FUNCTION FOR SORTAL AND GENERAL CLASSIFIERS IN CANTONESE AND MANDARIN

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ABSTRACT. Classifiers specify a noun as focus of attention. They are not triggered by gender-like rules, for some 40% of nouns appear without any classifier in matched Cantonese and Mandarin narratives. Classifiers add information by appearing with the noun rather than as a pro-form (97% Cantonese, 99% Mandarin). Sortal classifiers, e.g. 'extended object' *tiuh* 條, are rare. Just 18% of Cantonese nouns and 3% of Mandarin appear with a sortal. Sortals mark an event focus on new information, on objects of action verbs (63% Cantonese, 81% Mandarin). The general classifier appears in complementary distribution with existential or stative verbs. Cantonese uses six times more sortals than Mandarin, largely on later mentions of the same object. Though brain imaging can map categories which roughly correspond to classifiers, a frequency-weighted, connectionist analysis provides the best model. **Keywords:** classifiers, discourse, connectionism, Cantonese, Mandarin.

THE FAILURE OF CATEGORICAL RULES FOR CLASSIFIERS [1]

Both prescriptive and theoretical grammars assume that a noun classifier appears with every Chinese noun like gender in Romance languages. Dictionaries list the gender of every noun, for grammatical gender is automatic, obligatory and rule-governed for every noun, article and adjective. [2] But the gender model of categorical rules fails for classifiers (which are overviewed in Appendix 1). It fails to explain why sortal classifiers such as 'extended object-CL' *tiuh* 條 are rare. Some 40% of all nouns appear without either a general or sortal classifier when Cantonese and Mandarin speakers describe the same short 'Pear Stories' film (described in Appendix 2). In fact, 40% of the Mandarin speakers describe the whole film using only the general classifier (as do 3% of Cantonese). Speakers also disagree about even core classifiers. No two Mandarin speakers among 50 people tested agreed about which classifiers to use for the same set of objects (Bourgerie 1996).

This variability contradicts the classical theory of meaning, dominant from Aristotle on, which posits that each word and object possess a single, distinct defining feature (Taylor 1995). Classifiers once seemed a reasonable candidate for the Aristotlean features. Dictionary listing of classifiers encouraged this view. When more sophisticated views of prototype semantics superseded the classical approach, the search moved toward superordinate categories, such as 'animal' or 'vehicle' to subcategorize basic exemplars such as 'dog' or 'car'. However, more detailed examination finds that few classifiers work well as superordinate categories. Most define very heterogeneous, overlapping sets. In addition, the same object can often take any of several classifiers (Matthews and Yip 1994:105-07). And the same speaker may use different classifiers for the same object with no discernible change in viewpoint. In the Pear Stories, the goat, on screen for just seven seconds, is classified in Mandarin with the 'head-CL' *tou* 頭, the 'small animal/small object-CL' *zhi* 隻, as well as the 'extended object-CL' *tiao* 條, used also for the road and a string.

Classifier use is so irregular that sortals are not a reliable test of language damage or development. When researchers elicit classifiers by showing a picture, e.g. three chickens, both children and adults often respond with a bare noun, 'chicken[s]' *gai/ji* 雞. Pressed to answer 'how many', they often reply 'three' with the general classifier *go/ge* 個, avoiding the desired 'three animal-CL chickens'. (Omitting a general classifier where grammatically required *is* a valid measure of normal development.)

In conversation, even highly educated people often use a general classifier where prescriptive grammar requires a sortal. In the Pear Stories, these included the hat, bike, goat, and tree (1% of Cantonese nouns, 3% Mandarin). More important, the general classifier is the only possible choice for the overwhelming majority of nouns, not just abstractions like 'idea' or 'revolution', or large unique entities such as cities, lakes, or planets; but also for a huge

percentage of small concrete nouns, including pears, leaves, baskets, ladders, wheels, and toys. Even dictionaries of classifiers list only a small subset of nouns. Investigation is ongoing, but perhaps as few as 20% of nouns can even take a classifier.

Yet classifiers remain psychologically salient despite their low frequency. Jokes abound about dialect speakers, such as the Hakkas, referring to humans with the classifier which Cantonese and Mandarin speakers use for animals and small objects *jek / zhi* 隻. Classifiers are often named as speech errors typical of children, substandard speakers, and foreign students. Classifiers are salient not just because of grammatical theory, but because they reflect the noun superiority effect, the term psychologists use for the universal tendency to remember concrete nouns better, name them faster as examples, and use them in metaphors.

CLASSIFIERS ARE FOR SPECIFICATION. Why do the categorical rules which work so well for gender fail for classifiers? The puzzle is solved when we discard the seductive notion that classifiers exist primarily to categorize objects, and examine their discourse functions. A complementary system emerges between sortal and general classifiers, which appear only when a noun is specified as a focus of individuated attention. Such focus is necessarily variable, not categorical. Cantonese and Mandarin display a striking common pattern, as Table 1 indicates. About 40% of nouns appear without a classifier (39% Cantonese, 43% Mandarin). And so, virtually identical proportions appear with a classifier (62% Cantonese, 57% Mandarin). The general classifier appears with 44% of Cantonese nouns, 54% of Mandarin. There is no statistically significant difference between these proportions.

TABLE 1 COMPLEMENTARY CLASSIFIER SYSTEM

	NOUNS with NO CLASSIFIER	GENERAL 個	SORTAL (e.g. 條)
CANTONESE	**39%**	**44%**	**18%**
MANDARIN	**43%**	**54%**	**3%**

Sortal classifiers are used with nouns for new information, typically as objects of an action verb. General classifiers, in contrast, specify an existential, translatable as 'there's a ....' They appear disproportionately as subjects of stative verbs. This striking commonality is discussed further below, as is the much greater use of sortals in Cantonese. Neither Cantonese nor Mandarin speakers ever omit a classifier where grammatically required after a numeral or a determiner. But a bare noun is often correct, especially for generic or non-specific reference such as 'I'm busy writing a report' / 'I'm busy report-writing', Mandarin 'I busy-PROGRESSIVE write report' *wo mangzhe xie baogao* 我 忙著 寫 報告(Chen 1987).

