NOUN-NOUN COMPOUNDING IN ESAHIE

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Abstract

Noun-noun (N-N) compounds have been argued to constitute the commonest and most productive category of compounds cross-linguistically (cf. Downing 1977; Bauer 2017; Guevara & Scalise 2009) and this fact is well-established in Kwa languages as well (cf. Akan: Appah (2013), Lɛtɛ: Akrofi Ansah (2012), Ewe: Agbadah (2017), and Dangme: Lawer (2017), Lawer & Appah (2020)). However, the subject remains to be explored as far as Esahie, which also belongs to the Kwa group, is concerned. Based on data collected through documentary fieldworks conducted in Esahie-speaking communities in the Western North Region of Ghana, this paper examines the form and function of N-N compounds in Esahie, from a Construction Morphology (Booij 2010) perspective. Among other things, the study reveals that subordinate compounds are predominantly right-headed, while attributive-appositive compounds are predominantly left-headed, and that the former is the most productive compounding type. Coordinate compounds, on the other hand, tend to be dual-headed. Our findings on Esahie noun-noun compounds corroborate Booij's (1992) observation that there is a strong correlation between recursion and productivity. Furthermore, we show that semantic rather than formal features of compounds constitute the most reliable criterion for determining headedness in Esahie N-N compounds.

Keywords: Esahie, Noun-Noun compounding, headedness, recursion, Construction Morphology

1. Introduction

A compound, according to Bauer's (2001a: 40) is "a lexical unit made up of two or more elements, each of which can function as a lexeme independent of the other(s) in other context, and which shows some phonological and/or grammatical isolation from normal syntactic usage." Though the properties that a linguistic expression requires to be considered as a compound are highly controversial in the literature (cf. Ziering 2018; Nakov 2013; Lieber & Štekauer 2009; Štekauer & Lieber 2005), the present study adopts Bauer's (2001a) definition on grounds of scope and language-specific applicability.

Notwithstanding the vast putative lexeme pairings or permutations that are possible in compounding (such as adjective-noun compounding, verb-noun compounding, noun-verb compounding, verb-verb compounding, etc.), noun-noun (N-N) compounds have been argued to constitute the commonest and most productive category of compounds cross-linguistically (cf.

Downing 1977; Clark et al. 1985; Bauer 1998, 2001, 2008, 2009, 2017; Gagné 2002; Giegerich 2004; Gagné & Spalding 2006, 2010; Guevara & Scalise 2009; Libben et al. 2003). Booij (2018a) illustrates this point with the equivalent of the N-N compound 'blood pressure', which he shows to exist in several Germanic languages. Consider example (1).

(1) a. Afrikaans ***bloed-drukq*** f. Frisian ***bloed-druk***
   b. Danish ***blod-tryk***   g. German ***blut-druck***
   c. Dutch ***bloed-druk***   i. Icelandic ***blóð-þrýstingur***
   d. English ***blood-pressure*** j. Norwegian ***blod-trukk***
   e. Swedish ***blod-tryck***

                    (Booij 2018a: 2)

In Kwa languages too, N-N compounding is acknowledged to be the commonest compounding pattern (cf. Akan (Appah 2013, 2015, 2016, 2019); Lɛtɛ (Akrofi Ansah 2012); Ewe (Agbadah 2017); and Dangme (Lawer 2017; Lawer & Appah 2020)). However, as far as the Esahie language is concerned, the subject remains to be explored, hence, the need for the present work, which investigates the structure of various N-N compounds in Esahie (like subordinate compounds, attributive-appositive compounds, and coordinate compounds), with a view to highlighting their formal and semantic properties such as headedness, internal inflection, argumenthood, productivity, and interpretation. The study also discusses the nature of the semantic relation that obtains between the constituents of the compound and the compound as a whole.

The remainder of the paper is organized as follows: We discuss pertinent concepts in the subject of compounding in section 2: they include headedness, classification of compounds, compositionality, and productivity in N-N compounds. In section 3, we proceed to examine the structural and semantic properties of various kinds of N-N compounds in Esahie, comparing them with other African (as well as Indo-European) languages. Construction Morphology is then introduced as the theoretical framework for the study (in section 4). In this same section, the theory's formalization of Esahie N-N compounds is offered. The paper is concluded in section 5.

2. Some Pertinent Concepts

In this section, we explain a few concepts that are pertinent to the discussion of the subject of compounding. They include headedness (section 2.1), compound classification (section 2.2), and the productivity of N-N compounds (section 2.3).

2.1 Headedness

In most compounds, there are typically two categories of constituents, namely a *head* and a *non-head* (which may be a *modifier* or an argument of the head). The head functions as the lexical core and typically bears the essential semantic information, and determines the syntactic category as well as all morpho-syntactic features like *gender* and *number* (Neef 2009). A useful criterion in determining headedness is the morphological criterion of *locus inflectionis* (locus of inflection),

which has to do with the question of *what controls or determines inflection*. Cross-linguistically, the head tends to be the locus of inflection in compounds (Guevara & Scalise 2009). Consider the examples in (2) where the plural marker [-**s**] as an inflectional operator is attached to signal headhood in various compounds.

(2)   **Singular**   **Plural**
    a.   wall-clock   wall-clock**s**
    b.   legislative instrument   legislative-instrument**s**
    c.   desktop-computer   desktop-computer**s**
    d.   automobile-company   automobile-compan**ies**

Using the *locus inflectionis* parameter, therefore, we can tell that the headword in the compound *desktop-computer* in (2c), for instance, is the right-hand member *computer,* since it is the element that receives inflectional marking.[1]

       Beyond the morphological criterion of *locus inflectionis,* one may also resort either to a syntactic criterion or a semantic criterion, or a combination of all three criteria. A compound's syntactic head is the member element that shares its formal features (i.e., lexical category and subcategorization frame) with the whole compound, so that the whole compound has the same syntactic distribution as its syntactic head (Scalise and Guevara 2006; Appah 2017; Broohm 2019a). A compound's semantic head, on the other hand, is the member element that shares its lexical conceptual information with the whole compound, so that the compound will be a hyponym of the semantic head (Scalise and Guevara 2006). In a compound that semantically-headed, the whole compound is usually a sub-type or subset of the denotatum/denotation or referent of its head. In other words, the semantic head is the element which the whole compound is a hyponym of. For instance, a *wireless mouse*, is a hyponym (or subtype) its semantic head, *mouse*, therefore, the compound *wireless mouse* passes the hyponymy test.

       The constituent to be selected as the head of a compound may vary depending on the criterion used. A compound's syntactic head need not necessarily be the same as its semantic or formal head. This explains why the discussion of headedness in the literature distinguishes at least between a morphological head, syntactic head, and a semantic head; they may not necessarily coincide, although they typically do in endocentric compounds (cf. Bauer 1983; Guevara & Scalise 2009; Katamba 1993; Scalise; Bisetto & Guevara 2005; Scalise & Guevara 2006, Appah 2013; Broohm 2019a/b). In this work, we refer to both the syntactic and morphological heads as the *formal head*, following the traditional nomenclature.

