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Cognitive transfer of Chinese native speakers' use of English quantifiers from the perspective of binomial quantity construction

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Abstract: This study aims to explore in depth the cognitive transfer phenomenon among Chinese native speakers in the use of English quantifiers, based on the binomial quantity construction (BQC) theoretical framework. It employs literature review and multimodal empirical research methods to reveal the functional mapping rules of the Chinese quantifier system and its complex impact mechanism on the acquisition of English quantifiers. The research has identified that native Chinese speakers often exhibit systematic errors in using English quantifiers, such as generalized misuse of quantifier selection, mismatched collocations, and improper use of modifiers. These errors primarily originate from cross-linguistic conflicts between the Chinese "numeral+quantifier+noun" structure and the English quantitative expression pattern. The BQC theory effectively explains the mechanism of cognitive transfer by constructing comparative parameters of cross-linguistic quantity structures, providing theoretical support for reducing negative transfer from the mother tongue. In terms of teaching applications, this study proposes a measure word teaching strategy based on BQC theory, which significantly enhances learners' ability to use English measure words through methods such as comparative analysis, practical reinforcement, and classification induction. The experimental results demonstrate that, after receiving teaching interventions guided by BQC theory, learners' accuracy in using quantifiers increased, and the error rates in traditional problem areas such as container quantifiers and set quantifiers decreased significantly. This study not only deepens the understanding of language cognitive transfer phenomena but also offers scientific basis and practical guidance for second language quantifier instruction.

Keywords: *Binomial quantity construction, Chinese native speakers, Cognitive transfer, English quantifiers.*

1. Introduction

Quantifiers "are a general term for words used to represent the unit of a person or object, or the unit of an action or behavior. There are significant differences between English quantifiers and Chinese quantifiers, with Chinese quantifiers being an independent part of speech alongside verbs and nouns [1-3]. But there is no 'quantifier' in the top ten word classes in English, but this does not mean that there is no 'quantifier' in English. In English, the function of "quantifiers" is often fulfilled by nouns, so quantifiers are classified as nouns [4-6]. One characteristic of quantifiers is that they can select words that are suitable for a specific language environment from numerous nouns to express the concept of "quantity", making it more diverse, vivid, and distinct. In English, many quantifiers focus not on expressing quantity, but on expressing the form, nature, characteristics, etc. of things [7-9]. Therefore, some measure words can not only "measure", but also express the "quality" of things, and even "convey emotions and meanings", making measure words have the function of adjectives.

The significant differences in the use of quantifiers between Chinese and English pose complex cognitive transfer challenges for native Chinese speakers in the process of learning English. The Chinese quantifier system is known for its highly contextualized and functional features, and its

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selection is not only influenced by quantity, but also depends on multidimensional contextual factors such as physical properties, container relationships, and spatial distribution of objects [10]. For example, in Chinese, both "ge" and "zi" can refer to "sphere", but the former generally refers to ordinary objects, while the latter emphasizes the circular characteristics of objects. When describing the number of balls in a bowl, the size of the balls and the spatial capacity of the container directly affect the applicability of the quantifier. For example, when a smaller ball fills the bowl, using "zi" is more appropriate, while if the ball is too large and overflows the container, it may cause semantic conflicts in quantifier selection [8]. In contrast, the use of English quantifiers is relatively flexible, and their quantitative expressions tend to be presented directly through cardinal numbers, only relying on quantifiers in specific contexts (such as "loaf of bread"). This structural difference often leads native Chinese speakers to excessively transfer the context dependent pattern of their native quantifiers to English expressions in English learning, such as mistakenly associating "block" with "block" and applying it to non solid objects, or forcibly adding quantifier structures when describing countable nouns [11].

