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A Semantic Analysis of Sense Organs in Chinese Compound Words: Based on Embodied Cognition and Generative Lexicon Theory

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Abstract. This article aims to analyse the four major sense organs of human beings, viz., 眼 (yǎn, eyes), 耳 (ěr, ears), 口/嘴 (kǒu/zǔi, mouth) and 鼻 (bí, nose), in Chinese compound words with the combination of Generative Lexicon Theory and Embodied Cognition. It was shown that Embodied Cognition gives us an idea of the locus of the source domain in figurative use of organ-related words. Meanwhile, qualia structure in Generative Lexicon Theory, in particular, can be used to examine which sense of the word is activated when combining with other morphemes in a compound word. Moreover, the study found that the involved qualia roles vary in different syntactic structures and metaphorization of the compound words, which further demonstrates different lexical compositionality and productivity of the four basic sense organ words.

Keywords: sense organs, metaphor, metonymy, embodied cognition, qualia roles

1 Introduction

Human beings are known to use their eyes to see, ears to listen, mouth to eat and speak, and nose to smell. These four sense organs are the locus of our basic human senses, i.e., visual, auditory, gustatory and olfactory senses. They seemingly own their respective functions and interrelate with one another when we perceive and experience the outside world. However, senses are not equal. Various sensory-related studies have shown that different sensory modalities are linguistically represented to varying degrees, with a rich vocabulary in visual perception but a lack of expressions related to smell in English and other Indo-European languages [1, 2]. By examining the number of word senses for each of the above four organs in *Chinese WordNet* [3]¹ and 7th edition of *Xiandai Hanyu Cidian (Contemporary Chinese Dictionary)* [4], 8 major literal and extended senses were found for 眼 (yǎn, eyes), 3 for 耳 (ěr, ears),

¹ <http://cwn.ling.sinica.edu.tw/>

13 and 6 for 口 and 嘴² (kǒu and zuǐ, mouth) and 3 for 鼻 (bí, nose). In view of the multiple word meanings each sense organ carries, both literal and metaphorical, it is interesting to figure out what makes it possible to distinguish among various meanings and which one of the specific meanings is activated in similar and different constructions. For example, in the construction of [adjective + 眼 (yǎn, eyes)], how the meaning(s) of the same word 眼 (yǎn, eyes) vary in the compound words 碧眼 (bìyǎn, blue eyes), 白眼 (báiyǎn, supercilious look), and 冷眼 (lěngyǎn, cold shoulder)? Meanwhile, given senses are not equal as mentioned earlier, how each sense organ differs from others in the lexicalization is also one of the concerns of this study.

2 Previous Related Studies

Body parts studies have been conducted largely since ‘embodiment’ was introduced to cognitive linguistics in 1975 [5]. Different body parts in Mandarin Chinese were investigated by Yu [6, 7, 8, 9], including eyes, speech organs, head, heart, gallbladder, and so forth. He mainly adopted the decompositional approach by summarizing basic metaphorical mappings and listing words and expressions related, for instance, EYE FOR SEEING, EYE FOR MIND, and SPEECH ORGAN FOR SPEAKING. Although these conceptual metaphor mappings are familiar to us, the specific lexicalization method applied in the figurative uses of linguistic expressions containing different body parts are still under research. Moreover, with the ‘quantitative turn’ in cognitive linguistics since 2008 [10], it will be more objective and convincing if quantitative data, such as corpus, can be utilized in the metaphorical research of body parts.

With regard to Pustejovsky [11]’s qualia structure, Nissen [12] is considered the pioneer who incorporated Generative Lexicon Theory in Embodied Cognition when examining figurative meanings of ‘mouth’ in Danish, English, and Spanish. The study showed that mappings of mind and body are closely related to constitution, shape, and function(s) of ‘mouth’ and cultural differences may play a role in the metonymization and metaphorization processes.

Duann and Huang [13] also combined the two theories and studied four body parts in Mandarin Chinese, namely, blood, flesh, bone and meridian. It was suggested that metaphorization of the above four words is mainly realized when collocated with two visual verbs, 看 (kàn, to see) and 見 (jiàn, to see). Their telic role(s), that is, the function(s) of these body parts also help to explain the metaphorization.

In general, previous studies have given us an idea of metaphorical mappings related to major body parts in Mandarin Chinese and other languages. However, it has not been well researched what factor(s) motivates the lexicalization and metaphorization of the typical sense organs and body parts. It is also worthwhile to integrate quantitative method into semantic and metaphorical analysis to examine the language patterns and structures more objectively.

