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Mass-count distinction in Chinese-English bilingual students

Bin Yin and Beth Ann O'Brien

National Institute of Education, 1 Nanyang Walk, 637616, SG

Corresponding author: Bin Yin (bin.yin@nie.edu.sg)

There has been increased interest in examining the relationship between different linguistic modules in second language learners' grammar system. One such interface concerns learners' ability to map morphosyntax to target-like semantic interpretations, especially in cases where the first and second languages differ in morphosyntax-semantics mapping. We examined this issue by investigating Chinese-English bilingual adolescents' knowledge regarding the semantic consequences of mass-count morphosyntax in English. 228 Chinese-English bilingual students from Singapore took part in a quantity judgment task. Following previous studies, we tested five noun conditions including count (e.g., *shoe*), substance mass (e.g., *ketchup*), object mass (e.g., *furniture*) and two conditions involving items that can occur flexibly in both mass and count contexts (e.g., *string/strings*). The last two conditions specifically probe learners' ability to make use of morphosyntax in deriving semantics. The representation of quantity for objects/substance was manipulated for number or combined volume (e.g., two large shoes/portions of ketchup versus six tiny shoes/portions of ketchup). Participants were asked to make judgments on the quantity of items, in response to questions presented in a count and/or mass frame (*Who has more shoes/ketchup/furniture/string/strings?*). Results show that our bilingual participants were able to make appropriate semantic judgments of quantity in response to manipulation of morphosyntax. We compare our findings with previous research in first and second language contexts and discuss the differences in terms of the quantity and quality of input in shaping learners' grammar system.

Keywords: mass-count distinction; bilingual acquisition; English; Chinese; quantity judgment

1 Introduction

An important question in the field of second language acquisition is whether learners can correctly derive the semantic consequences of morphosyntactic material (e.g., Slabakova 2008). Existing evidence suggests that difficulties may arise when differences exist between the first language (L1) and second language (L2) in terms of morphosyntax-semantics mapping (e.g., Gabriele 2009; McManus 2015). Such differences may include the manner in which meanings are marked in languages. For example, McManus (2015) found that German speakers learning French had some trouble with the aspectual distinctions in the target language (*perfective* versus *habitual*). The difficulty was attributed to the fact that while French marks aspect explicitly via morphemes, German marks aspect implicitly through discursal and lexical means. However, even when both L1 and L2 mark meaning via morphosyntax, the different mapping relationship between form and meaning in L1 and L2 might pose challenges to learners, as shown in Gabriele's (2009) study on the learning of progressive morphemes in English and Japanese. On the other hand, it also has been argued that learning morphosyntax-semantics mappings is not

particularly challenging, as long as knowledge of the morphosyntax is in place (Slabakova 2008; White 2011) as evidenced in English speakers' acquisition of Spanish aspectual morphology (Montrul & Slabakova 2002). Much research on the morphosyntax-semantics mapping has been done in the aspectual domain. In the nominal realm, bilingual/second language acquisition research has mostly focused on the semantics of the article system (Ionin et al. 2004; Goad & White 2004; 2006; Trenkic 2007; Ionin et al. 2008) and the grammaticality of plural noun phrases in different semantic contexts (Serratrice et al. 2009). For instance, Ionin et al. (2004) found that when speakers from article-less languages (e.g., Russian and Korean) learn a language with an article system (e.g., English), they do not necessarily map the article to the correct meaning of definiteness, but rather fluctuate between the meanings of definiteness and specificity. Compared with work on the learning of articles, fewer studies address other nominal properties such as the mass-count distinction. In addition, most research on the L2/bilingual acquisition of nominal properties has been conducted on adults (e.g., Hua & Lee 2005; Snape 2008; Inagaki 2014) or younger children (e.g., 6–10 year olds, Serratrice et al. 2009) whereas we focus on adolescents (11 and 14 year olds) in this study.

The present study contributes to the understanding of form-meaning mapping in the nominal domain by investigating Singaporean Chinese-English bilinguals' ability to process morphosyntax-semantics mapping related to the mass-count distinction in English. In the next sections, we first discuss the differences between English and Chinese in mass-count distinction, followed by a review of studies on the L2/bilingual acquisition of the mass-count distinction. Then, we present our study.

2 Mass-count distinction in English and Chinese

The differences between count and mass nouns largely reflect their corresponding ontological properties. Discrete and individuated objects tend to be named by count nouns (e.g., *cat*) whereas homogeneous substance is generally referred to by mass nouns (e.g., *milk*). In terms of the morphosyntactic differences, in English, count nouns can be pluralized (*cats*) whereas mass nouns cannot (**milks*). Bare singular count nouns cannot denote kinds (**I like cat*) in contrast with mass singular nouns (*I like milk*) and bare plurals (*I like cats*). In addition, count and mass nouns permit different types of determiners (e.g., numerals and quantifiers like *many/few* for count nouns, and quantifiers like *much/little* for mass nouns).

In comparison, Chinese differs from English in two main respects. First, there is no mass-count distinction on the level of plural morphology (there is a plural morpheme in Chinese *-men* that is applied to humans or anthropomorphized non-humans only). It has been largely accepted that all Chinese head nouns are mass (Chierchia 1998). Second, there exists a generalized classifier system in Chinese (the syntactic order being: numeral + classifier + noun). Classifiers are obligatory in Chinese to enable counting for all nouns, regardless of their ontological properties. However, there is a difference in the type of classifiers used for count versus mass nouns in Chinese (Cheng & Sybesma 1999) such that “count classifiers” serve to name partitioning units for nouns whereas “mass classifiers” create such units. Therefore, it appears that the conceptual difference between count and mass is reflected in the classifier system in Chinese, in contrast with English where it is morphologically encoded. In this respect, Borer (2005) suggests that count classifiers in Chinese serve the same individuating function as plural morphology in English, and that cross-linguistically, they are in complementary distribution. These observations therefore point to the difference between English and Chinese in the morphosyntax-semantics mapping for the mass-count distinction. One question the present study examines, then, is whether bilingual participants with knowledge in Chinese might be less sensitive

to the morphological marking of the mass-count distinction in English, because of the cross-linguistic difference in the location where this property is marked.

In addition, we need to mention that in an informal variety of English spoken in the context of the present study (Colloquial Singapore English), a notable feature is its optional marking of number morphology and definiteness (e.g., Gil 2003; Wee & Alsado 2004). A sentence such as *Mary eat apple* is acceptable in this variety of English where the object *apple* can be understood as singular, mass, or bare plural (Gil 2003). Colloquial Singapore English is a contact variety whose grammar features are largely inherited from Chinese (e.g., Bao 2015). Given this, it is possible that the existence of both Chinese and a Chinese-influenced variety of English might affect our participants' acquisition of the morphosyntactic distinction for mass-count in English.

3 Mass-count knowledge in second language acquisition

Most L2 studies on nominal knowledge are concerned with the acquisition of the article system (e.g., Ionin et al. 2004; Goad & White 2004; 2006; Trenkic 2007; Ionin et al. 2008). Accounts of the variability in article acquisition by learners from article-less languages have appealed to semantic (e.g., Ionin et al. 2004), prosodic (Goad & White 2004; 2006) or general cognitive factors (Trenkic 2007). Direct investigations into the mass-count distinction are much less numerous. There are broadly two types of such research in this area. The first type is concerned with examining participants' sensitivity to the morphosyntactic properties of count versus mass nouns such as plural morphology and quantifiers (e.g., Hua & Lee 2005; Snape 2008). The second type of research looks at the morphosyntax-semantics mapping in relation to the mass-count distinction (Gathercole 1997; Inagaki 2014). We briefly review both types, while noting that the second type is more relevant to the present study.

Hua and Lee (2005) examined Chinese L2 English students' grasp of the mass-count distinction. Three areas were tested, including sensitivity to quantifiers (numerals/*many* for count versus *much* for mass), knowledge about the singular count noun rule (i.e., count nouns cannot occur in the singular bare form), and knowledge about the correct morphosyntax of nouns used in mass versus count contexts (e.g., *Thought depends on language* versus *A thought came to my mind*). Tasks included grammaticality judgments and a forced choice task. Participants included L2 learners with different proficiency levels and native speaking controls. The main finding is that advanced L2 participants generally did show sensitivity to the mass-count distinction in all three areas of morphosyntax (although they had problems with some conditions for the singular count rule), whereas the less proficient learners did not.

