WHO HAS MORE? SECOND-LANGUAGE PROCESSING OF MASS-COUNT NOUNS

Danica MacDonald and Susanne Carroll
University of Calgary

Our research examines the relationship between morpho-syntax and semantics in the mass-count distinction and our ability to categorize nouns in both a first (L1) and second language (L2). In particular, it investigates whether Korean learners of English are sensitive to the English morpho-syntactic cues to mass and count nouns or whether they rely on conceptual categories to make correct interpretations of English nouns.

1. Number-marking in English and Korean

The world's languages are generally classified into one of two categories with respect to number: *mass-count* languages and *classifier* languages (Allen, 1980; Chierchia 1998a). In mass-count languages, it is assumed that nouns are divided into two sub-categories: mass nouns (*water* or *sand*) and count nouns (*dog* or *chair*). Here, the mass/count distinction is intrinsic to the noun and is specified in its lexical entry. If we consider the view expressed in traditional grammars and in early semantic work (Quine, 1960) we find that the mass-count contrast is a semantically-based contrast: count nouns can individuate and be pluralized while mass nouns cannot. This semantic difference is cued by subtle morpho-syntactic differences. Count nouns can be marked by a plural suffix (*dog**s***). They can also be modified by numbers (***one*** *cat;* ***five*** *apples*), and they can be modified by certain distinct quantifiers, such as few and many (***few*** *dogs,* ***many*** *children*). Finally, singular count nouns do not occur without a determiner.

Mass nouns generally denote substances (such as *water* or *sand*). They cannot be marked by a plural suffix (**sand**s**, * water**s***), nor can they be modified by a number (*****one*** *rice, * **five*** *sand*). Like count nouns, mass nouns can be modified by distinct quantifiers, such as *little* or *much*, but these quantifiers are different from those used to modify count nouns (***little*** *water,* ***much*** *sand*). Unlike count nouns, mass nouns can occur without a determiner.

In English, there are also *object-mass nouns*[1]. These object-mass nouns denote individuals (*furniture* or *graffiti*) (Barner & Snedeker, 2005, 2006; Barner et al., 2008; Gillon, 1999). Still, they are grammatically mass nouns. As we see in (1a) and (b), *furniture* cannot be marked with a plural suffix. In (1c), it cannot be modified by a number. In (1d) and (e), we see that it can occur with mass quantifiers, such as *much*, but not with count quantifiers, such as *many*. Finally, in (1f), we see that *furniture* can occur without a determiner.

(1) a. There is *furniture* in the room.
b. * There are *furnitures* in the room.
c. * There are *three furnitures* in the room.

[1]The terminology *object-mass noun* and *substance-mass noun* come from Barner and Snedeker (2005).

Actes du congrès annuel de l'Association canadienne de linguistique 2013.
Proceedings of the 2013 annual conference of the Canadian Linguistic Association.

d. There is *much furniture* in the room.
e. *There is *many furniture* in the room
f. *Furniture* is in the room.

Korean, unlike English, is a *classifier language*. One of the main properties of a classifier language is that it lacks the obligatory singular/plural morphology that exists in English; for example, the bare noun 'book' (*chayk*) can refer to either a single entity or several entities. The Korean sentence *haksayng-un chayl-ul ilkessta* can elicit multiple readings (as we see in (2)).

(2) haksayng-un chayk-ul ilkessta
student-TOP book-ACC read
'A student/Students reads a book/books.'

Source: Nemoto, 2005: 384

Korean and English differ in the ways that they encode number. In mass-count languages such as English, plural marking is obligatory when we want to talk about more than one entity. In languages like Korean, in contrast, there is no obligatory plural marking morpheme corresponding to English *–s*, and a "bare" noun can be used to refer to either a single or a plural individual.

2. Mass-count and classifier languages

Traditionally, common nouns are distinguished from each other with respect to their countability (Quine, 1960). "Count" nouns refer to entities which can be counted and mass nouns refer to entities which cannot. This, in turn, presupposes that the entities denoted by count nouns are conceptually individuated. However, the mass-count distinction is also an aspect of grammar which encompasses both syntax and morphology. While researchers agree on the basic facts of mass-count morpho-syntax, there is often disagreement about its effects on the semantics of nouns. Since Quine's (1960) proposal, linguists and psychologists have put forth proposals regarding the semantics of mass-count nouns. While most researchers (Chierchia, 1998; Gillon, 1996; Jackendoff, 1991; Link, 1983) agree with Quine that count nouns cannot divide their reference, they differ on the semantic properties of mass nouns. According to Quine (1960), there is a "cumulative reference property" which he attributes to mass nouns. This "cumulative reference" states that mass terms like 'water' have the semantic property of referring cumulatively, however this is not the case for count nouns like 'horse'. However, as Link (1998) later pointed out, the properties of "cumulative reference" fail to distinguish mass from count since the false statement (such as "if *a* is a horse and *b* is a horse than *a* and *b* taken together are a horse" is true for plural count nouns. Similarly, Cheng's (1973) "divisity of reference" claims that any part or portion of something that is denoted by a mass noun can also be denoted by the same mass noun.

