Association of Nouns and Classifiers by Bilingual Children in Mandarin Chinese

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Abstract

This study examines 7-to-12-year-old Singaporean bilingual children's use of noun classifiers in Mandarin Chinese and their reasoning while making the associations between nouns and classifiers as a given task. The results show that the children made the association by applying their cognitive understanding of the properties and functions of the noun objects, comparing between them, as well as following self-generated or learned rules. To investigate other factors that may affect the children's learning, the children and their parents were given the task to make another 120 classifier phrases separately based on the list of the noun objects given. The results show that schooling, parents' language proficiency, father's age, mother's academic attainment, and family income had correlations with the children's result of this task-based language performance.

Keywords: bilingual children, Chinese language acquisition, Chinese noun classifier, classifier phrase

1. INTRODUCTION

As a typological feature, noun classifiers in Chinese are unavoidable in everyday use of the language. For example, "a book" in English must be expressed in Chinese as "yì běn shū", which has a classifier "běn" in between "a" and "book". This compulsory structure requires Chinese speaking children acquire classifiers at an early age.

While relatively scarce in relation to noun studies, there is still a sizeable volume of research done on classifier acquisition and production (e.g., Juntanamalaga, 1989; Zhang, & Schmitt, 1998; Uchida & Imai, 1999; Uchida & Imai, 1999; Yu, Lust & Chi, 2003; Yoshida & Smith 2005; Zhang, 2007; Lee, Barner, & Huang, 2008; Gao & Malt, 2009; Gao, 2010). For example, Uchida & Imai (1999) showed that Japanese and Chinese classifier acquisition came in stages and was bottom-up (input-driven) unlike noun acquisition which was top-down (theory-driven). The 'fast-mapping' in noun acquisition was not observed in classifier acquisition. This seems to imply that what children produce ought to be very much influenced by what they are exposed to. They also found that general classifiers were easier to learn than specific ones and as such, expected younger children to produce more general classifiers than older children. A general hypothesis of these studies was that learning classifiers required an ability to build a theoretical structure from fragments of information - an ability that children should have acquired around the age of five.

Zhang, & Schmitt's (1998) research on the impact of classifiers on cognition and memory found that classifiers affected cognition, memory, and judgment. In their study, Chinese speakers perceived objects associated with a same classifier as more similar compared to English (a non-classifier language) speakers. Chinese speakers also remembered more objects that required a same classifier compared to English speakers. These results seem to show that the influence of classifier learning affect cognition in one dimension and memory in the other. Speakers' perceived similarity of objects in association with classifiers enters into memory which further motivates the speakers' use of a same classifier.

Huang & Ahrens' (2003) study backs up the idea that classifier use influences cognition. They argue that it is the classifier that selects the relevant properties of the noun and coerces the appropriate meaning. However, this process has a restriction; the property must also apply to all the nouns, not just a subclass.

Research on other classifier languages, such as Thai showed that Thai classifier usage seemed to be influenced by the different aspects of a noun object that the speaker wished to highlight (Juntanamalaga, 1989). Zhang (2007) claimed that the same was true of Chinese classifiers. However, no empirical evidence was provided.

Mass count distinctions may also influence Chinese noun classifier usage. Contrary to the popular belief, the Chinese language does have a mass-count distinction for nouns and studies have shown that this distinction is made at the classifier and measure word level. For example, Yu et al's (2003) comprehension-based study showed that Chinese speaking children could differentiate between count and mass nouns at an age comparable to English children (approximately 3 years-old) and improved steadily with time until adulthood. This explains the fact that generally count nouns require classifiers and mass nouns require measure words. Hence, whether a classifier is used or even which classifier is used may be dependent on whether the noun is a count or mass noun. The study done by Lee et al. (2008) further supports this claim. They found that children began acquiring classifiers by attending to shape, and became sensitive to solidity over a period of several years. Their study also shows that even at the age of six, Chinese speaking children still had not fully grasped the mass-count distinction. This may be partly due to the fact that in their study, they used objects that were unfamiliar to the children.

