COMPOSITIONAL ARGUMENT SELECTION IN N+V QUALIA PAIRS WITHIN THE DISCOURSE OF COOKING: A CORPUS-BASED STUDY

SELECCIÓN ARGUMENTAL COMPOSICIONAL EN PARES DE QUALIA N+V EN EL DISCURSO DE LA COCINA: UN ESTUDIO BASADO EN CORPUS

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Abstract

This paper aims to analyse the compositional argument selection process represented by different syntactic alternations within the specialised domain of cooking, thus contributing to the characterisation of this specialised discourse. The syntactic alternations studied include canonical actives, passives, causative/ inchoative alternations, middles and Instrument-subject alternations. These constructions allow the incorporation of cooking verbs (Levin 1993) and denote divergent argument structure realisations. As indicated here through compositional analysis, the constructions contain distinctive N+V qualia pairs. As in Pustejovsky (1991, 1995), this paper follows a lexico-semantic approach and applies a corpus-based methodology to examine and compare over 8,300 contextualised examples from two corpora (a specialised corpus on cooking and a general corpus) using the Sketch Engine corpus tool. The results show that the syntactic alternations examined follow related but distinctive underlying patterns in semantic composition, and thus are construed with N+V qualia pairs that characterise the specialised discourse of cooking.

Keywords: argument selection, compositional analysis, syntactic alternations, discourse of cooking, qualia pairs.

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Resumen

El objetivo de este trabajo es analizar el proceso de selección argumental composicional representado por diferentes alternancias sintácticas en el ámbito especializado de la cocina y, de este modo, contribuir a la caracterización de este discurso especializado. Las alternancias sintácticas objeto de estudio son las activas canónicas, las pasivas, las alternancias causativo/incoativo, las medias, y las alternancias de sujeto instrumento. Estas construcciones permiten la incorporación de verbos de cocinar (Levin 1993) y denotan realizaciones divergentes de la estructura argumental y, en consecuencia, como se atestigua aquí, contienen pares de qualia N+V distintivos en el análisis composicional. En línea con Pustejovsky (1991, 1995), este trabajo sigue un enfoque léxico-semántico y una metodología basada en corpus para analizar y comparar 8300+ ejemplos contextualizados de dos corpus (un corpus especializado de cocina y un corpus genérico) mediante el uso del software Sketch Engine. Los resultados muestran que las alternancias sintácticas examinadas siguen patrones subyacentes relacionados pero distintivos en la composición semántica y, por lo tanto, se interpretan con pares de qualia N+V que caracterizan el discurso especializado de cocina.

Palabras clave: selección argumental, análisis composicional, alternancias sintácticas, discurso de la cocina, pares de qualia.

1. Introduction

The language of cooking has been widely explored from a linguistic perspective (e.g. Lévi-Strauss 1966; Lehrer 1969, 1972; Newman 1975; Bator 2014). This paper contributes to the characterisation of this specialised domain by contrasting data from two corpora: a specialised corpus of cooking and a general corpus of English. Particularly, it focuses on the usage of N+V configurations and the most productive syntactic patterns typically found in this specialised domain, contrasting these patterns with those from the general corpus.

Scholars like Casademont (2014) and Durán and L'Homme (2020: 37) consider verbs as 'conveyances of knowledge' that help characterise specialised discourse because they specify information about argument structure in their corresponding cultural domains. Unlike purely verb- or noun-centred approaches to compositionality (Sager 1990; Hale and Keyser 2002), this study follows Pustejovsky's (1991, 1995) ideas, thus advocating a lexico-semantic approach that spreads the semantic load across all the constituents of the utterance. Nouns and verbs are both considered specialised units of language in specific domains and as such contribute to the syntactic and lexico-semantic characterisation of a specialised discourse.

This study identifies typically-occurring N+V combinations in the discourse of cooking as qualia pairs, that is, as linguistic elements that are paired depending on the information predicated by a given verb about the meaning of a particular noun. This linguistic connection, in fact, is triggered by our basic knowledge about the nominal entity in question and our conceptualisation of it in terms of its more inherent features, known as qualia roles (Pustejovsky 1991, 1995). A N+V qualia pair is "a combination in which the predicate expresses one of the qualia values of the noun (like *picture-paint, book-read,* or *house-build*)" (Pustejovsky and Jezek 2016: 13). The qualia relational structure thus involves those lexico-semantic, syntactic and conceptual constraints that are "based on the idea that there is a system of relations that characterises the semantics of nominals" and "serves to specify the reading of a verb" (Yoshimura 1998: 115).

The hypothesis of this study is that there exists a correlation between the most productive N+V qualia pairs and the most typically-occurring syntactic structures in a given specialised domain, in contrast to those (qualia pairs and syntactic structures) found in a general corpus. Therefore, there should be a correspondence between the lexico-semantic and the syntactic features that characterise the specialised discourse of cooking. For example, if corpus data confirms the N+V qualia pair *chef_cook* as significantly productive, then it would follow that a syntactic canonical transitive structure with an agentive subject and a patientive object could be frequently found in this specialised discourse, thus revealing a given pattern of qualia structure that specifies the meaning of the noun in relation to the semantics of the verb.

45

This paper is organised as follows. Section 2 presents the analytical tools used (namely, syntactic alternations with cooking verbs and notions of qualia and co-specification phenomena). Section 3 describes the methodology employed. Section 4 presents the main findings and a discussion of the results. Finally, Section 5 offers some closing remarks.

2. Tools for Analysis

In this paper I examine the interaction between the lexico-semantic and syntactic features that characterise the discourse of cooking. I analyse the frequency of occurrence of different grammatical patterns and the most productive N+V qualia pairs. To do so, Subsection 2.1 explores the different syntactic alternations that appear with cooking verbs, and Subsection 2.2 examines the main principles of qualia structure and co-specification phenomena.

2.1. Syntactic Alternations with Cooking Verbs

Placing a particular nominal entity in subject position is anything but random, since doing so requires a process of lexico-semantic and discourse-pragmatic profiling. As stated in Palma Gutiérrez, "profiling is related to the specific portrayal of the foregrounded domain of a given linguistic expression as the focus of attention in discourse" (2024: 139). Depending on the profiling/defocusing phenomena involved in each case, distinct portions of the action chain and argument structure realisations are represented. This leads to the configuration of different syntactic patterns where diverse energetic interactions occur among the participants, that is, Agent, Patient and Instrument (Langacker 2013).

