
Biologically Based Merge Wh-questions in the Bamboo Slips of Tao Te Ching

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ABSTRACT

The bamboo slips of Tao Te Ching are the earliest found version of the ancient Chinese classic philosophical works written by Li Er in the Spring Warring State Era. The merge operation of the wh-questions in the bamboo slips of Tao Te Ching is dealt with in this thesis. External merge of the wh-words is contrasted with the internal merge of wh-words in wh-questions and non-wh-words in topic structures of wh-questions in the bamboo slips of Tao Te Ching. The biologically localized merge is further discussed and proven by the experiment on the aphasic patients of the biscuits stolen story.

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1. Introduction

The present research article aims at revealing the biologically oriented merge of the wh-words in wh-questions in the bamboo slips of Tao Te Ching. Tao Te Ching, also called Laozi, as a philosophical classic before Qin Dynasty in ancient China, is the basis of Taoist philosophy written by Li Er. There are many versions of Tao Te Ching, among which the handed-down ancient classic, the silk manuscripts and the bamboo slips are three of the well-known versions (Daoshan, 2016; 2017a; 2017b; 2017c). The bamboo slips of Tao Te Ching, as the earliest ever unearthed version whose academic value is considered as of the greatest, has been very popular. The bamboo slips of Tao Te Ching found in the Chu Dynastic Tomb at Guodian are compiled in three novels of Novel A, Novel B and Novel C (Daoshan, 2016; 2017a; 2017b; 2017c).

The bamboo slips of Tao Te Ching is unearthed from the tomb in Guodian, Jingmen, Hubei Province, China, as the earliest version of Tao Te Ching that we have ever been able to read in Chinese history (Daoshan, 2016; 2017a; 2017b; 2017c). In that version of Tao Te Ching altogether 12 interrogative sentences can be found, none of which is a yes-no question, and none of which carries any question particle at the end of the sentence (Daoshan, 2016; 2017a; 2017b; 2017c). In this thesis the merge operation of the wh-words in the wh-questions in the bamboo slips of Tao Te Ching is dwelled on. External merge of wh-words in the classic philosophical work is the most common property of linguistic operation.

Merge is a biological object, a recursive operation that constitutes the finite but unbounded systems of language which generate an endless number of representations in various fields such as language, art, music, mathematics. merge, as the central neuronal computational operation, is recycled cognitive procedure that is motivated by biological considerations (Boeckx, 2013). Traditionally, merge is defined as: it takes two constituents as input and combines them to form a novel constituent labeled by one of the inputs: $\{\alpha\} + \{\beta\} \rightarrow \{\alpha, \beta\}$ (Chomsky, 1995).

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Merge, as the basic property of language, is defined in the following (Everaet, Huybregts, Chomsky, Berwick, & Bolhuis, 2015; in Daoshan, 2018c): “Merge is a (dyadic) operation that takes two syntactic objects, call them X and Y, and constructs from them a single new syntactic object, call it Z. X, Y can be building blocks that are drawn from the lexicon or previously constructed objects. Put simply, Merge (X, Y) just forms the set containing X and Y. neither X nor Y is modified in the course of the operation Merge”

The above definition also follows Berwick and Chomsky (2016:112): “...we define Merge as a dyadic operation taking two syntactic objects as arguments, for example, two word-like atomic elements from the lexicon, such as read and books, returning the combination of the two as a single new syntactic object, leaving the original syntactic objects untouched. Merge is just set formation. Merge can then apply to this new hierarchically structured syntactic object, yielding, for example, the guy read books. In this way, merge recursively builds an infinite array of hierarchically structured representations.”

Chomsky (2007, 2008, 2013) suggests that merge refers to the basic combine operation that is unbounded, and Boeckx (2013) follows it: merge (simplicitor)=def $\{\alpha, \beta\}$, in which labeling is considered as the result of a Minimal Search algorithm (Chomsky, 2007, 2008, 2013). Berwick and Chomsky (2016: 112) further classifies merge into two types: “there are two logical possibilities for merge when it applies to two syntactic objects X and Y. either X and Y are disjoint, or else one of X or Y is a part of the other. The first case is External Merge (EM), and the second is Internal Merge (IM).”

