitions. Along the second axis, simple concrete nouns (NounConcSimp) are associated with class specific definitions (Classpc10) and simple verbs and adjectives (VerbSimp, AdjSimp) are associated with Synonym and Association /Result /Action definitions (Syn11, AscResAct6). Along the third axis, concrete compound nouns (NounConcComp) are associated with Class non-specific and Function definitions (Classnn9, Fun2). Last, along the fourth axis, abstract compound nouns (NounAbsComp) are associated with Combination II and Lexicographic definitions (CombII13, LexDef14).

Figure 3

Estimated Marginal Means of Content Score by Word Structure and Semantic Characteristics. Error Bars represent 95% Confidence Intervals.
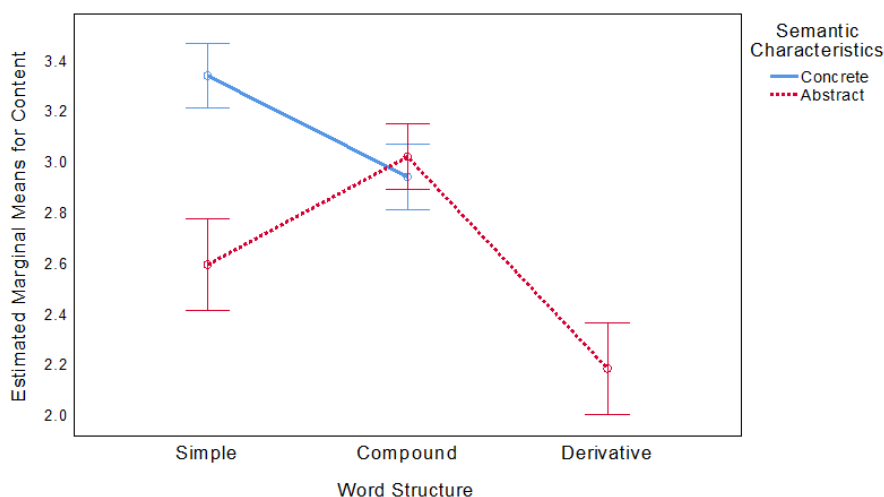
Figure 4