How bilingual Chinese speaking children acquire Chinese classifiers was unknown until the study conducted by Gao (2010) on 6-to-15-year-old Chinese-Swedish bilingual children's production of classifiers. It shows that the bilingual children took a bottom-up approach in learning classifier phrases and their matching nouns with classifiers indicated that their thinking was not confined to simple grammatical knowledge but involved knowledge sharing across categories. Gao's (2010) argument, which is in line with Gao & Malt's (2009) is that learning the meanings of classifiers requires a certain cognitive ability – an ability to synthesize pieces of partial knowledge and form them into a cohesive whole. Gao's study highlighted the point that Chinese classifiers are a language specific category that requires learners to understand cognitively its underlying semantically related association with nouns.

As many studies show that bilingual children's language acquisition is language specific. It involves both linguistic and non-linguistic factors. To investigate how Chinese classifiers are acquired by Singaporean English-Chinese bilingual children, this study aims to achieve the following three objectives. 1) to examine bilingual Chinese speaking children's use of noun classifiers, 2) to understand the reasons behind their choices in making the association and 3) to identify the non-linguistic factors that may influence the level of the children's classifier mastery.

2. METHODOLOGY

This study includes two parts: children's noun and classifier match task and a survey of children and their parents' use of classifiers

2.1 Children's Noun and Classifier Match Task

Participants

Thirty English-Chinese bilingual Singaporean children were recruited (Mean=9.5 years; range=7 to 12 years; 16 girls, 12 boys). Quota sampling (approximately 5 children per age group) was employed to ensure that each age group was fairly represented. There were 6 age groups, corresponding to the ages 7, 8, 9, 10, 11, 12 and the school grades were Primary 1, 2, 3, 4, 5, 6 respectively.

Stimuli

The stimuli set contained 30 picture cards of everyday items. 27 of them required the use of a classifier in quantification and 3 required the use of measure words. Each card also had a helping phrase to elicit responses from the children (e.g., 一（ ）椅子 one (classifier/measure word to be inserted) chair).

Procedure

The children were tested individually in a separate room from their peers. They were asked to provide a classifier for each object on the picture card. The images were shown sequentially and the children were asked to answer. They were also given the option of saying 'I don't know.'

After all the images had been shown and their respective answers were collected, children were asked to provide reasons for their incorrect use of the classifiers with each noun object shown in the picture. However, they were not informed of their mistakes.

2.2 Survey of Families

Participants

Thirty-five families that had children between the ages of 7 and 12 were recruited to fill in a questionnaire that includes a classifier-noun association task (for children and both of their parents to fill in) and enquires of family background. However, due to the incomplete answers, only 15 families' responses were selected as usable data. Among the families, there were 15 children (Mean=8.73 years; range=7 to 12 years; 10 girls, 5 boys), 14 mothers (Mean=42.2 years; range=33 to 45 years), and 7 fathers (Mean=48.36 years; range=47 to 51). Same as the children who participated in the first task, they all spoke both English and Chinese at home and took Mandarin Chinese classes at school regularly.

The majority 64.29/%). of the mothers graduated from secondary schools. 14.2% of them completed university studies. 7.14% graduated from Junior college or Polytechnic institutes. The rest completed primary school.

The majority (45.45%) of the fathers completed primary school. The rest of the fathers graduated from universities (18.18%), junior colleges or polytechnic institutes (18.18%), or had no formal education (18.18%).

66.67% of the mothers' dominant language was Mandarin Chinese and 53.33% of them spoke to their children mainly in Mandarin Chinese. The corresponding figures for fathers are 76.92% and 61.54% respectively.

In terms of housing, 40.00% of the families lived in 3-room flats, 26.67% stayed in 4-room flats, 13.33% lived in 5-room flats, and the rest lived in other types of housing.

The majority (57.14%) of the families had incomes less than $3000 a month. That is a rough gauge for the lowest quintile of the monthly household income in Singapore.

Stimuli

A self-designed questionnaire with 120 noun objects and a series of enquiries about the participants' language and SES backgrounds was ued. The children and both of their parents were required to fill in the questionnaire. The 120 objects are commonly seen or used objects which require different classifiers to count them. None of the objects required measure words for quantification.

Procedure

The questionnaires were delivered to the children's parents. For the 120 noun-classifier task, they were asked to fill in classifiers separately so that the child, the mother, and the father each gave answers of their own.