According to Levin's (1993) typology, cooking verbs are classified by the distinct methods or techniques of cooking they describe, such as baking, frying or boiling. Their prominence and frequent use in the specialised discourse of cooking reflects the centrality of these actions to this domain (cf. Levin 1993: 244). Following Levin's classification, these verbs participate in the syntactic patterns illustrated in Examples 1-5:[1]

(1) *Jennifer baked the potatoes (with her new oven).*

(2) *The potatoes were baked (by the chef).*

(3) *The potatoes baked.*

(4) *Idaho potatoes bake beautifully.*

(5) *This oven bakes potatoes well.* (Adapted from Levin 1993: 243-244)

The basic/canonical active form in Example 1 follows the SVO syntactic pattern: it contains a +Animate agentive subject (*Jennifer*) which is profiled syntactically and a -Animate patientive object (*the potatoes*), which is defocused. It also contains an oblique Instrument. Therefore, the flow of energy within the canonical action chain follows the sequence Agent-Patient(-Instrument). Traditionally, the transitive active clause is considered the most basic/unmarked syntactic pattern. As found in corpus studies by Givón, the assumption of the higher productivity of transitive actives "is associated, among other things, with the predication that the unmarked member of a binary distinction […] is more frequent in text" (1993: 52). Additionally, as Stockwell claims, "a prototypical subject acts as both topic and agent, and alternative clause-patterns represent a deviation away from this norm" (2002: 35). Accordingly, syntactic patterns with a different argument structure alignment, such as those illustrated in Examples 2-5, are considered syntactic alternations to the canonical pattern, as detailed below.

The passive construction in Example 2 portrays the same situation as the canonical pattern, but with the order of arguments reversed. It profiles a ±Animate Patient

(*the potatoes*), and, when specified, the Agent occupies a defocused oblique object position, introduced by a *by*-phrase (*the chef*). The causative/inchoative alternation in Example 3 occurs with verbs of change of state/position to describe an eventive situation (Levin 1993: 30). It follows the SV syntactic pattern since it only profiles a -Animate patientive subject (*the potatoes*) and no Agent is coded. The middle alternation in Example 4 follows the SVA syntactic pattern: it only profiles a -Animate patientive subject (*Idaho potatoes*). It describes a potential/facilitative (not an eventive) situation emphasised by the adverbial *beautifully* (26). Both causatives/inchoatives and middles are intransitive counterparts of the basic/ canonical active form. In turn, the Instrument-subject alternation in Example 5 is a transitive structure that follows the SVO syntactic pattern. However, it profiles the oblique participant *this oven* (with an instrumental, not agentive, role) and a patientive argument in object position (*potatoes*) (80). Here, the Instrument can be understood as a metonymic extension of the Agent, paraphrased by the sequence Agent-Patient-Instrument in *Jennifer baked the potatoes with her new oven.*

Following Pustejovsky's ideas, patientive participants are classified by their belonging to a natural or an artifactual kind (2001: 8; 2006: 54). The former are described as naturally-occurring entities (e.g. *water*), whereas the latter are described as artifacts, that is, objects created for a particular purpose (e.g. *sandwich*). Contrary to artifactual objects, naturally-occurring entities lack an agentive value and denote nominals that have not been created out of any intentional behaviour.

Table 1 summarises the features of the syntactic alternations examined in this paper regarding the syntactic and semantic arrangement of their argument structures:

47

	Canonical actives	Passive alternations	Causative/ inchoative alternations	Middle alternations	Instrument-subject alternations
Grammatical roles at the syntactic level	Subject and Object	Subject (and Oblique Object)	Subject	Subject	Subject and Object
Subject's semantic role (Profiled entity)	Agent	Patient	Patient	Patient	Instrument
Object's semantic role (Defocused entity)	Patient	Agent	X	X	Patient
±Animate subject	+Animate	±Animate	-Animate	-Animate	-Animate

Table 1. Syntactic and semantic features of the alternations under examination

2.2. Qualia Structure and the Process of Co-specification

The theory of qualia structure (Pustejovsky 1991, 1995) establishes a mechanism to represent lexical meaning based on a system of four dimensions of meaning, called qualia, whose main function is to "capture different properties of objects, as they are represented in language" (Pustejovsky and Jezek 2016: 3).

A single quale indicates a particular aspect of a word's meaning through the relationship between the concept expressed by the word and another concept evoked by it. Qualia roles rely on the conceptual relations that a word may activate. The four basic qualia roles are as follows:

- Formal qualia (Qf) encode taxonomic information about a lexical item (*type-of* relations), and they answer these questions: 'What type of thing is this?' and 'What is its nature?'

- Constitutive qualia (Qc) focus on partonomic information about the constituent parts/material of an object (*part-of/made-of* relations), and they address these questions: 'What are its constituent parts?' and 'What is it made of?'

- Telic qualia (Qt) capture information about the purpose/function of an entity (*used-for/functions-as* relations), and they answer these questions: 'What is its purpose?' and 'How does it function?'

- Agentive qualia (Qa) refer to information about the origin of an object (*created-by* relations), and they address these questions: 'How did it come into being?' and 'What brought it about?'

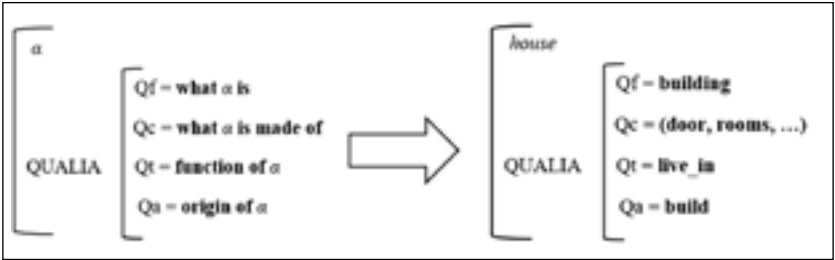Figure 1 illustrates the qualia structure of the lexical item *house* in terms of its qualia roles:

Figure 1. Representation of the qualia structure of the lexical item *house* (adapted from Pustejovsky and Jezek 2016: 8-9)

Even though this view of lexical meaning is basically decompositional,[2] this model also examines compositionality, that is, "how a word meaning may or may

not compose with other meanings, and how it changes in the different contexts"
(Pustejovsky and Jezek 2016: 5). Consider the contextual modulation of word
meaning in Examples 6a-6d below, paying special attention to how different
qualia roles are activated in the contexts provided:

(6)   a. *They have a three-story <u>house</u>.*

       b. *Never forget to lock your <u>house</u> when you leave.*

       c. *My cousin lives in a comfortable <u>house</u>.*

       d. *It took four years to finish the <u>house</u>.*

In 6a the lexical item *house* refers to a type of physical object, a building, thus
relying on a Qf relation between *house* and *three-story*. In 6b, the term *house*
metonymically evokes its most salient part (*the door lock*) in a Qc relation with the
predicate *lock*. In 6c the most salient feature of the house that is conceptually
activated in this context is its inhabitability and *comfortability*, that is, its function
(Qt). Finally, the conceptual relation between *house* and *finish* in 6d profiles a Qa
relation based on its process of creation/construction. Therefore, the meaning of
a lexical item adapts to the semantics of the elements surrounding it in a particular
context, thus profiling or activating the most salient features (qualia roles) evoked
in each case.