Snape (2008) conducted another study that examined East Asian language speakers' mass-count knowledge in English. He explicitly framed the study in terms of parameter re-setting, namely, whether Japanese speakers can re-set the Nominal Mapping Parameter (NMP) from the Japanese/Chinese value of [+arg, -pred] to the English value of [+arg, +pred].¹ Another learner group with Spanish background [-arg, +pred] was also included, as well as native English speaking controls, thus completing all three attested NMP permutations. Snape (2008) reasoned that since Japanese lacks the functional category DP and the uninterpretable number feature, the parameter resetting task might be

¹ The NMP was proposed by Chierchia (1998) according to whom nouns can play two roles: predicates (denoting property) or arguments (denoting entities). The value [+pred] refers to properties that must combine with determiner elements to be realized as arguments, and [+arg] corresponds to kinds that may appear on their own as bare noun phrase arguments. Languages have different settings for these two parameters, resulting in a three-way typological classification: English, Russian [+arg, +pred], Chinese, Japanese [+arg, -pred], and Spanish, Italian [-arg, +pred].

more difficult for Japanese speakers. Experiment 1, which is relevant to the present study, involved a grammaticality judgment task, similar to that used in Hua and Lee (2005). Noun type (count versus mass) was crossed with number (singular versus plural) to form four conditions. In addition, three types of quantifiers were used: count-selective (*many* and *few*), mass-selective (*much*), and flexible (*some*). An example of the test item is: *Terry needed ... some milk/*many butter/much sugar*, for which participants were asked to pick the possible continuations. The main findings again pointed to the role of proficiency. For the intermediate group, both Japanese and Spanish learners performed worse than the native speaking controls, in both count and mass conditions. Focusing on the Japanese learners, they had more problems with mass nouns than with count nouns. In addition, number morphology affected count and mass differently – while plural count nouns were judged more accurately than singular count nouns, there was no difference between mass nouns in the plural versus singular forms. In contrast, the advanced learners were indistinguishable from the native speaking controls in both count and mass conditions. The author concluded that the learners had been able to reset the NMP parameter, and that Japanese learners' problems with mass nouns may be due to the effects of quantifiers.

The two studies summarized above (Hua & Lee 2005; Snape 2008) were both concerned with learners' morphosyntactic knowledge of the mass-count distinction. Another line of L2/bilingual research on the mass-count distinction focuses instead on whether learners show sensitivity to the semantic effects of the morphosyntax related to the mass-count distinction. We discuss two such studies here (Gathercole 1997; Inagaki 2014). Gathercole (1997) tested English-Spanish bilingual children aged seven and nine, using novel objects and nonsense words. The author varied the shape or material of novel objects, with the assumption being that matching in shape is a count-related concept whereas matching in material is a mass-related concept. The names for the different novel objects were then presented in a specific syntactic frame such as a count context (*a*___), or a mass one (*some*___), as well as a third neutral context. Children were asked to match the object with the verbal description to see if they understood that *shape* and *material* relate to count and mass syntax, respectively. It was found that monolinguals from both age groups consistently differentiated between the three frames whereas the bilinguals did not (although the older bilingual group showed a trend). A further analysis separating "English-strong" bilinguals from the rest of the bilinguals found an effect of proficiency – the nine-year-old English-strong bilinguals did differentiate count from mass contexts. It was also found that in general the bilingual participants (including the English-strong ones) had more trouble with the mass context.

Inagaki (2014) tested L1 Japanese-L2 English adult learners' sensitivity to the syntax-semantics mapping for the mass-count distinction. The study adopted a quantity judgment paradigm (Barner & Snedeker 2005) in which the volume and number of objects/portions of substance were manipulated (such as two big shoes on one side and six tiny shoes on the other). Participants were asked to judge which side has more objects/substance. Essentially, the task paradigm capitalizes on the assumption that quantity for count nouns depends on number (e.g., the side with six tiny shoes) and for mass nouns, combined volume (e.g., the side with two large shoes). Different conditions were tested. Of interest was the one in which nouns could alternate between count (in plural form) and mass (in singular form) contexts: *Which side has more strings/string?* The results suggested that, unlike the English speaking controls, the learners' judgment of quantity did not change in response to the manipulation of mass-count syntax. In addition, their performance in the count condition was worse than that in the mass condition, although they also had trouble in a different task with "cross-linguistic variable nouns" regarding mass syntax in English.

Inagaki (2014) concluded that his participants had trouble with morphosyntax-semantics mapping for the mass-count distinction.

In summary, results from existing literature on the L2 mass-count distinction seem to show an effect of proficiency. On one hand, acquiring mass-count morphosyntax or morphosyntax-semantics mapping seems possible for advanced learners. For lower proficiency learners, effects of cross-linguistic influence are detected. Unresolved issues remain with regard to the acquisition of the mass-count distinction, including the relative ease or difficulty of count versus mass nouns. Existing studies show inconclusive results. For example, Gathercole (1997) and Snape (2008) pointed to mass nouns as sources of difficulty, whereas learners in Inagaki (2014) seemed to have difficulty with both count and mass syntax.

The present study focuses on investigating adolescent Chinese-English bilingual speakers' knowledge on the morphosyntax-semantics mapping in relation to the mass-count distinction in English. We follow previous research (e.g., Barner & Snedeker 2005; Inagaki 2014) in adopting the quantity judgment paradigm to examine this knowledge. In view of the results from previous research, we predict that participants would largely have no problem when morphosyntax of mass-count aligns with conceptual semantics (count and substance mass nouns). In addition, they would not have problems in situations where reliance on conceptual semantics alone (object mass nouns such as *furniture*) would allow them to make the correct judgments. On the contrary, difficulty might arise in situations where attention to morphosyntax is required (flexible nouns such as *string*). In this case, we predict that participants with more proficiency in English (i.e., those classified as being dominant in English in the present study), and perhaps also those in the older age group, might perform better.

4 The present study

4.1 Participants

Participants were 228 Chinese-English bilingual students from six primary and two secondary schools in Singapore selected from an initial pool of 236 whose parents completed language background questionnaires.² 107 students were in Primary grade 5 (aged 7;6–11;11, mean = 10;11) and 121 students were in Secondary grade 2 (aged 13;6–16;1, mean = 14;1). In Singapore, 74.3% of the resident population is ethnically Chinese (Statistics Singapore 2016) but the primary medium of education in Singapore schools is English. At the same time, the Singapore government promotes a bilingual policy where all school children are expected to become proficient in both English and the language associated with their ethnic background. Thus, there are no strictly monolingual students in this context, but individuals do differ in their exposure to and experience with each language.

We determined participants' language dominance by an evaluation of their parents' responses to a language background questionnaire (based on Lim et al. 2008). The questionnaire elicited information regarding different facets of participants' language ability and experience, including rated proficiency, and domains and frequency of use for both English and Chinese. Questions related to proficiency were in the form of "How proficient is your child/ward in speaking/understanding/reading/writing English/Mandarin?" (a 7-point rating scale was provided). Participants in Lim et al. (2008) were classified into different dominance patterns based on these ratings as validated by vocabulary measures

² Eight students from the initial pool had missing data on the task or from the language background questionnaires, such that they could not be classified into a language dominance group.

in both languages. Our criteria for determining students' dominance patterns were adapted from that study. Specifically, for this study, ratings were summed for "understanding" and "speaking" modalities in English and Chinese, and the Chinese score was subtracted from the English score. Therefore, a positive value indicates dominance in English, a negative value dominance in Chinese, and zero is balanced proficiency. Because the number of Chinese-dominant students is small (see Table 1 for the distribution), and to make group sizes more similar, we combined the Chinese dominant and Balanced bilingual students together for the analyses (henceforth referred to as the Chinese dominant/Balanced group). Participants were also given an independent assessment of their English language proficiency in the form of a cloze test with 75 items (from Oshita 1997). English dominant (ED) students scored higher than Chinese dominant/Balanced (CD/B) students in the cloze test ($M_{ED} = 54.68, SD_{ED} = 9.02; M_{CD/B} = 51.54, SD_{CD/B} = 9.34, p = .01$). Likewise, older students scored higher than younger students in the test ($M_{OLD} = 58.53, SD_{OLD} = 5.9; M_{YOUNG} = 47.42, SD_{YOUNG} = 8.89, p < .001$).

4.2 Design and task

We followed the design and rationale of Barner and Snedeker (2005) in assessing participants' mass-count knowledge in a quantity judgment task. Since the paradigm was already partly described above in presenting Inagaki (2014), we will briefly summarize it here. Figures 1–4 illustrate the design of the task providing examples for count, substance mass, object mass, and flexible nouns, respectively (the different categories are explained in section 4.3). The design capitalizes on the difference in the conceptualization

Table 1: Language dominance groups.

Language group	Age group	N
English dominant	11 year olds	72
	14 year olds	63
Balanced	11 year olds	18
	14 year olds	36
Chinese dominant	11 year olds	17
	14 year olds	22



Figure 1: Example item for count nouns.



Figure 2: Example item for substance mass nouns.

