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Original Paper

The Acquisition of Count-mass Distinction of English Flexible Nouns by Chinese-Speaking Learners of English

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Abstract

In recent years, count-mass distinction has attracted increasing attention from both domestic and overseas researchers. This study investigated the acquisition of English count-mass distinction by Chinese-speaking learners of English, focusing on flexible nouns (e.g., stone/stones, cake/cakes). A Quantity Judgment Task (QJT) was utilized in which learners judged the one with a greater number of entities as more than the one with greater volume or vice versa.

Results showed that Chinese college English learners correctly based judgments on number (e.g., judging three small apples as more than one big apple, or three small glasses of juice as more than one big glass of juice) for count nouns and object-mass nouns and on volume (e.g., judging one big apple as more than three small apples, or one big glass of juice as more than three small glasses of juice) for substance-mass nouns. In terms of nouns that can either be count or mass (flexible nouns, e.g., stone/stones), learners had difficulty using count-mass cues to disambiguate the meanings.

Keywords

Count-mass distinction, flexible nouns, Chinese-speaking learners of English

1. Introduction

1.1 Research Background

This study focuses on Chinese-speaking learners' acquisition of English count-mass distinction. This chapter of the paper introduces count-mass distinction in English and Chinese, and previous studies and findings about syntax-semantic mappings in count-mass distinction.

The differences between count nouns and mass nouns largely consist in the ontological properties of the nouns' references. Generally, count nouns refer to discrete and individualized objects (e.g., apple) whereas mass nouns refer to homogeneous substance.

1.1.1 Count-mass Distinction in English

In English, count nouns can be pluralized by markers (e.g., apples) whereas mass nouns cannot (*waters). The marker -s shows that the noun is countable.

Nouns can be divided into four types according to their countability: count nouns; substance-mass nouns; object-mass nouns; flexible nouns. Count nouns refer to individualized entities, and can be marked by a plural morpheme (trees; boxes). They can also be modified by numerals or certain distinct quantifiers (four apples; few boxes). When a numeral occurs, readers can easily know the exact quantity of the certain things. Moreover, singular count nouns need a determiner (a; the). Substance-mass nouns generally denote substances, and cannot be marked by a plural morpheme (*milks; *waters), nor can they be modified by a numeral (*two milks). Like count nouns, they can also be modified by certain distinct quantifiers (little water). Unlike count nouns, they can occur without a determiner. Object-mass nouns are similar to substance-mass nouns in morphosyntactic aspect. Object-mass nouns denote entities which are as object-like (furniture; jewelry) as the entities referred to by count nouns. Object-mass nouns are syntactically mass, and Quine's (1960) claimed that mass nouns cannot be individuated.

There is furniture in the room.

*There are (two) furnitures in the room.

Flexible nouns such as stone, string, cake can be interpreted as count or mass, depending on the context. Flexible nouns in count context (more stones) denote individualized entities; whereas in mass context (stone), they refer to substance. For example:

Andy has more stones than Susan.

Andy has more stone than Susan.

The first sentence can be interpreted as "Andy has more pieces of stone than Susan"; whereas the second sentence means that the volume of Andy's stone is larger than the volume of Susan's.

One aspect worth mentioning about flexible nouns like stone(s), rope(s), and pizza(s) is that their referents in real life are further divided to be used: rope is often cut into shorter lengths to fit into use, and pizza is also cut into pieces to be shared among a number of people (Chierchia, 2010).

1.1.2 Count-mass Distinction in Chinese

In comparison, Chinese differs from English mainly in two aspects.

Firstly, Chinese is not considered to have a plural marker (only has a restricted plural marker -men + human nouns). Usually a bare nominal is used, and the bare nominal can be interpreted as either singular or plural if there is no context. (Tang et al., 2021)

gou zai huayuan

dog in garden

"The dog is in the garden." / "The dogs are in the garden."

Secondly, Chinese has a classifier system. In Chinese, numerals cannot directly modify nouns (*san pingguo, three apples) and classifiers (CLs) are required (san CL-ge pingguo, three apples). According

to Cheng and Sybesma (1999), Chinese has two types of classifiers: counting classifiers and measuring classifiers. Counting classifiers name the natural unit of counting, while measuring classifiers specify a unit of measuring.

san ge pingguo

three CL apple

“three apples”

The count noun pingguo “apple” combines with a counting classifier ge, naming the natural individuated unit of apples.

san bei shui

three cup water

“three cups of water”

The mass noun shui “water” combines with a measuring classifier bei.

san che pingguo

three wagons apple

“three wagons of apple”

Although a count noun like pingguo “apple” has its natural unit, it can also combine with a measuring classifier so that the quantity is re-specified by a measuring unit che “wagon”.