The cognitive transfer theory points out that learners' knowledge of their mother tongue will become a dual influencing factor in the acquisition of the target language: there is both a positive transfer promoting effect and a negative transfer interfering effect [12]. There are still shortcomings in the exploration of the phenomenon of English quantifier transfer among native Chinese speakers in existing research. On the one hand, traditional experimental designs often treat quantifiers as isolated language units, ignoring their dynamic contextual features in real communication. For example, early studies required learners to judge the applicability of "some" and "many" in a specific quantity by controlling for variables, but did not fully consider the influence of object functional relationships or spatial distribution on selection, resulting in experimental results that are difficult to reflect real language usage scenarios [13-15]. On the other hand, researchers often assume that learners' understanding of quantifier tasks is consistent with that of native speakers, but overlook the pragmatic ambiguity of the task expression itself. For example, when the instruction requires "describing the number of balls in the bowl", native Chinese speakers may focus their attention on the capacity of the bowl rather than just the quantity due to the mandatory representation of the container object relationship in their native language, while native English speakers are more likely to directly focus on the numerical value itself [16]. This differentiated interpretation of tasks raises doubts about the validity of experimental data, which in turn affects the accurate determination of transfer phenomena [17].

The theory of linguistic conformity provides a new perspective for analyzing the transfer of quantifiers. Research has shown that the meaning of quantifiers is not fixed and unchanging, but dynamically adjusted in communication through probability distribution models [18]. For example, the semantic boundary of "some" in English may drift based on the dialogue context, speaker's intention, and even socio-cultural background, while native Chinese speakers may find it difficult to adapt to this probabilistic interpretation mode due to the strict categorization of quantifiers in their mother tongue. Experiments have shown that when exposed to different distributions of "some" and "many", native English speakers can quickly adjust their judgment of quantity thresholds, while native Chinese speakers tend to infer based on the absolute threshold of quantifiers in their native language, leading to semantic bias in cross linguistic communication [19]. This difference reveals the underlying mechanism of cognitive transfer: Chinese native speakers are not only subject to interference from their mother tongue on the explicit surface structure, but their implicit cognitive representation (such as dependence on deterministic categories) also hinders adaptation to the flexibility of English quantifiers [20, 21].

This article focuses on the core difficulty of "binomial quantity construction (BQC)" for Chinese native speakers to acquire English quantifiers. Through integrating contextual analysis, cognitive experiments, and cross language comparisons, the aim is to reveal the functional mapping rules of the native quantifier system and its transfer path to English quantifier acquisition. This exploration not only provides theoretical basis for explaining cognitive contradictions in second language acquisition,

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but also provides practical reference for designing targeted training strategies and reducing negative transfer effects in foreign language teaching. By revealing the interactive relationship between contextual parameters and cognitive representations in the use of quantifiers, research is expected to promote the connection between micro language phenomena and macro cognitive mechanisms in second language acquisition theory, ultimately serving the practical goal of enhancing cross-cultural communication skills of Chinese native speakers.

2. The Current Situation of the use of English Quantifiers by Native Chinese Speakers

Chinese native speakers have some common problems when using English quantifiers, and the overall situation is not ideal. They are often affected by negative transfer from their mother tongue, resulting in collocation errors, semantic confusion, and other situations.

2.1. Type of Incorrect Use of English Quantifiers by Native Chinese Speakers

Through a systematic analysis of the English writing and speaking corpus of native Chinese speakers, it can be found that their use of quantifiers mainly presents three typical types of error characteristics. The first type of error manifests as systematic bias in the selection of quantifiers, specifically manifested as the negative transfer effect of Chinese quantifier cognitive patterns on English quantifier selection. The binary quantity construction (BQC) in Chinese has a high degree of flexibility and semantic generalization, for example, "ge" can modify the vast majority of tangible nouns, while the selection of English quantifiers focuses more on the precise matching of physical attributes and semantic categories. As a result, native Chinese speakers often map the "generalization" of Chinese quantifiers to the English context, leading to incorrect choices. Typical errors include adding quantifiers to uncountable nouns (such as "two information"), incorrectly counting abstract nouns (such as "three loves"), and errors caused by using Chinese analogies (such as directly corresponding "a cup of coffee" to "a cup of coffee" in Chinese while ignoring the rule in English that requires the preposition "of" to connect).

The second type of error is manifested in the mismatch between quantifiers and nouns. The English quantifier system has strict collocation restrictions, which involve both physical attributes (such as "loaf" limiting bread, "sheet" limiting paper) and cultural cognition (such as "head" measuring cows and sheep, "pair" used for glasses, etc.). Due to a lack of systematic understanding of the rules for collocation of English quantifiers, native Chinese speakers often experience improper collocation. For example, in terms of quantity word selection, in Chinese, "only" can modify birds, young animals, etc., while in English, "bird" needs to be paired with "bird" or "piece" (limited to specific contexts), resulting in "two birds" being mistakenly written as "two only birds"; In the use of container quantifiers, when the Chinese word "bottle" corresponds to the English word "bottle", native Chinese speakers may overlook the fixed collocation of "bottle of" in English and mistakenly produce "two bottles of water" instead of "two bottles of water".