² Two words are chosen because both of them carry the meaning of ‘mouth’ in Mandarin Chinese.

3 Theoretical Background and Research Questions

3.1 Embodied Cognition

Challenging a long-standing view of mind-body dualism in Western cultures, cognitive scientists and philosophers have now suggested that our bodies cannot be isolated from the ways we think and speak. The subjective feelings of the body provide at least part of the fundamental grounding for the language we use and the thought we have in our mind [14, 15]. As Lakoff and Johnson [15, 16] proposed in the leading theory in cognitive linguistics - Conceptual Metaphor Theory (CMT), human beings' conceptual system is fundamentally metaphorical in nature and is reflected in linguistic expressions. The tenet of CMT is that abstract terms are understood by more concrete concepts, hence, our bodily experience can be a primary source for this mapping. Kövecses [17] holds a similar view by claiming that the human body is an ideal source domain for metaphors and plays a key role in the emergence of metaphorical meaning not only in English and other Western languages and cultures, but also in other languages and cultures around the world. Likewise, Gibbs et al. [18] suggested that many of the source domains of conceptual metaphors can reflect significant patterns of bodily experience.

In the light of the recognition that metaphor and metonymy are powerful tools for generating figurative expressions and these expressions are motivated by our bodily experiences, we can understand and identify the locus of the source domain in a metaphorical expression. However, how these expressions contribute to understanding of the conceptualization of body-part words seems hard to explain by Embodied Cognition.

3.2 Generative Lexicon Theory

Generative Lexicon Theory (GLT) was proposed by Pustejovsky in the 1990s to deal with the 'multiplicity of word meaning'. As all of the body-part related words are nouns, including the four sense organs we are examining in this study, only qualia structure in GLT is discussed here. Qualia structure was inspired by Aristotle's 'four causes' of explaining the emergence and development of the entity in the world, that is, material cause, formal cause, efficient or moving cause, and final cause [19, 20]. It depicts what X is made of, what X is, the function of X, and how X comes into being, which correspond to constitutive role, formal role, telic role and agentive role of an entity [11, 21].

Constitutive role describes the relation between an entity and its constitutive parts, as well as the relation between the parts and the entire entity. For example, with respect to eyes, they are a part of sense organs, the whole face and also the entire body. Meanwhile, the eye consists of the eyelid, orbit, pupil, sclera, etc. Formal role focuses on how the specific entity is distinguished from other objects within a larger domain in terms of its position, magnitude, shape, colour, and so forth. For instance, eyes and mouth are known to open and close voluntarily but ears and nose must keep 'open' all the time. Telic role deals with the purpose and function of the entity - the first sentence in this article has already summarized the respective functions of the four sense organs commonly agreed to by all human beings. Last but not least,

agentive role discusses factors involved in the entity's origin, like the entity is a natural type, an artefact object or a complex type [22]. As for the four sense organs, they are natural kinds in most cases. However, in some compound words they can be artificial, such as 假眼 (jiǎyǎn, artificial eyes) and 隆鼻 (lóngbí, rhinoplasty).

Recent GLT studies in Mandarin Chinese found that the most active role in metaphorical noun-noun compounds is formal role, while agentive role has the least effect in this type of compounds [23]. However, in adjective-noun compounds, formal role is used the most for nouns, and telic role is considered second [24]. In verb-object compounds, if a noun cannot satisfy the consistent meaning of the verb, the verb will 'coerce' the noun into its metonymy meaning [25].

3.3 Research Questions

By combining the two theories mentioned above, on the one hand we can figure out the relationship between the meanings of the word and other words it collocates with, and on the other hand, we can locate the source it arises from when interpreting its extended meanings.

Drawing upon this perspective, this study attempts to take the four basic sense organs as a start, firstly to compile a list of compound words in Mandarin Chinese containing 眼 (yǎn, eyes), 耳 (ěr, ears), 口/嘴 (kǒu/zǔi, mouth) and 鼻 (bí, nose), secondly to examine their respective qualia roles in the overall representations, including both literal and metaphorical meanings, and lastly, to explore the activation of different roles in metaphorical uses of the four words.

Two research questions are hereby raised:

- a) Which qualia role(s) is/are prominent in the various syntactic constructions of the four words?
- b) Which qualia role(s) is/are prominent in the metaphorical and metonymic meanings of the four words?