DIFFERENCES BETWEEN CANTONESE AND MANDARIN CLASSIFIERS

Cantonese and Mandarin classifiers differ far more than previously assumed. Semantic differences have received the bulk of attention. The Cantonese for 'needle' *jam* 針 takes 'eye-CL' *ngaan* 眼 . A Mandarin needle, written with the same character but pronounced *zhen*, takes 'root/thread-CL' *gen* 根 . Grammatical differences also exist. Cantonese classifiers can be used alone, without a determiner (Matthews and Yip 1994:92-109, Shi 1996, Zeng 1982, Zhou 1997). Cantonese for 'that book cannot be found' is, 'volume-CL book not perceive PERFECTIVE-ASPECT' *bun syu m gin jo* 本 書 唔 見咗. (Mandarin: That volume-CL book not perceive PERFECTIVE-ASPECT' *na ben shu bu jianle* 那 本 書 不 見 了 .)

Most sortals refer to more heterogeneous sets than 'book' or 'hat'. Brief glosses only hint at the complexity. Cantonese sortals refer to more mixed groups than Mandarin, in part because Cantonese is unstandardized and seldom written. The Mandarin *zhi* 隻 classifies birds, and other small, animals such as rabbits and cats. Tigers and leopards are included, by extension from cats; in addition to deer. Ears, hands, shoes and socks, also take *zhi*,

probably by extension from smallness and manipulability. In Cantonese, the same character, pronounced *jek*, covers both small and large animals, including horses and oxen, as well as teeth, eggs, battleships, and phonograph records. In other cases the same character is used as classifier for a different but related meaning. Mandarin *jian* 間 classifies individual rooms. In Cantonese, the same character, pronounced *gaan*, refers to a whole flat or building. Even the semantics of the general classifier differ. Cantonese *go* 個 is strongly associated with verticality, and humans, who are 90% of its referents in the Pear Stories. In Mandarin, only 64% of the general classifier *ge* 個 has human referents (difference significant at $p < .01$).

GREATER USE OF SORTALS IN CANTONESE. Cantonese speakers unexpectedly use six times more sortal classifiers per noun, a highly significant difference ($p < .001$). [3] Table 2 summarizes the contrast, while Tables 3 and 4 offer details for all speakers. The 19 Mandarin narratives yielded only 35 sortals, just two per narrative on average, or one every 30 nouns. [4] The 30 Cantonese narratives yielded 241 sortals, 8 per narrative, one every six nouns. Just 5% of the Mandarin classifiers were sortal, in contrast to 28% of the Cantonese. The difference is robust, because it emerged even though the Hong Kong women told much shorter stories. [5] And Mandarin, not Cantonese, serves as the high register, close to prescriptive written style. However, the greater Cantonese usage of sortals comes largely on later mentions of the same object.

TABLE 2 SORTAL VERSUS GENERAL CLASSIFIERS

	CANTONESE	MANDARIN
Sortals -- mean per narrative	**8**	**2**
Percentage of classifiers general	**72%**	**95%**
Percentage of classifiers sortal	**28%**	**5%**
Ratio of general to sortal classifiers	**2:1**	**20:1**

GREATER RANGE OF SORTALS. The Cantonese also use a 15% greater range of sortals, 14 compared to 12 in Mandarin. Five (35%) are distinctively Cantonese: 'tree-vegetable-CL' for the pear trees *po* 合; 'lump-CL' *gaau* 嘅 for the rock and a ball; 'performance-CL' *cheut* 齣 and 'set-CL' *tou* 套 for the film; and 'burst-CL' johk 濯 for a breeze. Cantonese classifier dictionaries show even greater difference. Some 62% of the sortals in the most comprehensive classifier dictionary do not exist in Mandarin, or differ substantially (Killingley 1982); 68% are differ in another source (Zeng 1982).

Cantonese also has a greater overall range of sortals in common use. Mandarin, closer to the written language, is the favorite of dictionary makers. One classifier dictionary lists 199 classifiers, 76 of them sortal (38%) (Wang and Wu 1989). A teaching grammar of 'the 143 most commonly used classifiers' lists 66 sortals (46%) (Jiao 1993). Cantonese has well over 80 sortals. One guide lists 87 classifiers, 59 sortal (69%) (Zeng 1982). The most extensive classifier dictionary lists 157 classifiers, 102 of them (65%) sortal, or a combination of sortal and measure (Killingley 1982). Cantonese appears to have a greater range of classifiers for transient events such as smells, sounds, and flashes of light.

Size and shape classifiers have attracted much attention, especially for Mandarin. They form 27% of classifiers in the Pear Stories, appearing on just under 1% of nouns (*tiao* 條, *kuai* 塊, *duan* 段, *pian* 片). [6] Cantonese size and shape classifiers comprise 14% of sortals (*gaau* 舊, *tiuh* 條, *faai* 塊, *dyuhn* 段). This lower percentage merely reflects the greater range of classifiers. Size and shape is at least as important in Cantonese, for they appear on 2% of nouns.