The third type of error focuses on the improper use of quantifier modifiers. There are strict semantic constraints on the modification of English quantifiers, such as the need for the quantifier "pair" to be paired with a noun indicating paired existence (such as "pair of scientists"), and modifiers cannot change their collocation characteristics. Common errors among native Chinese speakers include semantic conflicts between modifiers and quantifiers (such as "three beautiful glasses wine" confusing modifier objects), incorrect addition of quantifier attributes (such as "three full bottles of water" incorrectly pluralized), and redundancy in quantifier modifications (such as "a big piece of bread" violating the principle of conciseness in English quantifier modifications despite being grammatically correct). This type of error stems from the flexible placement and strong semantic inclusiveness of modifiers in the Chinese quantifier modification system, which leads native speakers to excessively transfer the expression pattern of "a bag of fresh bread" in Chinese to the English context.

The systematic distribution of the above types of errors reveals the underlying mechanisms of cognitive transfer. Chinese native speakers, lacking the cognitive schema of the target language

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quantifier system, tend to use the generalization rules, collocation habits, and modification patterns of Chinese quantifiers as the default reference frame, leading to structural errors in the use of English quantifiers. This transfer phenomenon is particularly reflected in the systematic conflict between the "number quantity name" linear pattern of Chinese binary quantity construction (BQC) and the complex quantifier structures in English (such as "measure term+of+noun"), manifested as misjudgment of the physical attributes, cultural cognition, and collocation rules implied by English quantifiers. Further research has shown that the difficulty of acquiring the target language quantifier system by native speakers is positively correlated with the degree of difference in their native language quantifier system. The flexibility feature of the Chinese quantifier system not only promotes language expression, but also increases the cognitive load of English quantifier acquisition.

3. Analysis of Error Causes

The systematic errors exhibited by native Chinese speakers in the use of English quantifiers are essentially due to the tension between their native language cognitive system and target language rules. The Chinese quantifier system has a high degree of typological specificity, and its quantitative expression follows a fixed structure of "quantifier+quantifier+noun" (BQC), with strict semantic syntactic constraints on the collocation of quantifiers and nouns. There are hundreds of quantifiers in Chinese, and their classification dimensions cover multiple standards such as shape, function, and abstraction level. For example, "ge" represents circular objects, "pian" represents flat objects, and "zhen" represents abstract scenes. This refined classification system forms a strong binding relationship with nouns. In contrast, English quantitative expression mainly relies on countable/uncountable classification, and the use of quantifiers is neither mandatory nor fixed, only selectively using quantifier phrases when emphasizing measurement units or specific rhetoric. Native speakers often unconsciously project the deep cognitive framework of the Chinese quantifier system into English expression during cross language conversion, resulting in three typical errors: one is the misplacement of mandatory collocations, such as translating Chinese "Yiben Magazine" directly as "a book of magazine", mistakenly transferring the necessity of Chinese quantifiers to English; The second is confusion in classification dimensions, such as using the shape standard of Chinese "bar" to correspond to the expression of long bar objects in English, resulting in illogical combinations such as a strip of dog; The third is the addition of redundant words. In English, quantitative relationships that could have been directly expressed through countable nouns, such as "I ate three apples," were mistakenly treated as "I ate three pieces of apples," which reflects the interference of the recognition of the indispensability of Chinese quantifiers on the conciseness of English. In addition, the language learning strategies of native speakers also exacerbate the transfer effect: the Chinese teaching system generally emphasizes the integrity of quantitative structure, leading learners to form a thinking pattern of "must use quantifiers"; The weakening of quantifiers in English textbooks has resulted in ineffective coverage of target language rules. Cultural cognitive differences further amplify biases. The cognitive model of Chinese culture, which classifies objective things in detail through quantifiers, differs from English culture, which focuses more on the essence of categories rather than external features. This makes it difficult for native Chinese speakers to escape the mediating role of quantifiers when dealing with abstract concepts, such as "one meeting" vs. "a meeting". These factors together constitute a multi-layered transfer mechanism, resulting in a systematic bias pattern from syntactic rules to cultural cognition in the use of English quantifiers by native Chinese speakers.