The two possible logical ways to merge X and Y can also be defined as: “Either X and Y are distinct, and neither one is a term of the other, or else one of the two elements X or Y is a term of the other, where Z is term of W if it is a subset of the other or the subset of a term of the other.” (Everaet, Huybregts, Chomsky, Berwick, & Bolhuis, 2015). Such a syntactic operation is called external merge, when two distinct objects are combined (Daoshan, 2018c). For example, in example (1), merge the syntactic object “he (what)” with another syntactic constituent “huan (illness)”, the new syntactic object is formed into “he huan (what illness)” as illustrated in the following example.

(1) Merge (*he, huan*) => {*he, huan*}

When the syntactic object X is a term of the other Y or the syntactic object Y is a term of X, X and Y are internally merged. For example, in sentence (2) the wh-question as a topic structure “ming yu shen shu qin” is internally merged by “ming yu shen” and “shu qin ming yu shen”.

(2) Merge (*ming yu shen, shu qin ming yu shen*) => {*ming yu shen, shu qin ming yu shen*}

As shown in (2) the internal merge of X and Y contains two copies of X. Only the structurally most prominent copy of the two copies of “ming yu shen” is pronounced or externalized as shown in (3).

(3) *ming yu shen shu qin*

Internal merge is a ubiquitous property of language, sometimes called displacement. Phrases are heard in one place but they are interpreted both there and somewhere else” (Everaet, Huybregts, Chomsky, Berwick, & Bolhuis, 2015). As it will be discussed later, in archaic Chinese internal merge and external merge of wh-words are both commonly seen in the earliest version of Tao Te Ching.

There is biological evidence to show that merge is localized in Brodmann Area 44 (Zaccarella & Friederici, 2017). The Broca’s area contains BA 44, which is responsible for the syntactic module of language. It is found that when the Broca’s area is damaged, patients will suffer from Broca aphasia, whose syntactic ability to use grammatical rules will be affected.

2. Research Methods

As is shown in the thesis, a quantitative research of the wh-questions in the bamboo slips of Tao Te Ching is first carried out, and it is found that in the bamboo slips of Tao Te Ching altogether 12 interrogative sentences can be found, none of which is a yes-no question, and none of which carries any question particle at the end of the sentence (Daoshan, 2017a). The 12 interrogative sentences will be listed in the following section for further discussion.

The merge operation as a basic property of language will be analyzed in the following section in details. External merge of the wh-words can be commonly found in the examples. Internal merge of the non-wh-word topics can also be found in topic structures of the wh-questions, which is quite different from the case in English in which the wh-words are internally merged in wh-questions. Finally, indirect evidence from Broca’s aphasia shows that merge is a basic property of language. The Broca aphasia patients are found to have been greatly

affected in their potential ability to merge two syntactic objects. This can be the evidence that merge is biologically oriented.

3. Results and Discussion

As is found in the bamboo slips of Tao Te Ching, the wh-words in the wh-questions in archaic Chinese are always put before the verb, which is generally called object shift. Object shift is not operated for the checking requirement of Q features of the head C as it is the case in English but for the checking of the [+focus] feature of the head Focus (Daoshan, 2016; 2017a; 2017b; 2017c). The 12 interrogative sentences found in the earliest version of Tao Te Ching are written as below (Daoshan, 2016; 2017a; 2017b; 2017c). In 4 of the wh-questions in the bamboo slips of Tao Te Ching, object shift occurs as shown in (8-10) and (12). In (4-6) the adjunct wh-words “*an* (how)” is fronted before the verb. In (7), (11) and (13-15) the wh-words stay in situ as it is in modern Chinese, while in the topic structure of (13-15), the topic is fronted to the sentence initial position of the left most edge.