Cantonese and Mandarin speakers mention almost exactly the same objects and events. But they differ in which objects take a sortal, and which sortals they choose (Table 5). The five most frequent Cantonese classifiers account for 81% of all tokens. In descending

order, they refer to the hat, the bike, the tree, the goat, and the rock. ('Hat/peak-CL' *ding* 頂, 'machine/frame-CL' *ga* 架, 'tree-CL' *po* 㘝, 'animal-small thing-CL' *jek* 隻, 'lump-CL' *gaau* 嘅舊.) The Mandarin top five are less concentrated, 62% of tokens. They refer to the bike, the tree, the sound of the whistle, the goat, and the road. (The bike takes 'vehicle-CL' *liang* 輛, the tree takes 'tree CL' *ke* 棵, the whistle takes 'sound-CL' *sheng* 聲, the goat takes 'head-CL' *tou* 頭, 'animal or small thing-CL' *zhi* 隻, and the 'extended object-CL' *tiao* 條. The road is equally likely to take the 'extended object-CL' or the 'section-CL' *duan* 段.) Much previous research considers the culturally valued objects which are more likely to receive classifiers: corn in Mayan, elephants in Thai. But the highest frequency classifiers are overwhelmingly banal. A large sample of adult Mandarin conversation found that speakers used only 22 different classifiers (Erbaugh 1986). [7]

SHARED PATTERNS OF INFORMATION DEPLOYMENT

IDEA UNITS AND SPECIFICATION OF NEW ENTITIES. Universals of information processing constrain both Cantonese and Mandarin. Speech emerges in short bursts of five or six words, which Chafe (1980) calls idea units, followed by a pause and/or falling intonation. The length, organization of idea units, and pause patterns of the Mandarin Pear Stories strikingly match the English stories, with Chinese speakers varying even less than the Americans (Cumming 1984, Erbaugh 1990). Narrators begin with an existential phrase such as 'There's a....' 'to have/to exist one + CL' 有一個. Though previous studies treated such phrases as indefinite, Matthews and Pacioni demonstrate that the classifier picks out a specific item (1997). 'One' functions not as a numeral, but as a specifier for the main character. The repetition of the tree classifier specifies the tree, first as a location of action, then as the farmer's property:

(1a) 我，唉。
ngoh, eih
I, uh.

(1b) 睇 到 有 一個 。。。 一個 男人 啦。
tai dou yauh yat go .... yat go naahmyahn la
See reach exist one gen-CL... one gen-CL male person PARTICLE.

(1c) 咁 佢 應該 喺 一 㘝 樹，
gam keuih yinggoi hai yat po syuh,
Well, he must be in one tree-CL tree,

一 㘝 梨 樹 嘅 主人 類 嘅。
one TREE-CL pear tree POSS owner sort POSS.
'I, uh. [I] see there's a ... um ... a man. Well, he must be in this tree, this pear tree's owner, that sort of thing'.

This initial framing is effortful, full of hesitations and substitutions. Later narration flows more smoothly, dividing into episode boundaries which closely match film cuts to different scenes. Classifiers tend to reappear at episode boundaries to re-establish reference.

Adults, preschool children and even foreign students follow the same principle, which is never explicitly taught, of choosing a sortal or general classifier based on the hearer's information needs (Erbaugh 1986, Polio 1994). A sortal is especially like to appear with a noun for a new topic, especially for objects which are unfamiliar to the hearer or not physically present. In Mandarin, a bike viewed out the window might be called 'that vehicle-CL bike' *na liang zixing che* 那輛 自行 車 But a bike parked in the living room, or a tiny toy bike on the

floor, would often be 'that general-CL bike' *nage zixing che* 那個自行車 . [8] Later references often use a general classifier or a bare noun.

Cantonese narratives move from classifier + noun, to a bare noun, a determiner without classifier, or to zero. Zero anaphora may be more common in Cantonese, though this awaits analysis. Unlike Mandarin, Cantonese sortal classifiers often persist through several mentions. Certain sortals are disproportionately likely to be repeated, especially for the bike and the hat. Cantonese classifiers often mark association with a person, sometimes implying possession:

(2a) 但係 佢 另外 有 頂 帽 都 跌 咗 架 嘛 .
dan hai keuih lihngngoih yauh ding maa dou dit zuo ga ma
But he also have hat-CL hat all fall PERFECTIVE PARTICLE PARTICLE

(2b) 咁個 三個 小朋友 就俾 頂 帽，番 頂 帽佢 啦啊 .
gam go saam go siu pahngyauh jauh bei ding mau fan ding mau keuih la a
Well these three general-CL child just gave hat-CL hat, return hat-CL hat him PARTICLE PARTICLE.
'But he also had a hat that fell off. Well, those three children just gave that hat back, returned that hat [back to] him'.

Matthews and Pacioni argue that Cantonese classifiers modify specific objects to indicate a uniquely specified individual (1997). They caution that too many researchers look for definite reference, 'this hat' versus 'a hat', where they should be looking for specificity. In 2a, the classifier appears with the head noun, translatable as a relative clause, to specify 'the hat that fell off'. Cantonese classifiers, Matthews and Pacioni say, differ from Mandarin according to Bisang's (1993) typology of classifiers, because they are closer to neighboring but unrelated Hmong and Miao-Yao languages which form a substratum for southern dialects. Both Mandarin and Cantonese classifiers express individuation and classification. But Cantonese, Hmong, and Miao-Yao classifiers also mark specificity (a referential function), and possession (a relational function).

EVENT FOCUS. Both Cantonese and Mandarin classifiers are significantly correlated with new information. Sortals appear as patient/objects of action verbs, as in the hat which blows off, about twice as often as general classifiers do, as Table 6 shows. Lambrecht (1994) calls this an event reporting focus, which emphasizes the predicate as a whole. It answers questions like 'Why are you walking so slowly?' with 'My FOOT hurts.' 'Entity central focus' might be a more appropriate term, Shen (2000) argues, for these sentences which highlight new information. This correlation between sortal classifiers and actions helps explain the concentration of classifiers on small manufactured or manipulated objects. It also helps explain the paucity of classifiers in picture naming. Sortal classifiers should also show up Lambrecht's argument-focus sentences, which correct a mistaken identity: 'Is your knee hurting?' 'No, my FOOT hurts.' But no argument focus examples occur in the Pear Stories.