Building on the work of Quine (1960), Gillon (1996) claims that some mass nouns, such as *furniture, silverware, jewelry* and *clothing*, etc., exhibit "divisity of reference". Gillon argues that these *object-mass nouns* denote "minimal parts" and that "divisity of reference" would fail as a way of

categorizing this group of mass nouns. Chierchia (1998b) agrees with Gillon (1996) in his classification of object-mass nouns and extending on this proposes an "Inherent Plurality Hypothesis" in which he claims that all mass nouns refer to sets of atoms (or individuals), and are "inherently plural" and that "mass nouns come out of the lexicon with plurality already built in... this is the only way in which they differ from count nouns" (p. 53). In Chierchia's (1998a) Nominal Mapping Parameter, he also claims that in classifier languages all nouns are mass and thus inherently refer to plural individuals since they lack count syntax. Cheng & Sybesma (1999) propose instead that classifier languages, such as Chinese, do make a mass-count distinction and that the only way in which count nouns in Chinese differ from those in English is that Chinese lacks number morphology.

Jackendoff (1983, 1991) views conceptual structures as mental representations common to all natural languages which permit us to talk about what we see, hear, feel and think. They encode not only the meanings of units of morpho-syntax, but whatever additional information we use to make sense of language-in-context. In this study, we will be concerned largely with the concepts of INDIVIDUAL and SUBSTANCE. INDIVIDUAL concepts in mass-count languages typically map to NPs headed by proper names or count nouns. In classifier languages, they map to bare NPs or to NPs that are determined by classifiers that cue specific PROPERTIES of the INDIVIDUAL (humanness, animacy, shape, and so on). In mass-count languages, SUBSTANCE concepts typically map to NPs headed by mass nouns. As we shall see, however, some INDIVIDUAL concepts in English can map to NPs headed by object-mass nouns (*furniture, jewelry, footwear,* etc.*)*.

A growing number of experimental studies have tested some of the theoretical claims discussed above. Barner and Snedeker (2005) tested how native speakers of English classify and conceptualize three categories of nouns: count nouns (like *shoe*), substance-mass nouns (like *toothpaste*) and object-mass nouns (like *furniture*). Their experiment proved to be an excellent testing ground for the proposals put forth by Quine (1960), Gillon (1996) and Chierchia (1998). They asked: How are object-mass nouns interpreted? Would the test subjects treat them like count nouns or like mass nouns? If mass nouns refer to non-individuals (as Quine proposes), then participants should not quantify over individuals when interpreting object mass nouns. If mass nouns can individuate (like Gillon and Chierchia propose), then participants should base quantification judgments on number, not overall volume.

The results of the first experiment showed that participants consistently quantified over mass for substance-mass nouns (like *toothpaste*) that occur in a bare noun context and over number for count nouns (like *shoe*) which are marked by the plural. They also revealed that when native speakers of English viewed pictures of object-mass nouns (like *furniture)* and heard sentences with bare noun syntax, they still quantified over individuals. These results do not support Quine's view that only count nouns individuate. They also reveal that English speakers only sometimes appear to rely on the count-mass syntax to carry out the task, namely with the nouns denoting INDIVIDUALS and SUBSTANCES.

Barner and Snedeker's second study looked at the conceptualization of mass-count flexible nouns (like *string/stings*) which are nouns that can appear as

both mass nouns and count nouns. Their study showed that participants based judgments on number when the mass-count flexible nouns were used in count syntax and on volume when they were used with mass syntax. In this case, therefore, participants did rely on morpho-syntactic cues to carry out the task.

3. The Present Study

From Barner and Snedeker's (2005) research, we see how speakers of a mass-count language conceptualize and classify nouns. In order to have a more complete view of how morpho-syntax forms the basis of the formation of conceptual representations, it is beneficial to expand this type of study to classifier languages to see how nouns are interpreted in languages which lack mass-count syntax. The main research questions that we ask are: How do speakers of different languages conceptualize nouns when confronted with entities of different conceptual types (INDIVIDUALS versus SUBSTANCES)? Are our conceptualizations influenced by the morpho-syntax of the language/s we speak? Do L2 learners eventually become sensitive to different morpho-syntactic cues (plural marking leading to quantification over number, no marking leading to quantification over volume), especially when the L1 does not have a mass/count distinction?

The first question we address is: Can we replicate Barner and Snedeker's (2005) results using different stimuli? The second question that we address is: How do Koreans conceptualize nouns denoting various conceptual categories when these appear in bare noun contexts in Korean?

Establishing how Koreans conceptualize nouns in their L1 is a necessary first step to examining their performance on the same task in English. In particular, if we want to determine if the properties of the L1 nouns transfer to the learners' interlanguage grammars, we must provide a foundation for Korean-English performance on the task by looking at their L1.

For the Korean L2 study, we address the following questions:

1. Do Korean L2 learners of English pay attention to the morpho-syntactic cues when processing English as a second language?
2. What role does lexical transfer from the L1 play in this processing?

4. Method

4.1 Participants

Forty native speakers of English and 40 native speakers of Korean were recruited from the student body at the University of Calgary.