       Headedness has been acknowledged in the literature to bring about a distinction between two kinds of compounds, namely *endocentric* and *exocentric* compounds. In endocentric compounds, the syntactic head tends to also be the semantic head (e.g., a *fireman* is a man). In

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[1] Admittedly, the head is not always the *locus inflectionis* in compound as has been argued (see Guevara and Scalise 2009). The plural form for the compounds *mother in-law* [*mothers-in-law*] and *sore-throat* [sore-throats], for instance, show that at least the (semantic) head is not always the *locus inflectionis*.

exocentric compounds, on the contrary, the syntactic head is different from the semantic head, which is not explicitly expressed (e.g., *white-elephant* is commonly understood as something that cost a lot of money but has no useful purpose, rather than an elephant which is white-colored). Semantically exocentric compounds such as *black-sheep* tend to fail the hyponymy test since the connotation of *black-sheep* 'one whose actions/inactions bring embarrassment or shame to his or her family' is neither a type of *sheep* nor a type of *black*. What seems to straddle the two is the endocentric coordinate compound class, e.g., *driver-mechanic* 'a trained driver who is also a mechanic', where one could argue for two heads or no head at all (cf. Lieber, 2009).

A final issue closely related to headedness is compositionality. A compositional compound is semantically transparent with respect to the meaning of its constituents, whereby each constituent contributes to the intended meaning of a compound. In other words, with compositionality, the sum of the individual meanings of the constituents of the compound determines the meaning of the whole compound. Hence, lexicalized compounds, such as *ivory tower* with idiosyncratic meanings or whose constituents' composition only becomes transparent where there is sufficient etymological or linguistic background, could be considered as being non-compositional or semantically opaque. For example, the English compound *hotdogs* (i.e., sausages) is usually interpreted metaphorically. Thus, it is non-compositional. As we shall see (in section 3), Esahie compounds can be compositional or non-compositional.

2.2 Classification of compounds

Scalise and Bisetto (2009) observe that the distinctiveness of compounds lies in the fact that they are word-forms whose constituent elements are connected by the same grammatical relations that exist between elements of phrases where these relations are not overtly expressed, hence the similarity between the compound *apron string* and the phrase *string of apron*. Therefore, an important criterion in the classification of compounds is the grammatical relation that holds between the constituents of the compounds. In this regard, Scalise and Bisetto (2009) argue for three types of relations: *subordination*, *attribution* and *coordination*. These translate into three macro types – subordinate compounds, attributive compounds, and coordinate compounds.

We present Bisetto and Scalise's (2009) classification in the figure below, with a view to showing that the classes they propose are well attested in Esahie.

Compounds

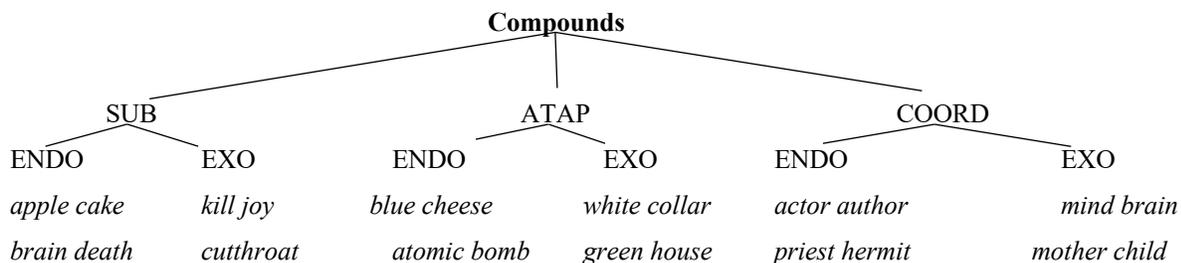| SUB		ATAP		COORD	
ENDO	EXO	ENDO	EXO	ENDO	EXO
apple cake	*kill joy*	*blue cheese*	*white collar*	*actor author*	*mind brain*
brain death	*cutthroat*	*atomic bomb*	*green house*	*priest hermit*	*mother child*

Figure 1: Compound taxonomy by Bisetto and Scalise (2009)

With subordinate (SUB) compounds, the relation between the modifier and head is one of a *complement relation*, as shown in the compounds *alarm clock* (a clock with an alarm system) or *bus-driver* (the driver of a bus), which respectively instantiate two micro categories of SUB compounds, *ground* and *verbal-nexus* compounds. In ground compounds, which correspond to the traditional *root/primary* compounds such as *wind-mill*, *cookbook-author*, *gas price* and *mushroom soup*, "[t]he semantic relation is determined by the semantic-encyclopedic information associated with the component lexemes" (cf. Lieber 2009: 50-52). The verbal-nexus subgroup, alternatively referred to as *synthetic compounds* are characterized by the argument-taking property and presence of a (de)verbal noun as in *truck-driver*, *fresh-baked* or *well-preserved*.

The *attributive* and *appositive* (ATAP) compound class is an amalgamation of two related types of compounds, namely attributive and appositive compounds, both of which generally encode an *attribution relation* of sort, and this relation is signaled differently. Attributive compounds are characterized by a relation where the modifier in the compound describes a property or quality of the head. The modifier in an ATAP compound could be either an adjective as in *blue kiosk, long term*, *heavy weight*, and *barefoot* in which case it plays an attributive role (i.e., *attributive compounds*) or a noun which is used in a metaphorical sense as in *snail mail* 'a slowly delivered mail', in which case it plays an appositive role (i.e., *appositive compounds*). As Scalise and Bisetto (2009: 77) point out, the metaphoricity feature of the non-head constitutes the most reliable and distinctive criterion for distinguishing between [N-N] SUB compounds such as *taxi driver*, wherein there is a complement relation between the two constituents as against ATAP compounds *snail mail*, where *snail* is interpreted metaphorically, being construed as a "representation of the duration of the delivering the mail" whose relevant feature in the compound under observation is *shape*. (Wisniewski 1996 and Scalise, Bisetto & Guevara 2005) Other attributive compounds include adjectival compounds such as *funny peculiar, life-long* and *dog tired* (Lieber, 2009). Since most nominal compounds in English like *key word*, *sister node*, and *satellite nation* have a nominal modifier (i.e., appositive N-N compounds), ATAP compounds have been argued to constitute perhaps the most productive class (Lieber, 2009). Like SUB compounds, ATAP compounds have both endocentric and exocentric subtypes (Lieber, 2009).

The third class of compounds is the coordinate (COORD) class. Here, the relation between the constituents of the compound is considered as one of *conjunction*. The compound *poet painter* refers to an entity which is both a *poet* and a *painter*, and the compound *singer songwriter* refers to an entity which is both a *singer* and a *songwriter*. As Lieber (2009) notes, coordinate endocentric compounds are not common in English. Examples of this class include *spiderman, comedy drama* or *king emperor* for nouns, *blue green* and *deaf mute* for adjectives and *slam dunk* for verbs. A more productive class is coordinate exocentric compounds. As Lieber (2009) argues, in this class, the constituents are kind of co-hyponyms (e.g., humans or grammatical relations). Examples of this class include *doctor patient* (*discussion*), *subject verb* (*agreement*) or *father daughter* (*dance*).