3. RESULTS AND ANALYSIS

3.1 Children's Noun and Classifier Match Task

3.1.1 Classifier Use

There are three main findings: The first is the lack of homogeneity in the children's classifier usage. Out of the 30 items, only 6 had 80% of participants' agreeing on their corresponding classifiers. The second is the significant deviation of the most often used classifiers from the correct answers. The third is the relatively high frequency of the incorrect use of the general classifier 'ge'.

With regards to the first finding, given that certain items correspond to more than one classifier, it is not surprising that different people tend to use different classifiers. We examined the items that can be associated with only one classifier. There are 23 of such items, of which, 6 had homogeneity (at least 80%) in classifier usage. Since we're discussing classifiers here, we do not include measure words (they will be discussed later). The final tally is then a total of 20 items with classifiers for 4 items being homogeneous. Respondents agreed on the appropriate classifier only one-fifth of the time.

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An explanation for this lack of consensus would be participants making wild guesses when they did not know which classifier to use. If so, we should expect more homogenous answers from the older children (whom we assume to have a better command of the language). We divide the participants into two groups of ages 10-12 and 7-9 respectively to test this hypothesis. The results show that the older group had a higher percentage of same answers for 17 items, an equal percentage for 5 items, and a lower percentage for 8 items. In other words, the older group provided more uniformed (but not necessarily correct) answers than the younger group. This evidence proves that the lack of homogeneity was a result of the participants making wild guesses.

The second finding - the deviation of the most often used classifier from the correct answers. The most often used classifier for 5 of the 30 items was different from the correct answers. There are two possible reasons for this. The majority of the participants may have used the incorrect classifier simply due to low levels of Mandarin Chinese language competency. The deviation may also be due to the influence of a certain Chinese dialect spoken in Singapore. The two reasons are not mutually exclusive. It is also possible that the deviation stems from both reasons. For example, in Singapore, 'li' is used to classify anything that is round, regardless of size. However, in Mandarin Chinese, 'li' has a size restriction (small) but no shape restriction.

The third finding - the relatively high frequency of the incorrect use of 'ge'. Twenty of the 30 items were incompatible with 'ge'. Of this 20, 'ge' was one of the two most-used classifiers for 9 items. No other classifier was used with such regularity. A possible inference we may draw from this data is that 'ge', a generic classifier, was the default choice when the participants did not know the correct answer.

3.1.2 Reasons for classifier usage

The reasons the participants provided as to why they used the classifiers the way they did can be broadly grouped into rule-based reasons, observation-based reasons, and others. The rules were either self-generated or learned. Observation-based reasons explain the usage based on observing others' use of classifiers. The other reasons relate to perception, cognition, and the presence of default classifiers.

3.1.2.1 Feature-based reasoning

Noun and classifier association may be broadly grouped based on the rules by quantity, size, shape, and other aspects of the objects. In formal schooling, children were not taught that there are rules to all classifier usage. However, they were taught the specific rules for individual classifiers. They might have extended their understanding to all classifiers, resulting in both learnt and self-generated rules. Their self-generated rules were found to be more likely to be mistake-prone and inconsistent.

Quantity: The quantity of the objects in question influenced the classifier chosen. When questioned about the use of 'ge', many participants replied that 'ge' was used because there was only one item displayed. The use of 'ge' and the above reason were especially common when the item displayed usually came in multiples (e.g. shoe, hand, leg, and tree). Similar reasons were given to explain the use of 'zhi', 'tiao' and 'zhang'.

Many participants used 'shuang' and 'dui' for items that are normally found in pairs (e.g. shoe, hand, and leg), even when there was clearly only one present. However, Chinese noun classifiers are not used based on different quantities. Quantities may be indicated by measure words. This result may be due to the confusion between measure words and classifiers.

Size: The size of the objects also determined the use of classifiers. A number of participants used 'jia' for a shelf, drawer, and computer because these items are big. This result is mainly due to the fact that there are size restrictions for certain classifiers.

Shape: Shape was also a factor in the choice of classifiers. Some children used 'pian' for paper and 'zhang' for door as both 'pian' and 'zhang' are supposed to be used for flat objects. Also, one child used 'lun' (the same word for a tire, something with a round shape) for keys as the keys in the picture were attached to a round key ring.