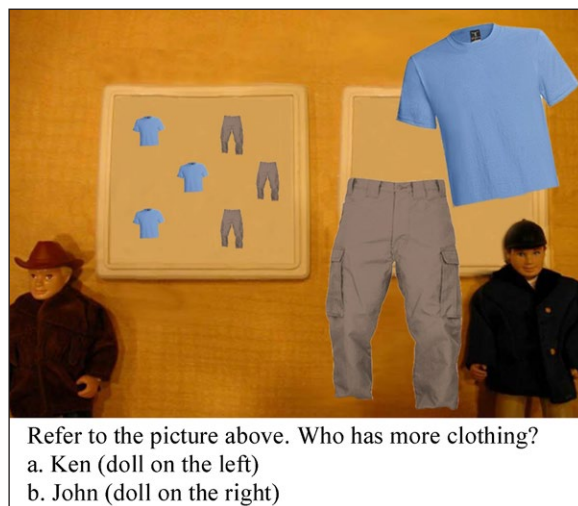


Figure 3: Example item for object mass nouns.

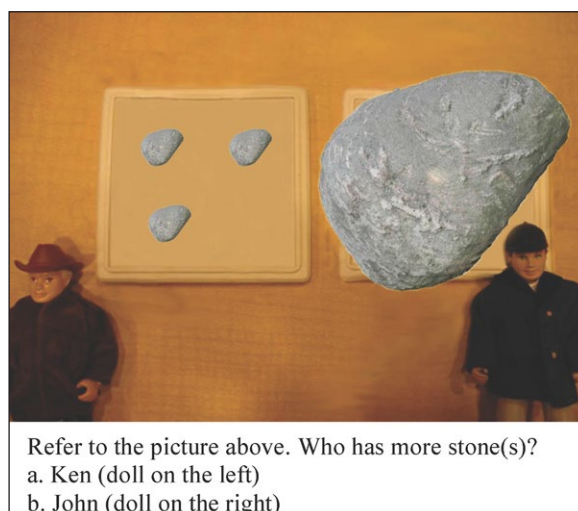


Figure 4: Example item for flexible nouns.

of quantity for objects denoted by count nouns (number is relevant) and for stuff denoted by mass nouns (volume is relevant). The relationship between morphosyntax and semantics varies across the five types of nouns tested in the study, as explained in more detail in section 4.3. Participants were presented with pictures such as those in Figures 1–4, and the question “Who has more ___?” appeared on the screen, where the blank is indicated by a noun in a proper/specific form (e.g., *shoes/ketchup*).

The stimuli were delivered via Qualtrics, an online survey software. Testing was done in groups and each participant was seated in front of a computer within their school’s computer lab that was equipped with internet connection. Task administration was self-paced after the instructions (with examples) were read and explained to them. Both pictures and questions in the experiment were presented visually. Participants viewed the picture and answered the question by clicking on the icon corresponding to the doll figure on the left (Ken), or to the doll figure on the right (John). They then advanced to the next item by clicking on a button at the bottom of the survey page. The instructions for this task are provided in Appendix A.

4.3 Materials

Following previous research (e.g., Barner & Snedeker 2005), we tested five noun conditions. For descriptive purposes, these are placed in three groups based on the mapping between ontology and morphosyntax: congruent mapping, incongruent mapping, and flexible mapping.

4.3.1 Congruent mapping

Nouns in this group are typical count or mass nouns, termed count and substance mass, respectively. They are typical in the sense that the ontology associated with these nouns aligns with the form in which they are presented in the study. Specifically, if the entity denoted by the noun is inherently discrete and individuated, then the corresponding noun can be pluralized (i.e., count). By contrast, if the entity denoted by the noun lacks such inherent partition, then the corresponding noun cannot be pluralized (i.e., substance mass). Figure 5 illustrates the mapping relationship between morphosyntax (count versus mass), conceptual semantics (individuation) and the semantic judgment required for the study (quantity). As can be seen, for count and substance mass nouns, participants could rely on either morphosyntax or conceptual semantics to make judgments about quantity.

4.3.2 Incongruent mapping

Different from the nouns with congruent mapping, nouns in the second group illustrate incongruent mapping between ontology and syntax (see Figure 6). Specifically, these are nouns such as *furniture* and *mail* which can potentially refer to discrete objects (i.e., individual pieces of furniture such as desks and chairs), but which can only occur in the

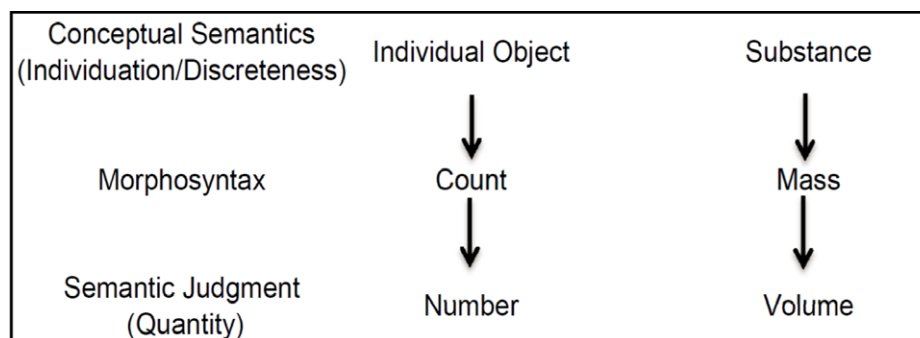


Figure 5: Morphosyntax-semantics mapping for count and substance mass.

mass form (e.g., singular morphology). These nouns are referred to as object mass nouns, following existing literature. As can be seen in Figure 6, participants need to access conceptual semantics to make the correct quantity judgment about object mass nouns in the present study.

4.3.3 Flexible mapping

The last group of nouns instantiate a flexible relationship between ontology and morphosyntax. These are nouns such as *chocolate*, *string* and *stone* which can occur in either count (e.g., *Who has more stones?*) or mass morphosyntactic environments (e.g., *Who has more stone?*) and the corresponding ontology/semantics (individuation) is determined by the morphosyntactic context in which the noun occurs. Figure 7 illustrates this mapping relationship whereby the mass-count status is mediated through morphosyntax. In order to make the correct judgment on quantity, participants need to heed the morphosyntactic cues on the noun.

The complete list of items in each of the three groups of nouns is provided in Table 2. We had 31 test items and nine fillers/practice items. Most of the test items were used in Barner and Snedeker (2005) and Inagaki (2014), and the rest (marked with asterisks) were from Hacoen (2010), a study conducted on Hebrew speaking children. The presentation of the items was balanced in terms of the side with greater number or volume. All conditions were administered as a within-subjects design, including the flexible condition items that were presented with both count and mass contexts. The participants saw these same items in both contexts, but not in contiguous trials. This condition differed from previous research (e.g., Barner & Snedeker 2005; Inagaki 2014) that adopted between-subjects designs for flexible nouns, where participants only saw the items in one context, not both.

The template of pictures (dolls and background) is from Barner and Snedeker (2005) via Hacoen (2010) and was used in the present study with permission. Some of the pictures

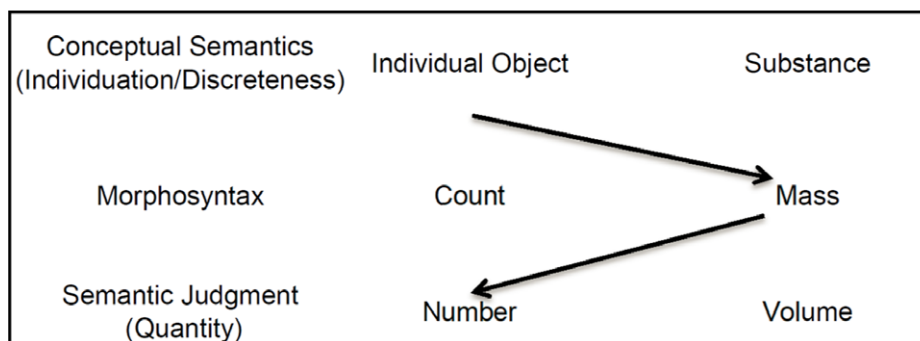


Figure 6: Morphosyntax-semantics mapping for object mass nouns.

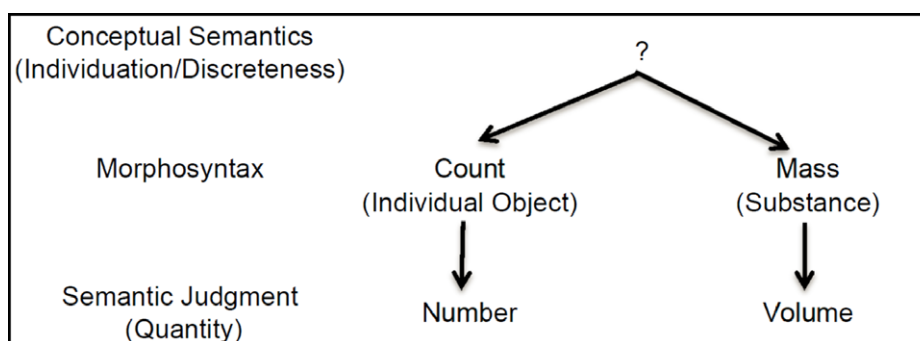


Figure 7: Morphosyntax-semantics mapping for flexible nouns.