General classifiers appear in complementary distribution to sortals, as subjects of indefinite sentences with existential verbs, especially 'to have, to exist' *yiu/you* 有: '[There] exists a general-CL stone' *you yige shitou* 有一個石頭 . Lambrecht (1994:144) discusses these as presentative sentences for newly introduced entities. General classifiers are also disproportionately likely to appear with stative verbs, 'that general-CL stone [is] big' *nage shitou hao da* 那個石頭好大. General classifiers also appear with verbs of perception, as in '[he] saw a general-CL rock' *jiandao yige shitou* 見到一個石頭.

TABLE 6 EVENT FOCUS

	SORTAL		GENERAL	
	Cantonese	Mandarin	Cantonese	Mandarin
Object, active verb	63%	81%	38%	33%
Subject/existential	25%	6%	68%	55%

This correlation between sortal classifiers and objects of action verbs, and general classifiers with existentials or statives is statistically significant ($p < 005$). Correlation does not amount to a categorical rule. Sortal classifiers do sometimes appear with existential verbs, and general classifiers with objects of active verbs. But given the ubiquity of the general classifier, and its strong association with human agents, the correlation between sortals and actions unexpectedly strong. Attempts to construct examples of indefinite subject sentences with sortal classifiers produce oddly infelicitous sentences, such as ?'[there] exists one volume-CL book' *you yi ben shu* ?有一本書 . This is about as anomalous and incomplete-feeling as its translation, ?'There is one book.' Such sentences can only take a reading for identification of object, for which the existential verb is inappropriate (Shen 2000).

Additional evidence for a correlation between classifiers and new information comes from Chui's (1994) broader discourse analysis. New information is overwhelmingly post-verbal, on objects of transitive verbs and subjects of intransitive verbs. Repeated mentions of non-human nouns appear as objects rather than subjects (quoted in Biq, Tai, and Thompson 1996:115-16).

NUMERALS FOR INDIVIDUATION, NOT QUANTIFICATION. Classifiers can take any number. Yet only the general classifier appears with numbers 'two' or above, and no number higher than three appears at all [9] Therefore, sortal classifiers are specialized for enumeration, while counting is associated with known or previously-mentioned objects, almost by definition. More important, 'one' almost always marks individuation rather than quantity, much like the European indefinite articles, English 'a' (etymologically 'one'), or French *un* , literally 'one'. In both Cantonese and Mandarin, 'one' is the only numerals for sortals, as Table 7 shows.

TABLE 7 NUMERALS

	SORTALS		GENERAL	
	Cantonese	Mandarin	Cantonese	Mandarin
Classifier with numeral	4%	82%	38%	43%
'One' as numeral	100%	100%	36%	62%

Further evidence for individuation emerges because Cantonese 'bare sortal + noun' is the translation equivalent of Mandarin 'one + CL noun'. Some 84% of Cantonese sortals are bare classifiers, almost exactly the same as the 82% of Mandarin sortals which are 'one + sortal'. 'One' is more likely to imply a full numeral in Cantonese, since it appears on just 4% of sortals.

'Numeral classifier' is a good label for Mandarin; 94% of sortals appear with a numeral, a determiner, or both, as Table 8 shows. But 'numeral classifier' is a poor label for Cantonese, describing only 14% of sortals. Instead, 84% appear as a bare classifier, without a determiner or numeral. This is perfectly grammatical. (And 4% of Mandarin sortals appear as a bare classifier.) The general classifier is much less common as a bare classifier, only 29% in Cantonese, and zero percent in Mandarin (though six tokens occur). The existence of bare classifiers offers further evidence of their use for specification rather than quantification.

TABLE 8 NUMERAL, DETERMINER, BARE CLASSIFIER

	Cantonese		Mandarin	
	Sortal	General	Sortal	General
Bare classifier	84%	29%	4%	--
With numeral	4%	38%	82%	43%
Determiner	10%	35%	12%	57%
Det + numeral	--	7%	--	4%

The full grammatical form Determiner + Numeral + Classifier + Noun is a rare, marked construction. It never once occurs with sortals in either Cantonese or Mandarin. It appears only with the general classifier (7% of Cantonese nouns, 4% Mandarin).

CLASSIFIERS AS NOUN SPECIFIERS, NOT SUBSTITUTES. Many assumptions about the categorizing function of classifiers rest on their use as noun substitutes. One can go to market, point to a pile of pens, and say, 'Give me five small, stick-like-CL' *gei wo wu zhi* 給我五支 . This turns out to be a highly marked construction, dependent on gesturing toward the pens. In the Pear Stories, almost all the classifiers appear with the noun, almost always immediately before it. (In Cantonese 97% of both sortal and general classifiers appear with the noun; Mandarin 99% and 95%. No classifier appeared after its noun.) [10] Classifiers add semantic weight to a newly highlighted noun, much like an adjective phrase. They very seldom stand in for them.

Most classifier phrases translate as 'that one', rather than the equally logical 'this one'. The overwhelming use of distant, distal 'that' demonstrates how classifiers pull a psychologically distant object toward the hearer's attention. In Cantonese, 100% of the determiners with classifiers are 'that' (*ni* 呢), as are the overwhelming majority in Mandarin (*na* 那), as Table 9 shows. 'This', the proximate determiner, is equally grammatical, (as Cantonese *go*個, Mandarin *zhe* 這). Yet 'this' never appeared with Cantonese classifiers, and only rarely in Mandarin. The slightly greater Mandarin use of 'this' with the general classifier indicates that near objects need less specification.