4 Data and Method

The data investigated in this study was collected from 7th edition of *Xiandai Hanyu Cidian (Contemporary Chinese Dictionary)* [4] and *Chinese GigaWord Corpus (Mainland)* in the *Sketch Engine* [26]³. The source data in *Chinese GigaWord Corpus (Mainland)* mainly contains news articles from *Xinhua News Agency, Beijing*, from 1991 and 2002 with a quantity of more than 200 million words. The function of 'Word List' in the corpus was used to generate a list containing the four words. With this function, it is believed that the collected data is comprehensive and currently in use with the frequencies denoted.

Only disyllabic and trisyllabic compounding expressions were chosen for further analysis because this study emphasizes on the productivity and compositionality of the word. Thus, conventional idioms were excluded, e.g. 眼疾手快 (yǎn-jí-shǒu-kuài, doing something at top speed), 眼不見為淨 (yǎn-bù-jiàn-wéi-jìng, out of sight, out of mind), etc. In trisyllabic compound words, those with similar meanings as in

³ <https://the.sketchengine.co.uk>

disyllabic words were also not considered, for instance, the senses of 眼 (yǎn, eyes) in 眼鏡店 (yǎnjìng diàn, optical shop) and in 眼鏡 (yǎnjìng, spectacles) are the same, so only the disyllabic word 眼鏡 (yǎnjìng, spectacles) was retained. Based on this criterion, 149 compound words for 眼 (yǎn, eyes), 72 for 耳 (ěr, ears), 215 for 口 (kǒu, mouth), 53 for 嘴 (zuǐ, mouth) and 36 for 鼻 (bí, nose) were compiled.

After the word list was generated, we adopted Song et al. [27] and Zhao and Song [23]’s annotation method for Chinese compound words, including lexical categories for each morpheme and the whole word, syntactic structure of the word, lexical meanings for each morpheme and the whole word, qualia roles of the word and extensions of the lexical meanings (metaphor and/or metonymy, if any).

It is hard to determine the involved qualia roles in some compound words because the meaning has become less transparent in the process of lexicalization, like 口 (kǒu, mouth) in the word 心口 (xīnkǒu, precordium/heart). As Song et al. [27] suggested, this annotation framework is only applicable to those words with high semantic transparency and strong semantic compositionality, and so these words were removed.

Those words with metonymical and metaphorical meanings were sorted separately after annotation was completed. For instance, 口徑 (kǒujìng) has two meanings; in its first meaning, 口 (kǒu, mouth) is a metaphor and the formal role (shape of the mouth) plays a part in the metaphorization; while 口徑 (kǒujìng) turns out to be a metonymy in the second meaning, and the telic role – use mouth to speak is activated here. Thus, these kinds of words were recorded as two or three lexical items according to their varying extended meanings.

5 Results and Discussion

5.1 眼 (yǎn, eyes)

In the general pattern of the compound words containing 眼 (yǎn, eyes) as shown in Table 1, modifier-head structure tops in the syntactic constructions, with 眼 (yǎn, eyes) as the modified morpheme and other morphemes are used to modify it. Formal role and telic role are evenly used in this construction and constitutive role also plays a considerable part in this structure. Verb-object structure ranks second and telic role is used the most in this structure, such as in the words 瞪眼 (dèngyǎn, to stare) and 睜眼 (zhēngyǎn, to open one’s eyes).

Table 1. Distributions of qualia roles in syntactic constructions of 眼 (yǎn, eyes)

Qualia Roles Syntactic Construction	Constitutive	Formal	Telic	Agentive
Coordination (4)	4 (100%)	0 (0%)	0 (0%)	0 (0%)
Modifier-head (108)	25 (23%)	39 (36%)	32 (30%)	12 (11%)
Subject-predicate (5)	0 (0%)	4 (80%)	1 (20%)	0 (0%)
Verb-object (32)	0 (0%)	12 (38%)	19 (59%)	1 (3%)
Total		149		

Table 2 presents the metaphorical and metonymical uses of 眼 (yǎn, eyes). The result generally accords with the findings in the distributions above – telic role mainly motivates the metaphorization, telic role and formal role both activate the metonymization. It further suggests that formal and telic roles are important for eyes - due to the shape of our eyes, and that the meaning has been extended metaphorically, like in the words 貓眼 (māoyǎn, peep hole), 孔眼 (kǒngyǎn, hole), and 鎖眼 (suǒyǎn, key hole). We can also get an abstract meaning based on the function of eyes, as in the word 眼福 (yǎnfú, feast one's eyes on something) and 冷眼 (lěngyǎn, cold-shoulder).