It can be seen form above that, mass nouns can only take measuring classifiers; count nouns can take counting classifiers, showing the exact number of individuals, or measuring classifiers, providing information about the quantity as measured by units, but not exactly how many individuals there are.

1.1.3 Syntax-semantic Mappings in Count-mass Distinction

Previous studies on count-mass distinction suggest two distinct possibilities. One possibility is that, the acquisition of count-mass grammar causes children to know that individual objects are differentiated and quantified according to number, while substances like “water” are not. (Quine, 1960)

Another possibility is that both count nouns and mass nouns can refer to sets of individuals. Researches have provided evidence for this opinion. Barner and Snedeker (2005) developed Quantity Judgment Task (QJT) where participants looked at pictures of objects or substances and were asked to decide “Who has more NP(s)?” All pictures of the experiment showed a large objects or portion of stuff and some small objects or tiny portions of stuff at the same time. Accordingly, participants responded by attending in the pictures to either the numbers of things or to the volume or comparative size of bits of substance. English speakers consistently quantified over number (choose the one with a greater number of entities over the one with greater volume, e.g., choose three small apples as more than one big apple) when they heard nouns with plural-marking or object-mass nouns (Who has more shoes, count noun; Who has more strings, count-form flexible noun; Who has more furniture, object-mass noun), and they tended to quantify over volume (choose the one with greater volume over the one with a greater number of entities, e.g., choose one big apple as more than three small apples) for substance-mass nouns or mass-form flexible nouns (Who has more toothpaste, substance-mass noun; Who has more

string, mass-form flexible noun).

With respect to classifier languages, it is found that Mandarin Chinese speakers had problems in making count-mass distinction especially when they met flexible nouns (shitou, "stone(s)") (Lin & Schaeffer, 2018; Cheung et al., 2012); and the mainly used language (Chinese/English) in daily life could affect English-Chinese bilinguals' count-mass distinction of flexible nouns (Yin & O'Brien, 2018).

In aspect of Second Language Acquisition, previous studies showed that classifier languages (e.g., Japanese, Korean) L1, English L2 would not notice whether flexible nouns in English were with plural markers, and could not correctly interpret meanings of flexible nouns in different contexts (count/mass) (Inagaki, 2014; MacDonald et al., 2018).

Because in classifier languages, no such syntax-semantic mappings in count-mass distinction like English is made. And interpretation of nouns' countability has proven different between count-mass languages (English and other Indo-European languages) and classifier languages (e.g., Chinese, Japanese, Korean). That is to say, the acquisition of the count-mass distinction in English is challenging for second language (L2) learners, especially when the first language (L1) is a classifier language. Therefore, the present study uses the method QJT, trying to find out whether Chinese-speaking English learners can make correct count-mass distinction in English.

1.2 Significance of the Study

This study discusses whether Mandarin Chinese L1, English L2 can make count-mass distinction in English, especially flexible nouns. For Chinese students, this is a key point when they learn English, and in the field of Second Language Acquisition, whether learners can correctly tell the semantic consequences of certain morphosyntactic material is an important question that we should pay attention to. In this study, this is reflected in whether learners can tell the meanings of nouns in count/mass form. Moreover, the present study has practical teaching value. English teachers can strengthen students' training on count-mass distinction and help students understand meanings of nouns better.

1.3 Structure of the Thesis

This paper consists of five parts. This part introduces the background, significance and structure of the study. The second part is the literature review, introducing theories and previous empirical findings relevant to this study. The third part is methodology part, including the research question and the procedure and details of the experiment. The fourth part shows the results, analyzes the experiment data and makes a discussion of possible reasons for these results. The last part is a conclusion of the main findings.

2. Literature Review

In this chapter, previous studies on L1/ L2 acquisition of count-mass distinction, which are related to the present study, will be discussed.

2.1 L1 Acquisition of Count-mass Distinction

Studies have found that before children master the count-mass distinction, they already have basic knowledge of the physical world and objects filling in it. Even linguistically naïve children can individuate and trace the identity of objects, and their treatment of non-solid substances is different (Huntley-Fenner, Carey, & Solimando, 2002). This indicates that, "object" and "substance" may help children to build the concept of "count" and "mass". And experiments suggest that children learning language parse words that refer to individuals as count nouns unless given morpho-syntactic and referential evidence to the contrary, in which case object-mass nouns are acquired (Barner & Snedeker, 2005).