TABLE 9 DISTANT 'THAT'

	Sortal		General	
	Cantonese	Mandarin	Cantonese	Mandarin
'That' as determiner	100%	96%	100%	87%

NEURAL CORRELATES OF CLASSIFIER CATEGORIES

The specifying function of classifiers lexicalizes a universal mental ability. Neural correlates to classifiers appear in networks which organize human-oriented, category-specific knowledge. Brain imaging research uses PET-scans (positron emission tomography) to measure blood flow to areas in active use. Privileged mental categories have been mapped for animals, humans, tools, living things versus artifacts, plants, fruits, and vegetables. (Caramazza and Hillis 1991, Damasio, Grabowski, Tranel, Hichwa and Damasio 1996; Martin, Wiggs, Ungerleider and Haxby 1996) Even though most people tested are English speakers, these categories show intriguing parallels to the objects most frequently marked by classifiers, with a parallel association to active verbs.

The neural networks for categories are integrated with associated actions, 'hit' with 'hammer'. These are activated not just by nouns, but by verbs of manipulation. [11] Similarly, Mandarin-speaking aphasics, tested on classifiers, unexpectedly show grammatical deficits beyond the predicted noun classes. A complex pattern of omission and substitution occurs, with different patterns for Broca's and Wernicke's aphasias (Tzeng, Chen, and Hung 1991).

Language-disordered Cantonese-speaking children also show complex and variable patterns of classifier omission and substitution (Stokes and So 1997). Experiments on reading also find that classifiers are not just associated with nouns, but with semantically related verbs (Chen 1996, 1999).

Understanding a category requires cross-modal integration of both verbal and non-verbal information across the senses, especially vision, hearing, touch and motion. Distinct, separable, largely left brain hemisphere regions of the temporal lobe coordinate the retrieval of words and concepts for different categories, with additional connections to visual and motor areas. Naming a tool, for example, activates a left premotor area, close to the region activated when one imagines grasping an object in the right hand. Naming an animal, or another category, activates slightly different areas (Martin et. al. 1996:650-51). Such cross-modal integration creates what Gibson (1979:134) calls the affordance of an object, permitting us to experience it as a whole which is not reducible to its features. Perceiving an affordance does not classify an object irrevocably. A stone might also be used as a weapon, a hammer, or a paper weight. Similar flexibility underlies language. A rock may be associated with a classifier and a verb, 'lump-CL' and 'hit'. But noun, classifier and verb are not categorically bound.

Humans perceive certain shapes with privileged efficiency. The coordination between visual and tactile classification predisposes us to classify objects as vertical, that is, as 1-D and extended; as 2-D, flat and sheetlike; and in a variety of 3-D grain-like and clump-like conglomerates. These shapes recur in classifiers world wide (Lee 1988). Shape is an especially informative category, with higher clue validity than function, which is often unknown. Infants first sort objects by shape, e.g. all round things together. Sorting by function develops gradually, often conventionally learned.

Additional evidence for flexible and cross-modal categorization comes from studies of aphasics, blind children, and gesture. Some aphasics lose the ability to name particular categories, while still understanding their function. Someone unable to name animals might fail to label a picture of a skunk, but say, 'oh, that animal makes a terrible smell...' (Damasio et.al. 1996:499). The inaccessible brain categories correspond roughly to superordinate categories such as 'animal' or 'tool'. The disorder blocks the naming of the most frequently-used, basic level examples, e.g. 'dog' or 'scissors'. Blind children's unexpectedly normal language development also testifies to cross-modal categorization. They have no trouble integrating non-visual input with language, picking up a dog and calling it a puppy. And both blind and seeing speakers almost irresistibly gesticulate iconically when describing moving objects, especially the animate or manipulable objects which so often take classifiers. In Deaf Sign Languages, including both American Sign Language and the Chinese Sign used in Taiwan, verb classifier systems are especially well-developed for actions and manipulations which refer to humans, animals, artifacts, and vehicles (Suppalla 1986).

DO CLASSIFIERS MAKE A COGNITIVE DIFFERENCE?

Whorf-inspired researchers have argued since the 1950's that speakers of classifier languages should do better at categorization, an important measure of intelligence. Chinese language enthusiasts welcome such claims. Yet efforts to correlate classifiers with a different world view, or even sorting ability, have proved disappointing. Some have tested whether classifiers help infants distinguish objects which are perceived as a whole. But evidence increasingly converges that even the youngest babies perceive objects as individuated and enumerable long before they can speak. A whole-object bias appears regardless of the language learned. Nor can differences in categorization ability be found among children of the same class, regardless of language. The occurance of classifiers with the noun, rather than as a pro-form, probably limits their information value. Cognitive differences attributable classifiers will probably never be documented.

On the contrary, infants first learn classifiers formally, as grammatically required morphemes after numerals or determiners. Mandarin, Cantonese, Thai, and Japanese children use a few classifiers from their first two-word utterances. But there is no evidence that they understand the semantic distinctions so salient to adults. Children learn classifiers extremely slowly throughout the primary school years (Carpenter 1991, Matsumoto 1985). Different tests elicit different numbers of classifiers. Picture-naming tasks are convenient. Yet they can underestimate classifier use by five to ten years compared to tediously collected conversation samples. The low yield from picture naming springs directly from their unambiguous referents. Even a child who knows the classifier may avoid it as redundant, since specifying redundant information is a task we learn in school. Classifier choice in picture naming also shows so much individual variation that sortal classifiers are not a reliable test of language development (Stokes and So 1997).

Children overuse the general classifier, but they almost never omit a classifier when grammatically required (Erbaugh 1984, 1986). Cantonese toddlers use a broader range of classifiers than Mandarin children, and are far less likely to overuse the general classifier (Lee, Wong and Wong 1995, Wong 1996). Four-to-six year old Cantonese children do overuse the general classifier in picture-naming (87% of all errors). But they virtually never omit it where required (0.3% of errors). Age-matched language delayed children, in contrast, omit classifiers 40 times more often (12% of errors). And 68% of these errors overuse the general classifier (Stokes and So 1997:93). Mandarin-speaking aphasic adults who suffer from grammatical deficits also often omit classifiers (Tzeng, Chen and Hung 1991).