Table 2: Conditions and items in the study.

Mapping relationship	Condition	Number of items
Congruent (morphosyntax and conceptual semantics aligned)	Substance mass (ketchup, butter, mustard, toothpaste, milk*, rice*, dough*)	7
	Count (shoes, candles, cups, plates, balls*, pencils*, bags*)	7
Incongruent (morphosyntax and conceptual semantics not aligned)	Object mass (furniture, clothing, jewelry, silverware, mail)	5
Flexible (nouns can occur in two morphosyntactic contexts)	Flexible in count context (strings, chocolates, papers, stones, ice creams*, pizzas*)	6
	Flexible in mass context (string, chocolate, paper, stone, ice cream*, pizza*)	6
Practice and fillers	bears (x2), pears, flour, cars, trucks, popcorn, dolls, apples	9

Note. *: item was from Hacoen (2010).

used in the present study were adapted from Hacoen (2010) with permission, and we created the rest of the pictures.

5 Results

In keeping with previous research using the quantity judgment paradigm, results were calculated as the percent of responses that were based on number (e.g., judging six small shoes as more than two large shoes, or six small dollops of ketchup as more than two large dollops). Also following previous research, we analyzed congruent and incongruent mapping items (namely count, substance mass, object mass) separately from flexible mapping items (flexible in count context, and flexible in mass context).³

5.1 Count, substance mass, and object mass conditions

We analyzed count, substance mass and object mass nouns first, and their results are presented in Figure 8 (collapsed across age groups) and Figure 9 (collapsed across language dominance groups). As can be seen in both bar charts, it seems that for both count and object mass conditions, participants performed similarly well (correctly favoring number-based judgments), regardless of their language background or age. For substance mass items, it seems that the older participants outperformed the younger participants in terms of correctly favoring volume-based judgments. A three-way, 3 by 2 by 2 mixed model ANOVA was conducted with noun type (count, substance mass, object mass) as a within-subjects factor, language dominance (English dominant or Chinese dominant/Balanced) as a between-subjects factor, and age (11 year olds or 14 year olds) as another between-subjects factor.

³ The results reported in this section were based on all the test items in Table 2. A subsidiary analysis focusing on the items shared with previous research on English speakers/learners (Barner & Snedeker 2005; Inagaki 2014) was also conducted, and the summary of the subsidiary analysis is provided in Appendix B. The results of the subsidiary analysis do not change the main finding, namely that younger students had trouble with mass conditions (substance mass and flexible mass). The subsidiary analysis additionally shows that the difficulty also extends to Chinese dominant/balanced students in one mass condition (flexible mass). Lastly, in the subsidiary analysis, the effect of age is only marginally significant for the flexible noun conditions whereas in the results presented in the text, the age effect is significant. While these may have some implications on our discussion of the task effect (section 6.3), they do not change our main argument therein.

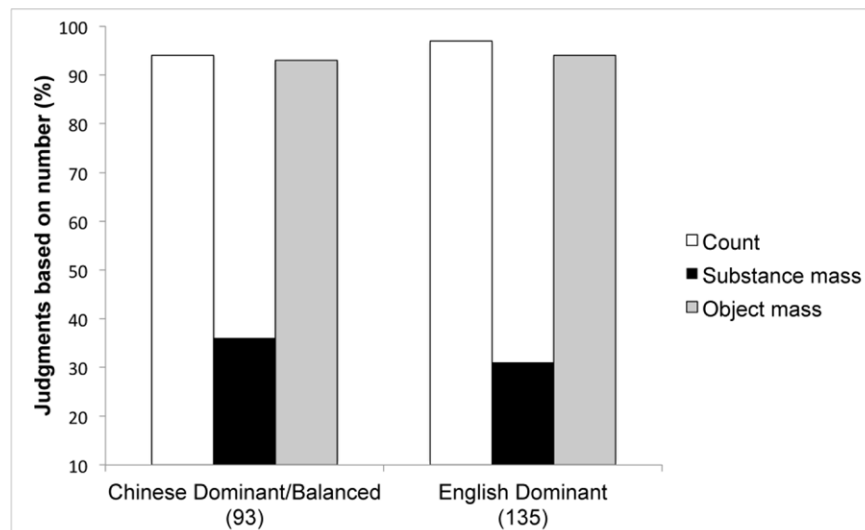


Figure 8: Judgments for count, substance mass, and object mass nouns by language dominance.

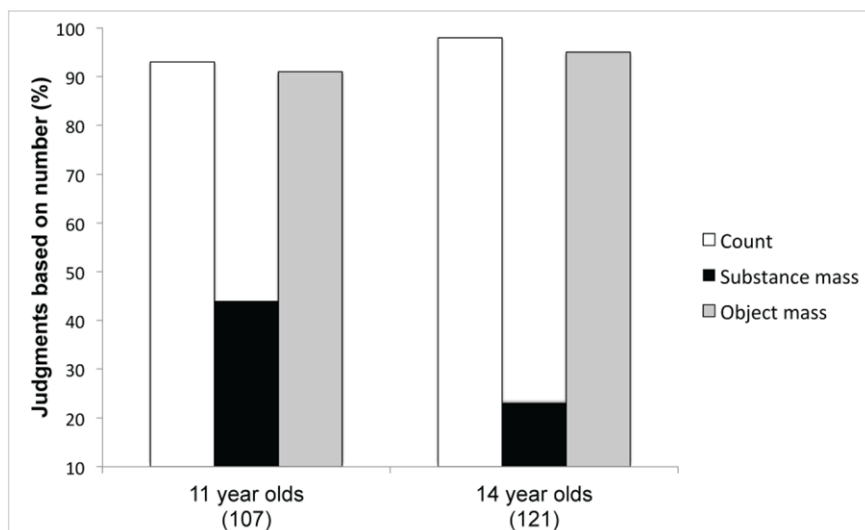


Figure 9: Judgments for count, substance mass, and object mass nouns by age.

There was a main effect of noun type ($F(1.2, 269.31) = 552.80, p < .001$), but no main effects of language dominance ($F(1, 224) = 0.25, p = .62$) or age ($F(1, 224) = 2.88, p = .09$). This shows that, overall, students based their quantity judgments on number for count nouns ($M = 0.95$) and object mass nouns ($M = 0.93$), but on combined volume/mass for substance mass nouns ($M = 0.35$). This was confirmed by pairwise comparisons with Bonferroni adjustment, showing that both count nouns and object mass nouns had significantly more number-based judgments than substance mass nouns (p 's $< .001$). On the other hand, there was no difference between count and object mass nouns ($p = .14$).

A significant interaction was found between noun type and language dominance ($F(1.2, 269.31) = 5.95, p = .01$). This means that, English dominant (ED) and Chinese dominant/Balanced (CD/B) bilingual students might differ from each other depending on the noun type. Nevertheless, three sets of independent t-tests comparing ED and CD/B students in their performance on count, substance mass, or object mass conditions revealed no cross-group difference in any of the three conditions (count: $M_{ED} = 0.97, SE_{ED}$

= 0.01, $M_{CD/B} = 0.94$, $SE_{CD/B} = 0.02$, $t(170.92) = 1.17$, $p = .24$; substance mass: $M_{ED} = 0.31$, $SE_{ED} = 0.03$, $M_{CD/B} = 0.36$, $SE_{CD/B} = 0.04$, $t(198.58) = -1.02$, $p = .31$; object mass: $M_{ED} = 0.94$, $SE_{ED} = 0.01$, $M_{CD/B} = 0.93$, $SE_{CD/B} = 0.02$, $t(161.55) = 0.43$, $p = .67$). In addition to cross-group comparisons, we also carried out one-sample t-tests comparing each language dominance group's performance in each of the three noun conditions against chance level (namely, 0.5). The results show that the performance of both English dominant and Chinese dominant/Balanced bilingual students was significantly different from chance level, for all three noun types (count: $t_{ED}(134) = 39.67$, $p_{ED} < .001$; $t_{CD/B}(92) = 25.43$, $p_{CD/B} < .001$; substance mass: $t_{ED}(134) = -6$, $p_{ED} < .001$; $t_{CD/B}(92) = -3.69$, $p_{CD/B} < .001$; object mass: $t_{ED}(134) = 32.33$, $p_{ED} < .001$; $t_{CD/B}(92) = 19.79$, $p_{CD/B} < .001$). Taken together, this suggests that performance on nouns with either congruent or incongruent mapping relationships between conceptual semantics and morphosyntax is not affected by relative language proficiency.