Adopting Bisetto and Scalise's (2009) classification, we discuss various macro-types of Esahie N-N compounds such as subordinate (SUB), attributive-appositive (ATAP) and coordinate

compounds (COORD), as well as the various micro-types such as endocentric and exocentric compounds (section 3). We also resort to the structural input-output [X+Y]$_Y$ classification in our analysis of the data, where in addition to listing the individual members that make-up the compound, the syntactic category of the output is also spelled out.

2.3 Productivity of N-N compounds

As Dal and Namer (2017) note, no new words are created unintentionally or subconsciously, i.e., with little language awareness via an unproductive pattern. Productivity of a word-formation operation concerns the potential to form new words to express a concept with a given pattern or word-formation rule (see Bauer 2001b; Dal and Namer 2017; Plag 1999). Productivity is clearly a scalar concept ranging from fully productive patterns to unproductive ones.

Cross-linguistically, compounding as a word-formation operation has been acknowledged to be extremely productive since new words will often be coined through compounding. The productivity of compounding could be attributed to several factors. Firstly, it is influenced by the fact that the meanings of newly coined compounds, that are scaffolded by the meanings of the words to which their constituents are related, are much easier to understand than monomorphemic neologisms would be (Libben, Gagné and Dressler 2019). Secondly, the productivity of compounding is considerably greater than that of other word formation processes because typically, compounding has fewer restrictions on which elements can participate in the word formation process and which positions in a newly produced word these elements can occupy (cf. Libben 2014).[2] Thirdly, the productivity of compounding is partly influenced by its degree of recursiveness. A linguistic entity is recursive when it has a complex structure that can be decomposed into two or more entities of the same type (Radford et al. 1999: 295). A compound pattern that is recursive is more productive than one that is not.

As noted earlier, N-N compounds constitute the most productive category of compounds cross-linguistically (cf. Downing 1977; Clark et al. 1985; Bauer 1998, (2001, 2008, 2009, 2017); Gagné (2002); Giegerich (2004); Gagné & Spalding (2006, 2010); Guevara & Scalise (2009); and Libben et al. (2003)). More productive word-formation operations produce more new words than less productive ones. This relates to the profitability of an operation in both type and token frequency, whereby, if the [X-*er*]$_N$ nominalization operation, for instance, is deemed productive than the [X-*ist*]$_N$ operation, one should expect to find more tokens of [-*er*]$_N$ derivatives or neologisms than -*ist*$_N$ derivatives.

As we will show (in section 3), N-N compounds in Esahie show varying degrees of productivity; right-headed SUB compounds are more productive than left-headed ATAP, and COORD compounds are relatively less productive.

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[2] As Libben (2014) explains, even for the simplest of compounds (those with two constituents), the statistical opportunities produce staggeringly high levels of potential productivity. The potential productivity for two member compounds is defined as the number of permutations of n elements taken r at a time [i.e., *n!/(n2r)!*]. So, if a language possessed but 1000 monomorphemic nouns, and these could each serve as either compound heads or compound modifiers, those 1000 nouns could generate 1000!/(100022)! ¼ 998,000 distinct noun–noun compounds.

3. Noun-noun compounding in Esahie

As hinted earlier, various types of N-N compounds are attested in Esahie. They include subordinate (SUB) compounds, N-N attributive-appositive (ATAP) compounds, as well as coordinate (COORD) compounds. In what follows, we discuss structural properties of these compounds such as headedness, internal inflection, argumenthood, recursion and productivity. We also discuss the nature of the semantic relation that obtains between the constituents and the compound as a whole, as well as their interpretation. We begin with endocentric right-headed SUB compounds (section 3.1), and proceed to left-headed ATAP compounds (section 3.2) and exocentric ATAP compounds (section 3.3).

3.1 Subordinate (SUB) Compounds

This category of Esahie compounds is regular and typically compositional, and constitute the commonest subtype of N-N compounds. They include forms such as those in (4) and (5).

(4)   a.   ***ngaen-anwa***   b.   ***a-fofi-kyẽã***
            machine-oil   SG-celebration-day
            'petrol'   'holiday'

      c.   ***a-tomvolɛ-braa***   d.   ***a-tomvolɛ-biãã***
            SG-wedding-woman   SG-wedding-man
            'bride'   'groom'

(5)   a.   ***ɛ-wɔfoɛ-sua***   b.   ***nyɔfone-nzue***
            SG-guest-house   breast-milk
            'guest house/hotel'   'breastmilk'

      c.   ***bakaa-baa***   d.   ***a-man-yɔ-fe-kue***
            tree-child   SG-nation-build-fellow-group
            'seed'   'political party'

As shown in (4) and (5), this class of compounds is formed via the concatenation of nominal stems and full forms, which results in nominal compounds; i.e. [N+N]$_N$. A form like ***amanyɔ*** in (5d), for instance, is itself very complex, as it is a noun-verb compound. Given the paucity of inflection in Esahie (cf. Broohm 2017; Broohm and Rabanus 2018), semantic headedness, rather than formal headedness[3], becomes the most reliable criterion for identifying the head in this class, since all the

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[3] Given the isolating morphology of Esahie (cf. Broohm and Melloni 2020; Broohm and Melloni 2021), the pattern it displays typically involves the concatenation of two bare nouns, unlike N-N compounds in German and Dutch (cf. Booij 2010c; 2018b) for example, which are highly inflecting languages, especially in the nominal domain. In such

[N-N] compounds in (4) and (5) are semantically headed, and they are right-headed, much in agreement with the predominantly preferred head position in compounds (cf. Williams 1981a; Dressler 2006). In (5a), for instance, the relation between **ngaen** 'machine' and **anwa** 'oil' is one of subordination since the left-hand member **ngaen** 'machine' is in modification relation with the right-hand member **anwa** 'oil' (the head). The whole compound **ngaen-anwa** is a hyponym of the semantic head **anwa** 'oil'. This means that the compound **ngaen-anwa** 'petrol' is semantically endocentric.

As a typical root compound, the semantic relation in **ngaen-anwa** 'petrol' is determined by the semantic-encyclopedic information associated with the component lexemes. In this particular instance, the relation is one where **anwa** 'oil' is understood to be the (liquid) substance used to power machines.

Right-headed SUB compounds in Esahie tend to be recursive. Consider examples (6) and (7) which are recursive.

(6) a. [[**musue-dwirɛ**] **ke~kã-nɛ-fʋɛ**] 'blasphemer'
         curse-matter   RED~say-NMLZ$_{E/R}$-NMLZ$_{P/P}$
         blasphemy   'one who speaks'

     b. [[**nzɛmba-hã́-nɛ**]   **adwuma**] 'evangelism ministry'
         PL-good.news-say-NMLZ$_{E/R}$ work
         evangelism

     c. [**kɔngoen-sukuu**   [**nikyee-sua-nɛ**]] 'Adult Education'
         night-school   thing-learn-NMLZ$_{E/R}$
                            'learning'

     d. [[**afupɔngɔ-nwiaa**] **ataadeɛ**]] 'horse-hair dress'
         horse-hair   dress

(7) a. [[**a-nan-groma**] **talie**] 'knee-cap'
         SG-leg-joint   cap
         'leg joint'

     b. [**a-bɔdeɛ-nu**   [**nyanza-penalɛ**]] 'science'
         SG-creation-inside wisdom-seek-NMLZ$_{E/R}$
         'creation-related' 'wisdom-seeking'

     c. [[**a-man-yɔ**] **nzɛm**] 'politics (lit. governance matter)'

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inflecting languages, compounds typically contain the so-called *linking elements*[3], i.e., *case* and *number* suffixes, on the non-head member of the compound. See the morpheme [*-e-*] in the German example in (1) below.

