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The Conceptual Relationships in N+N Compounds in Arabic Compared to English

Abstract

The current study investigates the semantic or conceptual relations that exist between two compound elements in Arabic based on the theoretical framework of Conceptual Semantics and a modified version of Parallel Architecture called Relational Morphology (RM). It also explores the similarities and/or differences between these relations and those identified by Jackendoff pertaining to English compounds. To this end, a corpus of Arabic compounds was collected and analysed to identify the type of conceptual basis on which both lexicalised and novel compounds are formed in Arabic. The analysis revealed that all conceptual relations found between elements of English compounds can also be found in Arabic, yet the direction of the head was different in the latter. The analysis also demonstrated that Arabic compounds exhibit other types of conceptual relations which were not mentioned by Jackendoff. It is suggested that both regular stored lexicalised compounds that have idiosyncratic interpretations and novel compounds (with the majority being formed based on Synthetic Genitive Construction) can be reconciled under the approach of Relational Morphology, as they can be generated by the same compound schema.
Keywords: conceptual semantics; relational morphology; compounds; Arabic; English

1 Introduction

Conceptual Semantics is defined as a formal approach examining natural language meaning as it plays an essential role in the formation of this meaning (Jackendoff, 1983, 2007; Pinker, 1989 among others). The primary objective of Conceptual Semantics is to provide a description of how humans express their understanding of the world using linguistic utterances. In this respect, the theory of meaning is concerned with describing the inner thoughts of individuals when they use a certain linguistic structure. The theory also aims to provide insights into the messages that speakers intend to convey in their linguistic utterances. Hence, this theory integrates everything that is traditionally classified under 'semantics', 'pragmatics', and 'world knowledge'. In Conceptual Semantics, as envisioned by Jackendoff (1988), the meanings of words and sentences are regarded to be structured in the minds of language users. In addition, phrases are considered to refer to the world; more specifically, the world as it is conceptualized by language users. The difference between Conceptual Semantics and Linguistic Semantics is that, unlike the latter, the former is taken to be concerned with the totality of meaning rather than the part determined or formed by syntactic structure. Conceptual Semantics focuses on the details of word meanings and the ways in which they interact with compositionality, which refers to the notion that the meaning of utterances should be formed in a systematic way to integrate the meaning of its words and syntactic structure (Gagné et al., 2016; Jackendoff, 2009; Pelletier, 2016). Given the fact that

Conceptual Semantics also incorporates pragmatic information, the way compounds are analysed is impacted by this outlook. In particular, compounds are regarded as problematic when one considers the division between the lexicon and grammar. On the one hand, a language user has to store a large number of lexicalised compounds with semi-idiosyncratic meanings, e.g., *peanut butter*, and on the other, novel compounds can be built spontaneously and without preparation (e.g., *aid inflow*), which suggests that they cannot be all stored in the lexicon (Jackendoff, 2009, p. 108). In addition, compounds exhibit little internal syntactic structure whether they are lexicalised or novel. Given the substantial number of novel compounds integrated into languages, it has been proposed that compounding as a word formation process cannot only be a list, but that rather it must include a productive system of semantic relations (Jackendoff, 2009). As a result, Jackendoff (2009) proposed a productive system of conceptual relations that hold between the elements of compounds relying on Conceptual Semantics and later on Parallel Architecture. Recently, Parallel Architecture has been revised in order to incorporate morphology into its texture under a new approach called Relational Morphology (RM), in which the boundary between grammar and lexicon is eliminated and the distinction between productive and non-productive patterns is gradable (Jackendoff & Audring, 2020). Adopting this new approach, this study aims to examine the conceptual or semantic relations between compound elements in Modern Standard Arabic (MSA) and Jordanian Arabic (JA), comparing them with those reported by Jackendoff (2009) pertaining to English.[1] In doing so, the productive system of conceptual relations that regulates the formation of compounds can be further described and understood, and by extension, expand our understanding of compounding.

2 General Background

2.1 Parallel Architecture and Relational Morphology

In his work, Jackendoff (1988, 2007, 2009) examined the semantic relations between compound elements, adopting the theoretical framework of Conceptual Semantics and later Parallel Architecture, which is compatible with the main tenets of the former. Jackendoff (2009, p. 109) argued that the novelty of compounds suggests that they are not a mere list but a productive system of rules. However, there are certain difficulties related to the reconciliation of productivity with the idiosyncratic nature of compounds. The case of VPs-idioms can provide insights into this dilemma. VPs are generated by a productive system of rules, yet at the same time there are many idioms comprising of VPs which have to be stored in the lexicon (Jackendoff, 2009, p. 109). Their meanings are also non-transparent (see Acquaviva, 2017; Rainer et al., 2014). This suggests that compounds are not unique in that matter, meaning that Parallel Architecture can be applied to compounds since it does not require a "principled line between freely generated compounds and morpho-syntactically complex listed items with the same structure" (Jackendoff, 2009, p. 109). Jackendoff goes on to elaborate that certain compounds, e.g., *soccer ball*, could be listed in one's lexicon because one cannot establish a link between this ball and a particular physical object, but can also encounter *backgammon ball* of which one may have not heard before, yet one can tell what the term is supposed to denote. This suggests that the productivity of compounds entails that language users have a set of rules or principles that make them capable of incorporating novel compounds, whereas lexicalised compounds are just specialised manifestations of these principles (Jackendoff, 2009, p. 110). On the distinction between lexicalised and novel compounds, Jackendoff (2010, p. 420) states: "The task for the language learner … is to learn the lexicalized compounds