There was also a significant interaction between noun type and age ($F(1.2, 269.31) = 33.73$, $p < .001$). This means that, younger and older students might differ from each other, depending on noun type. Three sets of independent t-tests comparing younger (11 years olds) and older students (14 years old) revealed that older students outperformed younger students in both congruent conditions. Namely, older students responded with more number-based judgments for count items ($M_{OLD} = 0.98$, $SE_{OLD} = 0.01$, $M_{YOUNG} = 0.93$, $SE_{YOUNG} = 0.02$, $t(120.23) = 2.69$, $p = .01$), but fewer number-based judgments for substance mass nouns ($M_{OLD} = 0.23$, $SE_{OLD} = 0.03$, $M_{YOUNG} = 0.44$, $SE_{YOUNG} = 0.04$, $t(196.94) = -4.35$, $p < .001$). There was no difference between the two age groups when it comes to object mass nouns ($M_{OLD} = 0.95$, $SE_{OLD} = 0.01$, $M_{YOUNG} = 0.91$, $SE_{YOUNG} = 0.02$, $t(163.06) = 1.63$, $p = .11$). One-sample t-tests showed that older students' performance was significantly different from chance level (namely, 0.5) in all three conditions (count: $t(120) = 92.99$, $p < .001$; substance mass: $t(120) = -9.62$, $p < .001$; object mass: $t(120) = 39.29$, $p < .001$). However, younger students' performance on the substance mass condition was not different from chance level (count: $t(106) = 21.31$, $p < .001$; substance mass: $t(106) = -1.55$, $p = .13$; object mass: $t(106) = 19.08$, $p < .001$). Taken together, this suggests that younger students had more difficulty with substance mass nouns than older students. No other significant effects were present.

5.2 Flexible noun conditions

Next, we present results from the category of flexible nouns. These are nouns that can appear in either count or mass contexts. The question of interest here is whether participants can make different quantity judgments (number-based or volume-based) depending on the morphosyntactic manipulation of the noun. Results are presented in Figures 10 (collapsed across age groups) and 11 (collapsed across language dominance groups), respectively. In both figures, we can see that participants made a distinction between flexible count and flexible mass contexts, but that the English dominant (Figure 10) and the older (Figure 11) ones seemed to have made a sharper distinction. We submitted the results to a three-way, 2 by 2 by 2 mixed-model ANOVA analysis, with noun context (flexible noun in count context, flexible noun in mass context) as a within-subjects factor, language dominance (English dominant or Chinese dominant/Balanced) as a between-subjects factor, and age (11 year olds or 14 year olds) as another between-subjects factor.

There was a main effect of noun context ($F(1, 224) = 125.53$, $p < .001$), showing that flexible nouns in the count context ($M = 0.64$) were given more number-based judgments than when they occur in the mass context ($M = 0.40$). There was no main effect of language dominance ($F(1, 224) = 0.02$, $p = .88$). Age was significant ($F(1, 224) = 4.75$,

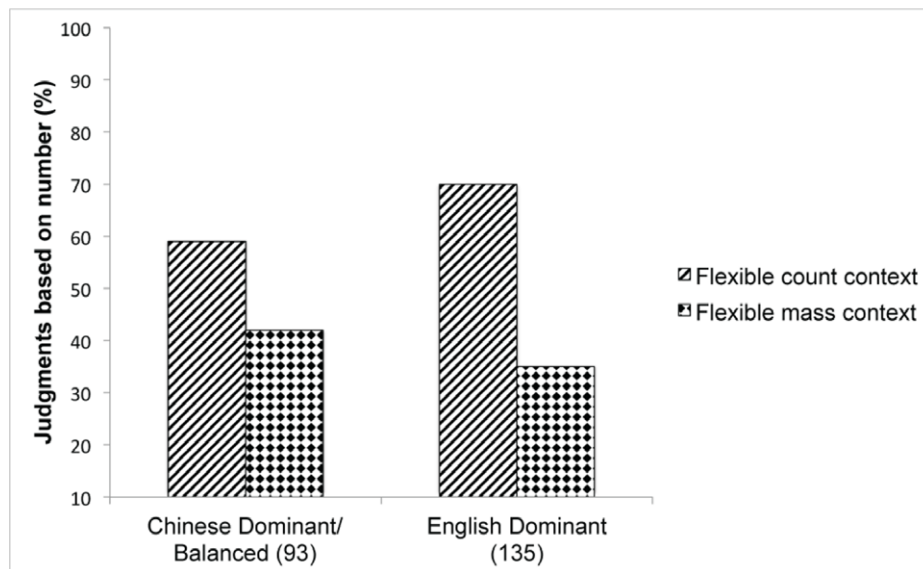


Figure 10: Judgments for flexible nouns by language dominance.

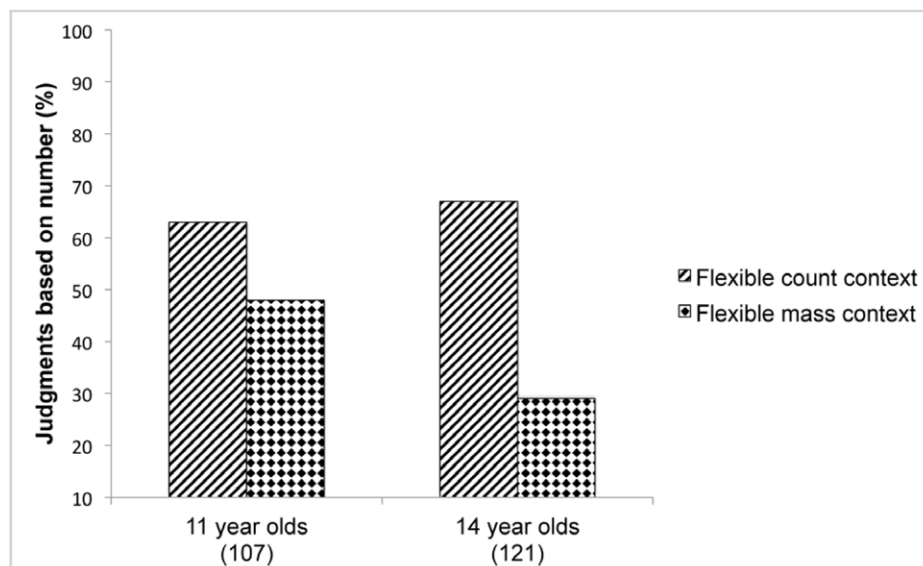


Figure 11: Judgments for flexible nouns by age.

$p = .03$) seemingly driven by the fact that younger students ($M = 0.56$) assigned more number-based judgments than older students ($M = 0.48$). We discuss the age effect below.

A significant interaction was found between noun type and language dominance ($F(1, 224) = 25.05, p < .001$). This means that, English dominant and Chinese dominant/Balanced bilingual students differed from each other in their performance, depending on the context in which the flexible noun occurred. Dependent t-tests showed that both language dominance groups made a significant distinction between count and mass uses of flexible nouns (English dominant students: $M_{COUNT} = 0.7, SE_{COUNT} = 0.02, M_{MASS} = 0.35, SE_{MASS} = 0.03, t(134) = 11.55, p < .001$; Chinese dominant/Balanced students: $M_{COUNT} = 0.59, SE_{COUNT} = 0.03, M_{MASS} = 0.42, SE_{MASS} = 0.03, t(92) = 4.85, p < .001$). Independent t-tests showed that ED students outperformed CB/D students when flexible nouns were presented in the count context ($t(186.87) = 2.90, p = .004$), but no difference was found for flexible nouns presented in the mass context

($t(209.03) = -1.64, p = .10$). In addition, one-sample t-tests show that both dominance groups performed significantly above chance level for both noun conditions (flexible count: $t_{ED}(134) = 8.68, p_{ED} < .001$; $t_{CD/B}(92) = 2.98, p_{ED} < .05$; flexible mass: $t_{ED}(134) = -5.11, p_{ED} < .001$; $t_{CD/B}(92) = -2.43, p_{CD/B} < .05$). Taken together, this suggests that both dominance groups were able to make appropriate semantic judgments on nouns in response to morphosyntactic cues.

There was also a significant interaction between context and age ($F(1, 224) = 34.23, p < .001$). This means that, older students (about 14 years of age) differed from younger students (about 11 years of age) in their performance, depending on the context in which the nouns occurred. Dependent t-tests show that both age groups made a significant distinction between count and mass uses of flexible nouns (older students: $M_{COUNT} = 0.67, SE_{COUNT} = 0.02, M_{MASS} = 0.29, SE_{COUNT} = 0.02, t(120) = 11.58, p < .001$; younger students: $M_{COUNT} = 0.63, SE_{COUNT} = 0.03, M_{MASS} = 0.48, SE_{COUNT} = 0.04, t(106) = 5.24, p < .001$) Independent t-tests showed that older students outperformed younger students when flexible nouns were presented in the mass context ($t(194.4) = -4.28, p < .001$), but not when they occurred in the count context ($t(207.45) = 1.05, p = 0.3$). One-sample t-tests further showed younger students' weakness in mass contexts: while older students' performance on either noun context was significantly different from chance level (count: $t(120) = 7.43, p < .001$; mass: $t(120) = -8.4, p < .001$), younger students performed significantly different from chance only in the count context ($t(106) = 4.51, p < .001$), but not in the mass context ($t(106) = -0.66, p = .51$). Taken together, this suggests that the younger students were less sensitive to morphosyntactic cues in making quantity judgments, and they particularly had problems with mass contexts. No other significant effects were present.