Estimated Marginal Means of Form Score by Word Structure and Semantic Characteristics. Error Bars Represent 95% Confidence Intervals.
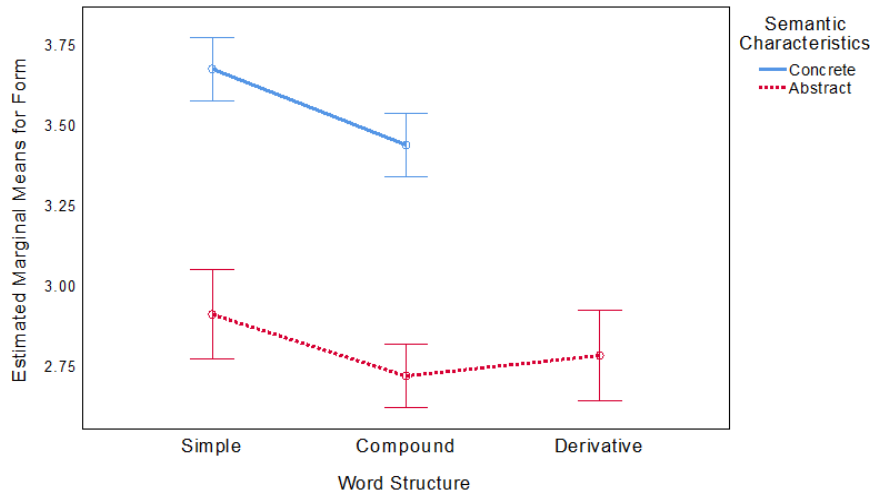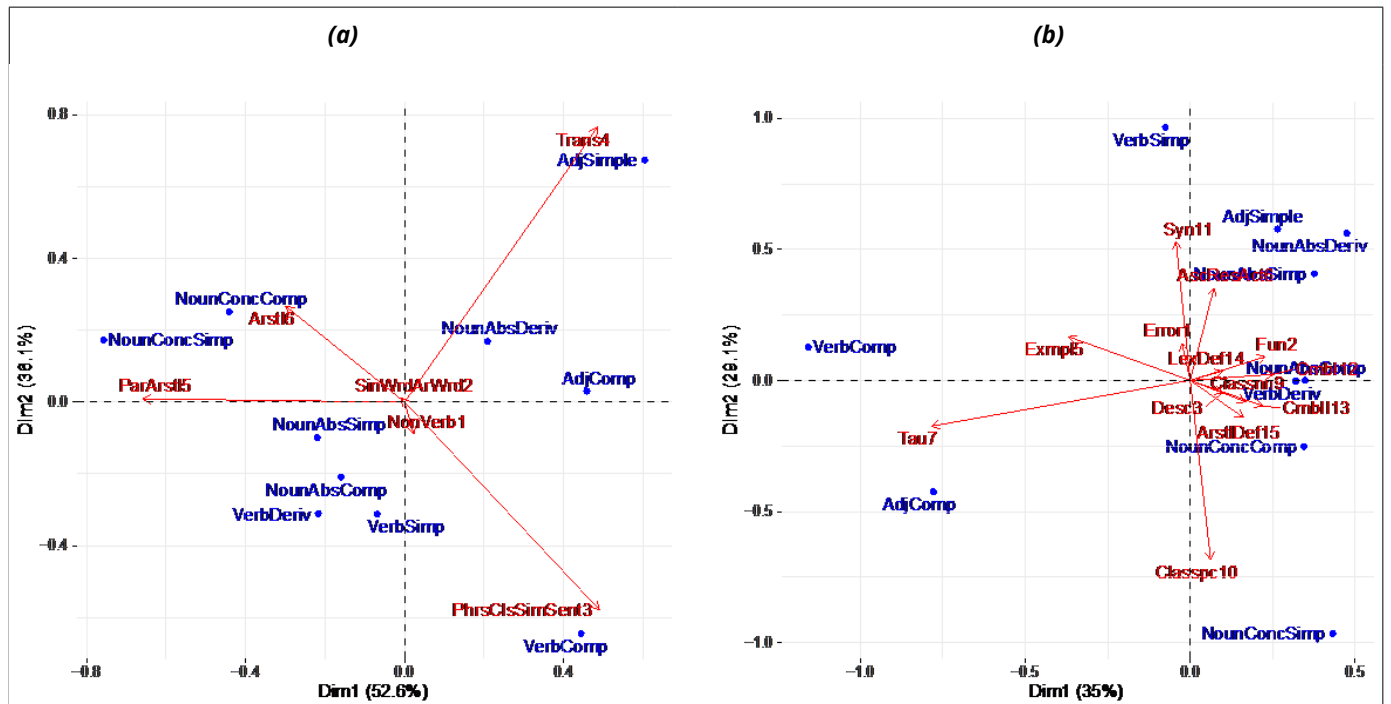

Figure 5

Contribution Biplots of CA on Grammatical Categories, Word Structure and Semantic Characteristics (as Combined Categories) and the Definitional Types of Form and Content.

DISCUSSION

The purpose of the present paper was to investigate the effect of grammatical categories (nouns, verbs and adjectives), word structure (simple words/derivatives vs. compounds), and semantic characteristics (concrete vs. abstract) on word definitions and definitional types of content and form.

Our first aim was to check the effect of grammatical categories on content and form of the produced definitions. It was expected that nouns would have higher scores compared to adjectives and verbs. This study verified our hypothesis. Confirming previous research (Dourou, 2019; Gavriilidou, 2015; Johnson & Anglin, 1995), the results showed that simple and compound nouns received better scores in defini-

tions, followed by simple and compound adjectives and, finally, simple and compound verbs. However, interestingly, a statistically significant interaction between grammatical category and word structure, not only for content but also for form, was found in our data that had not been mentioned in previous research: derived verbs were better defined than derived nouns suggesting that, in this case, it is not the distributional property of noun vs. verb per se, but the interaction between this property and word structure that had a greater influence. Future research should offer cross linguistic data for answering the question of how these two parameters interact.

Our second aim was to investigate the effect of word structure (simple words, derivatives and compounds) on word definitions and definitional types, both on content and form. Our findings contradict those reported in Dourou (2019) who found better performance of her sample in simple than in compound words. As discussed in the previous paragraph, a statistically significant interaction between grammatical category and word structure was found in our research. Our results showed that simple or compound nouns were better defined than derived nouns, while the opposite was the case with verbs and adjectives, where derived verbs received better scores than simple and compound verbs and derived nouns. In other words, the sample was better able to provide word definitions for simple or compound nouns than derived nouns but also defined better derived verbs compared with simple and compound verbs or derived nouns. This result may indicate that children find more transparent compounding compared to derivation for nouns and derivation compared to compounding for verbs and this may reflect that, in Greek, compounding is the more conventional and productive word formation device for nouns, while derivation is the most conventional word formation device for verbs. This finding should be verified with data from lexical statistics describing Greek vocabulary. Overall, this result indicates that the performance in definitions is a rather complex phenomenon and we should not look at word structure differences in children's definitions in a single, oversimplified way, but rather account for them in relation to grammatical category, semantic characteristics, or other variables.