Barner and Snedeker's (2005) study revealed how English speakers (English L1) interpret count and mass nouns. Quantity Judgment Task (QJT) was applied. In this task, participants should look at some pictures of objects or substances and will be asked "Who has more NP(s)?" These pictures showed a large objects or portion of substance and some small objects or tiny portions of substance at the same time (For example, two big apples on the left and three small apples on the right at the same time). Accordingly, participants should make a decision and choose which one is right in their opinion. Nearly all English speakers quantified over number (choose the one with a greater number of entities over the one with greater volume, e.g., choose three small apples as more than one big apple) when they heard count nouns and object-mass nouns (*Who has more **shoes***; *Who has more **furniture***), and over volume (choose the one with greater volume over the one with a greater number of entities, e.g., choose one big apple as more than three small apples) for substance-mass nouns (*Who has more **toothpaste***). It proves that count nouns and object-mass nouns are mapped to individualized things while substance-mass nouns are mapped to substance which cannot be counted clearly. In terms of flexible nouns, if the noun is shown with the plural marker and is like a count noun, native English speakers will quantify over number; if it is shown without the plural marker and is like a substance-mass noun, they probably quantify over volume. With respect to flexible nouns, count context suggests that the interpretation should be based on individual entities (e.g., rocks), while the mass context suggests that the interpretation should be based on substance (e.g., rock). The three experiments (Barner & Snedeker, 2005) proved that participants based their judgments not only on the ontological categories of stimuli, but also on grammatical information.

On the other hand, Chinese is a classifier language and no such distinction exists. Based on QJT (Barner & Snedeker, 2005), Lin and Schaeffer (2018) tested 27 Chinese native speakers and found that participants quantified based on number (choose the one with a greater number of entities over the one with greater volume) for count nouns (77%, adult) and for object-mass nouns (98%, adult), while tended to quantify over volume (choose the one with greater volume over the one with a greater number of entities) when they came across a substance-mass noun (92%, adult) and a flexible noun (82%, adult). Because of the lack of direct plural marker, whether a noun is countable is not as clear as in English. Therefore, there were still a few participants judging over volume for count nouns. In

addition, because of the lack of plural marker, flexible nouns in Chinese always appear without any marker just as English flexible nouns in mass context, which lead to the majority of Chinese L1 quantifying over volume for flexible nouns.

Furthermore, Cheung et al. (2012) found that the absence/presence of classifiers (CLs) in Chinese would affect judgments.

Shei you gengduo de shitou. (Without classifier)

"Who has more stone(s)."

*Shei you gengduo **kuai** shitou. (With classifier)*

"Who has more pieces of stones."

If the participants were asked the second question, they would comparatively tend to quantify over number (choose the one with a greater number of entities over the one with greater volume). This is because the classifier in Chinese can have the function of indicating nouns' countability. For example, when a Chinese hears "*san **CL-kuai** shitou*", they will naturally interpret this as three individualized stones, which is no doubt countable.

2.2 L2 Acquisition of Count-mass Distinction

Japanese and Korean are both classifier languages. There are previous studies on how native speakers of classifier languages make count-mass distinction in English, which are associated to the present study.

Inagaki (2014) conducted a study on the acquisition of English count-mass distinction of Japanese L1. 39 participants (Japanese L1, English L2) were involved. Based on QJT (Barner & Snedeker, 2005), the study included four types of nouns: count nouns, substance-mass nouns, object-mass nouns and flexible nouns. Inagaki (2014) contained four flexible nouns which were presented in both count form (***more strings***) and mass form (***more string***). The flexible nouns were ***stone(s)***, ***string(s)***, ***chocolate(s)*** and ***paper(s)***.

The result indicated that 52.6% of "Japanese L1, English L2" participants would choose based on number (choose the one with a greater number of entities over the one with greater volume) when the flexible nouns were asked in count form (Who has more string***s***?). In conclusion, Japanese L1, English L2 did count-mass distinction well for count and object-mass nouns (over number) and for substance-mass nouns (over volume), while for nouns that can be either count or mass in English, they failed to judge according to the mass-count syntax in which the words appeared. This showed that Japanese learners have difficulty using count-mass syntactic clues to disambiguate the meanings of flexible nouns.

MacDonald et al. (2018) studied the acquisition of plural nouns by native Korean English learners and tested three groups of participants: English L1, Korean L1 and English L2 (Korean L1). Similarly, the method of the experiment was QJT (Barner & Snedeker, 2005) and this task had 40 stimuli. Different to Inagaki (2014), instead of reading the question, participants listened to the question "Who has more X". If it is a flexible noun, half of the questions were read in count context (***Who has more stones?***) and the

other half in mass context (***Who has more stone?***).