4.1.1 English subjects

Summary data, including age, sex, place of birth, and childhood and current languages spoken at home are shown in Table 1.

Table 1: Summary data: English Participants

Age	Sex	Place of Birth	Childhood Language	Home Language
Range: 18-30 Mean: 21	Male: 14 Female: 26	Canada: 38 US: 1 Philippines: 1	English: 40	English: 40

4.1.2 Korean subjects

Forty native speakers of Korean were tested. The Korean native speakers completed high school in Korea, and are speakers of a Seoul dialect of Korean. Summary data for the Korean participants are shown in Table 2.

Table 2: Summary data: Korean Participants

Age	Sex	Place of Birth	Childhood Language spoken at home	Language spoken at home today
Range: 18-26 Mean: 23	Male: 17 Female: 23	Korea: 40	Korea: 40	Korea: 40

4.2 Design and stimuli

The methodology of Barner & Snedeker (2005) was used in this study.This experiment was a mixed between-subjects design. The English participants only completed the study in English in order to establish baseline data with which to compare the Korean subjects on the L2 study. Languages (English and Korean) were manipulated within subjects for the Korean participants.

For the English part of the experiment, all count nouns were cued by the plural morpheme – "count syntax" (*Who has more flowers?*). Substance-mass nouns and object-mass nouns were cued by bare noun context – "mass syntax" (*Who has more juice?* or *Who has more furniture?*). Mass count flexible nouns were presented to half of the participants with count syntax and to half of the participants with mass syntax (e.g., *Who has more string?* or *Who has more strings?*).

Korean nouns were presented in the Korean carrier sentence (*nwu-gwu te _____ka-ji-go iss-e-yo?*) which has the same meaning as the English carrier sentence 'Who has more_____?' Since Korean has no obligatory plural marking, all Korean nouns occurred as bare nouns.

A professional photographer prepared 80 digital pictures: two pictures for each test item. The pictures used in the training items showed 4 items (of the same size). The pictures used in the experimental items showed 2 large items on the left side of the picture and 6 small items on the right side of the picture.

4.3 Procedure

All testing was done in one of the psycholinguistics laboratories located in the Language Research Centre of the University of Calgary. Participants were given a brief description of the experiment and signed an ethical consent form. They also filled in a questionnaire answering questions on sex, age, and languages that they speak. Following this the English participants completed the experiment in English and the Korean participants completed the experiment in both Korean and English.

The experimental tasks were computer-controlled, using the E-prime platform 1.2 to present audio and visual stimuli. Instructions were presented in English (for the English participants) and Korean (for the Korean participants) in writing on the screen and also orally through earphones. Participants were told that, in the first part of the experiment, a picture would appear on the computer screen and that they would hear a sentence naming the item. In the second part of the experiment they were asked to look at two pictures and to make a judgment, based on the picture they saw and the sentence they heard, as to which item was "more". The participants could go through the instructions at their own pace. After the instructions, the speed of the rest of the experiment was experimenter controlled. Participants had 2.5 seconds to enter their answer after the offset of the stimuli.

Participants were asked to classify four categories of words: nouns that denote INDIVIDUALS (e.g., *gae* 'dog'*)*, nouns that denote non-solid SUBSTANCES (e.g., *mul* 'water'), nouns that denote AGGREGATES and which are object-mass nouns in English (*kago* 'furniture'*)*, and nouns which can appear with either mass or count syntax in English and are ambiguous between an INDIVIDUAL and a SUBSTANCE interpretation (*pacuri* 'rope').

Participants looked at pictures of items on a screen and were told the name of the item (Ex. *Here we see* ____ */* ____ *iss-im-nida*). They were then instructed to look at the pictures and listen to sentences; they did not need to respond. Participants were asked to look at the picture and listen to the name of the item to be sure that they understood what each picture was naming. This was to ensure that the participants were familiar with all the words in their L2. Participants then saw two pictures on the screen: one picture with two "big" objects and one picture with six "small" objects. The two "big" objects were designed to have a clearly visible larger volume then the six "small" objects. Participants were asked to imagine that one person owns the two "big" objects and that another person owns the six "small" objects. Then they are asked to decide *Who has more* _____*?* The assumption behind the design is that participants would make their judgment by comparing quantities in the two pictures. To compare quantities of INDIVIDUALS, they would have to count the members of a set. To compare magnitudes of SUBSTANCES, they would need to assess the volume of the SUBSTANCE. In each case, the participant would be able to make a decision only after a particular interpretation had been assigned to the NP contained in the question *Who has more NP?*

Participants responded by pressing a key on the computer keypad. If they wanted to choose the picture which appears on the right-hand side of the

screen, they were instructed to push "0", if they wanted to choose the picture on the left-hand side of the screen, they were instructed to press the "1" button.

Items were randomized in both parts of the experiment. Accuracy scores were recorded.

The experiment was run in English (with the English participants) and in both Korean and English (with the Korean participants). The English participants were asked to make judgments on 40 English nouns, and the Korean participants were asked to make judgments on 20 Korean nouns and 20 English nouns.