Cantonese speakers react proudly on hearing about their more abundant classifiers. Mandarin speakers may respond negatively, argue that the Pear Stories data must be wrong, and deny that 'those Cantonese' use more classifiers. A strong linguistic determinist might claim that the Cantonese classify the world more precisely. But then we must also accept that they are over 14 times more interested in hats. That is absurd. The content and organization of the Cantonese and Mandarin stories are almost identical, to each other and the English stories. Languages, with or without classifiers index very similar categories. The difference, as Slobin argues (1997:283), reflects how overtly a particular language requires grammatical marking. Some languages mark categories such as number or gender more overtly. But careful comparative testing finds no difference in ability to think about quantity or sex.

Classifiers offer grammatical marking of categories which languages, such as English, distinguish by separate words, 'a lump of clay', 'a burst of light', 'a length of road'. An innate propensity toward certain categories exists. All humans live in a similar world of objects and activities, which reinforce whatever brain specializations may be present at birth. Language sharpens, enriches, and conventionalizes categorization. Classifiers will be partly processed through brain networks which process lexical categories in non-classifier languages. The dramatic difference between Cantonese and Mandarin classifiers, in such closely related languages and cultures, is further evidence for a discourse rather than a conceptual function. The greater use of classifiers in Cantonese also reflects a historical borrowing of classifiers into Chinese from Tai, with only gradual diffusion to the northern dialects, with classifier use accelerating in written texts only during the Tang dynasty (Peyraube 1991). Ongoing comparisons of Pear Stories in the other dialects will likely find greater classifier use in the southernmost dialects.

Classical feature semantics fails for classifiers, which are too variable, redundant, and discourse-sensitive for binary truth values. Theories of parameter setting also fail to explain either child or adult usage, which emerge not rule-like, but in irregular, gradual and overlapping increments. Aand over a decade of efforts to fit classifiers to prototype theory have led to frustration. Few classifiers define prototypical hierarchies, of superordinates such as 'animal' with all basic level examples from 'horse' to 'dog' underneath. Historical overviews sometimes posit unrealistically binary splits; first between animate-inanimates, then human-animal, then artifacts and shapes. Neither Cantonese nor Mandarin has either a human or an

animate classifier, but few cultures place greater emphasis on human superiority to animals. Instead, multitudes of classifiers overlap for animals, plants, artifacts, and shapes.

A connectionist model works best by modeling language sub-systems in variable weighted frequencies. High-frequency categories are most accessible, easily learned, and generalized to new or unusual forms. The imprecise, overlapping and widely distributed semantic and grammatical correlations between classifiers, nouns, and associated verbs strongly resemble the highly distributed semantic networks modeled on computer by Small (1997) and others. A more complex weighting for sentence and discourse correlation with objects of actions is feasible, with a lexicalist tagging of each classifier. For both machine and human neural networks, the most frequently -- and saliently -- encountered words are accessed most quickly. Unusual or archaic classifiers should be accessed less quickly, accurately, and less completely across large groups of peakers. They may be learned late, over regularized, or not at all. A speaker's classifier system is both frequency sensitive and subtly individualized. The connectionist model better explains why speakers disagree so strongly, and how disagreement increases incrementally, rather than absolutely, by age, background, dialect --- and language. The perception of both verbal and non-verbal categories rests on a complex and variable integration of sensory perception and generic knowledge (Medin and Barsalou 1987). Similar complex and variable integration emerges in the irregular and overlapping systems of classifiers in discourse.

New or ambiguous objects and actions are constantly fitted out in language. Older speakers complain that classifier use is declining. Close analysis finds this concern misplaced. Speakers readily adapt classifiers to new objects, such as the Cantonese use of 'lump-CL' *gauh* 嘅 for AAA batteries. The Pears film includes an unusual object, a paddle ball toy. Most people call it a 'ball' or a 'toy', but some Cantonese use the 'lump-CL' for the ball. New classifiers are also created from nouns. One Hong Kong innovation, code-mixed with English, resembles a newly-coined classifier:

(3) 一 PACK 紙.
yat PACK ji.
'one PACK paper' [12]

The classifier 'piece' also featured prominently in Pidgin Chinese English, e.g. 'one PIECE shirt'. Classifiers may be especially receptive to code mixing, in contact languages where trade demands discussion of number and quantity. This borrowability helps explain the pervasiveness of classifiers as an East Asian areal feature. The borrowability into a non-classifier language, such as Pidgin English, and possibly into Proto-Japanese and Proto-Korean testifies further to the universally accessible cognitive foundations of classifiers.

TABLE 3 CANTONESE PEAR STORIES CLASSIFIERS

SPEAKER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NOUNS	**1,337**																				
CLASSIFIERS	**842**																				
Classifiers as % of nouns	**61%**																				
GENERAL個 *go*	**601**	25	27	20	8	35	17	31	11	19	12	24	31	15	15	17	21	10	24	39	15
Mean	**20**																				
% classifiers 個	**72%**																				
Nouns with 個	**44%**	43%	58%	50%	25%	53%	44%	52%	44%	61%	35%	45%	45%	60%	27%	39%	42%	37%	42%	44%	50%
SORTALS	**241**																				
頂 *ding* peak, hat	**64**	6	4	2	3	3	4	2	1	3	2	2	3	1	1	3	2		2	2	1
架 *ga* machine, bike	**60**	1	4		3	2		7	2	1		1	4		2	1	2	1	6	5	3
合 *po* tree	**36**	3		1		4		1	1		2	3	1		2		2	1	3		
隻 *jek* small thing, animal	**20**		1			2		1		3			1		1	1			2	1	
嚿 *gau* lump	**17**				1		1			1	1	3				2					
套 *tou* set, play, film	**14**	1	1				1						1		2					1	
條 *tiuh* extended object	**10**	2	1	1	1														1		
塊 *faai* clump, square, rock	**7**		2															1	1	2	
濯 *johk* burst, breeze	**5**	2												1	1						
部 *bouh* machine, bike	**4**				1														1		
齣 *cheut* play	**1**																		1		
聲 *sing* sound	**1**					1															
件 *gihn* situation, animal,	**1**																				
段 *dyuhn* section, interval	**1**																				
TOTAL SORTALS	**241**	15	13	4	9	12	6	11	4	8	5	9	10	2	9	7	6	3	17	11	4
Mean	**8**																				
% classifiers sortal	**28%**																				
DIFFERENT SORTALS	**14**	6	6	3	5	5	3	4	3	4	3	4	5	2	6	4	3	3	8	5	2
Mean	**4**																				
NOUNS WITH SORTALS																					
Mean	**17%**	25%	28%	10%	29%	18%	15%	18%	16%	25%	14%	16%	14%	8%	16%	16%	12%	11%	29%	12%	13%