[1] MSA and JA share many linguistic aspects, e.g., similar structures such as compounds and lexical items, but differ mainly in case marking where the former has a case-marking system, and the latter does not. This study analyses examples from both MSA and JA to avoid any confusion. However, if there are differences between the two Arabic dialects in terms of compounds, the researcher will not identify the dialects used in the examples but will refer to the compounds as Arabic compounds.

and to acquire the rules for interpreting novel compounds", which suggests that lexicalised compounds are stored in the lexicon, while novel ones are not. Other researchers (e.g., Gagné, 2002; Pollatsek et al., 2011) defined a lexicalised compound as one that is familiar and commonly used, whereas novel ones are less familiar and less frequently used. Both definitions use the concept of familiarity to make the distinction. Drawing on the above, it seems that challenges pertaining to the interplay between grammar and lexicon and the contrast between regularity and idiosyncrasy continually persist. To resolve such challenges, Jackendoff and Audring (2020) revisited Parallel Architecture by incorporating morphology under a new approach called Relational Morphology (RM).

In RM, Jackendoff and Audring (2020) attempted to extend the scope of Parallel Architecture to morphology by referring to relevant frameworks such as Construction Grammar (e.g., Croft, 2001; Hoffmann & Trousdale, 2013) and Construction Morphology (Booij, 2010, 2018). However, this integration resulted in a radical change in linguistic theory as envisaged by proponents of generative syntacticians. Specifically, Berwick and Chomsky (2016, p. 2) argued that the fundamental property of language constitutes a finite computational system producing infinite expressions. Thus, the grammar of language should characterize productive patterns and other aspects of language which are not productive are usually assigned to the lexicon. The latter is regarded as a container of idiosyncrasies. Jackendoff and Audring (2020, p. 1) argue that even though the lexicon contains unproductive patterns, it contains patterns nonetheless, e.g., *shake hands*, containing the regular plural suffix -s. This type of pattern, however, cannot be captured by productive rules, but rather lexical rules which are called under RM *schemas*. Even though *shake hands* has to be listed in the lexicon because of its semantic idiosyncrasy, the plural form should be derived by the productive plural rule, and as such the expression should not be listed in the lexicon. A paradox emerges here, since the plural suffix must both be generated by the productive grammar and listed in the lexicon at the same time (Jackendoff & Audring, 2020, p. 1). The solution to this paradox is provided by RM, whereby the plural pattern can be used in two different ways. Firstly, to create new items, e.g., *wugs*, the plural form can be used generatively and as such it is not listed in the lexicon. Secondly, to express generalisations among lexically listed collocations, e.g., *shake hands*, the suffix can be used relationally. This suggests that these two possibilities are available for all productive rules. Conversely, lexical rules or schemas can only be used relationally unlike productive rules. Here is where the radical change to linguistic theory emerges, referred to as the Relational Hypothesis, under which all rules/schemas can be used relationally, whereas only a subset of them can be used generatively. As such, grammar is "grounded in the relations among lexical items" while generativity is an add-on (Jackendoff & Audring, 2020, p. 4).

Other approaches to the processing of compounding exist in the relevant literature. For instance, Libben and Jarema (2005) and, more recently, Libben et al. (2020) examined the representation and processing of compound words in the mind. Their investigation reveals that the processing of compounds seems to be advantaged when the compounds are part of morphologically productive families and when they are semantically and formally transparent. However, unlike RM, their approach does not provide insights into the presentation and processing of non-productive compounds, and why they are listed in the mental lexicon. In this paper RM is adopted, as it does not only account for the production of semantically transparent compounds, but also identifies productive patterns in lexicalised compounds that are stored in the mental lexicon. This approach is used to identify the conceptual relations that hold between compound elements in Arabic compared to English.