Other features of the noun objects: According to the children's reasoning, 'jia' was for windows as they came in a set, 'zhi' for a bag as it could contain things, 'ba' for a pen as it could be held in one's hand, and 'tai' for a telephone as it could be put on a table top. The rules or criteria that the children described for 'jia', 'ba', and 'tai' were correct although the application was incorrect. The rule for 'zhi' was incorrect. Some contradiction and inconsistency were

observed in the rules that the children applied to classifier use. For example, one child first explained the use of 'jia' by referring to the large size of an object. However, the same child later explained the use of 'jia' for another object by referring to its small size. These cases were not very common though.

3.1.2.2 Perception and cognitive reasoning

Perceived similarity with other objects. Participants tended to use the same classifier for objects that they perceived to be similar. Examples are provided in Table 1 below.

Table 1: Objects sharing the same classifier

Classifier	Objects that the classifier was used wrongly with	Related Object
Zhi	nose, leg	Hand
Zhang	chair, drawer	Table
Tai	Telephone	Computer
Zhang	Letter	Paper

3.1.3 Temporary measure word interference

Participants' reasoning show that they sometimes were confused between classifiers and temporary measure words. For example, a percentage of participants used 'bei' to classify a glass. The reason they gave for doing so was that 'yi bei shui' (a glass of water) is what they always said. However, 'bei' in 'yi bei shui' is a temporary measure word to quantify water. It is not a noun classifier. Furthermore, the object quantified in 'yi bei shui' is the water, not the glass. It is most likely that they used 'bei' because a glass is 'bei' in Chinese and they thought that 'bei' was a classifier.

Further examples of this type are the children's use of 'zuo' (sit) to classify a chair, and 'bao' to classify a 'shu bao' (school bag)

3.1.4 Default classifiers

Another finding is the prevalence of default classifiers. Many participants said that there were certain classifiers they used when they did not know the correct classifier. The most common default classifiers were 'ge' and 'zhi' respectively.

3.1.5 External factors

In this section, we attempt to find out whether gender, age, school level, and the nature of the objects and classifiers have any influence on the children's correct rate of classifier usage. The mean score for all thirty children was 53.33%. This is comparable to the results of Gao's (2010) study of Swedish-Chinese bilingual children.

Gender. The average score for boys (57.14%) was slightly higher than the average score for girls (54.17%). However, the difference was not statistically significant at the 95% confidence level.

Age/School level. On average, the older children (upper-primary level) scored better than the younger children (lower-primary level). The exact breakdown is shown in Table 2.

Table 2: Scores by Age/School Level

Age	Seven	Eight	Nine	Ten	Eleven	Twelve
Primary Level	One	Two	Three	Four	Five	Six
Mean Score	46.67%	49.44%	59.17%	49.17%	58.33%	69.33%

A regression of scores on age found a weak but positive (beta=0.039, significant at 95% confidence level) relation between age and scores. Older children tended to do better than the younger children, albeit only slightly.

Properties of Objects. The three best and worst scored objects are presented Table 3.

Table 3: Best and Worst scored objects

	Highest Percentage Correct			Lowest Percentage Correct		
Object	Book	Shoes	Dictionary	Chair	Key	Lamp
Classifier	Ben	Shuang	Ben	Ba	Ba	Zhan
Percentage Correct	100.00%	100.00%	96.67%	6.67%	13.33%	23.33%

If the frequency of usage of objects is a determiner of correct usage of corresponding classifiers, then all six of the objects presented in the above table ought to have high scores. In fact, it is likely that the participants uses chairs, keys, and lamps more often than they used dictionaries.

Among the objects that the participants scored best in, both 'book' and 'dictionary' require the same classifier 'ben'. This classifier is used with objects that comprise of bound pages. It is inherently clear what objects ought to be paired with the classifier 'ben' and thus easy to acquire.

In comparing this to the objects that the participants scored poorly, two of the low-scored objects, chair and key, require the classifier 'ba'. This classifier is meant to pick out objects that can be gripped with one's hand. Compared to 'ben', 'ba' is a more difficult classifier to use as what constitutes an object that can be gripped in one's hand can be rather opaque. According to Uchida & Imai's (1999) study, opaque classifiers are harder to acquire. A note to further this point, 83.33% of the participants could use 'ba' correctly with scissors. This is probably because it is very clear that a pair of scissors is meant to be gripped with one's hand. Keys and chairs, on the other hand, are not so clear-cut.