6 Discussion

6.1 Summary of results

We carried out a quantity judgment task with Chinese-English bilingual adolescents to find out whether they grasped the mass-count distinction in English, given that there are cross-linguistic difference between Chinese and English. 228 students took part in our study in which they were asked to perform judgments about the quantity of objects or substance, following the quantity judgment paradigm (Barner & Snedeker 2005). Five conditions of nouns were tested, forming three groups of conditions in the mapping relationship between morphosyntax (plural morphology) and conceptual semantics (individuation/discreteness): congruent mapping (count, substance mass), incongruent mapping (object mass) and flexible mapping (flexible nouns in count context, flexible nouns in mass context). For congruent mapping conditions, it was hypothesized that participants would either follow morphosyntax or conceptual semantics to make judgments about quantity. For the incongruent mapping, we wanted to find out, whether our bilingual adolescents would utilize conceptual semantics to make judgments about quantity, as found in previous child language (Barner & Snedeker 2005) and adult L2 research (Inagaki 2014). For the flexible mapping, we wanted to find out whether participants could make use of morphosyntactic cues to make semantic judgments, when conceptual semantics was held constant. In addition, we wanted to explore any possible effect of participants' language dominance background (dominance in Chinese/balancedness compared with dominance in English), as well as any possible age-related developmental effects. Our results show both convergence with and divergence from previous results with children and L2 adults. For congruent mapping conditions, our participants did well in correctly assigning number-based judgments to count conditions and volume-based judgments to substance mass conditions, just as had been found with L1 English speaking and L2 English populations. However, we noticed a developmental effect whereby younger

participants in our study were weaker in the substance mass condition. Similarly, for our incongruent condition, in which morphosyntax and semantics competed, our participants relied on semantics in resolving the apparent conflict, just like L1 English speakers and L2 learners in previous research. Lastly, for the flexible noun condition where participants were “forced” to heed the cues of morphosyntax, our bilingual speakers’ performance was similar to that of L1 English speakers, and different from that of adult L2 learners when making a significant distinction between count and mass uses of the same nouns. We conclude that our participants were able to use morphosyntax to make semantic judgments, but that there seems to be a developmental effect, particularly for the mass use. Focusing on the findings about participants’ performance in the flexible noun conditions, we discuss below learners’ sensitivity to morphosyntax and the role of input in shaping linguistic knowledge, in addition to speculating about the reasons for the observed difficulty with mass syntax.

6.2 Sensitivity to morphosyntax and role of input

The present study provides evidence on grammatical knowledge/processing in bilingual adolescents. Clahsen and Felser (2006) conducted a comprehensive review of past studies examining the grammatical performance of L1 child learners and adult L2 learners in both off-line and on-line tasks, and compared them with mature native speakers. They concluded that monolingual child learners’ parsing mechanism is basically the same as that of mature speakers. For instance, their performance in sentence ambiguity resolution was guided by phrase structure-based principles and they were able to reactivate structurally defined gaps. Any differences observed between L1 learners and mature speakers in processing were generally explained by factors such as children’s limited working memory capacity. On the other hand, differences between L2 learners and mature native speakers seemed to be of a qualitative nature. For example, their performance in resolving relative clause attachment ambiguities was random even in situations where L1 and L2 are similar (Felser et al. 2003). In resolving long-distance filler-gap dependencies, they were shown to have failed to reactivate the structural gap (Marinis et al. 2005). The conclusion in Clahsen and Felser (2006) was that though L2 learners are guided by lexical-semantic cues during sentence parsing in the same way as native speakers, they are less able to make use of (complex) syntactic information.

The results of our study seem to suggest that unlike second language speakers, bilingual adolescents’ linguistic judgment is similar to that of native English learners and speakers. Specifically, while the children and adult English speakers in Barner and Snedeker (2005) both indicated a significant difference between count and mass uses for flexible items, the L2 learners in Inagaki (2014) did not. We take this to suggest that even in nominal morphosyntax (unlike the more complex sentential syntactic phenomena discussed in Clahsen & Felser 2006), adult L2 learners show an apparent deficit in grammar processing. While Clahsen and Felser (2006)’s model does not specifically address bilingual learners, our results from 11 and 14 year olds suggest that they were able to use morphosyntax to make semantic judgments related to quantity. The difference between our bilingual adolescents and the L2 learners in Inagaki (2014) could be due to the role of input quantity in language acquisition. The adult learners in Inagaki (2014) were learning English in a classroom context, had zero or limited stay in English speaking countries (on average 1.04 weeks), and were considered intermediate learners of English. In comparison, our participants, though younger in age, have had substantial exposure to English as a medium of instruction for most of their school subjects, as well as in non-school settings. The extensive exposure perhaps has resulted in a higher proficiency, enabling our bilingual participants to pick up morphosyntactic cues in deriving semantic consequences more effectively. Therefore,

if the adult L2 learners in Inagaki (2014) had been exposed to a comparable amount of input, they might have developed a grammar representation that is similar to that of the bilingual participants in the present study. This might have in turn led to similar processing patterns (see Clahsen & Felser 2017 for sources of differences in grammar processing). Other studies pointing to the role of input in explaining performance differences in grammar include Gathercole (2007), Argyri and Sorace (2007) and Serratrice et al. (2009). For example, Serratrice et al. (2009) found that in judging the grammaticality of bare Italian nouns in generic contexts, English-Italian bilingual school-age children residing in Italy performed significantly better than their counterparts residing in the UK. This was attributed to the fact that those living in Italy would have had more exposure to Italian than those living in the UK where the community language is English.

Further evidence regarding the importance of input in developing sensitivity to morphosyntactic cues can perhaps be seen in a descriptive comparison between our bilingual adolescents' performance and that of the monolingual four-year-old children in Barner and Snedeker (2005) for the flexible noun conditions. While monolingual children made quite a sharp distinction between count and mass uses in assigning number-based judgments (0.95 versus 0.25), our adolescents made a less sharp, though still statistically significant distinction (0.64 versus 0.40 for all participants; 0.70 versus 0.35 for English dominant bilinguals; 0.67 versus 0.29 for older bilinguals). We think that the difference between monolingual 4-year olds and our bilingual adolescents might be due to the quality of input. As briefly mentioned above, the linguistic environment of our sample includes both bilingualism (e.g., English and Chinese) and diglossia (standard English and informal English). While Chinese does not mark mass-count via plural morphology, the informal variety of English spoken in Singapore only optionally uses plural morphology (Gil 2003; Wee & Alsado 2004). This means that the quality of the English language input our adolescents have received may not be as consistent as that for the four-year olds in Barner and Snedeker (2005). Even in first language learning contexts, variability in input influences children's progression towards target-like knowledge, as seen in the comparison between Chilean and Mexican children with respect to Spanish plural morphology (Miller & Schmitt 2010). Compared with Mexican and standard Spanish, the Chilean variety pronounces plural morphology only half of the time. Therefore, Miller and Schmitt (2010) found that Chilean children were far less accurate than their Mexican age-matched counterparts in understanding the meaning of the plural morpheme. Similarly, Pires et al. (2011) found that European Portuguese 6–7 year olds already mastered some of the semantic consequences of inflected infinitives in Portuguese, whereas the same property was not mastered until much later (from age 10 on) by children learning Brazilian Portuguese (Pires & Rothman 2009). The explanation was that, in contrast with the European variety, informal Brazilian Portuguese has partially eliminated the use of this morphosyntactic property, but it exists in the more formal, educated variety that children are exposed to in adolescence. Therefore, it appears that the comparatively poorer performance of our adolescent bilinguals compared with monolingual children in previous research could be attributed to the different quality of English input they received.⁴ Namely, the optional morphosyntactic marking for the mass-count distinction in the informal variety of English

⁴ One might wonder why input quality did not seem to affect our bilingual participants' performance on the congruent and incongruent mapping items (e.g., count and object mass items). The explanation is simply that for both count and object mass items, participants had a choice of either relying on conceptual semantics or morphosyntax to make quantity judgments whereas the flexible condition items require attention to morphosyntactic cues (see Barner & Snedeker 2005: 53). Therefore, our participants could have relied on ontological properties of the nouns in making judgments for count and object mass items, for which the nature of input quality (e.g., optional plural marking in the informal variety of English spoken in Singapore) would have no effect.

spoken in the context of the present study might have made the grammar of our participants more indeterminate than that of monolingual learners/speakers.