2.2 The Conceptual Relationships Between NN Compound Elements in English

Examining the previous attempts to identify semantic relations between compound elements (e.g., Bell, 2015; Ryder, 1994), Jackendoff (2009) explained that asking participants to provide definitions of novel compounds is not reliable as they do not have linguists' intuition. Under Parallel

Architecture, the main goal is to offer an account of compound meaning which is as rich as that of word meaning. The primary intuition, according to Jackendoff (2009, p. 115) is that the meaning of a compound is a function of the meaning of its elements. Thus, if we have two nouns N_1 and N_2 meaning X_1 and Y_2 respectively, then we need to figure out the function $F(X_1, Y_2)$ that gives us the meaning of the compound $[N_1N_2]$. In other words, in order to establish the semantic structure of an N_1+N_2 compound, two things must be done: (1) identifying a head, in English N_2 based on the Right-Hand Head Rule (RHHR) first suggested by Williams (1981, p. 248)[2]; (2) determining the semantic relation between N_1 and N_2 (Jackendoff, 2009). Based on these assumptions, Jackendoff (2009, pp. 122–125) provided a list of the basic functions for English compounds:

(1) N_1 classifies N_2, e.g., *X-Ray*.[3]

(2) N_2 of/by N_1 (N_1 is an argument of N_2), e.g., *tooth decay*. It is sometimes reversible, i.e., an N_2 that people N_1, e.g., *drinking water* is water that people drink.

(3) Both N_1 and N_2, e.g., *boy king*. These are called dvandva compounds.

(4) N1 and N2 are the same or similar, e.g., *sunflower*.[4]

(5) N1 is a kind of N_2, e.g., *ferryboat*. It can be reversed, e.g., *bear cub*.

(6) N2 that serves as N_1, e.g., *extension cord*, a cord that serves as an extension.

(7) N2 is located in/on/at N_1, e.g., *window seat*. It can be reversed e.g., *ice water* (drinking water with ice cubes in it).

(8) N2 is caused by N_1, e.g., *sunburn*.

(9) N2 takes place at time N_1, e.g., *morning swim*.

(10) N2 is composed of N_1, e.g., *rubber band*. It can be reversed e.g., *foam rubber*.

(11) N2 is part of N_1, e.g., *fingertip*. It can be reversed e.g., *wheelchair*.

(12) N2 is made by N_1, e.g., *footprint*, *horseshit*.

(13) N2 is made from N_1, e.g., *apple juice*.

(14) N2 protects N_1, e.g., *lifeboat*.

(15) N2 protects from N_1, e.g., *sun hat*.

In many cases, N_2 has a proper function as opposed to N_1 which is mostly an argument. The following are functions of N_2:

(16) N_2 is a container, e.g., *coffee cup*.

(17) N_2 is a vehicle, e.g., *baby carriage*.

(18) N_2 is an article of clothing, e.g., *face mask*.

(19) N_2 is an incipient stage of something else, e.g., *rose bud*.

(20) N_2 is an agent of an action, e.g., *bus driver*.

(21) N_2 is an artefact, e.g., *snow shovel*.

The above list was compared to the list compiled for Arabic compounds in order to determine the similarities and/or differences between the conceptual structure of compounds in English and Ar-

[2] Williams (1981, p. 248) states that "in morphology, we define the head of a morphologically complex word to be the right-hand member of that word." For example, the head of *bookshop* is the right element *shop*.

[3] This is the loosest relation. The meaning of N1 only plays a classificatory role.

[4] These are not reversible because the function is symmetric: the sun is similar to the flower, but the flower is not similar to the sun. It moves in one direction, not two.

abic and to confirm Jackendoff's (2009) hypothesis that compounds are generated by a productive system that is entirely semantic.

With regard to Arabic, several studies have been conducted on Arabic compounds, tackling various issues including the headedness of Arabic compounds (Altakhaineh, 2016b), compounds that are not formed on the basis of Synthetic Genitive Construction (SGC) (see the following section), Adjective + Noun compounds in Arabic and the notion of a hidden head (Altakhaineh, 2017a), the metaphorical relationship between the elements of Arabic compounds (Zibin & Altakhaineh, 2018), Verb + Verb compounds and the serial verb construction in Arabic and English (Altakhaineh & Zibin, 2018), and the criteria of compoundhood in Noun + Noun compounds in Arabic (Altakhaineh, 2019). However, no study has been conducted to analyse the semantic or conceptual relations between compound elements in Arabic. Thus, this study aims to bridge this gap by providing answers to the following research questions:

1. What are the semantic/conceptual relations that exist between the two elements of NN compounds in Arabic?
2. Are there any similarities and/or differences between the semantic relations that exist between Arabic NN compounds compared to those identified in English compounds?

The next section provides an overview of compounding in Arabic.