- (4) *gu da dao fei, an you renyi?* (Bamboo Slips of Tao Te Ching Novel C)
Ancient great law abandoned how exist benevolence
‘How can benevolence exist when the ancient great law is abandoned?’
- (5) *liuqin bu he, an you xiaoci?* (Bamboo Slips of Tao Te Ching Novel C)
Kinship not harmonious how exist filial-piety
‘How can the filial piety exist without harmonious kinship?’
- (6) *bang jia hunluan, an you zheng chen?* (Bamboo Slips of Tao Te Ching Novel C)
State family dizzy how exist upright official
‘How can upright officials exist if the state and the family is dizzy?’
- (7) *wei yu e, xiangqu ji he?* (Bamboo Slips of Tao Te Ching Novel B)
Respect and vice difference much what
‘What degree is the difference between respect and vice?’
- (8) *mei e, xiangqu he ruo?* (Bamboo Slips of Tao Te Ching Novel B)
Beauty ugliness difference what like
‘What is the difference between beauty and ugliness?’
- (9) *he wei chong rui?* (Bamboo Slips of Tao Te Ching Novel B)
What call favor humiliation
‘What is favor or humiliation?’
- (10) *he wei gui da huan ruo shen?* (Bamboo Slips of Tao Te Ching Novel B)
What mean treasure great illness like body
‘What does it mean by treasuring great illness as you do your body?’
- (11) *ji wu wu shen, huo he huan?* (Bamboo Slips of Tao Te Ching Novel B)
And I no body or what illness
‘If I have no body, what illness do I have?’
- (12) *wu he yi zhi tianxia zhi ran?* (Bamboo Slips of Tao Te Ching Novel B)
I what with known universe of this
‘How do I know that the universe is like this?’
- (13) *ming yu shen shu qin?* (Bamboo Slips of Tao Te Ching Novel A)
Fame and body who dear
‘Which is dearer, fame or body?’
- (14) *shen yu huo shu duo?* (Bamboo Slips of Tao Te Ching Novel A)
Body and goods who more
‘Which is more, body or goods?’
- (15) *de yu wang shu bing?* (Bamboo Slips of Tao Te Ching Novel A)
Gain and loss who harmful
‘Which is more harmful, gain or loss?’

In (4-6) the adjunct wh-word *an* (how) is internally merged with the wh-phrase *you an* (exist how) into {*an, you an*}. As the first copy of the wh-words *an* is the most prominent copy, it is pronounced and the last copy is deleted, and finally the word order of the wh-phrase is formed as *an you*. In (8) the wh-word *he* (what) is

internally merged with the prepositional wh-phrase *ruo he* (like what) into {*he, ruo he*}. As the first copy of the wh-words *he* is the most prominent copy, it is externalized while the second copy is deleted and the wh-phrase *he ruo* is derived. In (9-10) the wh-word *he* (what) is internally merged with the verbal wh-phrase *wei he* (call what) into {*he, wei he*}. As the first copy of the wh-words *he* is the most prominent copy, it is externalized while the second copy is deleted and the wh-phrase *he wei* is formed. In (12) the wh-word *he* (what) is internally merged with the prepositional wh-phrase *yi he* (with what) into {*he, yi he*}. As the first copy of the wh-words *he* is the most prominent copy, it is externalized while the second copy is deleted and the wh-phrase *he yi* is derived. Internal merge of the displaced wh-words is triggered by the requirement of focus feature checking instead of [+WH] feature checking (Daoshan, 2018c). Probably the adjunct wh-word movement in (4-6) is also triggered by the need to check the focus feature located before the verb. Therefore, in archaic Chinese, wh-movement of the wh-words is licensed by focus feature. As the focus of most of the wh-questions is located in front of the verb in archaic Chinese, the wh-object or the wh-subject must move to the front of the verb to check the focus feature.

The wh-words functioned as the subject of the sentence or the modifier of a determiner phrase is not raised to the front of the verb. The wh-subject and the wh-modifier remain in situ. In sentence (7) the wh-word *he* (what/ how) is used as a modifier of the intensifier *ji* (much), and therefore it is not moved to the front of the intensifier. The word *ji* is externally merged with the wh-word *he* and forms a new intensifier phrase *ji he* (how much/ what degree). In (11) the wh-word *he* (what) as the modifier of the determiner D *huan* (illness) is externally merged with the D *huan* (illness) and derives a DP *he huan* (what illness). In sentences (13-15) the wh-word *shu* (who/ which) as the subject of the matrix clause is externally merged respectively with the adjectives of *qin* (dear), *duo* (more) and *bing* (harmful) and forms *shu qin* (who is dear), *shu duo* (which is more) and *shu bing* (which is more harmful).