Table 2. Distributions of qualia roles in metaphorical uses of 眼 (yǎn, eyes)

Qualia Roles Metaphor/Metonymy	Constitutive	Formal	Telic	Agentive
Metaphor (67)	2 (3%)	27 (40%)	38 (57%)	0 (0%)
Metonymy (21)	5 (24%)	8 (38%)	8 (38%)	0 (0%)
Total		88		

5.2 耳 (ěr, ears)

Although ears are seen as important as eyes for human beings, the number of compound words is much less than 眼 (yǎn, eyes). This is partly due to the formal role of 耳 (ěr, ears) - ears cannot voluntarily open or close, the shape and size also do not vary too much. In addition, the most critical function and constitution of ears are more invisible than those of eyes. These features of ears are reflected in the percentage of the formal and telic roles in the syntactic constructions of 耳 (ěr, ears) as shown in Table 3.

Table 3. Distributions of qualia roles in syntactic constructions of 耳 (ěr, ears)

Qualia Roles Syntactic Construction	Constitutive	Formal	Telic	Agentive
Coordination (4)	1 (25%)	3 (75%)	0 (0%)	0 (0%)
Modifier-head (50)	29 (58%)	2 (4%)	8 (16%)	11 (22%)
Subject-predicate (5)	0 (0%)	1 (20%)	4 (80%)	0 (0%)
Verb-object (13)	3 (23%)	0 (0%)	9 (69%)	1 (8%)
Total		72		

Constitutive role is more important in the modifier-head construction, with agentive role following in second place. While in other constructions, telic role is more prominent than other roles although only a few instances are found. Formal role has very little influence in the lexicalization of the compound words containing 耳 (ěr, ears) and agentive role, no doubt, has the least impact.

As in the metaphorical and metonymical uses of 耳 (ěr, ears) presented in Table 4, the results look quite consistent with 眼 (yǎn, eyes), with telic role being the main role in metaphorization.

Table 4. Distributions of qualia roles in metaphorical uses of 耳 (ěr, ears)

Qualia Roles Metaphor/Metonymy	Constitutive	Formal	Telic	Agentive
Metaphor (19)	0 (0%)	4 (21%)	15 (79%)	0 (0%)
Metonymy (3)	0 (0%)	1 (33%)	2 (67%)	0 (0%)
Total		22		

5.3 口/嘴 (kǒu/zuǐ, mouth)

The amount of compound words containing 口 (kǒu, mouth) is the most compared to other sense organs because most of the compound words are formed based on the shape and characteristics of the mouth – it can open and things can go in and out from it, and this is considered ‘formal role’ in the qualia structure such as in the words 窗 (chuāngkǒu, window) and 門口 (ménkǒu, doorway). Therefore, formal role is the most important role in the lexicalization as presented in Table 5.

Table 5. Distributions of qualia roles in syntactic constructions of 口 (kǒu, mouth)

Qualia Roles Syntactic Construction	Constitutive	Formal	Telic	Agentive
Coordination (10)	0 (0%)	5 (50%)	1 (10%)	4 (40%)
Modifier-head (156)	5 (3%)	107 (69%)	40 (26%)	2 (1%)
Subject-predicate (12)	0 (0%)	0 (0%)	12 (100%)	0 (0%)
Verb-object (37)	0 (0%)	8 (22%)	27 (73%)	0 (0%)
Total		215		

There are relatively much fewer words for 嘴 (zuǐ, mouth) because formal role is lost in the compound words containing 嘴 (zuǐ, mouth). Formal role is only found in words like 奶嘴 (nǎizuǐ, nipple of a feeding bottle) and 壺嘴 (húzuǐ, spout) though it is not about the shape of the mouth, but rather the object functions like the month when pouting. Nevertheless, telic role is seen as the most prominent role, as shown in Table 6.