From this notion of contextual modulation of word meaning, it follows that
different elements in a grammatical construction can be paired in discourse in
accordance with their qualia structure to specify their meaning. In this study, I
concentrate on the relationship between nouns and verbs forming qualia pairs in
the specialised discourse of cooking.[3] As proposed in Pustejovsky and Jezek, an
N+V qualia pair is a combination in which the verb promotes one of the qualia
values of the noun, as in *book-read* or *house-build* (2016: 13). This phenomenon is
known as co-specification. The results of this paper also show that metonymic
embedding can occur when certain qualia values are subsumed within others in
compositional analysis.

3. Data and Method

In this paper I conduct a corpus-based study of 8,385 instances to examine and
contrast the lexico-semantic and syntactic properties of four cooking verbs and
their syntactic alternations in a specialised corpus of cooking and a general corpus
(henceforth, SC and GC, respectively). I compiled 892 examples from the SC and
7,493 from the GC. Particularly, I examine those syntactic alternations that
involve productive N+V combinations in the domain of cooking.

The data collection process and subsequent analysis was divided into different phases. First, I used the Web search function of the Sketch Engine corpus tool (Kilgarriff et al. 2004) to compile the SC using texts from the internet (e.g. food blogs, cooking recipes, restaurant reviews). The resulting corpus contains 760,630 words. The GC used to contrast the data with the SC was the English Web 2021 (enTenTen21) corpus, the largest English-language corpus available on the platform (over 52 billion words).

The second step was to extract the most salient N+V qualia pairs in both corpora. To do so, I used the Word Sketch function of Sketch Engine, which provides a list of the most frequent collocates for a given target word in specific grammatical relations. In this case, the target words were the four selected verbs (i.e. *cook, bake, boil, fry*). I chose these four verbs for two reasons. First, as proposed by Levin, these verbs "describe the basic methods of cooking", and thus "are the ones that show the widest range of properties" among their class (1993: 244). The second reason was that these verbs proved to be highly frequent in the SC, as demonstrated by the results displayed in the Wordlist function of Sketch Engine. The Wordlist tool automatically generates frequency lists for the words in a corpus. When a filter was applied to the SC, 2,241 items were found. In terms of their frequency of occurrence, *cook* occupies the fourth position (3,273 occurrences), *bake* the ninth (2,243 occurrences), *fry* the twentieth (1,165 occurrences) and *boil* the twenty-third (1,100 occurrences).

I then manually coded the most frequent N+V collocates. Word Sketch collocates are classified in terms of their association score with the target word[4] and sorted into categories depending on their grammatical relations. I analysed the collocates in terms of the following two syntactic relations: 'Words that serve as Subject of the verb' and 'Words that serve as Object of the verb'. I selected the ten most frequent collocates in each syntactic category in both corpora. As Sketch Engine does not have the capacity to automatically filter out lexical/morphological mismatches, these were discarded manually, removing the non-valid instances that contained adjectives lemmatised as verbs (e.g. *baking* in *baking soda*) and nominalised forms of verbs (e.g. *fries* in *French fries*).

Later, I sorted the Word Sketch results for both corpora by searching for those nominals that co-occurred with the four cooking verbs and performed any of the following semantic roles:

- Agents: [+Animate] entities relying on the value *human*
- Patients: [-Animate] entities associated with the value *food*
- Instruments: [-Animate] entities related to the value *tool*

Once the N+V combinations were retrieved, the contextualised instances in both

corpora were then analysed and sorted according to their syntactic alternations. In the case of the GC, I analysed the first 100 examples from each N+V combination.

4. Results and Discussion

In this section, I discuss the main results of the corpus analysis. Firstly, I present the most salient N+V combinations from both corpora, distinguishing the semantic role of the nominal entities in each case. After this, I examine the modulation of word meaning in some N+V qualia pairs and their co-specified values at the lexico-semantic level. Finally, I explore the qualia patterns in compositional argument selection phenomena that were most syntactically productive in both corpora.

Table 2 shows the Word Sketch instances that were selected and thus identified as the most frequent N+V qualia pairs in both corpora. To compare these results, the pairs are ordered in terms of the raw frequency of occurrence of the nominal entities with each verb (Nº) and their normalised frequency in number of hits per million tokens (Freq).[5] The semantic roles of the nominal entities (whether Agent (A), Patient (P) or Instrument (I)) and the total number of occurrences (in both subject and object positions) in both corpora are also provided:

VERB *COOK*							
Specialised corpus (SC)				General corpus (GC)			
Subject position		Object position		Subject position		Object position	
Entity$_{(Role)}$	Nº/(Freq)	Entity$_{(Role)}$	Nº/(Freq)	Entity$_{(Role)}$	Nº/(Freq)	Entity$_{(Role)}$	Nº/(Freq)
potato$_{(P)}$	6/(6.68)	*chicken*$_{(P)}$	98/(128)	*chef*$_{(A)}$	4,132/(0.07)	*food*$_{(P)}$	78,933/(1.28)
rice$_{(P)}$	6/(6.68)	*potato*$_{(P)}$	66/(89.05)	*chicken*$_{(P)}$	768/(0.01)	*meal*$_{(P)}$	65,691/(1.07)
egg$_{(P)}$	6/(6.68)	*fish*$_{(P)}$	48/(58.99)	*pasta*$_{(P)}$	757/(0.01)	*meat*$_{(P)}$	26,132/(0.42)
chicken$_{(P)}$	5/(5.57)	*egg*$_{(P)}$	45/(53.44)	*meat*$_{(P)}$	751/(0.01)	*dinner*$_{(P)}$	25,159/(0.41)
fish$_{(P)}$	3/(3.45)	*rice*$_{(P)}$	40/(52.71)	*rice*$_{(P)}$	734/(0.01)	*rice*$_{(P)}$	24,245/(0.39)
--	--	*pasta*$_{(P)}$	35/(51.77)	*potato*$_{(P)}$	654/(0.01)	*dish*$_{(P)}$	21,247/(0.34)
--	--	*food*$_{(P)}$	25/(34.51)	*oven*$_{(I)}$	537/(0.01)	*chicken*$_{(P)}$	19,254/(0.31)
--	--	*corn*$_{(P)}$	23/(28.94)	*bean*$_{(P)}$	457/(0.01)	*breakfast*$_{(P)}$	13,998/(0.23)
--	--	*onion*$_{(P)}$	21/(25.62)	*onion*$_{(P)}$	415/(0.01)	*vegetable*$_{(P)}$	12,525/(0.2)
--	--	*noodles*$_{(P)}$	18/(20.04)	*steak*$_{(P)}$	374/(0.01)	*pasta*$_{(P)}$	9,741/(0.16)
Total nº	**26**	**Total nº**	**419**	**Total nº**	**9,579**	**Total nº**	**296,925**
		TOTAL Nº: 445				**TOTAL Nº: 306,504**	