Our third aim was to examine the effect of semantic characteristics (concrete and abstract words) on content and form of definitions. It was expected to find better scores for concrete nouns than for the abstract ones both in content and in form. The results of the present study partially confirmed our hypothesis, since statistically significant differences were found only for content suggesting that semantic characteristics of the word to be defined have an impact mainly on the information included in the definition, in other words the semantics of it. An interesting statistically significant interaction between semantic characteristics and word structure was also found; simple concrete nouns

were better defined than simple abstract nouns in content. The results also showed that abstract derived nouns are the most difficult category to be defined. Thus, the findings of the present study extend previous work (Gavriilidou, 2015; Johnson & Anglin, 1995; Nippold et al.) by showing that semantic characteristics interrelate with other variables such as word structure.

Finally, with respect to the effect of grammatical categories, word structure and semantic characteristics on definition types of content and form provided by our sample it was found that, for form, simple and compound concrete nouns tend to be associated with the Partially Aristotelian form and the Aristotelian form. This finding extends previous studies (Markowitz & Franz, 1988; Snow, 1990) which found that nouns are defined with Class specific, Aristotelian or formal definitions, including a superordinate term plus distinguishing characteristics in a modifying clause, and suggests that the type of definitions depends not on isolated variables but on an interaction of parameters and that categories that are easier to be defined associate mainly with the Aristotelian form in definitions. With regard to content, it was found that: (1) compound verbs and compound adjectives tend to be associated with Tautologic definitions; This finding may be accounted for by the fact that, in their effort to define a compound word, speakers tend to analyse its components, thus often arriving to tautologic definitions; (2) simple concrete nouns are associated with class specific definitions, suggesting that concrete nouns may activate more easily hyperonymic terms in their definition than other categories of words; these terms function as an anchor around which the definition is formed; (3) simple verbs and adjectives are associated with definitions by a Synonym, reflecting teachers' classroom practices that systematically promote synonym definitions for verbs and adjectives; (4) concrete compound nouns are associated with Class non-specific definitions.

These findings also extend previous studies (Marinellie & Chan, 2006; Marinellie & Johnson, 2003).

Limitations

There are two major limitations of this study. First, following the research protocol of Marinellie & Johnson (2004), definitions for nouns were elicited through a different prompt than definitions for verbs and adjectives. This may have had an impact on the results. Second, only one derived adjective was included in the study.

Despite any limitations, it is hoped that this study provides additional understanding of how speakers define words and that this research-based knowledge can be employed in helping secondary or university teachers to expand their perspectives on good teaching to their pupils/students of how to effectively define different types of words.

CONCLUSION

To summarize, this study investigated the effect of grammatical categories, word structure, and semantic characteristics on word definitions and definitional types of content and form. Its significance lies in the fact that it has extended research on definitional skills and definitional types by adding new dimensions of variation in definitional skills, such as word structure, and extending prior knowledge of dimensions like grammatical category or semantic characteristics.

An interaction between grammatical category, semantic category and word structure was found providing evidence about the theoretical assumption that the performance in definitions is a complex phenomenon and we should not look at isolated variables in an oversimplified way, but instead we should investigate the interaction of multiple parameters. The present study also offered useful insights about the most conventional word formation device in Greek by grammatical category; compounding for nouns and derivation for verbs this finding, however, needs to be verified with further research.

Future investigation should test with Greek data how effective a single coding system that jointly considers form and content would be. Furthermore, it would be interesting to use Greek data to check the effect of concreteness/ abstractness on definitions for verbs and adjectives.

DECLARATION OF COMPETING INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Zoe Gavriilidou: conceptualization, methodology, project administration, resources, supervision, validation, writing-review & editing.

Angelos Markos: conceptualization, data curation, investigation, methodology, project administration, validation, visualization, writing-original draft, formal analysis.

Chryssa Dourou: conceptualization, formal analysis, methodology, project administration, supervision, validation, visualization, writing-original draft, writing-review & editing.

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