Properties of Classifiers. Table 4 lists the children's classifier correct use rate. Some classifiers are used rarely. This may be an indication that they are not commonly known classifiers to children. They probably have to have a better command of the Chinese language. This is supported by the fact that they were mostly (75%) used by older children (9 years and above). If we compare classifiers that were used at least 20 times, the three classifiers that meet the criteria and were most used correctly are 'ben', 'feng', and 'jian'. The classifiers used least correctly were 'tai', 'zhi', and 'zhang'.

Table 4: Classifiers by correct use

Classifier	No. of correct use	No. of incorrect use	Total	Percentage
Shan	4	0	4	100.00%

Zhan	7	0	7	100.00%
Dao	1	0	1	100.00%
Ben	59	1	60	98.33%
Feng	24	1	25	96.00%
Tiao	14	1	15	93.33%
chuan*	6	1	7	85.71%
Jian	21	4	25	84.00%
Ba	31	6	37	83.78%
Ge	147	83	230	63.91%
shuang*	58	36	94	61.70%
Zhang	52	35	87	59.77%
Zhi	40	43	83	48.19%
Tai	13	14	27	48.15%

*measure words

The three classifiers that were most often used correctly are more specific in their requirements than those that were most often used incorrectly. 'Ben' is used for bound materials, 'feng' is used specifically for letters only, and 'jian' is most commonly used for articles of clothing worn on the torso. On the other hand, 'tai' is used for mid-sized electronics. 'Zhi' is used for a variety of objects from small animals to certain body parts, and 'zhang' is used for things that are flat or have a flat surface (usually paper products). This shows that the higher the degree of specificity in its requirement, the lower the probability of misusing the classifier. This result contradicts with Uchida & Imai's (1999) claim that children acquire general classifiers more easily than specific ones.

Instead, the result shows that the higher the degree to which the object coincides with the requirements of the classifier, the higher the likelihood of correct classifier usage. Also, the more specific the requirements of the classifier, the more likely it will be used correctly.

Two types of incorrect usage stand out regarding the use of 'shuang'. The first is its inappropriate association with items that are not a matching pair in the common sense of a Chinese language speaker. Many participants used 'shuang' with pants and scissors. Upon questioning, most participants said that such usage was the effect of spill-over from the English language. Both pants and scissors require the quantifying phrase 'a pair of' in English usage. This was then simply translated into 'shuang' in Chinese. This response was independent of age, suggesting that absolute levels of English exposure had little effect on the magnitude of transfer.

The other type of incorrect use is the matching of 'shuang' with paired objects even when the object is presented in singular. The percentage of participants who used 'shuang' in this manner is presented in Table 5.

Table 5: Singular objects for which 'shuang' was used incorrectly

Singular Object	hand	leg	shoe
Classifier	zhi	tiao	zhi
Percentage that used 'shuang'	30.00%	16.67%	40.00%

The relatively high incidence of this improper usage seems to suggest that the participants are not entirely aware of the fact that 'shuang' is used for paired items when the pair is present. If this is the case, then it is strong evidence for the input-driven hypothesis whereby children, upon hearing the phrase 'yi shuang xie' (a pair of shoes) simply memorise 'shuang' coming before 'xie' (shoe). In a similar study, Gao (2010) found out that some children used 'shuang' and the reason they gave was that shoes are supposed to be used in pairs.

3.2 Survey of Children and Their Parents' Use of Classifiers

In this section, we use a quantitative approach to sift out which factors have an impact on classifier competency of bilingual Singaporean children. Acceptable but awkward uses of classifiers, such as "ge" in 'yi ge xie zi' (a [classifier] shoe) were considered incorrect to measure true competency. Hence, the scores presented in the following sections are not measures of proficiency in the usual sense but measures of mastery. However, the terms proficiency, mastery, and competency will be used interchangeably.

The factors we examined were gender, age, schooling, scores of parents, age of parents, education level of parents, the main language spoken to the child, the main language parents speak to others, housing, and income.

3.2.1 Significant factors

Schooling. A one-way ANOVA was conducted to check if schooling influenced classifier mastery. The participants were grouped into private lower primary, public lower primary, and public upper primary. The mean score for each group was 28.33%, 49.00%, and 40.00% respectively. There were no participants belonging to the other classes. The result was a significant difference at 90% (p=0.1) confidence level but not at 95% (p=0.05) confidence level.