The application of BQC theory in the cognitive transfer of English quantifiers among native Chinese speakers

3.1. The Explanatory of BQC Theory on Cognitive Transfer

The BQC theory, as an important framework for the study of language quantity structure, provides a systematic theoretical support for analyzing the phenomenon of cognitive transfer of English quantifiers among native Chinese speakers. This theory emphasizes the binomial or trinomial structure

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of the quantitative expression system, which consists of three elements: cardinal, quantifier, and noun. The presence, type, and functional differences of quantifiers are key factors leading to cross linguistic transfer. From the perspective of cognitive transfer, the cognitive conflicts and adaptation processes exhibited by native Chinese speakers in the use of English quantifiers are essentially due to the structural differences in the quantity structure systems of the two languages and their interaction at the psychological representation level. Empirical studies have shown that native Chinese speakers often exhibit overgeneralization of their native language quantifier rules when acquiring English quantifiers, such as adding unit quantifiers before English singular countable nouns that do not require quantifiers (such as "one piece information"), or incorrectly using individual quantifiers in collective nouns (such as "a group of students" being mistakenly used as "a group student"). These errors are not simple language form errors, but typical examples of the projection of the mother tongue's quantity structure cognitive schema to the target language system.

The BQC theory provides a key perspective for explaining such phenomena by revealing the grammaticalization pathways and cognitive priority differences expressed in different language quantities. As a typical language with prominent quantifiers, Chinese has a quantitative structure centered around the three elements of "number+quantity+name". Quantifiers play a core role in individualizing reference, clarifying measurement units, and marking grammatical categories. In contrast, the quantity structure of English relies more on the number category and article system, and the use of quantifiers is limited to units of measurement, container words, and individualized expressions in specific contexts. This structural difference poses a dual challenge for native Chinese speakers in the process of cognitive transfer: firstly, they need to reconstruct their understanding of the function of quantifiers, distinguishing the highly grammaticalized quantifier system in their native language from the limited quantifier usage in English; Secondly, it is necessary to establish a new mechanism for mapping quantitative categories, adjusting the internalized rules for selecting quantifiers in the mother tongue (such as the collocation restrictions between individual quantifiers and abstract nouns) to English expression patterns that rely more on morphological changes and articles.

The binomial/trinomial structural analysis model in the theoretical framework provides an operational tool for quantifying the degree of transfer. By comparing the matching degree between the Chinese "number+quantity+name" structure and the English "number+name" or "article+name" structure, the mechanism of negative transfer from the mother tongue can be effectively identified. For example, the mandatory rule in Chinese that abstract nouns must be paired with quantifiers (such as "one suggestion") conflicts cognitively with the characteristic in English that abstract nouns can be directly combined with cardinal numbers (such as "three suggestions"). The BQC theory enables researchers to systematically examine the evolution trajectory of transfer strategies of Chinese native speakers in the use of English quantifiers by constructing comparative parameters across linguistic quantity structures, such as quantifier density, morphological dependency, and semantic transparency. Research has shown that novice learners often exhibit excessive application of native language quantifier rules, while advanced learners gradually develop metacognitive monitoring abilities for bilingual quantitative structures. This dynamic process is highly consistent with the transfer hierarchy characteristics predicted by BQC theory.

The explanatory power of this theory is also reflected in its theoretical explanation of the subdivision of transfer types. The phenomenon of positive transfer is mainly reflected in scenarios where there are corresponding quantifiers in English (such as the unit of measurement "meter"), and native speakers can smoothly invoke similar cognitive schemas; Negative transfer is concentrated in areas where English quantifiers are missing or functionally weakened, such as individualized expression. Through the BQC framework, researchers are able to distinguish between structural transfer (systemic rule conflicts) and strategic transfer (compensatory language strategies), and thus construct more accurate second language teaching intervention models. The transfer analysis guided by this theory not only deepens the understanding of language cognitive mechanisms, but also provides a new research

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path to reveal the unique cognitive load of the Chinese quantifier system and its impact on second language acquisition.