21	22	23	24	25	26	27	28	29	30
3	17	9	29	22	13	12	17	13	50
75%	36%	45%	40%	46%	44%	50%	48%	43%	46%
	3	3	2		3		1	1	4
	1	1	3	4	2	1	1		2
	5		3			3		1	
			1	1			3		2
	1			1			1	1	4
	1	1		1			2		2
									4
				1					
									1
									2
			1						
								1	
0	11	5	10	8	5	4	8	4	21
0	5	3	5	4	2	2	5	4	8
0	23%	25%	14%	19%	17%	16%	22%	13%	19%

TABLE 4 MANDARIN PEAR STORIES CLASSIFIERS

SPEAKER			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
NOUNS		**1,308**																			
CLASSIFIERS		**734**																			
Classifiers as % of nouns		**56%**																			
GENERAL	個 *ge*	**691**	16	30	16	48	107	51	52	29	23	37	67	21	39	26	45	13	19	10	42
	Mean	**36**																			
	% classifiers 個	**95%**																			
	Noun with 個	**54%**	46%	37%	69%	50%	52%	47%	51%	44%	89%	54%	76%	37%	81%	49%	60%	42%	48%	83%	64%
SORTALS		**43**																			
輛 *liang* vehicle, bike		7				2	1					1	1	1							2
聲 *sheng* sound, whistle		6		1		1	1	1					1								1
頭 *tou* head, animal		5					1	1					1	1			1				1
隻 *zhi* small thing, animal		5		1								1	2								
條 *tiao* extended object rope		4				1	2														1
塊 *kuai* square, lump, rock		4		1				1	1					1							
頂 *ding* peak, hat		3				1	1														
棵 *ke* tree		2				1						1									
段 *duan* section, interval		2		1																	
片 *pian* slice, section		2					2							1							
件 *jian* item, situation, clothing		1														1					
位 *wei* seat, honored person		1														1					
TOTAL SORTALS		**43**	0	4	0	6	8	3	1	0	0	3	6	4	0	2	1	0	0	0	5
	Mean	**2**																			
	% classifiers sortal	**5%**																			
DIFFERENT SORTALS		**12**																			
	Mean	**2**	0	4	0	6	6	3	1	0	0	3	5	4	0	2	1	0	0	0	4
NOUNS WITH SORTALS																					
	Mean	**3%**	0%	7%	0	6%	3%	2%	1%	0	0	4%	6%	6%	0	4%	1%	0	0	0	7%

TABLE 5 RANKED FREQUENCY

CANTONESE ADULTS
(n = 30)

Classifier	Common referent	Number
頂	Hat, peak	64
架	Bike, machine	60
棵	Tree	36
隻	Small thing, animal	20
嚿	Clump, rock	17
套	Set, play, film	14
條	Extended object	10
塊	Clump, square	7
瀡	Burst, flash, breeze	5
部	Bike, machine	4
聲	Whistle, sound	1
件	Situation, clothing	1
齣	Play	1
段	Section, interval	1
		241

MANDARIN ADULTS
(n = 19)

Classifier	Common referent	Number
輛	Bike, vehicle	7
聲	Sound	6
頭	Head	5
隻	Small animal or thing	5
條	Extended object	4
塊	Square, clump	4
頂	Hat, peak	3
棵	Tree	3
段	Section, interval	2
片	Slice, section	2
位	Honored person	1
件	Situation, clothing	1
		43

NOTES

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[2] In Spanish, for example, a 'table' *mesa* takes feminine gender, often signaled by a final '-a'. The article and adjective which modify it must also be feminine. 'The red table' is *la mesa roja*. However, 'desk' *escritorio* is masculine, often signaled by a final '-o' . It takes the masculine forms of the article and adjective. 'The red desk' is *el escritorio rojo* .

[3] The difference is 13 times greater when calculated by the less precise measure of classifiers per utterance.

[4] Mandarin speaking two and three year olds use even fewer, only 138 in 135,000 utterances from 64 hours of home conversation (Erbaugh 1984, 1986).

[5] There is no clear reason for the Taipei women's longer stories. They did seem more intrigued by the activity. Entertainment was in such short supply under martial law in 1976 that many men also came to the film, knowing they would not be interviewed. Participants decided among themselves that the film was a personality test. They laughed in disbelief at the debriefing on being told the interviews were language samples. The Hong Kong women of 1997 had much busier lives.

[6] Two and three year old children use an even higher percentage, between 35% and 58% (Erbaugh 1984, 1986).