2.3 NN Compounding in Arabic

To provide a description of the structure of Arabic compounds, it is necessary to explain the structure referred to as Construct State (CS) or the Synthetic Genitive Construction (SGC), which is called *Idʿa:fah* in Arabic. This construction usually comprises two nouns or an adjective and a noun in which the left or first element can have a nominative, accusative, or genitive case depending on the function of the entire construct in the target sentence, whilst the right or the second element bears the genitive case regardless of the function of the construct in the sentence. The construction is also characterized by another feature (Fassi Fehri, 2012, p. 156), which is that the left element is always indefinite, while the right element can either be definite or indefinite. Due to the distinction between the analytic genitive construction that accepts possessive markers such as *li* 'of/for' and SGCs which do not, I adopted the term SGC in this study to stress the important distinction between these two constructions giving rise to the distinction between compounds and phrases in Arabic. This is because both constructions look syntactically the same, as in:

(22) *sa:ʕa-tu* *l-walad-i* (phrase)
watch-NOM DEF-boy-GEN
'the boy's watch'

(23) *mudʒaffif-u* *ʃaʕr-i* (compound)
dryer-NOM DEF-hair-GEN
'the hair dryer'

In example (22), it is clear that the relationship between the two elements of the phrase is that of possession, where N_2 possesses N_1, whereas that is not the case in example (23) where N_2 classifies N_1. In this regard, Altakhaineh (2019) explains that the most reliable criteria to make a distinction between phrases and compounds in Arabic and possibly cross-linguistically are adjacency (syntactic) and referentiality (semantics). The former, according to Lieber and Štekauer (2009, pp. 11–12), points to the impenetrable nature of compounds where no element can be inserted between its two components, unlike what is possible within phrases, which accept insertion, and are illustrated as follows:

(24) ʔaqla:m baʕḍ ṯ-ṯulla:b (phrase)
pens some the-students
'the pens of some students'

(25) ʕaṯi:r (*l-ba:rid) l-burtuqa:l (compound)
juice.M (*the-cold.M) the-orange.M
'the cold orange juice'
lit. the juice of the cold orange

Examples (24–25) demonstrate that the elements of phrases in Arabic are separable where *baʕd* 'some' can be inserted between *ʔaqla:m* 'pens' and *ṯṯulla:b* 'the students', whereas this insertion is not possible between the elements of compounds where *lba:rid* 'the cold' cannot be inserted between *ʕasi:r* 'juice' and *lburtuqa:l* 'the orange'. The latter criterion is concerned with reference where a linguistic expression can refer to an entity in the outside world. Specifically, the right element of Arabic compounds is non-referential (see example 23 where *ʃʃaʕri* 'the hair' refers to no specific hair). In contrast, the right element of phrases in Arabic is always referential (see example 22 where *lwaladi* 'the boy' refers to a specific one). We can conclude that regardless of the syntactic similarity between both SGCs, compounds and phrases in Arabic are different in terms of adjacency and referentiality as shown above. With regard to compositionality, compounds in Arabic can either be compositional or non-compositional as in:

(26) *findʒa:n-u l-qahwa-ti* (compositional compound)
cup-NOM DEF-coffee-GEN
'the coffee cup'

(27) *ka:sit l-ʔaṯi:r* (compositional compound)
glass DEF-juice
'the juice glass'

(28) *ra:ʔid-u l-faḏa:ʔ-i* (non-compositional compound)
pioneer-NOM DEF-space-GEN
'the astronaut'
lit. the space pioneer

(29) *ʃaʔir l-bana:t* (non-compositional compound)
hair DEF-girls
'the candy floss'
lit. the girls' hair

Examples (26) and (27) are ones in which the two elements of the compound provide the meaning of the whole compound, whereas in (28) and (29) the meaning of the whole compound may not be extracted from the meaning of the two elements. In addition to compositionality, compounds in Arabic may be lexicalised, such as *ʕaru:s lbaħr lit.* bride of the sea 'mermaid', or novel, such as *ħala ʃʃiʕriyyeh* 'vermicelli sweet'. The latter are usually found in spoken dialects such as Jordanian Arabic (JA) rather than in Modern Standard Arabic (MSA), since the latter has no speech community and is only used in formal settings or as a lingua franca between individuals who speak mutually unintelligible dialects such as Moroccan Arabic and Jordanian Arabic. JA and other spoken dialects are the ones nativized by Arab children and used in daily life.

The majority of compounds in MSA and JA are examples of SGC, yet there are other N + N combinations which are not SGCs. These consist of two indefinite nouns juxtaposed next to each other, such as:

(30) sˤaba:ħa masa:ʔ
morning evening
'all day long'

In example (30), *sˤaba:ħa* 'morning' and *masa:ʔ* 'evening' are nouns, and the syntactic category of the output is hence most probably a noun as well. These combinations function as an adverbial of time. Furthermore, it can be observed that the 1st and 2nd nouns are inseparable, i.e., no element

can be inserted between them *sʕaba:ħa* (**wa*) *masa:ʔ* 'morning (*and) evening'. With regard to referentiality, neither the 1st nor the 2nd constituents are referential. Thus, these combinations can be regarded as compounds (Altakhaineh, 2016c).