The results showed that in English L1 group, 100% of the participants quantified over number (choose the one with a greater number of entities over the one with greater volume) if they heard count nouns, 1% if substance-mass nouns, 99% if object-mass nouns. In flexible nouns, when asked in count context, 96% of the participants would quantify over number (choose the one with a greater number of entities over the one with greater volume); when asked in mass context, 94% would quantify over volume (choose the one with greater volume over the one with a greater number of entities). In Korean L1 group, the questions were asked in Korean and the proportions of the participants who quantify over number were as follows: count nouns 99%; substance-mass nouns 2%; object-mass nouns 98%; flexible nouns 45% (Korean is a classifier language, lacking direct plural markers, so all the questions were asked without any markers). It is shown that native Korean speakers tend to use semantic rather than morphological and syntactic clues to make judgments and interpret sentences. In Korean L1, English L2 group, the proportion of the participants who judged the one with a greater number of entities as more than the one with greater volume was as follows: count nouns 99%; substance-mass nouns 1%; object-mass nouns 98%. If flexible nouns were asked in count form, 51% of participants quantified over number; When in mass form, 45% quantified over number. English L2 seemed to neglect the plural marker of count-form flexible nouns. As to flexible nouns, the number of participants who quantified over number was similar to those who quantified over volume, indicating that English L2 were affected by their mother tongue and had lower sensitivity to plural markers in English.

Yin and O'Brien (2018) studied the sensitivity of English and Chinese bilinguals aged 11 and 14 to the semantics of English nouns. The participants were divided into six groups: Chinese dominant, 11 year old; Balanced, 11 year old; English dominant, 11 year old; Chinese dominant, 14 year old; Balanced, 14 year old; English dominant, 14 year old. In terms of flexible nouns, about 60% of Chinese dominant/Balanced and 70% of English dominant made judgments based on number when the flexible nouns were in the count context; 40% of Chinese dominant/Balanced and 30% of English dominant made judgments based on number when the nouns were in the mass context.

It can be concluded that there is significant difference between the Chinese dominant/Balanced group and English dominant group. English dominant bilinguals have more chances to expose themselves to the English environment and use English in their daily life, and they have more exposure to different forms of flexible nouns (rock/rocks), so that their proficiency of English is higher. At the meantime, proficiency is also differed in L2 learners; thus, the present study also tries to find out whether proficiency of English can affect learners' judgments.

2.3 Motivation for the Present Study

Barner and Snedeker (2005) research revealed how speakers of English interpret count and mass nouns; Inagaki (2014) and MacDonald et al. (2018) investigated how native speakers of Japanese and Korean, classifier languages, make judgments on flexible nouns in L2 English. Chinese is also a classifier language; therefore, the present study tries to give possible answers to the following two questions.

First, whether Chinese-speaking English learners are able to make count-mass distinction, especially the distinction of flexible nouns in different contexts (count/mass)? Second, would proficiency affect their distinction?

3. Method

3.1 Research Questions

This study aims to answer the following two questions:

First, whether English learners (Chinese L1) are able to make count-mass distinction and understand the meanings of flexible nouns in English?

Second, can English proficiency affect learners' count-mass distinction?

3.2 Participants

A total of 40 participants studying at universities in Jiangsu Province, China participated in this study. Among them, the youngest is 18 years old and the oldest is 21 years old. They were all English learners and had been studying English in class for 9-12 years since they were in the third grade in primary school, and noun of them had experiences of living abroad.

All participants did the LexTALE test: they saw strings of letters and decided whether they were existing English words or not. 40 participants were divided into two groups according to their scores of the LexTALE test, and details of the two groups is shown in Table 1. (Above 60.25: Advanced; Below 60.25: Intermediate)

Table 1. Participants' Background Information

Groups	**Gender**	**Mean AoT (range)**	**Mean LexTALE Score (range)**
Advanced (N=20)	*Male(n=5)*	18.9 (18-20)	76.75 (65.25-90)
	Female(n=15)	18.7 (18-19)	68.25 (60.5-82.5)
Intermediate (N=20)	*Male(n=6)*	19.7 (19-21)	54.25 (48.75-58.25)
	Female(n=14)	18.6 (18-19)	56.75 (52.25-60)

Note. AoT= age at time of test.

3.3 Materials

The experiment included 48 items: 24 target questions and 24 fillers (Appendix A). The target questions covered 4 types of nouns: 6 count nouns, 6 substance-mass nouns, 6 object-mass nouns and 6 flexible nouns (in count/mass context).

The variable of this experiment is noun type (count nouns/substance-mass nouns/object-mass nouns/flexible nouns in count context/flexible nouns in mass context). Each question had a picture which was divided into two parts similar to those in QJT (Barner & Snedeker, 2005). Example target

questions and fillers are presented respectively in Table 2 and Table 3.