5. Results

5.1 English L1 Results

Summed totals for each type of stimuli are presented in Figure 1 for the English native speaker results. The English native speakers judged count nouns by quantifying over number 99% of the time; they judged substance-mass nouns by quantifying over number 1% of the time; and they judged object-mass nouns by quantifying over number 98.8% of the time. For the flexible nouns presented with count syntax, the English native speakers judged this group of nouns by quantifying over number 96% of the time, and only 6% of the time did they quantify over number for the flexible nouns presented in a mass syntax context. A one sample means comparison test with alpha = 0.5 shows that all these results were significantly different from chance[2].

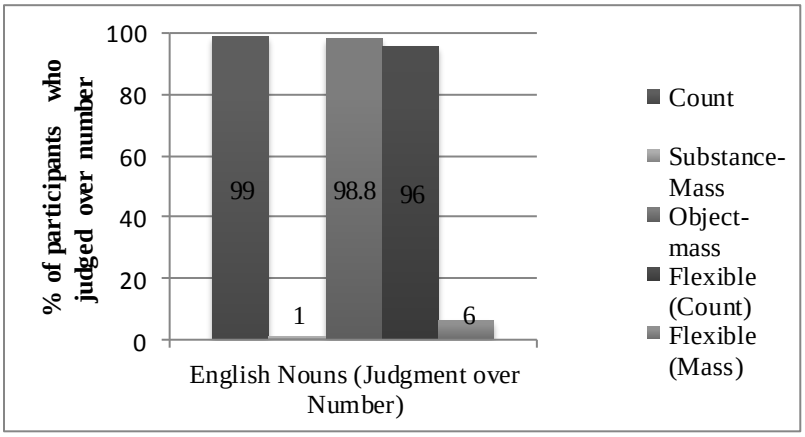

Figure 1: Results – English Native Speakers

The English results were consistent with the findings of Barner & Snedeker (2005).

[2] One sample means comparison test results: count nouns ($F(1,399) = 114.02$, $p < 0.001$), substance-mass nouns $F(1,399) = 98.37$, $p < 0.001$), object-mass nouns $F(1,399) = 87.65$, $p < 0.001$), flexible nouns presented in count syntax $F(1,199) = 26.14$, $p < 0.001$), and flexible nouns presented in mass syntax $F(1,199) = 33.11$, $p < 0.001$)

5.1.1 English L1 Discussion

The English participants quantified count nouns over number, they quantified substance-mass nouns over volume, and they quantified object-mass nouns over number. When the English participants were presented with mass-count flexible nouns they quantified the nouns presented in count syntax (plural morpheme) over number and the nouns presented in mass syntax (bare nouns) over volume. We can see that the presentation of the object-mass nouns in mass syntax did not lead English speakers to make judgments over volume for this category of nouns. In the case of flexible nouns, English speakers judgments were swayed by the morpho-syntactic cues, showing that they are sensitive to the cues.

5.2 K**orean L1 Results**

Summed totals for each type of stimuli are presented in Figure 2 for the Korean native speaker results. As can be seen from this figure, the Korean native speakers judged count nouns as INDIVIDUALS and quantified them over number 97.5% of the time; they judged substance-mass nouns as SUBSTANCES and quantified them over number 2% of the time; and the judged object-mass nouns as AGGREGATES and quantified them over number 98% of the time. For the flexible nouns, the Korean native speakers judged this group of nouns by quantifying over number 45% of the time. A one sample means comparison test with alpha = 0.5 shows that for the nouns which reference INDIVIDUALS (count nouns), SUBSTANCES (substance-mass), and AGGREGATES (object-mass) all these results were significantly different from chance[3]. However, for the flexible terms there was no significant difference from chance ($F(1,199) = 1.42$, $p > 0.15$).

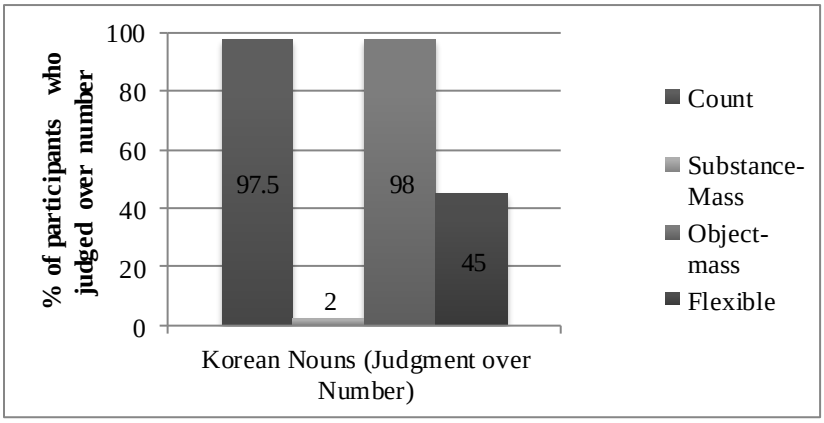

Figure 2: Results – Korean Native Speakers

[3] One sample means comparison test results: count nouns ($F(1,199) = 42.92$, $p < 0.001$), substance-mass nouns $F(1,199) = 48.37$, $p < 0.001$), object-mass nouns $F(1,199) = 48.37$, $p < 0.001$)

Our study thus shows that when judging Korean nouns that denote INDIVIDUALS, Koreans consistently quantified over number. When judging Korean nouns that denote SUBSTANCES they consistently quantified over volume. When judging nouns that denote AGGREGATES, they consistently quantified over number. For these categories of nouns, the Korean response patterns are almost identical to those of the English-speakers in the English study. The one category of noun where the Korean judgments differed from those of the English speakers is the flexible nouns. A one sample mean comparison test shows that there is no significant difference from chance for any of the word items.