External merge of the wh-words in the sentence stays in situ and the [+WH] feature of the head C is checked by feature movement of the wh-words to the specifier CP position at the left periphery according to the Wh-feature Attraction Principle (Daoshan, 2016; 2017d; 2018a; 2018b; 2018c). Internal merge of the wh-words in the sentence raises the wh-words to the focus position, leaving the [+WH] feature of the head C unchecked, and the [+WH] feature of the head C is then checked by feature movement of the wh-words to the specifier CP position at the left periphery according to the Wh-feature Attraction Principle (Daoshan, 2016; 2017d; 2018a; 2018b; 2018c).

Another type of internal merge that needs to mention here is the topic movement that takes place in sentences (13-15). In (13) the topic phrase *ming yu shen* is internally merged with the clause *shu qin ming yu shen* and forms the representation {*ming yu shen, shu qin ming yu shen*}. As the first copy of the coordinated phrase *ming yu shen* is syntactically prominent and thus it is externalized or pronounced, and finally the sentence *ming yu shen shu qin* is derived. In (14) the topic phrase *shen yu huo* is internally merged with the clause *shu duo shen yu huo* and forms the representation {*shen yu huo, shu duo shen yu huo*}. As the first copy of the coordinated phrase *shen yu huo* is syntactically prominent and thus it is externalized or pronounced, and finally the sentence *shen yu huo shu duo* is formed. In (15) the topic phrase *de yu wang* is internally merged with the clause *shu bing de yu wang* and forms the representation {*de yu wang, shu bing de yu wang*}. As the first copy of the coordinated phrase *de yu wang* is syntactically prominent and thus it is externalized or pronounced, and finally the sentence *de yu wang shu bing* is derived. Topic movement is triggered to move to the edge at the left periphery by the attraction of the head feature for the requirement to check the strong topic features [+ABOUTNESS] and [+DEFINITENESS] of the head topic (Daoshan, 2019a; 2019b).

As is mentioned in the Introduction, merge is the basic property of language. The basic universal property of language gives rise to the faculty of language. There is biological evidence to show that merge is localized in Brodmann Area 44 (Zaccarella & Friederici, 2017). BA 44, known as pars opercularis (of the inferior frontal gyrus), as a part of the front cortex in the human brain, a subdivision of the cytoarchitecturally defined frontal region of cerebral cortex, is located at anterior to premotor cortex and on the lateral surface, inferior to BA 9. Thus, it is bounded caudally by the inferior precentral sulcus and rostrally by the anterior ascending limb of lateral sulcus. It surrounds the diagonal sulcus. In the depth of the lateral sulcus it borders on the insula. Cytoarchitecturally it is bounded caudally and dorsally by the agranular frontal area 6, dorsally by the granular frontal area 9 and rostrally by the triangular area 45 (Brodmann, 1909). BA 44 is comprised in Broca's area a region involved in syntactic tasks. This is shown by the experiments of the Broca aphasia.

Aphasia does not refer to a total loss of the linguistic ability to speak. What the patients suffer from aphasia are only different aspects of language. Such linguistic disorder is always related with the position of the brain damage. For example, we hear people say: "The bathroom falls into my cellphone" "Today I'd like to invite

you to Goubuli for Pizza” “What day is it on Tuesday?” or “I’m going the buffet for cafeteria” etc (Daoshan, 2018a). Patients whose Broca area is damaged will suffer from Broca aphasia. Broca aphasia sufferers usually have difficulty in speaking and in choice of words, who speak slowly with great difficulty. Broca aphasia usually affects the patient’s ability to use grammatical rules to make sentences. The most notable language feature of Broca aphasia is the telegraphic grammatical dysfunction, often lack of functional words such as articles, prepositions, pronouns and auxiliaries. For example, the Broca aphasia in the biscuit stolen story (Helm-Estabrooks, Fitzpatrick, & Barresi, 1981; Pesetsky, 2016; qtd. in Daoshan, 2018a) is illustrated in (16):

- (16) “Well...see...girl eating no...cookie...no...ah...school no...stool...ah...tip over.....and
ah...cookie jar...ah...kid...no...see...water all over...spilled
over...yuck...Mother...daydreaming.”