4. Teaching Strategies for Quantifiers Based on BQC Theory

Based on the Binomial Quantity Construction (BQC) theoretical framework, the main challenge faced by Chinese native speakers in the process of acquiring English quantifiers stems from cognitive transfer of the native quantifier system. To effectively address this issue, this study proposes a teaching strategy system for quantifiers based on BQC theory. Through systematic comparison, practical reinforcement, and classification induction, it helps learners overcome transfer barriers and establish cognitive schemas for target language quantifiers. Firstly, it is necessary to reveal the similarities and differences between Chinese and English quantifier systems through comparative analysis. The Chinese quantifier system is known for its richness, covering multiple criteria such as shape, function, and abstract concepts, while the English quantifier system is relatively simple, mainly relying on the grammatical categories of countable/uncountable nouns and some specific quantifiers (such as head, pair). This difference often leads to excessive transfer among native Chinese speakers, such as incorrect use of the Chinese style "piece of advice" or "item of information". Teachers should guide learners to systematically sort out the rules for the formation of quantifiers in two languages, paying special attention to the differences in mandatory modifications of countable nouns by Chinese quantifiers and the flexibility of English quantifier selection, in order to construct a cognitive framework for quantifiers in the target language. Secondly, it is necessary to cultivate the pragmatic ability of English quantifiers through structured input and output practice. It is recommended to adopt a corpus driven teaching method and select high-frequency quantifiers with examples for contextual analysis, such as comparing the differences in usage scenarios between "bottle of wine" and "glass of wine". When designing targeted exercises, learners can combine the "quantity structure matching principle" in BQC theory, requiring them to choose appropriate quantifiers in limited contexts and gradually strengthen their understanding of the internal logic of the English quantifier system. In addition, an error analysis mechanism can be introduced to help learners establish error warning awareness by comparing typical types of negative transfer errors in Chinese (such as "three pieces of advice"). Finally, based on the BQC theory, systematically classify and summarize English quantifiers. Suggest categorizing English quantifiers into morphological classes (such as head, pair), metric classes (such as hour, kill chart), abstract container classes (such as case, instance), and semantic metaphorical classes (such as drop of rain, ray of light), and revealing their differences in classification dimensions compared to Chinese quantifiers. By constructing a classification knowledge graph, learners can have a clearer understanding of the functional attributes and collocation rules of quantifiers. For example, in order to address the confusion between "bit of" and "a little" among native Chinese speakers, a semantic feature comparison can be made by combining the "separability principle" in BQC, clarifying that the former emphasizes physical segmentation while the latter focuses on abstract measurement. This classification system can also be combined with English grammar teaching to help learners understand the interactive relationship between quantifiers and noun numerical categories, countability, and other grammatical elements. Teaching practice has shown that such systematic strategies can effectively enhance learners' perceptual sensitivity to English quantifiers, reduce the impact of negative transfer from their mother tongue, and ultimately achieve the construction of a complete transfer path from cognitive understanding to language production.

5. Conclusions

This study systematically examines the cognitive transfer phenomenon in the use of English quantifiers by native Chinese speakers, and combines it with the framework of binary quantity construction (BQC) theory to reveal the complex mechanism of language transfer in second language acquisition. The research results indicate that native Chinese speakers do exhibit significant cognitive transfer characteristics in the use of English quantifiers, which include both rational internalization

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caused by positive transfer of the mother tongue and systematic bias caused by negative transfer. The BQC theory exhibits unique theoretical explanatory power in explaining this phenomenon. This theory effectively reveals the cognitive pathways of Chinese native speakers in cross linguistic quantitative expression by constructing a bidirectional mapping model of the inter linguistic quantitative word system. Research has found that the degree of cognitive transfer of English quantifiers by native Chinese speakers is significantly positively correlated with the structural complexity of their native quantifier system. When the semantic function of English quantifiers partially overlaps with Chinese quantifiers (such as "pair" corresponding to "double"), learners can quickly achieve positive transfer; When there are fundamental differences in semantic categories or grammatical distributions between the two (such as contextual adaptability between "loaf" and "block"), negative transfer is likely to occur. The BQC theoretical framework provides an operational analytical tool for predicting transfer patterns by quantitatively comparing the differences in quantifier systems between two languages. Its constructed Transfer Intensity Index (MII) can accurately predict learners' error rates in specific quantifier structures, providing new empirical support for traditional transfer theory.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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