6.3 Difficulty with mass conditions and transparency in form-meaning mapping

Our results for substance mass and flexible mass use conditions show that the younger group (11 year olds) performed at chance level, whereas the older group gave significantly fewer number-based judgments for these conditions than the chance level. This seems to suggest that participants either had trouble with the conceptual semantics for mass nouns as depicted in the current study, or that they have problems with mass syntax. One explanation for the former, conceptual semantics scenario could be a task-specific effect of this particular quantity judgment paradigm. Specifically, homogeneity is a property of substance, and artificially dividing it into pieces/portions may increase the processing cost in determining the amount of mass. Take *ketchup* as an example. In the task, two big dollops of ketchup were placed alongside six tiny dollops of ketchup to query participants' understanding of the concept of quantity for substance nouns. While this set up (manipulation of quantity in terms of number and volume) is a necessity for the purposes of the study and other similar studies, the way quantity was represented is not the most natural state for mass nouns. Participants perhaps had to mentally merge the portions of ketchup together on both sides, before being able to compare the amount of volume, since the unmarked state for us to observe substance is in an undivided mass. This extra step might have resulted in an increase in processing costs.⁵ Hence, aspects of this quantity judgment task, such as the way mass substance is represented, could have worked to decrease the accuracy within mass noun conditions for the younger group who may be more affected by increased cognitive processing demands than older students.⁶ This could explain the age effects observed in the flexible noun conditions where younger participants made more number-based judgments overall (but see footnote 3). On the other hand, the count nouns (and perhaps object mass nouns too) in the study do not suffer the same problem, as they are always presented in discrete forms, which would be their natural state. Participants therefore did not have to perform an extra step of mental amalgamation in order to arrive at the correct answer for quantity regarding count nouns. The counting bias referred to above would only work in their favor. Indeed, even in the results reported in Barner and Snedeker (2005), children seemed to have fared worse than adults in the mass conditions (39.6% versus 0% of number-based judgments for substance mass nouns in experiment two; 25% vs 3% of number-based judgments for mass uses in experiment three) but their performance in the count conditions were comparable to that of adults. Future research using the quantity judgment paradigm could perhaps look into the role of working memory resources as well as task effects in accounting for the performance on mass contexts.

⁵ Relatedly, the way *number* is represented in the task could have further complicated this process, where multiple copies of a single portion of stuff were created to represent the notion of number (e.g., two big dollops of ketchup versus six small dollops of ketchup, all being the enlarged or shrunk versions of the same image). This could predispose participants to count the number of copies in completing the quantity judgment task instead of mentally merging the stuff on each side to estimate the combined volume, thereby elevating their number-based judgments across the board. We thank an anonymous reviewer for pointing this out. However, in Barner and Snedeker (2005), children were presented with real objects/stuff, rather than images thereof, which presumably would have circumvented the problem of multiple copies being used to represent number. Yet, the children in that study also seemed to have more trouble with mass items. Future research using the quantity judgment paradigm should nevertheless perhaps vary the appearance of the different objects/portions of stuff to potentially reduce the counting bias.

⁶ A subsidiary analysis focusing on the items shared with Barner and Snedeker (2005) and Inagaki (2014) in addition shows that the Chinese dominant/balanced bilinguals also had some difficulty with the substance mass condition (see footnote 3 and Appendix B). Therefore, the discussions of task effects on younger bilinguals may also partially apply to them.

Alternatively, the difficulty with mass conditions lies with the inherent complexity in the mapping relationship between mass morphosyntax and conceptual semantics. As can be seen in Figure 5 (and also Figure 6 in Barner & Snedeker 2005), count morphosyntax is mapped to the semantic concept of *individual* only, hence a transparent one-to-one mapping relationship. On the other hand, mass syntax is mapped to two semantic concepts: *non-individual* (i.e., substance mass) and *individual* (i.e., object mass, Figure 6). It has been postulated that a transparent mapping relationship is easier to acquire for both first language (van Hout 1998) and second language learning contexts (e.g., VanPatten 2004). For example, van Hout (1998) examined English learning and Dutch learning children's knowledge of lexical aspect in transparent (participle conditions) and non-transparent mapping constructions (intransitive, bare transitive, possessive transitive conditions), and found the transparent construction was acquired much earlier than non-transparent ones. Based on this, van Hout (1998) proposed the following learning principle:

“Transparency principle as a general learning theory: If acquisition involves finding the mappings between particular cognitive notions and their linguistic encodings, possibly mediated by UG defined morphosyntactic features, the learning should be easier for overt and unambiguous mappings (one-to-one) than for covert and/or conflated ones (many-to-one).” (van Hout 1998: 399)

There is evidence for the effect of the transparency form-meaning mapping in second language learning too. For example, the German article *dem* expresses various meanings such as definiteness, case, number and gender. Yet, L2 learners of German only assign one of such meanings to articles, namely, definiteness, ignoring all the others (Andersen 1984). Similarly, articles in Romance languages also encode gender, realized in two forms (e.g., *le* for masculine definite and *la* for feminine definite articles in French). Yet, even advanced learners of L2 French were found to use only one form for both genders (Hawkins 2001). This pattern of simplification was found in both learners with genderless L1 (Hawkins 2001; Cuza & Pérez-Tattam 2016) and in those whose L1 has grammatical gender (Bruhn de Garavito & White 2002), suggesting that the tendency towards transparent form-meaning mapping is likely a universal principle.

It is true that the participants in our study did not encounter problems with the object-mass condition (neither did the monolingual participants and adult L2 learners in previous studies). Nevertheless, it is possible that the very existence of the two possibilities for mass syntax (individual and non-individual) makes this form more complex to process and learn than the more straightforward count syntax. This, coupled with the issue of the representation of substance in the task paradigm may explain the decreased performance in the mass conditions.

6.4 Limitations and future directions

The present study did not include a group of native English speaking adolescents, partly due to logistical constraints. We would expect such individuals to have performed similarly to native English speaking adults in making quantity judgments, since 4-year-old monolingual English speaking children in Barner and Snedeker (2005) already performed at adult levels. Thus, we considered comparison to previous monolingual research to be an adequate comparison. Another limitation in respect to participants is the lack of a native Chinese speaking group who would have taken part in a Chinese version of the task. Future work could address whether this group compares with the native Japanese speaking participants in Inagaki (2014) with respect to quantity judgment. Further, we noted

that there are some differences in the design and items used in the present study versus previous ones. We opted to use a repeated measures, within subjects design as opposed to a between groups design which would have required precise matching of subjects on all language background variables. Also, we included additional items compared with previous studies on English speakers/learners. When we restricted our analysis to the original items, though, we did find similar patterns of results that do not alter our overall observations (but see a summary of the set of specific results in Appendix B). Nonetheless, comparison of our results with the previous research studies should be considered with caution according to this caveat.

Abbreviations

ARG = argument, CD/B = Chinese dominant or balanced proficiency, DP = determiner phrase, ED = English dominant, L1 = first language, L2 = second language, NMP = nominal mapping parameter, PRED = predicate

Additional Files

The additional files for this article can be found as follows:

- **Appendix A.** Instructions for the study. DOI: <https://doi.org/10.5334/gjgl.382.s1>
- **Appendix B.** Results of subsidiary analysis. DOI: <https://doi.org/10.5334/gjgl.382.s1>

Acknowledgements

The study reported in this paper was supported by a grant from the Office of Education Research (OER 4/13 OBA). Views expressed in this article do not necessarily reflect those of the National Institute of Education.

Competing Interests

The authors have no competing interests to declare.

References

- Andersen, Roger. 1984. The one to one principle of interlanguage construction. *Language Learning* 34(4). 77–95. DOI: <https://doi.org/10.1111/j.1467-1770.1984.tb00353.x>
- Argyri, Efrosyni & Antonella Sorace. 2007. Crosslinguistic influence and language dominance in older bilingual children. *Bilingualism: Language and Cognition* 10(01). 79–99. DOI: <https://doi.org/10.1017/S1366728906002835>
- Bao, Zhiming. 2015. *The making of vernacular Singapore English: System, transfer and filter*. Cambridge: Cambridge University Press. DOI: <https://doi.org/10.1017/CBO9781139135375>
- Barner, David & Jesse Snedeker. 2005. Quantity judgments and individuation: Evidence that mass nouns count. *Cognition* 97(01). 41–66. DOI: <https://doi.org/10.1016/j.cognition.2004.06.009>
- Borer, Hagit. 2005. *In name only* (Structuring Sense I). Oxford: Oxford University Press. DOI: <https://doi.org/10.1093/acprof:oso/9780199263905.001.0001>
- Bruhn de Garavito, Joyce & Lydia White. 2002. The second language acquisition of Spanish DPs: The status of grammatical features. In Ana Teresa Pérez-Leroux & Juana Muñoz Licerias (eds.), *The acquisition of Spanish morphosyntax*, 153–178. Dordrecht; Boston: Kluwer.
- Cheng, Lisa Lai-Shen & Rint Sybesma. 1999. Bare and not-so-bare nouns and the structure of NP. *Linguistic Inquiry* 30. 509–542. DOI: <https://doi.org/10.1162/002438999554192>