5.2.1 Korean L1 Discussion

In Korean, nouns that denote INDIVIDUALS and SUBSTANCES can occur in the same syntactic context. Despite this fact, Koreans clearly conceptualize the two types of noun differently as indicated by their patterns of quantification. They quantify over number for INDIVIDUALS and they clearly quantify over SUBSTANCES using volume. This difference in patterns shows that Koreans do not treat nouns occurring in bare noun contexts in the same way and, moreover, they do not conceptualize SUBSTANCES as pluralities, contra Chierchia (1998) who claims that classifier languages treat all nouns alike irrespective of the ontological status of what they denote. On the contrary, their behaviour in Korean is indistinguishable from that of English-speakers in English. With respect to the flexible nouns, Koreans quantify over number and volume, a pattern which is perfectly consistent with the claim that such nouns are ambiguous. What would appear to distinguish English-speakers and Korean-speakers is simply that English grammar provides disambiguating cues while our Korean stimuli did not.

What our results clearly show is that Koreans are limited by the absence of morpho-syntactic cues in Korean, only in the case of the flexible nouns which cross-linguistically can encode either INDIVIDUALS or SUBSTANCES. The absence of morpho-syntactic cues in Korean does not alter the interpretations of Koreans in cases where nouns clearly denote INDIVIDUALS (they count them) or SUBSTANCES (they assess magnitudes of volumes). These results are consistent with the finding of Inagaki and Barner (2009) in the study on quantification in Japanese.

5.3 English L2 Results

This section looks at the results for the English L2 acquisition study. As can be seen from Figure 3, the Korean native speakers judged count nouns by quantifying over number 99% of the time; they judged substance-mass nouns by quantifying over number 1% of the time; and the judged object-mass nouns by quantifying over number 97.5% of the time. A one sample means comparison test with alpha = 0.5 shows that these three results were significantly different from chance[4].

[4] One sample means comparison test results: count nouns ($F(1,199) = 69.47$, $p < 0.001$), substance-mass nouns $F(1,199) = 69.47$, $p < 0.001$), object-mass nouns $F(1,199) = 42.92$, $p < 0.001$).

With respect to the English flexible nouns, the Korean participants who were presented with the flexible nouns in count syntax judged these nouns 51% of the time over number, while the participants who were presented with the nouns in mass syntax judged 44% of the flexible nouns over number. A one sample means comparison test showed that neither of these results was significant from chance[5].

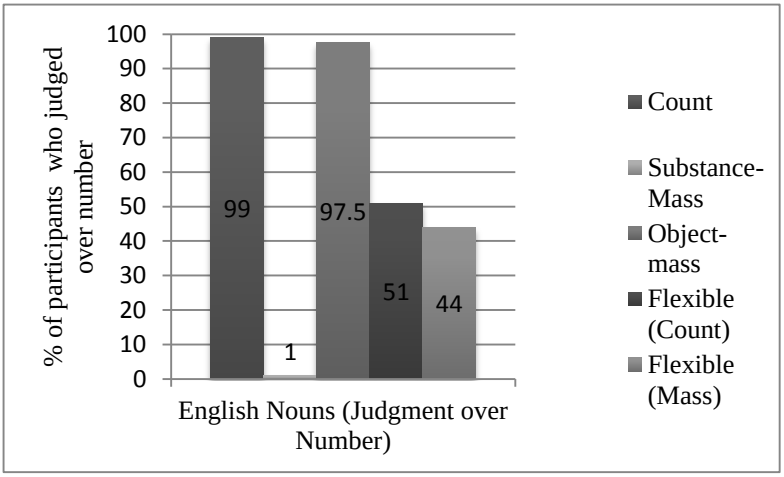

Figure 3: Results – English L2

Figure 4, presents a comparison of the English native speaker results and the English L2 results. Unpaired t-tests were conducted on the English L1 and the English L2 results comparing percentage of judgments over number by each of these two groups of participants. Not surprisingly, since the two groups showed exactly the same percentage of judgments over number on the count nouns (99%) and on the substance-mass nouns, no significant difference was found ($F(2,598)=1.32$, $p > .75$) and ($F(2,598)=0.00$, $p = 1$) respectively. As well, since the two groups had virtually identical percentages of judgments over number on the object-mass nouns (Koreans: 97.5%; English speakers: 98.8%) there was also no significant difference for this category ($F(2,598)=1.13$, $p > .26$). However, for mass-count flexible nouns that appeared in count syntax contexts, a statistically significant difference was found ($F(2,298)=11.10$, $p < 0.001$), due to the fact that English speakers were at ceiling in judging over number for this category (96%) while only 51% of the Koreans responded in this way. For the flexible nouns that appeared in mass syntax contexts, a significant difference was found as well, ($F(2,298)=8.94$, $p < 0.001$), this time for quite different reasons. For this category, only 6% of the English speakers judged over number while 44% of the Koreans judged over number. These results are particularly striking because they reveal that the Korean participants appear to be insufficiently sensitive to the plural marker, not using it appropriately as a cue to quantify over