VERB *BAKE*							
Specialised corpus (SC)				General corpus (GC)			
Subject position		Object position		Subject position		Object position	
Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)
oven(I)	6/(6.68)	pie(P)	11/(12.24)	bread(P)	5,696/(0.09)	bread(P)	41,596/(0.68)
--	--	pastry(P)	8/(8.9)	oven(I)	2,788/(0.05)	dish(P)	32,684/(0.53)
--	--	fish(P)	8/(8.9)	cookie(P)	2,567/(0.04)	cake(P)	31,169/(0.51)
--	--	tart(P)	7/(7.79)	cake(P)	2,437/(0.04)	potato(P)	26,902/(0.44)
--	--	cake(P)	7/(7.79)	pie(P)	1,410/(0.02)	cookie(P)	22,328/(0.36)
--	--	bun(P)	6/(6.68)	cupcake(P)	467/(0.01)	bean(P)	20,099/(0.33)
--	--	cookie(P)	6/(6.68)	pizza(P)	430/(0.01)	pan(I*)	18,387/(0.3)
--	--	loaf(P)	6/(6.68)	baker(A)	418/(0.01)	pie(P)	10,299/(0.17)
--	--	chicken(P)	4/(4.45)	pastry(P)	411/(0.01)	apple(P)	5,040/(0.08)
--	--	biscuit(P)	3/(3.45)	muffin(P)	322/(0.01)	chicken(P)	4,373/(0.07)
Total n°	**6**	**Total n°**	**66**	**Total n°**	**16,946**	**Total n°**	**212,877**
		TOTAL N°: 72				**TOTAL N°: 229,823**	

VERB *BOIL*							
Specialised corpus (SC)				General corpus (GC)			
Subject position		Object position		Subject position		Object position	
Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)
water(P)	16/(17.81)	potato(P)	29/(31.3)	pot(I)	2,692/(0.04)	water(P)	101,495/(1.65)
mixture(P)	6/(6.68)	corn(P)	21/(23.62)	kettle(I)	1,628/(0.03)	egg(P)	26,026/(0.42)
--	--	mixture(P)	20/(22.26)	water(P)	633/(0.01)	potato(P)	10,461/(0.17)
--	--	turkey(P)	16/(17.81)	mixture(P)	612/(0.01)	rice(P)	4,823/(0.08)
--	--	cookie(P)	12/(13.36)	liquid(P)	519/(0.01)	milk(P)	3,117/(0.05)
--	--	ham(P)	9/(10.7)	soup(P)	95/(0)	pot(I*)	2,977/(0.05)
--	--	kettle(I*)	8/(8.9)	wort(P)	95/(0)	kettle(I*)	2,797/(0.05)
--	--	chicken(P)	6/(6.68)	pasta(P)	87/(0)	peanut(P)	1,776/(0.03)
--	--	wing(P)	6/(6.68)	cook(A)	82/(0)	pasta(P)	1,613/(0.03)
--	--	pierogi(P)	4/(4.45)	potato(P)	65/(0)	noodle(P)	1,390/(0.02)
Total n°	**22**	**Total n°**	**131**	**Total n°**	**924**	**Total n°**	**156,475**
		TOTAL N°: 153				**TOTAL N°: 157,399**	

VERB *FRY*							
Specialised corpus (SC)				General corpus (GC)			
Subject position		Object position		Subject position		Object position	
Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)	Entity(Role)	N°/(Freq)
--	--	*onion*(P)	113/(125.7)	*egg*(P)	246/(0)	*egg*(P)	4,872/(0.08)
--	--	*shallot*(P)	18/(20.04)	*bacon*(P)	161/(0)	*chicken*(P)	3,815/(0.06)
--	--	*chicken*(P)	17/(18.92)	*onion*(P)	114/(0)	*onion*(P)	2,869/(0.05)
--	--	*egg*(P)	16/(17.81)	*garlic*(P)	76/(0)	*bacon*(P)	1,986/(0.03)
--	--	*mushroom*(P)	12/(13.36)	*cook*(A)	74/(0)	*potato*(P)	1,782/(0.03)
--	--	*gnocchi*(P)	11/(12.24)	*turkey*(P)	72/(0)	*rice*(P)	1,150/(0.02)
--	--	*potato*(P)	11/(12.24)	*sausage*(P)	35/(0)	*turkey*(P)	897/(0.01)
--	--	*garlic*(P)	10/(11.13)	*chicken*(P)	33/(0)	*tortilla*(P)	620/(0.01)
--	--	*bacon*(P)	8/(8.9)	*burger*(P)	19/(0)	*noodles*(P)	620/(0.01)
--	--	*pancetta*(P)	6/(6.68)	*tofu*(P)	14/(0)	*tofu*(P)	457/(0.01)
Total n°	**0**	**Total n°**	**222**	**Total n°**	**623**	**Total n°**	**19,068**
TOTAL N°: 153				**TOTAL N°: 19,691**			

Table 2. Frequency of the most salient N+V qualia pairs in both corpora

Table 2 illustrates the N+V combinations and lexico-semantic features that characterise each corpus. With the verb *cook*, the most frequent semantic roles in subject position are the Patient *potato* (in the SC) and the Agent *chef* (in the GC). Additionally, both corpora reveal the saliency of Patients in object position (*chicken* and *food*, respectively). The two corpora differ in that the verb *cook* only occurs with Patients (in both subject and object positions) in the SC, whereas in the GC, other semantic roles are found in subject position (*chef* as Agent and *oven* as Instrument).