3 Methodology

Due to the unavailability of a freely accessible corpus representative of Modern Standard Arabic and Jordanian Arabic, the Arabic compounds analysed in the current study were collected from various sources, which included works on Arabic morphology delineating CSs or SGCs, e.g., Fassi Fehri (2012), among other works on SGCs (e.g. Altakhaineh, 2016a, 2016b, 2016c, 2017a, 2019). Data for this study was also collected from 20 linguistics-major students whose first language is Arabic, social media websites, i.e. Facebook, and some newspapers, such as the Jordanian newspaper *Al Rai*. The compounds were sampled from these sources manually, e.g., all CSs\SGCs, and those compounds that were not CSs\SGCs collected from previous studies on Arabic morphology were manually examined based on the criteria of compoundhood proposed by Altakhaineh (2019). The latter provided a detailed analysis of the criteria that distinguish compounds from phrases cross-linguistically and in Arabic (see the previous section). The informants were asked to produce CSs\SGCs that they use in their everyday interactions (JA compounds) and write down any that they have memorised from MSA, as they do not speak it natively. I explained to them what is meant by CSs\SGCs before they provided the data to ensure their comprehension of the task. Then, the CSs\SGCs provided by the informants were filtered using the criteria proposed by Altakhaineh (2019). Facebook and *Al Rai* newspaper were selected to collect more JA compounds, especially those other than CSs\SGCs from the former and more MSA compounds from the latter. In the former, the posts and comments of JA speakers on pages mostly used by JA speakers, e.g., مطب 'bump', were filtered. In the latter, 50 articles were collected randomly from different sections in the newspaper published between 2021 and 2022 and examples of CSs\SGCs were searched for. Following this, Altakhaineh's criteria of compoundhood were used to exclude phrases and other structures. In total, a corpus of 500 examples of compounds was collected from the mentioned sources. The semantic relationship between the two elements of the collected compounds was analysed taking into account Jackendoff's (2009) analysis of English compounds. Given that the size of the collected corpus is small, the data analysis was conducted manually. All the collected compounds were analysed one by one and then grouped into sets based on the semantic relationship between the two elements. To measure reliability, Cohen Kappa was employed to test inter-rater reliability (see De Raadt et al., 2019). The other rater was an Arab linguist who was asked to rate the categorisation I provided for the semantic relations between compound elements and their degree of lexicalization versus novelty. This means that there were two raters, my fellow Arab linguist and I. The level of agreement between the two raters was 0.92, suggesting that the level of agreement was almost perfect.

4 Results

Following the data analysis process, the results revealed that there are similarities between the semantic relations found between compound elements in Arabic, on the one hand, and those in English as identified by Jackendoff (2009), on the other. Interestingly, because the direction of the head is different in English (right-headed) and in Arabic (left-headed), the semantic relation between N1 and N2 is reversed in the latter. For instance, in English N2 is made from N1, e.g., *apple juice* while in Arabic, N1 is made from N2, e.g., *ʕaṣi:r ttufa:h* 'apple juice' where *ʕaṣi:r* means 'juice' and *ttufa:h* means 'apple. A sample of the Arabic compounds in which the semantic relations between the two elements correspond with those in English are presented below:

(31) N_2 classifies N_1, such as:
◇ ʔadab lʔat̲fa:l 'children literature' (ʔadab 'literature'+ lʔat̲fa:l 'the children')
◇ mu:si:qa: rrokk 'rock music' (mu:si:qa: 'music' + rrokk 'the rock')

(32) N_1 of/by N_2 (N_2 is an argument of N_1), such as:
◇ tas̲abbuɣ ldʒild 'skin pigmentation'(tas̲abbuɣ 'pigmentation'+ ldʒild 'the skin')
◇ bit̲a:qat tahniʔah 'greeting card' (bit̲a:qat 'card' + tahniʔah 'greeting')
◇ zaqzaqat lʕas̲a:fi:r 'birds' chirping' (zaqzaqat 'chirp' + lʕas̲a:fi:r 'the birds')
it is reversible, i.e., an N_1 that people N_2, e.g. ma:ʔ ʃʃurb 'drinking water'

(33) Both N_1 and N_2, such as:
◇ s̲aba:h̲ masa:ʔ 'morning evening' (s̲aba:h̲ 'morning'+ masa:ʔ 'evening')[5]
◇ layl naha:r 'night day' (layl 'night' + naha:r 'day')[6]

(34) N_1 and N_2 are the same or similar, such as:
◇ samakat nnadʒmah 'star fish' (samakat 'fish'+ nnadʒmah 'the star')

(35) N_2 is a kind of N_1, such as:
◇ qa:rib l-kaya:k 'kayak boat' (qa:rib 'boat'+lkaya:k 'the kayak')
◇ dha:n ldʒi:r 'lime paint' (dha:n 'paint'+ldʒi:r 'the lime')

(36) N1 serves as N_2, such as:
◇ silik ttaws̲i:l 'extension cord' (silik 'cord'+ ttaws̲i:l 'the extension')

(37) N_1 is located in/at N_2, such as:
◇ nadʒmat ssama:ʔ 'star in the sky' (najmat 'star'+ ssama:ʔ 'the sky')
◇ kursi lmamarr 'aisle seat' (kursi 'seat'+ lmamarr 'the aisle')
◇ muʕallim lmadrasah 'school teacher' (muʕallim 'teacher'+lmadrasah 'the school')