In (16) the aphasic patient whose Broca area is damaged clearly reduces his/her ability of merge. First the patient is hesitant to externally merge the verb “see” with the sentence fragment “girl eating no...cookie” into “see...girl eating no...cookie”. The merged sentence lacks a subject in violation of the related projection theory. In the embedded clause, the subject “girl” lacks a head D and the verb is deprived of its ability to check the nominative feature of the subject. Therefore, the sentence is ungrammatical. This story shows that merge is also biologically oriented in the Broca area. If the Broca area in area 44 is damaged, the patient will suffer from a reduction of his/her ability to merge acceptable phrases or sentences.

In the bamboo slips of Tao Te Ching, there are altogether 12 interrogative sentences, all of which are wh-questions without any question particles used at the end of the sentences. In 7 of these wh-questions the wh-words are internally merged, and in 5 of them the wh-words are externally merged. Internal merge of the wh-words in archaic Chinese is quite different from that in English wh-questions. In English the wh-word is moved overtly to the spec of CP position for the checking of the strong [+WH] feature of the head C. Based on the Wh-feature Attraction Principle (Daoshan, 2016; 2017d; 2018a; 2018b; 2018c), the wh-feature of the wh-words in English is moved to the spec CP for feature checking requirement, and the whole wh-word pied pipes with the wh-feature and moves to the spec CP position in the left periphery at the sentence initial position. However, in the internal merged wh-questions, just as it is in the externally merged wh-questions in Chinese, the wh-feature of the wh-words is moved to the spec CP for feature checking requirement, but the whole wh-word does not pied pipe with the wh-feature nor moves to the spec CP position in the left periphery at the sentence initial position. Although feature checking is different in the two different languages, merge is universally localized in Brodmann Area 44. The biologically localized merge exhibits extreme theoretical significance to the universality of the syntactic operation of wh-words in the feature checking requirement of wh-questions. Merge is a biologically based universal operation in syntax (Daoshan, 2018c). The neuronal oscillations in the brain generate the recursive operation of merge.

4. Conclusion

There are 12 wh-questions in the bamboo slips of Tao Te Ching, in which some of the wh-words are externally merged and remain in situ as it is the case in modern Chinese while others are internally merged and moved to spec Focus phrase position although the internal merge of the wh-words is quite different from the internal merge of wh-words in English wh-questions which are moved to spec CP in the sentence initial position. However, the internal merge of the topics in archaic Chinese classic works of Tao Te Ching behaves much like the internal merge of the wh-words in English when both of them are moved to the sentence initial position of CP. As there has been some evidence to show that merge is a biologically based operation universal in syntax (Daoshan, 2018c), whatever it is, internal merge or external merge, merge is localized in Brodmann Area 44. The nature of the merge operation is recursive at the heart of the human language faculty, and merge is brain based (Boeckx, 2013).

According to Hagoort (2005), BA 44/ 45 is responsible for the information integration of syntactic operation, BA 45/ 47 is responsible for the information integration of semantic operation, while BA 44/ 6 is responsible for the information integration of phonological operation. If this observation is on the right tack, it can be concluded that BA 44/ 45 is in charge of merge operation, BA 45/ 47 is in charge of Move F operation, while BA 44/ 6 is in charge of the syntactic phonological processing of the question particles affixed at the end of the sentence in Chinese wh-questions. The modules of syntax, semantics and phonology are localized in different areas of the brain. This also proves that human knowledge of language is biologically modular. The modularity of human knowledge about natural languages is localized in different parts of the brain. The dorsal pathway is more related with syntax and phonology. The processing of affix particles in Chinese wh-questions is related

with the dorsal pathway. The ventral pathway is related with semantic processing. Probably Move F is more related with the ventral pathway. The brain-based modularity of Move F, merge of wh-words, and the phonological insertion after the Spell-out of the question particles at the end of the Chinese wh-questions is localized in the different areas of the brain.

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