[5] One sample means comparison test results: flexible nouns presented in count syntax ($F(1,99) = 0.12$, $p > 0.84$), flexible nouns presented in mass syntax $F(1,99) = 1.20$, $p > 0.23$).

INDIVIDUALS. On the other hand, they appear to be quantifying over individuals in the bare noun context, which in English is the morpho-syntactic cue to the presence of SUBSTANCES.

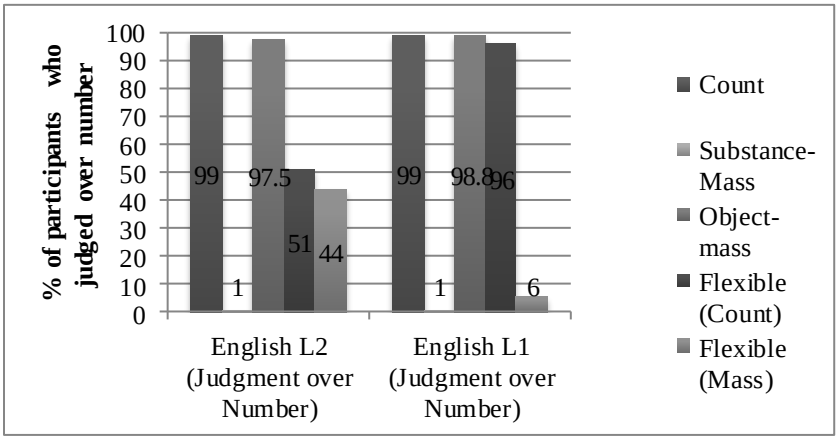

Figure 4: Results - English L1 and English L2

In Figure 5, we compare the Korean L1 and English L2 data. Paired t-tests were conducted on the Korean L1 and the English L2 results, and no significant differences were found. We can see that while there is some variability between what the Koreans are doing in their L1 and what they are doing in their L2 with respect to the flexible nouns, this variability is minimal.

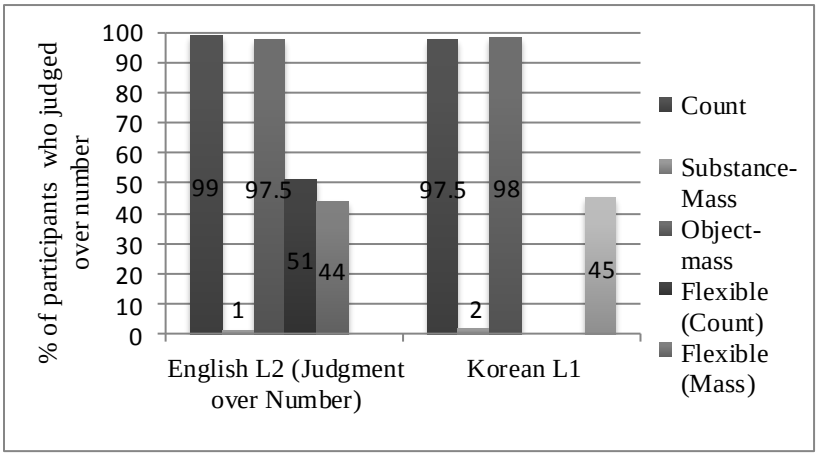

Figure 5: Results – Korean L1 and English L2

An analysis of individual speaker data was done to help us decide if the participants are performing randomly when they are making their judgments of the flexible nouns or if some of the subjects are performing above chance on

these nouns and thus have 'acquired' the mass-count distinction. For the most part, the Koreans are mirroring what they did in their L1 in their L2. One participant, for example, judged all 5 of the Korean bare nouns over volume, and in the L2 study, despite being prompted by the plural morpho-syntactic cues, she judged all but one of the nouns to be mass nouns. The English data of this participant alone reveal that she is not sensitive to the plural marker, and her Korean data suggest that she is using the same response strategy in both languages. If we look at another participant's results, he judged all the English count nouns accurately. On the basis of the English results alone, we might have concluded that he has learnt the function of the plural marker, but such a conclusion is unwarranted. This is because he also judged all 5 Korean bare nouns over number. This participant has a response bias that favours quantification over number. We ran a coefficient of correlation statistical analysis between these two sets of data. There is a strong, positive correlation between these two sets of data ($r = 0.87$). From these findings, it is clear that there is evidence of a response bias from the L1 to the L2.