(1) **hund-e-futter**
     dog-SG-food
     'dog food.'

	PL-nation-building	matter	
	'nation-building'		
d.	[[***nwãtĩ-hɔ-lɛ***]	***nekaa***]	'refuge (lit. hiding place)'
	run-go-NMLZ$_{E/R}$	place	
	'(act of) running'		

The examples in (6) and (7) also show an interesting dichotomy in N-N compounds in Esahie. We notice that there is both right and left recursion. In (6c), for instance, both elements of the compound are themselves compounds; whereas the head, ***nikyee-suanɛ*** 'education', is a (synthetic) compound, the modifier, ***kɔngoen-sukuu*** 'night-school', is a (root) compound.[4] Furthermore, the modifiers ***musue-dwirɛ*** 'curse word' and ***afupɔngɔ-nwiaa*** 'donkey hair', of the compounds in (6a) & (6d) respectively, are themselves root compounds. In a similar fashion, the modifier ***nzɛmba-hanɛ*** 'evangelism' in (6b), is a synthetic compound. Similarly, the modifier ***anangroma*** 'leg-joint' in (6a) is complex, while in (6b), the head (***nyanza-penalɛ*** 'wisdom-seeking') and modifier (***abɔdeɛnu*** 'creation-related') are both recursive. The modifiers ***amanyɔ*** 'governance' and ***nwãtĩ-hɔ-lɛ*** '(act of) running' in (7c) and (7d), respectively, are also recursive.[5]

   Relatively speaking, however, the Esahie SUB N-N compounds are predominantly left-recursive. This observation is consistent with observations about cross-linguistically preferred patterns of recursion in compounds (cf. Dressler 2006; Krott et al. 2004). Krott et al. (2004: 89), for instance, in their study of German and Dutch, observed that left-branching compounds outnumber their right-branching counterparts. This implies that, in both German and Dutch, left branching recursion is the unmarked structure for the three-element compounds they analyzed. This observation is also true for Akan (cf. Appah 2013).

   In terms of the semantic properties of the SUB N-N compounds discussed here, it appears that they are typically compositional and, in a few instances, lexicalized. This explains why compounds such as ***ngaen-anwa*** 'petrol' (4a), ***ɛwɔfoɛsua*** 'guest house/hotel' (5a), ***afofi-kyẽã*** 'holiday' (4b) and ***atomvolɛ-braa*** 'bride' (4c) are transparent in meaning, reflecting the meanings of the various constituents. The meaning of the compound ***ɛwɔfoɛsua*** 'guest house/hotel', for instance, derives compositionally from the meanings of the relevant constituents, ***ɛwɔfoɛ*** 'guest/visitor' and ***sua*** 'house'.

   There are, however, instances where right-headed SUB N-N compounds may not exhibit full compositional semantics, where their meanings are not always transparently related to those of the constituents. Such cases involve forms such as ***nyɔfone-nzue*** 'breastmilk' which, to some extent, has a lexicalized meaning. The literal meaning of the head element ***nzue*** 'water' is not

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[4] On the distinction between root and synthetic compounds, the latter tend to involve a V(erb) element that exhibits argument-taking properties, while the former does not. See (Ackema and Neelman 2004; Grimshaw 1990; Harley 2009; McIntyre 2015; Roeper and Siegel 1978) for more on this distinction.

[5] This puts Esahie in sharp contrast with languages such as Slovak (Štekauer and Valera 2007) in which recursion is completely banned, as well as some African languages such as Fongbe (Lefebvre & Brousseau 2002: 227) and Ngiti (Lojenga 1994: 162-3), where recursion is extremely restricted.

directly reflected in the meaning of the compound ***nyɔfone-nzue*** [lit. breast-water] 'breastmilk' because it is not literally a kind of ***nzue*** 'water'.[6] The semantic opacity of such compounds is due to the lexicalization phenomena typically occurring within the lexicon.

In terms of semantic opacity, another related sub-class of right-headed compounds are those with one member (usually the head) being what has been termed in the literature as an 'affixoid' (cf. Lieber and Štekauer 2009; Booij & Hüning 2014; and Hüning & Booij 2014). In the process of compound formation, some forms acquire specific meanings that are more abstract than the meaning of the corresponding word when used on its own in a sentence (Booij 2018a&b). In the literature, such forms have been technically called *affixoids*. Affixoids are words with more abstract meanings (usually of intensification) when embedded in compounds. Characterized by this tendency, their presence in the compound affects compositionality, especially so since in the case of Esahie, such forms are heads as could be observed in the examples in (8).

	Output	**Input**	
(8)	a. ***atu-yile*** 'gun powder'	***atu***	***eyile***
		'gun'	'medicine'
	b. ***sona-bakaa*** '(human) body'	***sona***	***bakaa***
		'human'	'tree'
	c. ***anyea-kyiremvua*** 'eyeball (lit. eye's egg)'	***anyea***	***kyiremvua***
		'eye'	'egg'
	d. ***agyee-namonɛ***[7] 'gum'	***agyee***	***nain-monɛ***
		tooth	meat-fresh
			'fresh meat'

The compounds in (8) have meanings that are non-compositional because they are somewhat metaphorical or metonymical given that the most important semantic member of the compound, the head element, is an affixoid. The meaning of ***eyile*** 'medicine' in (8a) is abstract since it is not specific (or immediately identifiable) in the meaning of the entire compound ***atu-yile*** 'gun powder'; i.e., ***eyile*** 'medicine' acquires a special meaning, different from its original meaning in the language. This explains why there is nothing 'medicinal' about the meaning of the compound ***atu-yile*** 'gun powder'. In (8b) too, the head element ***bakaa*** 'tree' acquires an abstract meaning. So, although the human body has the shape and form of tree to an extent, strictly speaking, it is not a type of tree, hence, *tree* evokes a metaphorical reading. This implies, therefore, that the compound ***sona-bakaa*** 'body', fails the hyponymy test, although there seems to exist a sort of subordination relation between the elements of the compound at an abstract level. The heads of the compounds in (8c) and (8d), ***kyiremvua*** 'egg' and ***namonɛ*** 'fresh meat' respectively also acquire restricted meanings than what they usually bear. Apart from the shape the egg, all other features of an egg are lost in the meaning of the compound ***anyea-kyiremvua*** 'eyeball'. This

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[6] Breastmilk is probably conceptualized as water because of its liquid form.
[7] The compound is right-recursive since the head constituent ***namonɛ*** 'fresh meat' is itself a compound.

explains why ***anyea-kyiremvua*** 'eyeball' is not a type of ***kyiremvua*** 'egg'. Same can be said for ***namonɛ*** 'fresh meat', the head of the compound in (8d).