- Chierchia, Gennaro. 1998. Plurality of mass nouns and the notion of “semantic parameter”. In Susan Rothstein (ed.), *Events and grammar*, 53–103. Dordrecht: Kluwer.
- Clahsen, Harald & Claudia Felser. 2006. Grammatical processing in language learners. *Applied Psycholinguistics* 27(01). 3–42. DOI: <https://doi.org/10.1017/S0142716406060024>
- Clahsen, Harald & Claudia Felser. 2017. Some notes on the shallow structure hypothesis. *Studies in Second Language Acquisition*. Advance online publication. DOI: <https://doi.org/10.1017/S0272263117000250>
- Cuza, Alejandro & Rocío Pérez-Tattam. 2016. Grammatical gender selection and phrasal word order in child heritage Spanish: A feature re-assembly approach. *Bilingualism: Language and Cognition* 19(01). 50–68. DOI: <https://doi.org/10.1017/S1366728914000893>
- Felser, Claudia, Leah Roberts, Theodore Marinis & Rebecca Gross. 2003. The processing of ambiguous sentences by first and second language learners of English. *Applied Psycholinguistics* 24(03). 453–89. DOI: <https://doi.org/10.1017/S0142716403000237>
- Gabriele, Alison. 2009. Transfer and transition in the SLA of aspect. *Studies in Second Language Acquisition* 31(03). 371–402. DOI: <https://doi.org/10.1017/S0272263109090342>
- Gathercole, Virginia C. Mueller. 1997. The linguistic mass/count distinction as an indicator of referent categorization in monolingual and bilingual children. *Child Development* 68(5). 832–842. DOI: <https://doi.org/10.1111/j.1467-8624.1997.tb01965.x>
- Gathercole, Virginia C. Mueller. 2007. Miami and North Wales, so far and yet so near: Constructivist account of morphosyntactic development in bilingual children. *International Journal of Bilingual Education and Bilingualism* 10. 224–247. DOI: <https://doi.org/10.2167/beb442.0>
- Gil, David. 2003. English goes Asian: Number and (in)definiteness in the Singlish noun phrase. In Frans Plank (ed.), *Noun phrase structure in the languages of Europe*, 467–514. Berlin: Mouton de Gruyter.
- Goad, Heather & Lydia White. 2004. Ultimate attainment of L2 inflection. *EUROSLA Yearbook* 4 (January), 119–45. DOI: <https://doi.org/10.1075/eurosla.4.07goa>
- Goad, Heather & Lydia White. 2006. Ultimate attainment in interlanguage grammars: A prosodic approach. *Second Language Research* 22(3). 243–68. DOI: <https://doi.org/10.1191/0267658306sr268oa>
- Hacohen, Aviya. 2010. *On the acquisition of (Hebrew) compositional telicity*. Beer-Sheva: Ben-Gurion University of the Negev dissertation.
- Hawkins, Roger. 2001. *Second language syntax: A generative introduction*. Oxford: Blackwell.
- Hua, Dongfan & Hun-tak Thomas Lee. 2005. Chinese ESL learners’ understanding of the English count-mass distinction. In Laurent Dekydtspotter, Rex A. Sprouse & Audrey Liljestrang (eds.), *Proceedings of the 7th Generative Approaches to Second Language Acquisition Conference (GASLA 2004)*, 138–149. Somerville, MA: Cascadilla Proceedings Project.
- Inagaki, Shunji. 2014. Syntax–semantics mappings as a source of difficulty in Japanese speakers’ acquisition of the mass–count distinction in English. *Bilingualism: Language and Cognition* 17(03). 464–77. DOI: <https://doi.org/10.1017/S1366728913000540>
- Ionin, Tania, Heejeong Ko & Kenneth Wexler. 2004. Article semantics in L2 acquisition: The role of specificity. *Language Acquisition* 12(1). 3–69. DOI: https://doi.org/10.1207/s15327817la1201_2

- Ionin, Tania, Maria Luisa Zubizarreta & Salvador Bautista Maldonado. 2008. Sources of linguistic knowledge in the second language acquisition of English articles. *Lingua* 118(4). 554–76. DOI: <https://doi.org/10.1016/j.lingua.2006.11.012>
- Lim, Valerie P. C., Susan J. Rickard Liow, Michelle Lincoln, Yiong Huak Chan & Mark Onslow. 2008. Determining language dominance in English–Mandarin bilinguals: Development of a self-report classification tool for clinical use. *Applied Psycholinguistics* 29(03). 389–412. DOI: <https://doi.org/10.1017/S0142716408080181>
- Marinis, Theodore, Leah Roberts, Claudia Felser & Harald Clahsen. 2005. Gaps in second language sentence processing. *Studies in Second Language Acquisition* 27(01). DOI: <https://doi.org/10.1017/S0272263105050035>
- McManus, Kevin. 2015. L1–L2 differences in the acquisition of form–meaning pairings in a second language. *Canadian Modern Language Review* 71(2). 51–77. DOI: <https://doi.org/10.3138/cmlr.2070.51>
- Miller, Karen & Cristina Schmitt. 2010. Effects of variable input in the acquisition of plural in two dialects of Spanish. *Lingua* 120(5). 1178–93. DOI: <https://doi.org/10.1016/j.lingua.2008.05.009>
- Montrul, Silvina & Roumyana Slabakova. 2002. The L2 acquisition of morphosyntactic and semantic properties of the aspectual tenses preterite and imperfect. In Ana Teresa Pérez-Leroux & Juana Muñoz Licerias (eds.), *The acquisition of Spanish morphosyntax*, 153–178. Dordrecht, Boston: Kluwer. DOI: https://doi.org/10.1007/978-94-010-0291-2_5
- Oshita, Hiroyuki. 1997. *The unaccusative trap: L2 acquisition of English intransitive verbs*. Los Angeles, CA: University of Southern California dissertation.
- Pires, Acrisio & Jason Rothman. 2009. Acquisition of Brazilian Portuguese in late childhood: Implications for syntactic theory and language change. In Acrisio Pires & Jason Rothman (eds.), *Minimalist inquiries into child and adult language acquisition: Case studies across Portuguese*, 129–154. Berlin: Mouton de Gruyter.
- Pires, Acrisio, Jason Rothman & Ana Lúcia Santos. 2011. L1 acquisition across Portuguese dialects: Modular and interdisciplinary interfaces as sources of explanation. *Lingua* 121(4). 605–22. DOI: <https://doi.org/10.1016/j.lingua.2010.06.002>
- Serratrice, Ludovica, Antonella Sorace, Francesca Filiaci & Michela Baldo. 2009. Bilingual children's sensitivity to specificity and genericity: Evidence from metalinguistic awareness. *Bilingualism: Language and Cognition* 12(02). 239–57. DOI: <https://doi.org/10.1017/S1366728909004027>
- Slabakova, Roumyana. 2008. *Meaning in the second language*. Berlin, New York: Mouton de Gruyter. DOI: <https://doi.org/10.1515/9783110211511>
- Snape, Neal. 2008. Resetting the nominal mapping parameter in L2 English: Definite article use and the count–mass distinction. *Bilingualism: Language and Cognition* 11(01). 63–79. DOI: <https://doi.org/10.1017/S1366728907003215>
- Statistics Singapore. 2016. Population trends. http://www.singstat.gov.sg/docs/default-source/default-document-library/publications/publications_and_papers/population_and_population_structure/population2016.pdf (Accessed 2017-02-20).
- Trenkic, Danijela. 2007. Variability in second language article production: Beyond the representational deficit vs. processing constraints debate. *Second Language Research* 23(3). 289–327. DOI: <https://doi.org/10.1177/0267658307077643>
- van Hout, Angeliek. 1998. On the role of direct objects and particles in learning telicity in Dutch and English. In Annabel Greenhill, Mary Hughes, Heather Littlefield & Hugué Walsh (eds.), *Proceedings of the 22nd Annual Boston University Conference on Language Development*, 397–408. Somerville, MA: Cascadilla Press.

- VanPatten, Bill (ed.). 2004. *Form-meaning connections in second language acquisitions*. Mahwah, NJ: Erlbaum. DOI: <https://doi.org/10.1075/veaw.g33.05wee>
- Wee, Lionel & Umberto Ansaldi. 2004. Nouns and noun phrases. In Lisa Lim (ed.), *Singapore English: A grammatical description*, 57–74. Amsterdam, Philadelphia: John Benjamins.
- White, Lydia. 2011. Second language acquisition at the interfaces. *Lingua* 121(4). 577–90. DOI: <https://doi.org/10.1016/j.lingua.2010.05.005>

How to cite this article: Yin, Bin and Beth Ann O'Brien. 2018. Mass-count distinction in Chinese-English bilingual students. *Glossa: a journal of general linguistics* 3(1): 23.1–22, DOI: <https://doi.org/10.5334/gjgl.382>

Submitted: 21 March 2017 **Accepted:** 25 October 2017 **Published:** 08 February 2018

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