One final question that we could ask is: Is there is a correlation between the participants' proficiency level in English, and their scores on the English L2 experiment? Given the obligatory nature of the count/mass syntax in English, one would predict that as Koreans become more proficient in English, their sensitivity to such marking should increase. We ran a coefficient of correlation statistical analysis to compare the participants' scores on the Oxford English Placement Test with their accuracy scores on the flexible English nouns. In this case $r = 0.05$, meaning there was no correlation between their accuracy on the placement test and their results on the L2 part of the study.

5.3.1 English L2 Discussion

To come back to our research questions: Are Korean L2 learners of English sensitive to the plural marker when it is present to cue quantification over INDIVIDUALS? Because we used Koreans as their own controls, performing the task both in Korean and English, we were able to show that count nouns, the prime category where we expect L2 learners to be sensitive to morpho-syntactic cues, are unrevealing. This is because the Korean participants responded identically to this category of nouns in both their L1 and their L2. Koreans can respond correctly to the task simply by relying on the semantic properties of nouns that denote INDIVIDUALS. They might be sensitive to plural-marking, but they can also ignore it. Similarly, Koreans responded correctly to the mass nouns denoting SUBSTANCES and AGGREGATES, but again, their performance was the same in both the L1 and the L2. Thus patterns of correct responses, calculated on an English-only study would misrepresent the nature of the Koreans' knowledge. Without the comparative Korean L1 data, one might conclude that the Koreans correctly analyze the plural marker as a cue to quantify over INDIVIDUALS and the bare noun context as a cue to quantify over volumes.

The mass-count flexible nouns are also revealing. These are nouns that are ambiguous in Korean but whose interpretation is cued critically by the plural

marker in English. Analysis of the data revealed that English L1 and L2 speakers responded quite differently to this class of words. Koreans do not respond enough to the plural marker in the count syntax contexts, and they quantified over INDIVIDUALS too much in the mass syntax contexts.

The second question asked what role transfer plays in this task. Are the Korean participants simply mirroring their L1 when asked to make judgments on English mass-count flexible nouns or are they doing something else? The paired t-tests showed no significant difference between the Korean participants in the L1 and the L2 study. This, however, cannot lead us to conclude that there is a transfer effect. There is a clear response bias taking place, but to confirm if there is in fact transfer taking place we would have to test the participants on the same group of words in their L1 and their L2.

6. General Discussion and Conclusion

6.1 Discussion

Carroll (1999, 2001, 2002) considers the role of "input" in Second Language Acquisition. In languages like Korean, where cues to plurality are not marked syntactically on nouns, then Korean learners of English will have to become exposed to the English input and will have to be able to extract from the input the cues to English plural marking. For processing to take place, Koreans will also have to acquire the morpho-syntactic distributions of English nouns. If Koreans have not acquired a particular grammatical distinction – such as plural marking – then they will have no mental representation which will encode that information. Under Carroll's theory of acquisition the "initial stage of learning" is assumed to be L1 knowledge, but learning might be possible if learners can process relevant cues to a distinction. Thus, the Autonomous Induction Theory (AIT) predicts that while learning is possible, it is not guaranteed. Clearly on this task, the participants' grammatical representations have not changed yet, and they may never change. The AIT predicts transfer of lexical content, which might explain what the Koreans are doing on the English task. However, it would be unwise to draw hard conclusions from this particular study about lexical transfer since the L1 nouns and the L2 nouns were different lexical items, a fact which prevented us from exploring in a rigorous manner the issue of lexical transfer of morpho-syntactic and semantic features. Our data does show that the Koreans correctly map to OBJECT and SUBSTANCE nouns using what knowledge they already possess, presumably drawing on the conceptual structure of Korean translation equivalents. The flexible nouns are a different story; for these nouns, the Koreans have to rely on the English morpho-syntax to answer the question correctly. It should be kept in mind that the flexible nouns will be infrequent in comparison to the other classes of nouns. Infrequent too will be contexts which draw the learners attention to the fact that flexible nouns shift meaning based on the syntactic context they occur in. Since Koreans can arrive at correct interpretations of both count and mass nouns much of the time independently of plural-marking. The AIT actually predicts that learning will not occur. This prediction is borne out by the data here which demonstrate that mere exposure to English does not guarantee that L2ers will acquire mass/count syntax.

6.2 Implications

What are the implications for a story of language acquisition? While this study is a processing study, it does have implications for language acquisition. Acquisition theories need to explain how learners come to know what they know. Many psychologists (e.g., MacWhinney 1997; Ellis 2003, 2006) assert that the same learning mechanisms are responsible for L1 acquisition and L2 acquisition, in particular, a single mechanism such as statistical learning (itself based on association). If this were true, then cases where despite abundant input L2 learners fail to acquire the mass-count distinction require an explanation. The mass-count distinction is obligatory in English, it is frequent in the input, and the Koreans are instructed on it, but despite this, they appear not to learn it. Our results therefore present a challenge for language learning theories that claim that the same mechanisms apply in first and second language acquisition. Something is clearly different in the case of Koreans learning English.