Table 2. Example Target Questions

Noun type	Noun	Question
Count	apples	Who has more apples?
Substance-mass	juice	Who has more juice?
Object-mass	furniture	Who has more furniture?
Flexible (Count)	stones	Who has more stones?
Flexible (Mass)	stone	Who has more stone?

Table 3. Example Fillers

Noun	Adjective	Question
bag	big	Who has a bigger bag?
ruler	long	Who has a longer ruler?

When the formal experiment began, the participants were informed that "A" in the pictures stood for Andy and "B" in the pictures stood for Bob. All the pictures showed what they had.

3.4 Procedures

All participants were tested by online questionnaire platform, Wenjuanxing (www.wjx.cn). They received the questionnaire online and did it on their phone. Firstly, they were all required to fill in personal information (gender, age, age of learning English, etc.). After that, they did the LexTALE test and the formal experiment. The formal experiment was based on Quantity Judgment Task (Barner & Snedeker, 2005) with 24 stimuli and 24 fillers arranged at random. Each page presented only one question and one corresponding picture. When participants saw the question and the picture, they needed to choose the answer which they thought was proper and click the "next page" button to continue. Questions of count, substance-mass and object-mass conditions shown to the participants in advanced group and in intermediate group are same. However, in terms of flexible nouns, 20 participants (10 advanced, 10 intermediate) saw them in count context, and the other 20 participants (10 advanced, 10 intermediate) saw them in mass context. Therefore, the data of count, substance-mass and object-mass nouns are divided into two groups: Advanced(N=20), Intermediate(N=20); the data of flexible nouns are divided into four groups: Advanced/mass(N=10), Intermediate/mass(N=10), Advanced/count(N=10), and Intermediate/count(N=10). Participants usually spent about 6-8 minutes on the whole test.

3.5 Data Analysis

Data were collected from a total of 40 participants in this experiment. Their LexTALE scores were calculated and participants were divided into two groups according to whether their score was above

60.25.

A 3 by 2 repeated ANOVA was conducted with the SPSS 22.0 to examine the main effects and interactions in the data of count nouns, substance-mass nouns and object-mass nouns. A two-way ANOVA was carried out to analyze the data of flexible nouns in the two different contexts (count/mass).

4. Results

To keep with previous studies using QJT, results were calculated as the percent of responses that were based on number (e.g., judging three small apples as more than one big apple, or three small glasses of juice as more than one big glass of juice). Also similar to previous studies, analysis of count nouns, substance-mass nouns and object-mass nouns was separated from that of flexible nouns. Results of Count, Substance-mass, and Object-mass Conditions are presented in section 4.1, and results of flexible conditions are presented in section 4.2.

4.1 Count, Substance-mass, and Object-mass Conditions

Results of count nouns, substance-mass nouns and object-mass nouns were analyzed by 3 by 2 mixed model ANOVA. There were two variables: proficiency (advanced, intermediate) and noun type (count, substance-mass, object-mass). The results are presented in Figure 1 and Table 4.

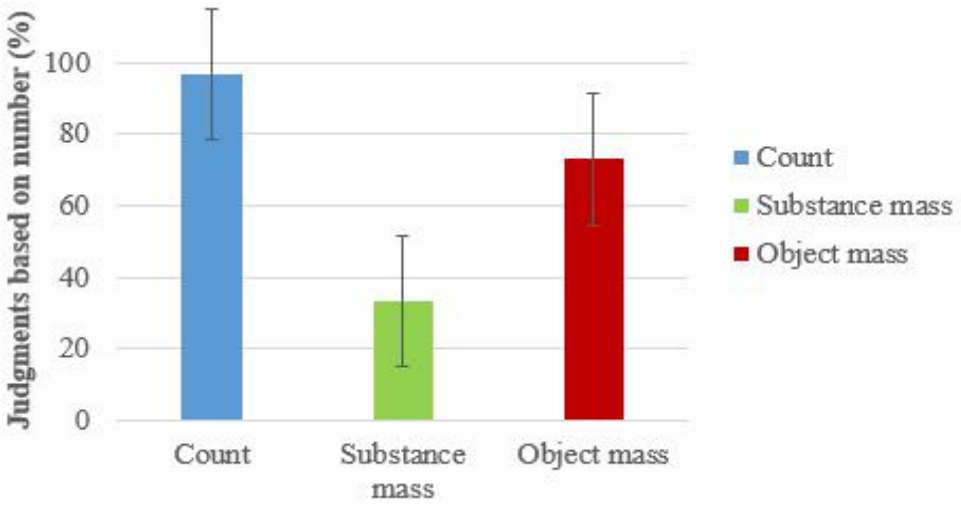

Figure 1. Judgments for Count, Substance-mass, and Object-mass Nouns

There was a main effect of noun type (F (2, 76) =92.587, p=.000) ($t_{count/substance}$ (39) =12.49, p=.000; $t_{count/object}$ (39) =8.51, p=.000; $t_{substance/object}$ (39) =-6.93, p=.000). Generally, participants tended to base their quantity judgments on number for count nouns (M=96.67, SD=9.40) and object-mass nouns (M=72.92, SD=20.22), but on volume for substance-mass nouns (M=33.34, SD=32.47).