3.2 Attributive-Appositive (ATAP) Compounds

So far, we have shown that SUB N-N compounds in Esahie are typically right-headed, fairly recursive (and consequently productive), and exhibit compositional semantics. There is, however, a category of compounds that is made up of left-headed Attributive-Appositive (ATAP) compounds in Esahie. The compounds in this category, constitute a small subtype of N-N compounds in the language, are irregular and typically lexicalized in meaning. There are two sub-groups in this class, those made up of two nouns (N-N) and those made up of a noun and a numeral (N-Num) (as we shall see later in example (10) below). In both cases, however, there appears to be an apposition-attribution relation between their constituents. They include forms such as those in (9) and (10).

(9)   a.   ***ngaen-kɔmea***   b.   ***maen-daen***
            machine-magician   nation-parent
            'computer (lit. magic machine)'   'region (of a country)'
   c.   ***temuafoɛ-paen***   d.   ***nyɔbo-taen***
            judge-leader   stone-parent
            'Chief Justice'   'rock'

When we apply the *locus inflectionis* test, we are able to confirm that the left-hand members of the compounds in (9) are indeed the (formal) heads of the compounds. Consider the pluralized equivalents of the compounds in (10).

(10)   a.   ***n-ngaen-kɔmea***   b.   ***a-maen-daen***
            PL-machine-magician   PL-nation-parent
            'computer (lit. magic machine)'   'region (of a country)'
   c.   ***a-temuafoɛ-paen***   d.   ***n-nyɔbo-taen***
            PL-judge-leader   PL-stone-parent
            'Chief Justice'   'rock'

Semantic headedness also proves useful since the compounds pass the hyponym test, given that (9a), for instance, is semantically headed by ***ngaen*** 'machine', while that of (9b) is headed by ***maen*** 'nation'. For these compounds, semantic headedness coincides with formal headedness.

      In contrast with the predominantly preferred (right) head position in compounds (cf. Williams 1981; Dressler 2006), the Esahie compounds in (9), like most Bemba and Italian N-N compounds (cf. Scalise 1994; Scalise & Fábregas 2010; Basciano et al. 2011), are left-headed. In

(9a), for instance, the relation between the constituents ***ngaen*** 'machine' and ***kɔmea*** 'magician' is one of apposition, since the right-hand member ***kɔmea*** 'magician' attributively modifies the left-hand member ***ngaen*** 'machine'.[8] The whole compound ***ngaen-kɔmea*** 'computer' is a hyponym of the semantic head ***ngaen*** 'machine'. This means that the compound ***ngaen-kɔmea*** 'computer' is semantically endocentric. In (9b), also, the relation between ***maen*** 'nation' and ***taen*** 'parent' is one of apposition, since the right-hand member (i.e., the modifier), ***daen*** 'parent', modifies the left-hand member, ***maen*** 'machine' (i.e., the head). The whole compound ***maen-daen*** 'region (of a country)' is a hyponym of the semantic head ***maen*** 'nation'.

The degree of compositionality exhibited by these compounds is not as strong as the right-headed ones in section (4.1), since their meanings are to some extent lexicalized, an interpretational feature which they share with Bemba (Bantu) compounds.[9]

In Scalise and Bisetto (2009)'s classification, such compounds are appositive compounds given that the modifiers in these compounds are typically interpreted metaphorically. This explains the fact that the meaning of that the modifier ***kɔmea*** 'magician' in (9a) adds to the meaning of the compound is metaphorical rather than literal. A similar argument could be made for the modifier ***taen*** 'parent' in (9b), which also encodes a metaphorical meaning in the interpretation of the compounds.

As explained earlier, the second sub-group of left-headed N-N compounds have numeral right-hand constituents. Accordingly, they may be characterized as Noun-Numeral (N-Num) compounds. It is instructive to note that the categorial labelling of numerals remains a highly debated issue (cf. Corbett 1978; Hurford 1987; Corver & Zwarts 2006; von Mengden 2010; Verhoeven & Huyssteen 2013). With a broad conceptualization of nouns as names of things, places, persons, etc., we treat numerals as a class of nouns that name NUMBERs following (cf. Brainerd 1966; Brandt Corstius 1968; Appah 2013).

As noted earlier, these compound forms are lexicalized and, as a result, are not fully compositional. Let us examine the forms in (11), which constitute a special class since they are clearly exocentric. The compound form in (11a) is of the Bahuvrihi type (possessive compounds; *see* Andreou and Ralli 2015; Ralli and Andreou 2012; and Bauer 2010, Appah 2017a) with the meaning 'a (deformed) baby with six fingers.' Similarly, the referent of the compound form in (11b) *ahen-gan* 'first born after the crowning of a King' is not necessarily a King.

(11)   a.   ***n-za-nzia***   b.   ***ahen-gan***
                 PL-hand-six   king-first
        'a (deformed) baby with six fingers'   'first born after the crowning of a King'

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[8] It instructive to note that attributive modification in Esahie takes the form of post-modification where the modifier follows the head in noun phrases. However, in right-headed N-N compounds, the canonical order of modification is reversed so that we have an instance of pre-modification rather than post-modification, since the head of the compound is the right-hand member.

[9] This interpretational feature puts them in sharp contrast with Italian compounds, which, though left-headed, have interpretations that are constrained along compositional lines (Delfitto and Melloni 2009; Basciano et al. 2011; Radimský 2013).

Like their left-headed equivalents in Italian (cf. Basciano et al. 2011) and Akan (cf. Appah 2013), they are hardly recursive. The fact of their non-recursivity, coupled with their non-compositionality, ultimately affects the productivity of this subtype of left-headed N-N compounds.

Another class of ATAP compounds established in Esahie are those that are exocentric, wherein the compound as a whole is not a hyponym of its head. Examples are given in (12) below.

(12)   a   **ŋgondĩĩ-nzaa**   b.   **abilie-wura**
           fight-alcohol   dance-owner
           'one who incites people to fight'   'mantodea (a type of wasp)'

      c.   **akondaa-dadeɛ**   d.   **angolɛ-wura**
           in-law cutlass   play-owner
           'money given to prospective in-laws'   'praying mantis'

The N-N compounds in (12) fail the hyponymy test. For instance, the constituents of **ŋgondĩĩ nzaa** in (12a) are **ŋgondĩĩ** 'fight' and **nzaa** 'alcohol' but the idiomatic meaning of the compound is 'one who incite people to fight' which is neither a type *fight* nor a type of *alcohol*. Indeed, one may argue that the causer-relation is the basis of the idiomatic meaning of the compound. Similarly, the literal meaning of the constituents **akondaa** and **dadeɛ** respectively are 'in-law' and 'cutlass,' but the compound refers to the monetary token given to the brothers of the bride rather than the cutlass given to prospective in-laws[10] of the groom.[11] Thus, the compounds are semantically exocentric.

The compounds in (12c-d) share a common right-hand member, **wura**, which literally means 'owner/lord'. However, having the characterization of an affixoid, **wura** no longer bears its literal meaning, since its use in the compound restricts its original meaning. Consequently, the affixoid status of the right-hand constituent affects the compositionality of the compounds and contributes to their exocentricity. This accounts for the idiomatic meanings of the compounds **angolɛ-wura** 'praying mantis' and *abilie-wura* 'a type of wasp' (lit. king of dancing), so that the referents of the compound **angolɛ-wura** 'praying mantis' is not necessarily an 'owner/king of play', neither is the referent of **abilie-wura** an 'owner/king of dance' in (12c-d), respectively. An important mechanism that underpins the interpretation of such compounds is metonymy where, like their Akan counterparts (cf. Appah 2017a), something is referred to by a word which describes a quality or feature of that thing. The compound **angolɛ-wura** 'praying mantis', for example, has

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[10] The opacity in the meaning of the compound is probably a diachronic semantic bleaching or extension that has occurred in the lexicon. A reviewer has hinted that traditionally, the money was meant for the brother in-law to get a cutlass to guard the betrothed woman. I am grateful to a reviewer for pointing this out.

to be interpreted metonymically since it is the 'folded foreleg characteristic property' of the insect *praying mantis*, the referent, that is used to represent the whole entity.