My results are consistent, in contrast, with theories of acquisition, such as Representational Deficit Hypothesis (RDH) (originally the Failed Functional Features Hypothesis) Hawkins and Chan's (1997) (Hawkins 2000, 2003) and Carroll (2001) which claim that adult L2 learning is not like L1 learning, and that exposure to L2 input is not enough for learning to take place. The Autonomous Induction Theory (Carroll 2001) ties language acquisition to interpretation in such a way that if learners can correctly interpret an input, morpho-syntactic acquisition need not occur. We have demonstrated that in many cases (e.g., noun phrases denoting INDIVIDUALS, SUBSTANCES, and AGGREGATES), Koreans do arrive at the correct interpretation. .

References

Allen, K. (1980). Nouns and countability. *Language* 56: 541-67.

Barner, D. & J. Snedeker. (2005). Quantity judgments and individuation: Evidence that mass nouns count. *Cognition* 97: 41-66.

Barner, D. & J. Snedeker. (2006). Children's early understanding of mass-count syntax: Individuations, lexical content, and the number asymmetry hypothesis. *Language Learning and Development 2*(3): 163-194.

Barner, D., L. Wagner, & J. Snedeker. (2008). Events and the ontology of individuals: Verbs as a source of individuating mass and count nouns. *Cognition. 106*: 805-832.

Carroll, S. E. (1999). Putting 'input' in its proper place. *Second Language Research* 15: 337-388.

Carroll, S. E. (2001). *Input and evidence: The raw material of second language acquisition*. Amsterdam: John Benjamins.

Carroll, S. E. (2002). Induction in a modular learner. *Second Language Research* 18: 224-249.

Cheng, C. Y. (1973). Response to Moravcsik. In J. Hintikkia, J. Moravcsik, & P. Suppes (Eds.), *Approaches to Natural Language*. Dordrecht: Reidel, 286-288.

Cheng, L. & R. Sybesma. (1999). Bare and not-so-bare nouns and the structure of NP. *Linguistic Inquiry* 30(4): 509-542.

Chierchia, G. (1998a). Reference to kinds across languages. *Natural Language Semantics 6*: 339-405.

Chierchia, G. (1998b). Plurality of mass nouns and the notion of 'semantic parameter'. *Events and Grammar* 70: 53-103.

Ellis, N. C. (2003). Constructions, chunking, and connectionism: The emergence of second language structure. In C. Doughty & M. H. Long (Eds.), *Handbook of second language acquisition*, 33-68. Oxford: Blackwell.

Ellis, N. C. (2006). Cognitive perspectives on SLA: The Associative-Cognitive CREED. *AILA Review 19:* 100-121.

Gillon, B. (1996). *The lexical semantics of English count and mass nouns*. Paper presented at the workshop on the breadth and depth of semantic lexicons, Santa Cruz.

Gillon, B. (1999). The lexical semantics of English count and mass nouns. In E. Viegas (Ed.), *The breadth and depth of semantic lexicons*, 19–37. Dordrecht, Netherlands: Kluwer.

Hawkins, R. and C. Chan. (1997). The partial availability of Universal Grammar in second language acquisition: the 'failed functional features hypothesis'. *Second Language Research* 9: 189-233.

Hawkins, R. (2000). Persistent selective fossilization in second language acquisition and the optimal design of the language faculty. *Essec Research Reports in Linguistics* 34: 75-90.

Hawkins, R. (2003). 'Representational deficit' theories of (adult) SLA: Evidence, counterevidence and implications. Plenary paper presented at EUROSLA, Edinburgh.

Inagaki, S., & Barner, D. (2009). Countability in absence of count syntax: Evidence from Japanese quantity judgments. In M. Hirakawa, S. Inagaki, Y. Hirakawa, H. Sirai,S. Arita,H. Morikawa, M. Nakayama, & J. Tsubakita (Eds.), Studies in Language Sciences (8): Papers from the Eighth Annual Conference of the Japanese Society for Language Sciences. Tokyo: Kurosio.

Jackendoff, R. (1983). *Semantics and cognition*. Cambridge, Mass.: MIT Press.

Jackendoff, R. (1991). Parts and boundaries. *Cognition* 41: 9-45.

Jackendoff, R. (2002). *Foundations of language.* Oxford: Oxford University Press.

Kim, C.-H. (2005). The Korean plural marker *tul* and its implications. *PdD. Dissertation (University of Delaware).*

Link, G. (1983). The logical analysis of plurals and mass terms: A lattice-theoretical approach. In R. Bauerle, C. Schwarze, & A. Stechow (Eds.), *Meaning, use, and interpretation of language*. Berlin: de Gruyter.

Link, G. (1998). *Algebraic semantics in language and philosophy*. Stanford, CA: Center for the study of Language and Information.

MacWhinney, B. (1997). Second language acquisition and the Competition Model. In J. Kroll & A. De Groot (Eds.), *Tutorials in bilingualism*, Mahwah, NJ: Lawrence Erlbaum.

Nemoto, N. (2005). On mass denotations of bare nouns in Japanese and Korean. *Linguistics*, 43(2): 383-413.

Quine, W. V. O. (1960). *Word and object*. Cambridge, MA: MIT Press.

Whorf, B. L. (1956). *Language, thought, and reality*. New York: John Wiley & Sons, and The Technology Press of MIT.