(38) N_1 is caused by N_2, such as:
◇ lasʔit nnaħlah 'bee sting' (lasʔit 'sting'+ nnaħlah 'the bee')

(39) N_1 takes place at time N_2, such as:
◇ s̲ala:t ðð̲uhur 'noon pray' (s̲ala:t 'pray'+ ðð̲uhur 'the noon')

(40) N_1 is composed of N_2, such as:
◇ kursi lxaʃab 'wooden chair' (kursi 'chair'+ lxaʃab 'the wood')
◇ ħabil lmat̲t̲at 'rubber robe' (ħabil 'robe'+ lmat̲t̲at 'the rubber')

(41) N_1 is a part of N_2, it cannot be reversed, such as:
◇ ɣurfat lfunduq 'hotel room' (ɣurfat 'room'+ lfunduq 'the hotel')
◇ ɣusn ʃʃajarah 'tree branch' (ɣusn 'branch' + ʃʃajarah 'the tree')
◇ ri:ʃ t̲t̲a:ʔir 'bird's feathers' (ri:ʃ 'feathers' + t̲t̲a:ʔir 'the bird')

(42) N_1 is made by N_2, such as:
◇ ʕasal nnah̲il 'bees honey' (ʕasal 'honey' + nnah̲il 'the bees')
◇ xuyu:t̲ lʕankabu:t 'spider webs' (xuyu:t̲ 'webs'+ lʕankabu:t 'the spider')
◇ ʃuʕa:ʕ ʃʃams 'sun's ray' (ʃuʕa:ʕ 'ray' + ʃʃams 'the sun')

(43) N_1 is made from N_2, such as:
◇ rubb l-bando:rah 'tomato paste' (rubb 'paste' + lbando:rah 'the tomato')
◇ zait zzaitu:n 'olive oil' (zait 'oil' + zzaitu:n 'the olive')
◇ sikkat ħadi:d 'railway' (sikkat 'rail'+ ħadi:d 'iron')

(44) N_1 protects N_2, such as:
◇ miðallat ssiyya:rah 'car cover' (miðallat 'cover'+ ssiyya:rah 'car') a cover that protects cars from the sun

[5] This compound means 'all day long'.
[6] This compound means 'twenty-four seven'.

(45) N_1 protects from N_2, such as:
◇ xu:ðit lliħa:m 'welding helmet' (xu:ðit 'helmet' + lliħa:m 'the welding'), a helmet that protects

Based on Jackendoff's (2009) analysis, N_2 in English has a proper function as opposed to N_1, yet in Arabic, N_1 has a proper function as opposed to N_2, since the former is the head. Below are the functions which are similar to Jackendoff's list:

(46) N_1 is a container, such as:
◇ finja:n lqahwa 'coffee cup' (finja:n 'cup' + lqahwa 'the coffee')
◇ ʔibri:q lma:ʔ 'water pitcher' (ʔibri:q 'pitcher' + lma:ʔ 'the water')

(47) N_1 is a vehicle, such as:
◇ ʕaraba:yit tt̲ifil 'baby carriage' (ʕaraba:yit 'carriage'+ tt̲ifil 'the baby')

(48) N_1 is an article of clothing, such as:
◇ ʕga:l rra:s 'head dress' (ʕga:l 'dress'+ rra:s 'the head')

(49) N_1 is an incipient stage of something else, such as:
◇ burʕum lward 'rose bud' (burʕum 'bud'+ lward 'the rose')

(50) N_1 is the agent of an action, such as:
◇ sawwag lba:s̲ 'bus driver' (sawwag 'driver'+ lba:s̲ 'the bus')
◇ qubt̲a:n tt̲a:ʔirah 'pilot' (qubta:n 'captain' + lt̲a:ʔirah 'the plane')

(51) N_1 is an artefact, such as:
◇ maqas lwaraq 'scissors for paper' (maqas 'scissors'+ lwaraq 'the paper')
◇ min∫a:r lxa∫ab 'saw for wood' (min∫a:r 'saw' + lxa∫ab 'the wood')

Analysis of the collected Arabic compounds revealed that these compounds exhibit additional types of conceptual relations which were not discussed by Jackendoff (2009, pp. 122–125). Examples of these relations are presented below:

(52) N_1 is specified by N_2, such as:
◇ madi:nat alquds 'the city of Jerusalem' (madi:nat'city'+alquds 'the Jerusalem')
◇ wazi:r lxa:riji:ah 'the minister of foreign affairs' (wazi:r'minister'+lxa:riji:ah 'the foreign')

(53) N_1 is the sound of N_2, such as:
◇ xari:r lma:ʔ 'murmur of water' (xari:r 'murmur' + lma:ʔ 'the water')
◇ s̲ari:r lqalam 'squeak of pencil' (s̲ari:r 'squeak' + lqalam 'the pencil')
◇ ħafi:f lʔafʕa: 'hiss of the snake' (ħafi:f 'hiss' + lʔafʕa: 'the snake')