Parents' scores. The mean score for mother, father, and child was 51.73%, 52.14%, and 45.22% respectively. The scores of parents were moderately correlated to the children's scores (Correlation coefficient for Father-Child=-0.6273, Mother-Child=0.6768).

Interestingly, the children's scores correlated positively to their mothers' but negatively to their fathers'. To have a better picture, we regressed children's scores on their parents' scores, as shown in Table 6.

Table 6: Regression of children's scores on parents' scores

Source	SS	df	MS	Number of obs =	7
				F(2, 4) =	23.73
Model	.025194661	2	.01259733	Prob > F =	0.0060
Residual	.002123673	4	.000530918	R-squared =	0.9223
				Adj R-squared =	0.8834
Total	.027318334	6	.004553056	Root MSE =	.02304

child_score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
father_score	-1.815873	.3715342	-4.89	0.008	-2.847417	-.7843287
mother_score	1.658829	.3198252	5.22	0.006	.7758492	2.541808
_cons	.5845136	.2427561	2.41	0.074	-.0894687	1.258496

The negative coefficient of the father's score and the positive coefficient of the mother's score (both significant at 95% (p=0.05) confidence level) are further proof of the earlier point.

The positive correlation between the mothers' scores and the children's scores was not surprising. Children are likely

to mimic what they hear and it is fair to assume that they hear their mothers' speech most. Thus, children whose mothers are more proficient in classifier usage are likely to score better.

The reason for the negative relation between the fathers' scores and the children's scores is not quite clear. Perhaps fathers' wrong usage prompted children to watch their own usage.

Fathers' age. A regression of children's score on fathers' age was performed. The result shows that a weak but positive relation (beta=0.036) between them, significant at 90% (p=0.1) confidence level.

A one-way ANOVA was also conducted on the mean score of the children whose fathers belonged to different age groups (31-40years, 41-50years, and 51-60years) to confirm the above result. The differences between the means were significant at 95% (p=0.05) confidence level.

A possible explanation is that older fathers possibly used Mandarin Chinese more often, leading to the children being more exposed to Mandarin Chinese. As such, the children achieve a higher level of language (inclusive of classifier) competency. The probability of this being true will increase if older fathers really speak more Mandarin Chinese, and if children's language environment has a significant impact on their language proficiency. We do not have any evidence of the former condition. The latter condition will be discussed in the later section.

Mothers' Academic Achievement. Participants fell into four groups. Children whose mothers completed primary school, secondary school, tertiary studies (either junior college or polytechnic), or university. The mean score for each group was 49.99%, 46.67%, 62.5%, and 28.75% respectively. A one-way ANOVA at 95% (p=0.05) confidence level showed the differences between the means to be significant.

Income. The mean score of children from families of different income levels is shown in Table 7.

Table 7: Child's score by income level

Average Monthly Household Income	Less than $3000	$3000-$4500	$6500-$9000	More than $9000
Mean score	49.48%	37.50%	33.75%	62.50%

A one-way ANOVA shows that the differences between the means were significant at 99% (p=0.01) confidence level. This result probably stemmed from the correlation between education and income.

3.2.2 The insignificant factors

Gender, age, mothers' age, father's academic attainment, housing, and the main language parents spoke to children showed no statistically significant influence on children's scores. The main language parents spoke to children was statistically insignificant (0.8<p<0.95). This is rather surprising. Perhaps the language influence of parents on children has been diluted.

4 CONCLUSION

Bilingual Singaporean children learn and use Chinese classifiers by feature-based reasoning, observing, generating or learning rules. Their feature-based reasoning was based on their cognitive understanding of the properties of objects. The rules based on which they applied to the use of classifiers were either generated by themselves through learning from the people around them, such as their parents and teachers or the results of their own reasoning based on their understanding of the functional use or perceptual features of the noun objects. This is similar to what Gao (2010) found in Swedish-Chinese bilingual children's application of Chinese classifiers. Also, using the default classifier "ge" was a common strategy adopted by the children for objects that they failed to have a clue to associate to a specific classifier. The non-linguistic factors, such as age, schooling, parents' classifier proficiency, father's age, mother's academic attainment, and income were found to have influence on the bilingual children's learning of Mandarin Chinese classifiers.

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