In the case of *bake*, the most salient semantic roles in subject position are the instrumental participant *oven* (in the SC) and the patientive entity *bread* (in the GC). No other nominal entities in subject position were found in the SC with the verb *bake*, whereas in the GC, three different semantic roles were found in subject position: Patient (*bread*), Instrument (*oven*) and Agent (*baker*). In both corpora, all the participants have a patientive nature in object position, with the exception of *pan* in the GC, working as Instrument and conveying a metonymic value. To illustrate this, consider Example 7 from the GC:

(7) *Bake each pan 10-12 min.*

Here, the term *pan* stands for the ingredients inside it, meaning 'bake the ingredients *with* the pan'. The conceptual metonymy underlying this process is CONTAINER FOR CONTENT.

Regarding *boil*, the most salient co-occurring semantic roles in subject position refer to the Patient *water* (in the SC) and the Instrument *pot* (in the GC). Once again, the GC presents the three different semantic roles found in subject position: Instrument (*pot* and *kettle*), Patient (*water*) and Agent (*cook*). In the SC, the most frequently co-occurring entities with *boil* have a patientive nature, either in subject or object position. The only exception is *kettle* in object position (see Example 8 taken from the SC), which follows the same process as *pan* in Example 7:

(8) *Boil the kettle.*

Here, the term *kettle* stands for the water inside it, meaning 'boil the water *with* the kettle'. The conceptual metonymy underlying this process is CONTAINER FOR CONTENT as well.

In the case of *fry*, no statistically relevant nominal entities in subject position were found in the SC, whereas two different semantic roles (Patient and Agent) occurred in the GC, as illustrated by *egg* and *cook*, respectively. All the entities found in both subject and object position in both corpora with *fry* have a patientive nature (with the exception of *cook* in subject position in the SC).

The lack of nominal entities and variety of semantic roles in subject position observed throughout the SC is due to the pervasive use of instructional imperatives, where no agentive subject is syntactically coded, though semantically recoverable as *you*. Consider the following instance in Example 9 taken from the SC in this regard:

(9) *Fry the onions.*

Recipe texts commonly contain imperative structures that guide users in the cooking process. The SC contains a higher concentration of this type of patterns as compared with the GC. As detailed below in this section, the most productive structure in both corpora is the basic/canonical pattern. The main difference is that the GC tends to portray the whole action chain, including salient Agent and Patient entities (in declarative patterns), whereas the SC focuses on patientive participants (within imperative forms).

Below I discuss the corpus results by examining the subject-verb qualia pairs in N+V combinations where we find the different semantic roles of the nominal entity (Agent, Patient and Instrument). Figure 2 shows the qualia structure representation of four lexical items and highlights the co-specified qualia values of these nominal entities in subject position in combination with cooking verbs.

54

The four lexical items and their semantic roles are *chef* (as an Agent), *bread* (as Patient of the artifactual kind), *kettle* (as Instrument) and *water* (as Patient of the natural kind).
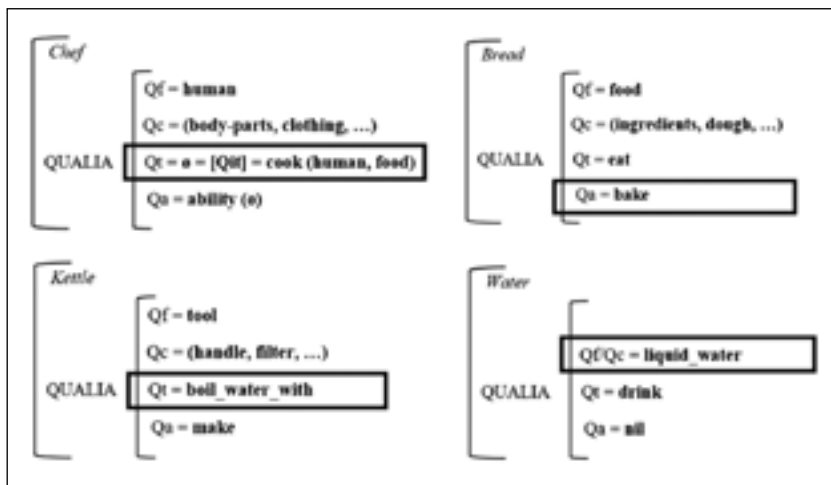

Figure 2. Qualia structure representation of nouns with different semantic roles + cooking verbs

As illustrated in Figure 2, when these four nominal entities co-occur with cooking verbs, they profile different qualia values depending on their semantic roles (Agent, Patient and Instrument when in subject position) and the most conceptually salient information they provide. The list below captures the main principles of argument selection of these lexical items to form N+V qualia pairs in the specialised discourse of cooking:

- Agentive participants (like *chef*) + cooking verb (like *cook*) = [Qt = ø = Qit]
- Artifactual patientive participants (like *bread*) + cooking verb (like *bake*) = [Qa]
- Naturally-occurring patientive participants (like *water*) + cooking verb (like *boil*) = [Qf/Qc][6]
- Instrumental participants (like *kettle*) + cooking verb (like *boil*) = [Qt]

In the case of agentive and instrumental participants with cooking verbs, different types of telic values are denoted, as represented by *chef* and *kettle* in Figure 2 above. The former refers to the 'indirect telic' (Qit) and the latter refers to the 'direct telic' (Qt) value. According to Pustejovsky and Jezek (2016: 30), the (Qt)

55

characterises the entity as something used to perform a particular activity (as in *kettle_boil*), whereas the (Qit) characterises the entity as something that has the function of carrying out the action denoted (as in *chef_cook*).

Therefore, as stated in Pustejovsky and Jezek (2016: 29), even though the (Qt) is mostly associated with instrumental objects (as in *kettle_boil*), a telic value is also present in nouns that denote concepts such as professions (as in *chef_cook*), agentive nominals (like *runner_run*) and functional locations (such as *school_learn*).

As illustrated in Figure 2, *chef* denotes a person (Qf) having the ability (Qa) to cook (Qit). Correspondingly, in the case of *kettle*, this nominal denotes a tool (Qf) used to boil water (Qt). Hence, in N+V qualia pairs where the nominal entity is an Agent, the cooking verb co-specifies the (Qit) of its argument (either in subject or object position). Similarly, in those N+V qualia pairs where the nominal entity is an Instrument, the cooking verb co-specifies the (Qt) of its argument, either in subject or (oblique) object position.