Table 4. Results of ANOVA on Count, Substance-mass, and Object-mass Nouns

Measures	F	p
Noun type	**92.587**	**.000**
Proficiency	**.275**	**.603**
Noun type*Proficiency	**.895**	**.413**

However, no significant interaction found between group and noun type (F (1, 38) =.895, p=.413) suggested that there was no significant difference between "intermediate" and "advanced". This shows that, the results of the advanced group are similar to those of the intermediate group in terms of count (p=.230), substance-mass (p=.394) and object-mass (p=.788) nouns.

4.2 Flexible Conditions

Next, results of flexible nouns in count/mass context are analyzed by two-way ANOVA (variables: proficiency and context), and presented in Figure 2 and Table 5.

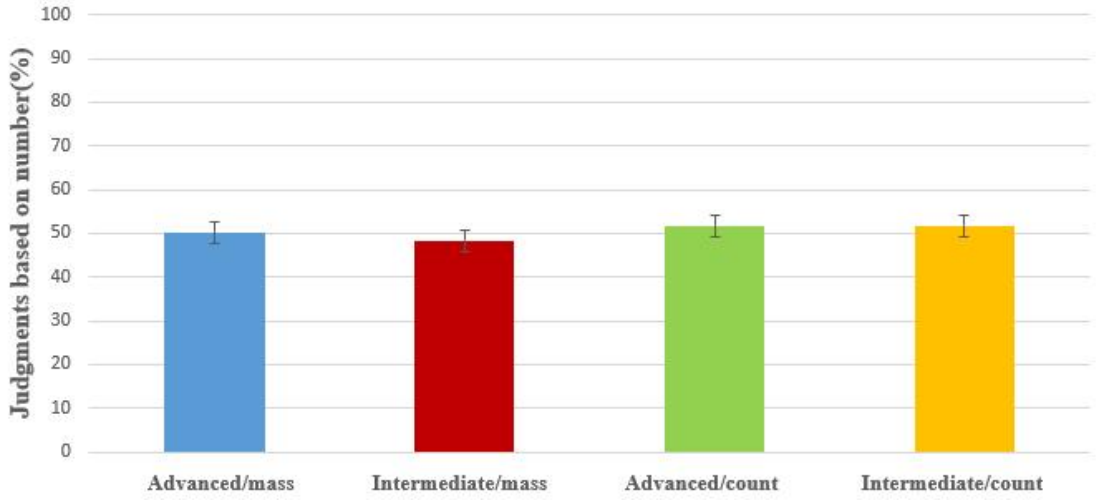

Figure 2. Judgments for Flexible Nouns

Table 5. Results of ANOVA on Flexible Nouns

Measures	F	p
Context	**.066**	**.800**
Proficiency	**.009**	**.927**
Context*Proficiency	**.007**	**.933**

As can be seen in Figure 2 and Table 5, there is no significant main effect or interaction between proficiency and the context (F (1, 18) =.007, p=.933) in which the flexible nouns appeared. Results of all conditions are around 50 percent. One possibility is that some participants consistently chose the number-based judgment while the rest opting for the volume-based judgment. Another possibility is

that some items triggered participants to give number-based judgment while others triggered volume-based judgment. To investigate the possibilities mentioned above, item-analysis and participant-analysis were further conducted:

Table 6. Judgments Based on Number by item (%) (Flexible Nouns)

	Mass context (e.g., stone)	Count context (e.g., stones)
chocolate	45	40
stone	40	55
ribbon	50	60
rope	45	50
paper	55	55
cake	60	50

As can be seen in Table 6, all flexible nouns (in count/mass contexts) were judged on number for about 50 percent: chocolate (40%/45%), stone (55%/40%), ribbon (60%/50%), rope (50%/45%), paper (55%/55%), cake (50%/60%). Therefore, no item triggered participants to give the number-based or volume-based judgment.

If we analyze by item (Appendix B), two participants in advanced group (A12, A19) consistently judged based on number when they saw flexible nouns in mass context; for intermediate/count group, B09 based all judgments on number and B10 based all judgments on volume; B19 consistently quantified over volume when the nouns were in mass context Therefore, there were only about 10 percent of the participants consistently choosing the same judgments, and the rest were usually judged on number for about 50 percent.