3.3 Coordinate Compounds

The last category of endocentric compounds we deal with in this section is the coordinate [N-N]$_N$ compound class. These compounds are dual-headed both semantically and syntactically. Semantically, the compound is a hyponym of both constituents. Syntactically, both constituents are nouns so it is difficult to attribute the syntactic category of the compound to a particular constituent. As Appah (2013) notes, sometimes, whether an N-N compound is analyzed as coordinate or otherwise is a matter of construal and perspectivization, depending on whether the relation between the constituents is seen to be symmetrical or asymmetrical. However, in a recent work, Arcodia (2018) proposes that, depending on the language, the criterion of *reversal of constituent order* may be applied as a test for their equipollent status. Arcodia (2018) further notes that, unless lexicalized, prototypical endocentric coordinating compounds tend to tolerate inversion of the constituents. This criterion proves useful in ascertaining the coordinate status of the N-N compounds in (13) given that the order of constituents in these compounds is amenable to manipulation. Let us examine (13).

(13) a. ***emumu**   **asotiriwaa-niɛ***
          dumb   ear-block-NMLZ.SG
                        'deaf and dumb person'

    b. ***kɔmeɛ**   **dunze-niɛ***
          fetish.priest   herb-NMLZ.SG
                        'Herbalist-fetish priest'

To confirm further the equipollent status of both constituents of the compound, we resort to the *locus inflectionis* parameter by testing plural (number) marking in the compound. In the pluralized versions of the compound in (14), we observe that both constituents of the compound are independently inflected when pluralized, suggesting that they are of equal status. The compounds could therefore be said to be dual-headed.

(14) a. ***emumu-fuɛ**   **asotiriwaa-fuɛ***
          dumb-NMLZ.PL   ear-block-NMLZ.PL
          'deaf and dumb persons'

    b. ***n-gɔmeɛ-dunze-fuɛ***
          PL-fetish.priest-herb-NMLZ.PL
          'Herbalist-fetish priests'

4. Construction Morphology

Construction Morphology (CM) is a product-oriented theory of morphology that evolved out of Construction Grammar (Michaelis & Lambrecht 1996; Goldberg 1995, 2006). CM aims at accounting for the shared and unshared properties of both word-level and phrase-level constructs (Booij 2010). There are three cardinal tenets of CM: a theory of the notion of *construction*, a theory of *word structure* and a theory of the *lexicon*. The notion of *construction* refers to a form and meaning pairing that is formed by means of a schema. Hence, in CM, both words and phrases are constructions, the latter being phrase-level form-meaning pairs, and the former being word-level form-meaning pairs. Morphological constructions are the products of schemas that abstract over sets of existing complex words, rather than of word formation rules. Schemas generalize over sets of existing complex words and simultaneously serve as a template for forming other words of similar formal complexity (Booij 2010). This is exemplified by the schema in (15) which generalizes over all right-headed compounds.

(15) $< [[a]_{Xi} [b]_{Yj}]_{Yk} \leftrightarrow [SEM_j \text{ with relation R to } SEM_i]_k >$ (Appah 2015: 363)

The upper-case variables X and Y stand for the major lexical categories (N, V & A). The lower-case variable *a* and *b* stand for arbitrary strings of sound segments, whilst *i*, *j* and *k* are indexes for the matching properties of the compound and its constituents.

With respect to the theory of the lexicon, the understanding in CM is that morphological constructions exist in the lexicon together with the schemas that they instantiate. In other words, schemas and their instantiating constructions co-exist in the lexicon. The lexicon in CM is conceptualized as a hierarchically stratified repository where two types of relations obtain; i.e., the relation which obtains between a schema and a construction that is formed by the schema, called an "*instantiation* relation" and the relation which exist between a construction and its constituents (sub-parts), known as the "*part of* relation". These relations are illustrated in (16), where a lower-level constructional schema is an instantiation of a higher level one, and the individual constituents, **ngaen** 'machine' and **anwa** 'oil' are 'part of' the compound **ngaen-anwa** [machine-oil] 'petrol'.

(16) $\langle[[a]_{Xi} [b]_{Y j}]_{Nk}$ $\leftrightarrow [SEM_j \text{ with relation R to } SEM_i]_k\rangle$

               $\langle[[N]_i [N]_j]_{Nk}$ $\leftrightarrow [SEM_j \text{ is substance/ingredient used in } SEM_i]_k\rangle$

               $[[ngaen]N_i [anwa]_{Nj}]_{Nk}$ 'petrol (oil used in automobiles)'

      ngaen 'automobile/machine'   **anwa** 'oil'

—

(Broohm 2019a/b: 289)

The hierarchical representation in (16) explains how instantiation works: the higher the schema, the more abstract it is, and vice versa. It is understood that constructions which share common features or constituents are also connected in the lexicon. For example, ***ngaen-anwa*** is linked with other schemas that contain either ***ngaen*** such as ***ngaen kɔmea*** 'computer', or the constituent *anwa* such as ***kube anwa*** 'coconut oil' (cf. Broohm 2019a.). The hierarchical ordering of schemas also indicates the possibility of default inheritance which allows us to account for sub-regularities within the morphological system (cf. Appah 2015; Appah & Broohm 2023). Here, we assume that the syntactic category of the compound is from the head.

The theory of word structure in CM is premised on the fact that CM is abstractionist and word-based in orientation. As such, the assumption is that the word is the minimal linguistic sign (i.e., a form-meaning pair). There are (at least) two dimensions to the structure of the word, namely the phonological form of the word and its morpho-syntactic properties. This means that a word is associated with three types of information – PHON(ological), SYN(tactic) and SEM(antic). In computing the properties of a construction, the grammar of the construction must accurately capture the systematic relations between these three components (Booij 2007; 2010c).

It is possible for a construction to bear properties that do not emanate from the properties of the constituents. An example is the (exocentric) compound *red herring* 'a piece of information intended to mislead or distract', whose meaning (semantic property) has nothing to do with neither the adjective *red* nor the noun *herring* (a type of fish). Such properties are termed *holistic* or *extra-compositional* properties of constructions (Booij 2010; 2012; Appah 2015; 2017).

4. 1 A CM formalism of N-N compounds in Esahie

In this section, we provide constructionist formalization of N-N compounding in Esahie, as discussed earlier. We begin with endocentric compounds (section 4.1) and then proceed to formalize exocentric compounds (section 4.2).

4.1.1 Endocentric compounds in Esahie

For the endocentric category, we examine compound types including right-headed SUB N-N compounds (in section 4.1.1), left-headed ATAP N-N compounds (in section 4.1.2), left headed N-A (ATAP) compounds (in section 4.1.3), as well as dual-headed COORD N-N compounds (section 4.1.4).