The other N+V qualia pairs retrieved from the corpus analysis that also denote the (Qit) relation between the Agent and a cooking verb are *baker_bake*, *cook_boil* and *cook_fry*. These combinations only appear in the GC, since no salient Agents were identified in the SC. However, a (Qt) relation is found in the following N+V qualia pairs, where the nominal performs the semantic role of Instrument: *oven_bake* (in both corpora), and *oven_cook*, *oven_fry*, *utensil_cook* and *pan_bake* (only in the GC).

Regarding artifactual and naturally-occurring patientive participants with cooking verbs, we observe different patientive entities (natural and artifactual kinds) participating in cooking events, thus denoting divergent N+V qualia pairs. This is represented by the lexical items *bread* and *water*, respectively, in Figure 2 above. Whereas artifactual Patient-oriented entities profile a (Qa) value, naturally-occurring Patients rely on a (Qf/Qc) relation, as detailed below.

The patientive entity *bread* belongs to the artifactual kind since it has been created intentionally through a baking event. In the field of cooking, artifactual Patient-oriented entities denote specific types of food (Qf) that are meant to be eaten (Qt) following a process of creation (Qa). Therefore, in N+V qualia pairs where the nominal entity is an artifactual Patient, the cooking verb co-specifies the (Qa) of its argument (either in subject or object position). The other most productive N+V qualia pairs retrieved from the corpora analysis that also denote artifactual patientive entities co-specifying a (Qa) value are *potato_cook* (in the SC) and *cake_bake* and *egg_fry* (in the GC).

Finally, the patientive participant *water* is a naturally-occurring entity. As represented in Figure 2, the default value of (nil Qa) of this type of entities captures "the primacy of a natural origin" (Pustejovsky and Jezek 2016: 34), since they have not been created through any activity or intentional behaviour. The only patientive entity of a natural kind found in the corpus is *water*, profiling a (Qf/Qc) relation with the predicate *boil*. Thus, *water* denotes a type of liquid that can boil due to its internal composition (Qf subsuming Qc); it is meant to be drunk (Qt); and its origin possesses a naturally-occurring nature (nil Qa). Therefore, in N+V qualia pairs where the nominal entity is a naturally-occurring Patient, the cooking verb co-specifies the (Qf/Qc) values of its argument (either in subject or object position).

So far, I have analysed modulation of word meaning in N+V qualia pairs and their co-specified values at a lexico-semantic level, paying special attention to salient lexical items in the discourse of cooking and focusing on the semantic roles of these nominal entities with regard to a set of cooking verbs. Let us now further explore the qualia patterns in compositional argument selection phenomena at the syntactic level. Examples 10, 11 and 17 were retrieved from the GC, whereas Examples 12-16 were taken from the SC:

(10) *The chef had never cooked vegan food before.*

(11) *The cook boiled the water for sterilizing.*

(12) *The fish fillets cooked through after 10min.*

(13) *The water boiled after 3-4min.*

(14) *Baked potatoes cook in about half the usual time in an air fryer.*

(15) *Water boils rapidly.*

(16) *This oven baked the salmon recipe perfectly.*

(17) *The oven cooks quickly and evenly.*

Examples 10 and 11 represent canonical active transitives, whereas Examples 12-15 represent intransitive alternations classified as follows: 12 and 13 are instances of the causative/inchoative alternation, respectively incorporating an artifactual and a naturally-occurring entity as Patients in subject position (*fish fillets* and *water*). Examples 14 and 15 represent middles, which also incorporate an artifactual and a naturally-occurring entity as Patients in subject position (*baked potatoes* and *water*). Finally, Examples 16 and 17 represent, respectively, the transitive and intransitive counterparts of the Instrument-subject alternation (with *oven*).

Examples 10-17 are represented in Figure 3 to profile their qualia patterns in compositional analysis at the syntactic level.

Canonical actives (*The chef had never cooked vegan food before*) Subject + Verb of cooking + Object (Agent) (Patient) *chef* *cook* *vegan food* [Qit] [Qa]	Canonical actives (*The cook boiled the water for sterilizing*) Subject + Verb of cooking + Object (Agent) (Patient) *cook* *boil* *water* [Qit] [Qf/Qc]
Causative/Inchoative alternations (*The fish fillets cooked through after 10min*) Subject + Verb of cooking (Artifactual Patient) *fish fillets* *cook* [Qa]	Causative/Inchoative alternations (*The water boiled after 3–4min*) Subject + Verb of cooking (Naturally-occurring Patient) *water* *boil* [Qf/Qc]
Middle constructions (*Baked potatoes cook in about half the usual time in an air fryer*) Subject + Verb of cooking (Artifactual Patient) *baked potatoes* *cook* [Qa]	Middle constructions (*Water boils rapidly*) Subject + Verb of cooking (Naturally-occurring Patient) *water* *boil* [Qf/Qc]
Instrument subject alternations (T) (*This oven baked the salmon recipe perfectly*) Subject + Verb of cooking + Object (Instrument) (Patient) *oven* *bake* *salmon* [Qt] [Qa]	Instrument subject alternations (I) (*The oven cooks quickly and evenly*) Subject + Verb of cooking (Instrument) *oven* *cook* [Qt(ca)]

Figure 3. Qualia patterns in compositional analysis at the syntactic level

As shown in Figure 3, canonical actives within the field of cooking (as in Example 10) are transitive constructions that typically consist of patterns in which the cooking verb expresses the (Qit) of the subject. Depending on the nature of the Patient (whether artifactual or naturally-occurring), the cooking verb expresses a different pattern in qualia structure: in combination with artifactual Patients (like *vegan food*), the cooking verb expresses the (Qa) of the object, thus profiling the creation process that the entity undergoes. Alternatively,

in combination with a naturally-occurring entity (like *water*), the cooking verb expresses the (Qf/Qc) value of the object, since no (Qa) is found in natural kinds. Thus, canonical active structures with artifactual Patients involve a [Qit + Qa] qualia pattern in compositional analysis, whereas canonical actives with naturally-occurring entities as Patients profile the [Qit + Qf/Qc] qualia pattern.