5. Discussion

As can be seen from the data in chapter 4, almost all participants judged based on number (choose the one with a greater number of entities over the one with greater volume) when they saw count nouns; about 70 percent of the participants judged based on number when they saw object-mass nouns and on volume (choose the one with greater volume over the one with a greater number of entities) when they saw substance-mass nouns, regardless of their proficiency of English. In addition, all flexible nouns were quantified over number/volume for about 50 percent.

According to MacDonald et al. (2018), the results of English L1 judging based on number were: count nouns (100%), substance-mass nouns (1%), object-mass nouns (99%), flexible nouns (count context: 96%; mass context: 6%).

Firstly, the results of count condition in the present study are similar to those of English L1, which is

that nearly all people would choose based on number. Count nouns have discrete individuated units, which function as natural counting units if no additional measuring unit is imposed (chapter 1). Such a property is reflected in the languages' syntax: plural-marking languages pluralizes count nouns (e.g., apples) whereas classifier (CL) languages use counting classifiers before count nouns (e.g., san CL-*ge* pingguo, "three apples"). In the Quantity Judgment task, when asked "Who has more X? X is a count noun", participants (both native speakers and learners) would make judgment based on number. (MacDonald et al., 2018)

Secondly, in terms of mass nouns, nearly all English native speakers quantify over number when they come across object-mass nouns and over volume when they come across substance-mass nouns. About 70 percent of Chinese-speaking English learners respond like English native speakers.

Since there are no discrete individuated units in substance-mass nouns, no natural counting units are available. Such a property is reflected in the languages' syntax: in plural-marking languages like English, mass form is used (e.g., a lot of water) whereas classifier languages can only use measuring classifiers (e.g., san CL-*bei* shui, "three cups of water") (Cheng & Sybesma, 1999), which provide information about the quantity as measured by units, but not exactly how many individuals there are. In the Quantity Judgment task, when asked "Who has more X? X is a substance-mass noun", the majority of participants would make judgment based on volume. (MacDonald et al., 2018)

In addition to substance-mass nouns, English object-mass nouns can be modified by a classifier in Chinese:

wu ***jian*** *jiaju*

'five pieces of furniture'

This makes English object-mass nouns countable in Chinese. When the participants saw object-mass nouns, they would process them as count nouns, which have discrete individuated units, functioning as natural counting units if no additional measuring unit is imposed. This leads the majority of participants to judging object-mass nouns based on number.

Thirdly, as is shown from the results, all flexible nouns were judged based on number/volume for about 50 percent (between 40% and 60%), which is similar to Korean L1, English L2 (MacDonald et al., 2018) and Japanese L1, English L2 (Inagaki, 2014). And if we analyze by participant, only a few (about 10%) participants consistently quantified over number or volume. While English native speakers tend to judge on number when the flexible nouns are in count context and on volume when the flexible nouns are in mass context.

This reveals that almost all the participants could not make count-mass distinction well for flexible nouns, regardless of the proficiency of English or the context. This is similar to the results of Korean L1, English L2 (judgments based on number: flexible count 51%; flexible mass 45%, MacDonald et al., 2018). Korean and Chinese are both classifier languages. Korean has an optional plural marker *-tul* which can attach to human, animate, and inanimate nouns, causing them to make better interpretations for object-mass nouns (they made judgment based on number) as well as substance-mass nouns (they

made judgment based on volume) than Chinese. But with respect to flexible nouns, results are similar. Chinese lacks count-mass syntactic cues. Learners fail to shift judgments according to the context (count/mass) (Cheung et al., 2012). For classifier language native speakers, English flexible nouns are often neglected when they learn English, and it is difficult for learners to make count-mass distinction for flexible nouns as well as English native speakers. This is because for second language learners, they usually cannot relate the morphological or syntactic clues with the semantic meaning.

If we analyze between groups, we can find that the advanced group did as well as the intermediate group. However, Yin and O'Brien (2018) found that there was significant difference between the Chinese dominant/Balanced group (judgements of flexible nouns based on number: count context 60%; mass context 40%) and the English dominant group (judgements of flexible nouns based on number: count context 70%; mass context 30%). The participants in English Dominant group use English more in their daily life. They have much more chances to expose themselves to the English environment and to the two different contexts of flexible nouns, which is like English native speakers. In the present research, only the LexTALE score determined the participants' proficiency, and this could indicate that the Advanced group participants were just more capable to deal with English tests. In addition, English learning is usually carried out in class, and learners lack the exposure to actual English environments. Therefore, there was no significant difference between the Advanced group and the Intermediate group.