4.1.1.1 Right headed N-N Subordinate Compounds

Right-headed compounds in general can be captured by the schema in (17), where the compound is shown to be a subtype of the right-hand constituent with some relation R to the left-hand constituent.

(17)   a.   *ɛwɔfʋɛ-sua*   ⟨[[N]*ᵢ* [N]*ⱼ*]ₙₖ ↔ [SEM*ⱼ for* SEM*ᵢ*]ₖ⟩
            guest   house
            'guest house/hotel'

       b.   *nyɔfone-nzue*   ⟨[[N]*ᵢ* [N]*ⱼ*]ₙₖ ↔ [SEM*ⱼ produced by* SEM*ᵢ*]ₖ⟩
            breast water
            'breastmilk'

       c.   *bakaa-baa*   ⟨[[N]*ᵢ* [N]*ⱼ*]ₙₖ ↔ [SEM*ⱼ is produced by* SEM*ᵢ*]ₖ⟩
            tree child
            'seed'

       d.   *amanyɔ fekue*   ⟨[[N]*ᵢ* [N]*ⱼ*]ₙₖ ↔ [SEM*ⱼ meant for* SEM*ᵢ*]ₖ⟩
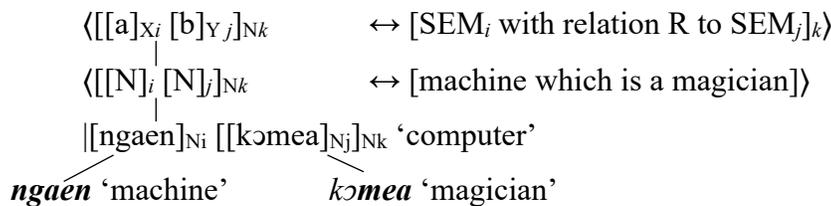   politics group
            'political party'

In interpretating the compound ***ngaen-anwa*** 'petrol', the meaning of the right-hand constituent ***anwa*** 'oil' is linked to the meaning of the left-hand member ***ngaen*** 'machine (automobile) because oil is a substance used in automobiles. In keeping with the understanding that the actual interpretation of each compound depends on the meaning of the constituents and the encyclopedic knowledge one applies to the interpretation process, the relation **R** has to be spelled out separately for each instantiating compound. For each of the SUB N-N compounds below, the semantic relation between the constituents has to be specified to suit the relevant nuances of the compound. Therefore, although the meta-schema can abstract over all the compounds in (17), their actual realization is spelled out separately for each case.

Our discussion has shown that right-headed N-N compounds in Esahie come in various forms, and that in order to accurately capture the meaning of a compound, the semantic relation that holds between the constituents ought to be spelled out in finer details.

4.1.1.2 Left headed N-N ATAP Compounds
Left-headed compounds in general can be captured by the schema below, where the compound is a subtype of the left-hand constituent with some relation R to the right-hand constituent.

(18)   *Schema for left headed N-N ATAP Compounds*

⟨[[a]ₓ*ᵢ* [b]ᵧ *ⱼ*]ₙₖ   ↔ [SEM*ᵢ* with relation R to SEM*ⱼ*]ₖ⟩
⟨[[N]*ᵢ* [N]*ⱼ*]ₙₖ   ↔ [machine which is a magician]⟩
|[ngaen]ₙᵢ [[kɔmea]ₙⱼ]ₙₖ 'computer'
ngaen 'machine'   ***kɔmea*** 'magician'

In the interpretation of the compound **n̄gaen-kɔmea** 'computer' the meaning of the left-hand constituent **ngaen** 'machine' is connected to the meaning of the right-hand member *kɔmea* 'magician'. Here, unlike the SUB N-N compounds previously discussed, the interpretation of each compound needs not be specified because the compound in (18), for instance, involves a 'classic' appositional relation, and more so since in CM each construction is seen as a particular pairing of form and meaning, which may share relations with other similar constructions.

(19) **nyɔboɛ-taen**   ⟨[[N]$_i$ [N]$_j$]$_{Nk}$ ↔ [stone which is a parent]⟩
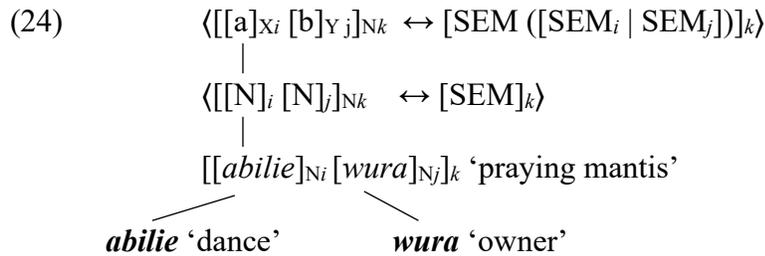   stone-parent
      'rock'

4.1.1.3 Coordinate N-N compounds

The internal structure, the semantic relation between the constituents, and the syntactic category of such compounds can be captured by the schema below in (20), where the meaning of the whole compound captures the individual meanings of both constituents, hence the semantic component contains the indexes of both constituents.
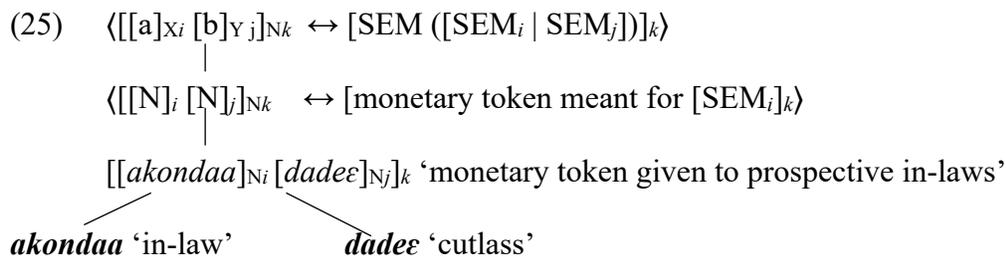
(20) ⟨[[a]$_i$ [b]$_j$]$_{Nk}$ ↔ [SEM$_{ij}$]$_k$⟩   Appah (2013: 302)

Having been formed, this schema becomes the template for forming other coordinate N-N compounds as those in (21) (see Arcodia (2011; 2018); Appah (2015) for more on the CM treatment of coordinate compounds).