Figure 3 further illustrates both causatives/inchoatives and middles as intransitive alternations. They have a common syntactic one-argument structure with a patientive subject. However, depending on the nature of the nominal entity (whether artifactual or naturally-occurring), a different qualia pattern is profiled in compositional analysis. In those structures with an artifactual Patient-oriented subject (as illustrated in Examples 12 and 14, respectively), the cooking verb co-specifies the (Qa) of the subject by conceptually implying its creation processes. However, in those structures with a natural-kind Patient-oriented subject (as in Examples 13 and 15, respectively), the cooking verb co-specifies the (Qf/Qc) values of the subject, since no (Qa) is found in natural kinds. Thus, causatives/inchoatives and middles with an artifactual Patient-oriented subject underlie the [Qa] qualia pattern in compositional analysis, but with natural-kind Patient-oriented subjects they undergo the [Qf/Qc] pattern. The main difference between these constructions is that causatives/inchoatives involve a specific time reference, whereas middles incorporate adverbial/modal modifiers (time-oriented adjuncts in 14 and 15) that influence their aspectual properties and reinforce their non-eventive nature (Palma Gutiérrez 2022: 44).

The same qualia analysis can be applied to the passive structure. Even though Levin (1993) does not contemplate passives as possible alternations with cooking verbs, this Patient-subject alternation has been found very frequently in the corpora examined, as detailed below.[7] The main difference between the passive and the other Patient-oriented structures (middles and causatives/inchoatives) is that the passive Agent is either defocused (in a *by-* clause) or omitted syntactically, whereas in the other structures, the Agent is totally demoted.

Finally, the Instrument-subject alternations illustrated in Figure 3 capture both the transitive and the intransitive syntactic counterparts (respectively shown in Examples 16 and 17). Semantically, both alternations contain Instruments in subject position (*oven*), and thus, their cooking verbs express the (Qt) of these participants. The main difference between these alternations is that the transitive counterpart encodes the patientive object at the syntactic level, whereas the intransitive counterpart conceptually evokes it via metonymy. As detailed below, in order to analyse the intransitive counterpart, I examine the notion of conceptual modulation of noun meaning (Pustejovsky and Jezek 2016: 12) based on the predicate's argument selection process through a metonymic operation.

First, in the case of the transitive counterpart of the Instrument-subject alternation, I observed the following. In the selectional context of the verb *bake*, the noun *salmon* is used to explicitly denote the entity that undergoes the baking process (Qa), thus profiling the [Qt + Qa] qualia pattern in compositional analysis. However, in the intransitive counterpart, I explored the notion of conceptual modulation of noun meaning via metonymy. In the selectional context of the verb *cook*, the noun *oven* is used to implicitly denote the entity that undergoes the cooking process (Qa) by means of the metonymic complex INSTRUMENT FOR ACTION FOR RESULT (Serrano-Losada 2015: 43). This metonymic complex implies a dual analysis: first, a domain expansion metonymy whereby the instrumental entity *oven* stands for the action denoted *cooking* (i.e. INSTRUMENT FOR ACTION), and then, a domain reduction metonymy whereby the action of *cooking* stands for its resulting product *food* (i.e. ACTION FOR RESULT). Therefore, intransitive alternations of the Instrument-subject construction profile the $[Qt_{[Qa]}]$ qualia pattern in compositional analysis, where the (Qa) value is metonymically embedded within the (Qt) of the N+V qualia pair.

Yet, as observed in the corpora, another metonymic relation is possible with intransitive Instrument-subject alternations like *The kettle boiled*. In this case, in the selectional context of *boil*, the noun *kettle* is used to metonymically evoke a CONTAINER FOR CONTENT relation ('kettle' for 'water contained in the kettle'). In contrast to the analysis carried out in Example 17, where a (Qa) value is embedded within the (Qt) relation between *oven* and *cook* ($[Qt_{[Qa]}]$), in the case of *The kettle boiled*, the embedded qualia values are (Qf/Qc) because the nominal *water* is of a natural kind ($[Qt_{[Qf/Qc]}]$). Exploring which type of nominal entity is most frequently topicalised when in combination with these verbs demonstrates the tendency of these N+V combinations to participate in certain syntactic alternations more productively.

As shown in Table 3, the four verbs under study were more productive in the canonical pattern in both corpora, despite their differences in size. The main differences were found in the second most productive N+V pairs retrieved in each case.

	Specialised corpus (SC)				General corpus (GC)			
	cook	*bake*	*boil*	*fry*	*cook*	*bake*	*boil*	*fry*
Canonical	265	64	129	221	953	902	1042	975
Caus/Incho	20	0	18	0	661	499	436	500
Middle	2	0	4	0	139	296	208	38
Instr. Subj	2	6	0	0	99	213	206	0
Passive	156	2	2	1	115	69	32	110

Table 3. Frequency of the syntactic alternations with each verb in both corpora

The data displayed in Table 3 confirms the research hypothesis: there exists a correlation between the most productive N+V qualia pairs and the most frequent syntactic constructions found in the corpora. First, the N+V[*cook*] combinations suggest the following: the most salient pairs are *cook_chicken* (in the SC) and *cook_food* (in the GC), thus entailing a higher productivity of the basic/canonical action chain with Patients in object position and Agents in subject position (which can be elicited in the imperative form) in both corpora. Additionally, other salient N+V[*cook*] combinations are *potato_cook* (in the SC) and *chef_cook* (in the GC). The former indicates a higher productivity of grammatical patterns containing patientive subjects (such as passives, causative/inchoatives or middles) in the SC, whereas the latter implies a higher productivity of Agent-subject structures, whether in the canonical form (i.e. also including a Patient in object position) or in the unspecified object alternation (i.e. with no object specified).

Second, the N+V[*bake*] combinations show that the most salient pairs are *bake_pie* (in the SC) and *bake_bread* (in the GC), therefore pointing to a higher productivity of the basic/canonical action chain with Patients in object position in both corpora. Also relevant is the case of *oven_bake*, which is highly frequent in both corpora and implies a higher productivity of the Instrument-subject alternation (transitive and intransitive variants) in both corpora.

Third, the N+V[*boil*] combinations indicate that the most salient pairs are *boil_potato* (in the SC) and *boil_water* (in the GC), thus revealing a higher productivity of the canonical structure with Patients in object position in both corpora. Additionally, the other most salient N+V[*boil*] combinations are *water_boil* (in the SC) and *pot_boil* (in the GC). The former would lead to a higher productivity of Patient-oriented subject (such as middles, passives or causative/inchoative alternations) in the SC, whereas the latter would imply a higher productivity of Instrument-subject alternations in the GC.

Finally, the N+V[*fry*] combinations show that the most salient pairs are *fry_onion* (in the SC) and *fry_egg* (in the GC), therefore indicating a higher productivity of canonical patterns with patientive objects in both corpora. Additionally, in the GC we also observe another highly salient pair, *egg_fry*, therefore implying a higher productivity of Patient-subject structures (like middles, passives or causatives/inchoatives).