6. Conclusions

In this study, the most important question is whether Chinese speakers can make count-mass distinction of English nouns. By means of QJT, the experiment shows that almost all Chinese learners quantify over number (choose the one with a greater number of entities over the one with greater volume) for count nouns, because count nouns are usually mapped as individualized objects. There is a high degree of similarity between English and Chinese in this aspect, so that Chinese learners can correctly interpret count nouns in English.

With respect to substance-mass nouns and object-mass nouns, the majority of Chinese learners can make correct count-mass distinction. However, there are numerical differences between Chinese L1, English L2 and English native speakers. About 70 percent of the participants based their judgments on volume (choose the one with greater volume over the one with a greater number of entities) for substance-mass nouns; for object-mass nouns, about 70 percent on number. Nevertheless, due to the optional plural marker, other classifier languages L1 (Japanese, Korean), English L2 can make count-mass distinction of substance-mass nouns, object-mass nouns and count nouns compared with English native speakers.

Finally, like other classifier languages L1 (Japanese, Korean), English L2, flexible nouns are difficult for Chinese learners, and they do not seem to know whether a noun is flexible or understand the differences of flexible nouns in count context and in mass context, regardless of their proficiency of English. Chinese learners usually acquire English in class and lack opportunities to use English in their

daily life, resulting in difficulties for them to link grammatical clues with connotations of flexible nouns in the two different contexts.

In response to these findings, it is suggested that English teachers should guide students to associate grammatical clues or context with meanings when they learn a new word, especially when learning a noun that can be both countable and uncountable.

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Appendix List

Appendix A Stimuli and Fillers

Stimuli (N=24)

Count condition (N=6)

Who has more cups?

Who has more pens?

Who has more boxes?

Who has more apples?

Who has more books?

Who has more trees?

Substance-mass condition (N=6)

Who has more ketchup?

Who has more juice?

Who has more butter?

Who has more coffee?

Who has more cola?

Who has more wine?

Object-mass condition (N=6)

Who has more kitchenware?

Who has more furniture?

Who has more stationery?

Who has more luggage?

Who has more clothing?

Who has more jewelry?

Flexible condition (N=6)

Who has more chocolate(s)?

Who has more stone(s)?

Who has more ribbon(s)?

Who has more rope(s)?

Who has more paper(s)?

Who has more cake(s)?

Fillers (N=24)

Who has a bigger bag?

Who has a busier day?

Who has a clearer picture?

Who has a deeper plate?

Who has a dirtier sweater?

Who has an easier math problem?

Who has a fuller glass?

Who has a happier child?

Who has a fatter cat?

Who has a higher score?

Who has a larger family?

Who has a longer ruler?

Who has a lower heartbeat?

Who has an older friend?

Who has a shorter skirt?

Who has a smaller house?

Who has a thinner dog?

Who has a warmer coat?

Who has a cleaner room?

Who has a newer shoe?

Who has a faster vehicle?

Who has a darker mug?

Who has a taller classmate?

Who has a sharper knife?

Appendix B Judgments based on number for flexible nouns by participant (%)

Group	Participant ID	Result
Advanced/Count	A01	83.33
Advanced/Count	A02	66.67
Advanced/Count	A03	50.00
Advanced/Count	A04	16.67
Advanced/Count	A05	66.67
Advanced/Count	A06	50.00
Advanced/Count	A07	50.00
Advanced/Count	A08	16.67
Advanced/Count	A09	33.33
Advanced/Count	A10	83.33
Advanced/Mass	A11	66.67
Advanced/Mass	A12	100.00
Advanced/Mass	A13	16.67
Advanced/Mass	A14	16.67
Advanced/Mass	A15	83.33
Advanced/Mass	A16	33.33
Advanced/Mass	A17	33.33
Advanced/Mass	A18	16.67
Advanced/Mass	A19	100.00
Advanced/Mass	A20	33.33
Intermediate/Count	B01	33.33
Intermediate/Count	B02	33.33
Intermediate/Count	B03	16.67
Intermediate/Count	B04	83.33
Intermediate/Count	B05	66.67
Intermediate/Count	B06	33.33
Intermediate/Count	B07	66.67

Intermediate/Count	B08	83.33
Intermediate/Count	B09	100.00
Intermediate/Count	B10	0.00
Intermediate/Mass	B11	66.67
Intermediate/Mass	B12	66.67
Intermediate/Mass	B13	50.00
Intermediate/Mass	B14	16.67
Intermediate/Mass	B15	50.00
Intermediate/Mass	B16	50.00
Intermediate/Mass	B17	33.33
Intermediate/Mass	B18	83.33
Intermediate/Mass	B19	0.00
Intermediate/Mass	B20	66.67