(21) a.   ⟨[[a]$_i$ [b]$_j$]$_{Nk}$ ↔ [SEM$_{ij}$]$_k$⟩
              |
              [[N]$_i$ [N]$_k$]$_{Nk}$ ↔ [an ENTITY which is both SEM$_i$ and SEM$_j$]$_k$
              |
              [[emumu]$_{Ni}$ [asotiriwaaniɛ]$_{Nj}$]$_{Nk}$ ↔ 'deaf and dumb person'

      emumu 'dumb person'   **asotiriwaaniɛ** 'deaf person'

      b.   ⟨[[a]$_i$ [b]$_j$]$_{Nk}$ ↔ [SEM$_{ij}$]$_k$⟩
              |
              [[N]$_i$ [N]$_j$]$_k$ ↔ [an ENTITY which is both SEM$_i$ and SEM$_j$]$_k$
              |
              [[kɔmeɛ]$_i$ [dunzeniɛ]$_j$]$_k$ ↔ 'fetish priest-herbalist'

      kɔmeɛ 'fetish priest'   **dunzeniɛ** 'herbalist'

4.2 Exocentric compounds in Esahie

In this section, we deal with (ATAP) [N-N]$_N$ compounds forms which are exocentric compounds at a semantic level, or at both syntactic and semantic levels. Regarding the treatment of exocentric compounds in CM, Appah (2013: 237) posits that, if the meaning of an 'exocentric compound is in a way relatable to the meaning of either constituent or to their combined meaning, but the meanings of the constituents do not exhaust the meaning of the compound, the extra-compositional meaning may be represented as a semantic operator (i.e., the unindexed **SEM**) over the meaning of the compound, or the meaning of the relevant constituent'. This is captured by the disjunction (|) in the schema (22).

(22) $\langle[[a]_{Xi}\,[b]_{Yj}]_{Nk} \leftrightarrow [\textbf{SEM}\,([SEM_i \mid SEM_j])]_k\rangle$ **(**Appah 2017: 154)

We proceed to discuss the various classes of exocentric compounds instantiating the meta-schema above.

4.2.1 ATAP [N-N]$_N$

ATAP [N-N]$_N$ compounds are semantically exocentric. In this class, we find cases where the compound has a meaning that is completely unrelated to the meanings of the constituents. An example of this is **kwasea-adanvo** 'tsetsefly' (**kwasea** 'fool', **adanvo** 'friend') for which there is no conceivable link between the (idiomatic) meaning of the compound and the meanings of the individual constituents, so that, there is no way to tell that the two constituents combined will/can refer to a particular insect. As such, its meaning has to be learned and stored in the lexicon of the Esahie speaker. Another example of this is **abilie-wura** 'praying mantis' (**abilie** 'dance', **wura** 'owner') for which there is also no compositional connection between the idiomatic meaning of the compound and the meanings of the individual constituents, and there is no way to tell that the two constituents combined will/can refer to a particular insect. Here, a typical property of dancing, is extended metonymically to refer to the entity that has the habit of dancing. This class of compounds may be represented in (23) and (24), where the parenthesized part of the semantic pole is not part of the meaning of the compound because the meaning of the compound is not related to the meanings of the constituents at all (cf. Appah (2017a)).

(23) $\langle[[a]_{Xi}\,[b]_{Yj}]_{Nk} \leftrightarrow [SEM\,([SEM_i \mid SEM_j])]_k\rangle$

$\langle[[N]_i\,[N]_j]_{Nk} \leftrightarrow [SEM]_k\rangle$

$[[kwasea]_{Ni}\,[adanvo]_{Nj}]_k$ 'tsetsefly'

$kwasea$ 'fool' $adanvo$ 'friend'

–

(24) $\langle[[a]_{Xi} [b]_{Yj}]_{Nk} \leftrightarrow [SEM ([SEM_i | SEM_j])]_k\rangle$

$\quad$ |

$\quad \langle[[N]_i [N]_j]_{Nk} \leftrightarrow [SEM]_k\rangle$

$\quad$ |

$\quad [[abilie]_{Ni} [wura]_{Nj}]_k$ 'praying mantis'

$\quad\quad$ *abilie* 'dance' $\quad\quad\quad$ *wura* 'owner'

There are also some exocentric N-N compounds for which one may be able to link the meaning of the whole to the meaning of one or both of the constituents, but the compound still violates the hyponymy test. For example, the constituents of *akondaa-dadeɛ* (lit. the in-law's cutlass) are *akondaa* 'in-law' and *dadeɛ* 'cutlass,' but the idiomatic meaning of the compound which is 'monetary token given to prospective in-laws', is neither a type of in-law nor a type of cutlass. Nevertheless, the meaning of the left-hand constituent *akondaa* 'in-law' is still somewhat preserved in the idiomatic meaning of the compound, so that the metaphoric meaning of the compound *akondaa-dadeɛ* still has something to do with 'in-laws'. Since the 'monetary token' meaning component is not directly encoded in either constituent of the compound *akondaa-dadeɛ*, it has to be treated as a constructional property, and this meaning will be represented as an operator over the meaning of the constituent *akondaa* which is somewhat preserved in the meaning of the compound, as exemplified in (25).

(25) $\langle[[a]_{Xi} [b]_{Yj}]_{Nk} \leftrightarrow [SEM ([SEM_i | SEM_j])]_k\rangle$

$\quad$ |

$\langle[[N]_i [N]_j]_{Nk} \leftrightarrow [\text{monetary token meant for } [SEM_i]_k\rangle$

$\quad$ |

$[[akondaa]_{Ni} [dadeɛ]_{Nj}]_k$ 'monetary token given to prospective in-laws'

akondaa 'in-law' $\quad\quad\quad$ *dadeɛ* 'cutlass'

5. Summary and Conclusion

Our analysis of N-N compounds in Esahie has revealed interesting parallels with other languages as well as peculiarities in terms of structural and semantic properties. We have shown that compounds with internally inflected elements tend to be formally endocentric. As we have demonstrated, there are also instances where it is difficult to figure out the particular element from which the nominal property of a compound percolates, given the isolating typology of Esahie. Below in Table 1, we summarize some of the crucial formal and semantic properties of Esahie N-N compounds such as headedness, recursion, argumenthood, interpretation, and productivity.

Table 1: **Summary of formal properties of Esahie N-N compounds**

		SUB N-N	ATAP N-N 1	ATAP N-N 2	COORD N-N
		a-saa-m-maa PL-hand- PL-child 'fingers'	*ngaen-kɔmea* machine-magician 'computer'	*kwasea-adanvo* fool-friend 'tsetse fly'	*emumu-aso-tiriwaa-niɛ* dumb-ear-block-NMLZ$_{E/R}$ 'dumb and deaf person'
HEAD	**Formal**	Endocentric	Endocentric	Exocentric	Endocentric (right-headed)
	Semantic	Endocentric	Endocentric (but with an exocentric subgroup as in *nza-nzia* 'baby with six fingers')	Exocentric	Endocentric
	Position	Right	Left	-	Dual
INTERNAL INFLECTION		Yes	No affixes	Yes	No affixes
RECURSION		Yes	No	No	No
PRODUCTIVITY		Yes	No	No	No
INTREPRETATION		Compositional	Lexicalized	Lexicalized	Compositional

Apart from ATAP N-N 2 compounds, all other compounds pass the hyponymy test since they are semantically endocentric. Thus, semantic headedness provides the most reliable criterion for determining headedness in Esahie. In cases where a semantic head can be clearly established, we can argue further that the semantic head is also the formal head, since typologically, it is very rare that the two do not coincide. Moreover, since the canonical head position in Esahie is the right, the formal head is the rightmost in these cases. Overall, subordinate compounds are consistently right-headed, while ATAP compounds are consistently left-headed.

Finally, we have shown that the Esahie data also point to a strong correlation between recursion and productivity. This confirms Booij's (1992) observation that recursion enhances productivity in N-N compounds. Overall, right-headed subordinate N-N compounds are the most productive in Esahie.

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