5 Discussion

The results presented in Section 4 provide a potential answer to the two research questions concerned with the conceptual relations between compound elements in Arabic and whether there are similarities and/or differences between these relations in English and Arabic. The results demonstrated that all the conceptual relations identified between compound elements in English by Jackendoff (2009) exist in Arabic. In addition, more conceptual relations which exist between the elements of Arabic compounds were also identified. The question that arises here is: is compounding in Arabic a mere list of conceptual relations or does it include a productive rule system? I will present an argument in line with Parallel Architecture (Jackendoff, 2009) before it has been modified into RM (Jackendoff & Audring, 2020), then I will explain how the new approach can resolve the problem of the idiosyncratic nature of compounds.

Before answering the above question, we need to take into account the fact that arguing that there is actually a productive rule system responsible for generating compounds suggests that such a system possibly exhibits regularity without exception in line with Parallel Architecture.

However, this is not the case, which means that a reconciliation must be found between the productivity of compounds and their idiosyncratic nature, especially given the fact that the majority of compounds listed in the lexicon are similar to the productive ones at least from a morphosyntactic viewpoint, i.e., they are SGCs while the rest are compounds (other than SGCs) which also have the same morphosyntactic structure, namely, two indefinite nouns juxtaposed next to each other (cf. Jackendoff, 2009). In line with Parallel Architecture which applies smoothly to VPs (see Section 2.1), a similar approach can be applied to compounding. For instance, *sikkat ħadi:d* 'railway' like *tawjihi Al-Thneibat* 'the secondary school certificate at the time of Al-Thneibat'[7] are arguably listed in the lexicon of Arabic speakers, that is, speakers can connect them to actual physical objects/times. However, if a speaker of Arabic, especially a speaker of JA, encounters the term *tawjihi lqawwas* 'the secondary school certificate at the time of *lqawwas*', which nobody has ever heard before, they would still know what the term is supposed to denote (although there is no such thing).[8] However, from a linguistic perspective, both have similar analyses but are elicited using different routes. Hence, this suggests that arguing for a productive system of Arabic compounding may indicate that speakers should possess a set of rules that make them capable of analysing novel compounds, e.g. *vi:djo ltiktuk* 'TikTok video', *ħaðir ldʒumʕah* 'Friday curfew', *ra:bit̲ daʕim ʕummal lmuya:wamah* 'support of daily paid workers link', *liqa:ħ lkoro:na* 'Coronavirus vaccine', etc. On the other hand, compounds, e.g. *ʕaru:s lbaħr* 'mermaid', *ra:ʔid lfad̲a:ʔ* 'astronaut', *layla naha:r* 'night daytime', and *ʃaʔir lbana:t* 'candy floss' among others are mostly specialized manifestations of such principles (cf. Jackendoff, 2009).

The above analysis does not provide a clear explanation of how regular stored lexicalised compounds that have idiosyncratic interpretations and novel compounds, which are both based on SGCs, can be reconciled under the approach of Parallel Architecture. That is, N + N compounds in Arabic conform to existing syntactic structure rules, i.e., SGCs, thus if regular stored lexicalised compounds with idiosyncratic meanings look like freely generated compounds, why should it be assumed that they are the product of lexical rules? Under RM, it can be argued that there should not be two identical sets of rules, i.e. syntactic for ordinary structures outside the lexicon and lexical rules for the ones listed in the lexicon. In RM, productive and non-productive schemes are in the same format. The lexical rules that capture the relationships in lexicalised compounds can also be used creatively to generate novel compounds, i.e. they are one and the same (Jackendoff & Audring, 2020, p. 39). In its generative role, the productive schema of compounds generates novel ones, but it also functions relationally by motivating the pattern of perfectly regular but stored compounds following SGC which resolves the problem of stored regular NN Arabic compounds formed based on SGCs. Then, the non-productive schemas that are used relationally are not responsible for producing everything about their instances. Thus, this property can be extended to productive schemas when they have a relational role. For example, the compound schema motivates the morpho-syntactic structure of regular stored lexicalised compounds with idiosyncratic meanings, yet it does not predict their meaning. However, it is the same schema, but it is only used in a different role. This resolves the problem of regular lexicalised compounds with idiosyncratic meanings (Jackendoff & Audring, 2020, p. 40).

Drawing on the above discussion, it can be suggested that RM can provide an account of how novel compounds and regular stored lexicalised compounds with idiosyncratic meanings are formed following the same schema. When one comes across novel compounds in Arabic, which takes place all the time, a compound schema needs to function generatively to create new structures. Simultaneously, however, thousands of lexicalised compounds that observe this compound schema but have idiosyncratic interpretations also exist and fall under the above compound schema but

[7] This term was coined in Jordan to refer to the time in which Mohammed Al-Thneibat was the Minister of Education. In his era, the questions of the secondary school examination (tawjihi) were difficult and as a result, the marks were rather low, so a term was coined to denote the level of difficulty found in tawjihi.