Table 6. Distributions of qualia roles in syntactic constructions of 嘴 (zuǐ, mouth)

Qualia Roles	Constitutive	Formal	Telic	Agentive
Syntactic Construction				
Coordination (2)	2 (100%)	0 (0%)	0 (0%)	0 (0%)
Modifier-head (35)	3 (9%)	13 (37%)	19 (54%)	0 (0%)
Subject-predicate (2)	0 (0%)	0 (0%)	2 (100%)	0 (0%)
Verb-object (14)	0 (0%)	4 (29%)	10 (71%)	0 (0%)
Total		53		

In relation to the metaphorical and metonymical meanings of mouth, formal role is much more prominent than other roles as for 口 (kǒu, mouth) while telic role is the most important for the metaphorization of 嘴 (zuǐ, mouth). Mouth is seen as the most ‘useful’ among the four organs due to its two functions – to eat and to speak. Between the two functions, the speaking function is deemed more pronounced. Even in words related to senses of taste and smell, like 口氣 (kǒuqì, literal meaning: bad breath; metaphorical meaning: tone of voice) and 嘴甜 (zuǐtián, honey-mouthed), telic role of speaking is activated in most cases.

Table 7. Distributions of qualia roles in metaphorical uses of 口 (kǒu, mouth)

Qualia Roles	Constitutive	Formal	Telic	Agentive
Metaphor/Metonymy				
Metaphor (167)	0 (%)	110 (66%)	57 (34%)	0 (0%)
Metonymy (15)	0 (0%)	2 (13%)	13 (87%)	0 (0%)
Total		182		

Table 8. Distributions of qualia roles in metaphorical uses of 嘴 (zuǐ, mouth)

Qualia Roles	Constitutive	Formal	Telic	Agentive
Metaphor/Metonymy				
Metaphor (37)	0 (%)	10 (27%)	27 (73%)	0 (0%)
Metonymy (4)	1 (25%)	0 (0%)	3 (75%)	0 (0%)
Total		41		

5.4 鼻 (bí, nose)

Olfactory sense is a relatively ‘lower’ sense in the sensory system and is described as the most ‘ineffable’ sense [2]. This peculiarity is also reflected in the number of lexical items of compound words containing 鼻 (bí, nose). Quite similar to other senses, telic role is seen as the most significant role which motivates lexicalization and metaphorization using its unitary function of smelling. Formal role has much less influence in this case than in other sense organs.

Table 9. Distributions of qualia roles in syntactic constructions of 鼻 (bí, nose)

Qualia Roles	Constitutive	Formal	Telic	Agentive
Syntactic Construction				
Coordination (4)	2 (50%)	2 (50%)	0 (0%)	0 (0%)
Modifier-head (20)	10 (50%)	2 (10%)	1 (5%)	7 (35%)
Subject-predicate (5)	0 (0%)	0 (0%)	5 (100%)	0 (0%)
Verb-object (7)	0 (0%)	0 (0%)	6 (86%)	1 (14%)
Total		36		

Table 10. Distributions of qualia roles in metaphorical uses of 鼻 (bí, nose)

Qualia Roles	Constitutive	Formal	Telic	Agentive
Metaphor/Metonymy				
Metaphor (7)	1	0 (0%)	6	0 (0%)
Metonymy (2)	1	0 (0%)	0 (0%)	0 (0%)
Total		9		

6 Conclusion

By analysing different qualia roles in the Chinese compound words containing 眼 (yǎn, eyes), 耳 (ěr, ears), 口/嘴 (kǒu/zǔi, mouth) and 鼻 (bí, nose) during their lexicalization and metaphorization/ metonymization, firstly we have identified that the most distinct syntactic construction among the four words is the modifier-head structure, with each sense organ being modified as the head word.

In the overall representations, including their literal and metaphorical meanings, all four qualia roles manifest in the lexicalization process but with asymmetrical distribution. Telic role is seen as the most prominent in the verb-object structure among the four roles. In other structures, all the four roles contribute to the constructions, especially formal role and constitutive role. Agentive role is seen as the least useful as all the sense organs are natural kinds.

While in the activation of different qualia roles in metaphorical uses of the four sense organs, we have found that constitutive role and agentive role lost their places while formal role and telic role are still relevant to the metaphorization and metonymization processes, with telic role being the most prominent.

This study further confirms that although we use our physical senses and experiences to generate abstract notions, senses are not in symmetrical distributions. They are reflected in the number of extended meanings and compound words as we have demonstrated in this study. It can also be explained by the qualia roles examined here. Constitutive role allows us to form new words with different parts of a sense organ and closely related sense organs; those with more distinct features, in terms of shapes and sizes, are more likely to have stronger lexical productivity than other organs. Moreover, organs with more than one function are also proved to be more productive in yielding metaphors.

The concept of embodied cognition and qualia roles in GLT allows us to study body parts in a more comprehensive way. In addition to locating the abstract notions with our embodied experiences, we can also understand the reason for such locus and identify the patterns of lexicalization and metaphorization.

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