Therefore, the data provided in Table 3 above, together with the previous discussion of the connections between the normalised frequency of occurrence of certain N+V qualia pairs and certain syntactic patterns, demonstrate that these correspondences are different in each corpus, and this contrast contributes to the

61

lexico-semantic and syntactic characterisation of the discourse of cooking. In both corpora, the most frequent grammatical pattern is the canonical structure with the four verbs. However, the second most salient syntactic alternations differ in both corpora. In the GC, the second most productive structure is the causative/ inchoative alternation with the four verbs due to the saliency of N+V combinations containing Patient-oriented subjects. On the other hand, in the SC, each verb is more productive in different structures, either relying on the saliency of N+V pairs with Patient- or Instrument-oriented subjects: *cook* is more frequent in the passive form, *bake* in the Instrument-subject alternation, *boil* in the causative/ inchoative alternation and *fry* in the passive form.

5. Conclusions

This paper analyses naturally-occurring language by applying the principles of argument selection phenomena to examine the motivating factors behind the processes of qualia-pairing and co-specification in the specialised discourse of cooking. To do so, I examined the selectional contexts of four cooking verbs (*cook, bake, boil* and *fry*) and the most salient nominal entities (in subject/object positions) in combination with these verbs in two corpora (a specialised corpus and a general corpus). This led to the creation of different argument structure realisations as well as distinctive syntactic alternations in which the N+V combinations were found. The results of this corpus-based study shed light on the lexico-semantic and syntactic characterisation of the specialised discourse of cooking.

As demonstrated here, the type of nominal entity most frequently topicalised with the cooking verbs examined shows the tendency of each N+V combination to participate more productively in certain syntactic alternations. In both corpora, the four verbs are more productive in the canonical pattern. Concerning the remaining less prototypical syntactic alternations, there are different tendencies depending on the nature of the most frequent N+V pairs with each verb. In the GC, the most frequent non-prototypical alternation is the causative/inchoative pattern with the four verbs. In contrast, in the SC, other grammatical structures become salient.

Regarding the notion of qualia structure, I have also demonstrated that these cooking verbs express a (Qit) value when combined with agentive subjects. This is illustrated in the N+V qualia pairs *chef_cook, baker_bake* and *cook_fry*. These cooking verbs express divergent patterns in qualia structure depending on the nature of the patientive entities they accompany (whether artifactual or naturally-

occurring). Therefore, artifactual Patients (in both subject and object position) with cooking verbs evoke a (Qa) relation in their qualia patterns. These nominals co-specify the meaning of the predicates by conceptually implying their creation process (Qa) and encoding the resulting outcome. This is illustrated in the N+V qualia pair *bread_bake, egg_fry* and *potato_cook*. However, this relation is not found in naturally-occurring Patients with cooking verbs, since natural kinds have (nil Qa) and thus profile a (Qf/Qc) value in co-specification with the predicates, as shown in the N+V qualia pair *water_boil*. Finally, the cooking verbs examined here express a (Qt) value when combined with Instrument subjects in both transitive and intransitive counterparts. This is illustrated in the N+V qualia pairs *pot_boil, oven_cook, oven_bake* and *kettle_boil*.

When the above N+V qualia pairs are examined regarding the syntactic alternations that these cooking verbs can undergo, the following patterns in compositional co-specification are found:

(i)   Canonical active structures represent one of these complex patterns depending on the nature of the grammatical object: [Qit + Qa] or [Qit + Qf/Qc].

(i)   Causatives/Inchoatives, middles and passives illustrate one of these simple patterns depending on the nature of the grammatical subject: [Qa] or [Qf/Qc].

(iii) Instrument-subject alternations denote one of these qualia patterns depending on the occurrence or not of a metonymically-based operation on the grammatical subject: [Qt + Qa], [Qt$_{[Qa]}$] or [Qt$_{[Qf/Qc]}$].

This study has examined contextual modulation of word meaning by exploring the process of compositional argument selection in N+V qualia pairs in the specialised discourse of cooking. The significance of the present study for the specialised domain of cooking is directly associated with its linguistic characterisation in terms of its lexico-semantic and syntactic features, particularly, when in combination with a usage-based approach. Future lines of research may explore other syntactic alternations, as well as other metonymically-based operations.

Acknowledgements

63

Notes

1. Levin also presents other alternations with cooking verbs (adjectival passive participle alternations (e.g. *a baked potato*), and resultative phrases (e.g. *Jennifer baked the potatoes to a crisp*)) (1993: 244). However, these were discarded because the former have a lexical (not a syntactic) nature, and thus, no transitivity alternations can be examined, and the latter, because no instances were found in the corpora consulted.

2. The process of lexical decomposition follows the idea that words can be decomposed into semantic primitives annotated as (±) binary values. For example, the word *chair* can be decomposed as [-Animate], [+Countable], [+Concrete], [+Artifact].

3. As Pustejovsky and Jezek explain, "[a] qualia pair may take the form of a verb-noun pairing, and adjective-noun pairing, or a compound" (2016: 31). This paper focuses exclusively on N+V qualia pairs to analyse the argument selection process within the specialised discourse of cooking.

4. Association score uses pointwise mutual information between the target word and its collocate, multiplied by the log of the pair frequency for the particular grammatical relation examined. Association score uses the so-called logDice statistical measure to automatically identify collocations and frequent combinations of words and is not affected by the size of the corpus (Rychlý 2008).

5. In Table 2, both raw frequency and normalised frequency are provided. Even though the raw frequency in the SC is minimal compared to that of the GC, the normalised frequency is higher in the SC. This is so because the N+V pairs are more productive in the SC than in the GC, despite their size.

6. The qualia representation of the naturally-occurring entity *water* merges Qf and Qc values because we cannot separate what this entity is (Qf) from what it is made of (Qc). In fact, we could specify the Qc value since each water molecule is identical and is made up of one oxygen atom and two hydrogen atoms, chemically represented as H_2O. However, its Qf value cannot be separated from this established Qc condition.

7. Two syntactic patterns not proposed by Levin (1993) as potential alternations with cooking verbs were identified in the GC (not in the SC), particularly, with the verbs *cook* and *bake*, distributed as follows: 26 instances with *cook* and 19 with *bake* in the unspecified object alternation, and seven instances with *cook* and two with *bake* in the benefactive alternation.

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66