[8] lqawwa:s is an Arabic surname.

only relationally rather than generatively (see Jackendoff & Audring, 2020, p. 40). The following is the proposed compound schema for Arabic based on the one proposed for English by Jackendoff and Audring (2020, p. 101), taking into account that the direction of the head in Arabic is left-hand rather than right-hand:

(54) Compound Schema: Semantics: $[\text{F } (\text{X}_x, \text{Y}_y)]_z$
Morpho-syntax: $[_N \text{ N}_x \text{ N}_y]_z$
Phonology: $/\ldots_x \ldots_y/_z$

The semantics in the above schema only captures the fact that the meaning of the compound F is some function of the meanings of the constituent elements. However, if the compound has a non-compositional reading, e.g. *ʕaru:s lbaħr* 'mermaid', then there is no F, so that relational links (links to other lexical items enabling morphological decomposition of the compound) will only appear in phonology and morphosyntax but not in semantics (Jackendoff & Audring, 2020, p. 95). Based on the above, the following are applications of the compounding schema in using illustrative examples of Arabic compounds whose meaning is compositional, lexicalised compound with an idiosyncratic meaning, and finally a novel compound:

(55) Semantics: $[\text{CLASSIFY } (\text{ʔadab}_x, \text{lʔat̲fa:l}_y)]_z$
Morpho-syntax: $[_N \text{ N}_x \text{ N}_y]_z$
Phonology: $/\text{`(ʔadab}_x \text{ lʔat̲fa:l}_y/_z$

In example (55), the semantic function of the constituent elements of the compound is CLASSIFY where N2 (i.e. *lʔatfa:l* 'the children') classifies N1 (i.e. *ʔadab* 'literature'). At the morpho-syntactic level, the syntactic category of the entire compound is N since the head, i.e., *ʔadab* is a noun. Then, at the phonological level, the compound is pronounced with the stress falling on the first element (see Altakhaineh, 2017b). The following is an example of a lexicalised compound with an idiosyncratic meaning:

(56)

	a. ra:ʔid	b. lfad̲a:ʔ	c. ra:ʔid lfad̲a:ʔ
Semantics:	RA:ʔID 'pioneer'$_1$	LFAD̲A:ʔ 'the space'$_2$	[ASTRONAUT]$_3$
Morpho-syntax:	N_1	N_2	$[_N\text{N}_1\text{N}_2]_3$
Phonology:	$/\text{ra:ʔid}/_1$	/lfad ʕa:ʔ/$_2$	$/\text{ra:ʔid}_1$ lfad ʕa:ʔ$_2/_3$

The lexicalised compound in (56) is based on the productive pattern SGC but its meaning is independent of its constituent elements. The coindexing notation used in (56) allows the capture of the disconnection between the linguistic structure and the meaning. The following is an example of a novel compound:

(57) Semantics: [COMPOSE (ħala:$_x$ 'sweet', ʃʃʕi:riyyeh 'vermicelli'$_y$)]$_z$
Morpho-syntax: $[_N \text{ N}_x \text{ N}_y]_z$
Phonology: /ħala:$_x$ 'ʃʃʕi:riyyeh $_y/_z$

In example (57), N_1 *ħala:* 'sweet' is composed of N_2 *ʃʃʕi:riyyeh* 'vermicelli' and the meaning of the compound is derivable from the constituent elements.

6 Conclusion and Recommendations

This paper has analysed the conceptual relations between the elements of NN compounds in Arabic and compared them to those found in English by Jackendoff (2009) based on the framework of Conceptual Semantics and a modified version of Parallel Architecture referred to as Relational Morphology. The analysis revealed that the repertoire of possible semantic relations between the two nouns in Arabic NN compounds reproduces that in English NN compounds as reported by Jackendoff (2009), and that therefore the main difference is in headedness (right-headed in English,

left-headed in Arabic). Adopting RM allows productive and idiosyncratic elements to interweave with each other naturally. Semantically transparent compounds can be stored in memory or produced and understood online, while compounds with different degrees of semantic idiosyncrasy are stored in memory. Furthermore, the predictable parts of idiosyncratic compounds are captured by general schemas. In compounds, such schemas pick out the range of possible semantic relations between the two nouns.

Finally, conducting a cross-linguistic study of the systematic patterns of possible conceptual relationships between compound elements is an area worthy of further exploration. In addition, comparing and contrasting compounding in Arabic and Hebrew, especially as they are both Semitic languages, is another area that needs to be investigated thoroughly. It will help morphologists understand the extent to which Jackendoff's repertoire of semantic relations in compounds is universal. If a language as distant from English as Arabic displays a similar range of cases, this is evidence for a (relatively) universal set of relations from which individual languages may pick and choose.

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