[7] Japanese classifiers are even more heavily concentrated. Downing finds that only seven classifiers account for 85% of tokens. These are the classifiers for humans, inanimate objects, animals, elongated objects, flat thin objects, buildings, and small, 3-D objects (人，匹，本，枚，軒，個) (1996:55). These characters were borrowed from Chinese over a thousand years ago. The modern Mandarin meaning has shifted dramatically. The Japanese classifier for humans is the modern Mandarin noun 'human' *ren*. The inanimate objects classifier no longer exists in Chinese. The 'animal-CL' is almost entirely restricted to horses. The 'elongated objects-CL' refers almost exclusively to books. The 'flat thin objects-CL' refers largely to needles and badges. The 'building-CL' is an archaic adjective for 'lofty, glorious', (and a Cantonese and Southern Min noun for stores and restaurants). The 'small 3-D CL' is now the general classifier. Such semantic shifts argue against any rigidly essentialist semantic claims for either characters or classifeirs.

[8] Sometimes a contrastive interpretation is possible. 'We all sent her this volume-CL book' *women dou gei ta songle zhe ben shu* 我們都給她送了這本書 implies 'We collectively sent her one copy of that book'. 'We all sent her this general-CL book' 我們都給她送了這個書 implies many copies of the same book. I thank Li Ruzhan for this example.

[9] Some 99% of Japanese classifiers occur with 'three' or below (Downing 1996: 219-20).

[10] Japanese speakers also use classifiers to supplement the noun far more than as a substitute (Downing 1996:169).

[11] The classifier for many tools, swords and other manipulated objects in both Cantonese and Mandarin is *ba* 把, also etymologically a verb for handling things, as well as the object marker for topicalized patients of an active verb.

[12] This is a measure classifier, but hints at a broader process. In Japanese, a lane of traffic is classified as a 'vehicle-line-CLASSIFIER' *shasen* 車 線 . But a lane in a bowling alley is now classified as a *rein* , borrowed from English 'lane', and written phonetically (Downing 1996:264).

APPENDIX 1 OVERVIEW OF CLASSIFIERS

Classifiers are morphemes which categorize nouns in hundreds of unrelated languages, from Mayan to Australian aborigine languages, from Japanese to the American Sign Language of the deaf (Allen 1977, Craig 1986). Important differences emerge among different types of classifier systems (Aikenvald 2000, Croft 1994). Both Cantonese and Mandarin belong to the numeral classifier subtype, along with unrelated languages including Thai, Japanese, Vietnamese, and Hmong. Numeral classifiers are obligatory after a number or a determiner to specify a noun category. The closest English parallels are rare measure words such as 'four head of cattle'.

Classifier languages, in contrast, have dozens of classifiers. Mandarin for 'four tables' is 'four flat-CL table' *si zhang zhuozi* 三張桌子 ; 'three trees' is 'three tree-CL tree' *san ke shu* 三棵樹 . These are ungrammatical without a classifier, though the general classifier, *ge* 個 is often works as default. Classifiers also appear after determiners equivalent to English 'that', as in 'that hat/peak-CL hat' *na ding maozi* 那頂帽子. Determiner + classifier can also appear without a noun, like a more specified pronoun, 'I want that [hat/peak type thing]' *wo yao na ding* 我要那頂.

Numeral classifiers include three subtypes: measure classifiers, collective classifiers, and the sortal classifiers. Measure classifiers refer to quantities, translatable as 'a bottle of', 'a basket of', or 'a mouthful', as well as more precise measures such as 'an ounce' or 'a kilometer'. Collective classifiers describe arrangements of objects, equivalent to 'a row of', 'a bunch of'. Sortal classifiers, in contrast, refer to a particular category. Books, for example, take a 'volume-CL' *bun* in Cantonese, using the Yale romanization, *ben* in Mandarin pinyin. Both are written with the same character, 本. (Examples in both languages are listed with Cantonese first.) Machines often take a 'machine/frame-CL' *ga/jia* 架. So a Cantonese radio becomes 'a machine/frame-CL radio' *yat ga sauyamgei* 一架收音機 . Shape classifiers form a small but important sub-set, especially the classifiers for two-dimensional extended objects such as ropes *tiuh/tiao* 條 , and for flat, horizontal, sheet-like objects such as blankets or paper *jeung / zhang* 張 .

The Chinese word for classifier is literally 'measure word' *leuhngchih/liangci* 量詞, which refers equally to measures, collectives, and sortals. Their grammar is identical. Classifier dictionaries include many measures and collectives, as well as sortals. But every language has very similar measures and collectives. The concept of classifier languages becomes meaningless if we include them. It is the sortals which are distinctive, and form the focus of this study.

APPENDIX 2 PEAR STORIES FILM

The 'Pear Stories Film' was designed by Wallace Chafe to elicit narratives world-wide (Chafe 1980). Native speakers have described the film in both spoken and written English (Chafe 1980), in Greek (Tannen 1980), Japanese (Clancy 1980, Downing 1986), German, Mayan, and other languages. The seven-minute color film has background sounds, such as chirping birds, but no dialogue. The story is deliberately loose to minimize cultural bias. Actors depict a dark-haired man climbing a tree and picking pears. A man leads a goat across the screen, then disappears. Some boys ride along on their bikes, steal a basket of pears, and ride away. They bump into a rock, one loses his hat, and they spill the pears. In the last shot, the farmer looks down and discovers that a whole basket of pears is missing.

All speakers are young women native speakers from the same background. The interviewer, another woman native speaker, says to each participant, 'I have not seen the film you just saw. Can you tell me what happened?' She provides no specific cues. Most people

describe the film in about two minutes, though some take more than five, and a few sum it up in one sentence. The taped interviews are transcribed and checked by native speakers.

The Mandarin Pear Stories come from nineteen young women with degrees in literature at the National Taiwan University (Erbaugh 1984, 1986, 1990). All but two are mother-tongue Mandarin speakers, children of post-1949 migrants from north China. The other two, teachers of Mandarin, had spoken Mandarin since preschool.

The Cantonese narratives come from thirty students at the City University of Hong Kong. They are largely businesss majors, chosen from outside literature or linguistics departments to avoid bookish or Mandarinized speech. The Hong Kong women speak good English, as the Taipei women also do, but little or no Mandarin.

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