

The necessity of class internal regularities in the acquisition of Tsez noun classes

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(1) Why study noun class acquisition?

Two kinds of distributional information characterizing noun classes:

- noun external (e.g. agreement, highly reliable)
- probabilistic noun internal (inherent noun properties, variable reliability)

Research Questions:

- What information is actually available in speech to children?
- What information is used in noun class acquisition?
- Is information used in proportion to its reliability?

(2) Tsez Noun Classes

Nakh-Dagestanian language with 4 noun classes spoken by about 6,000 people in Dagestan



Noun External Distributional Information

Class 1	Class 2	Class 3	Class 4
∅-igu uži	j-igu kid	b-igu k'et'u	r-igu čorpa
I-good boy(I)	II-good girl(II)	III-good cat(III)	IV-good soup(IV)
<i>good boy</i>	<i>good girl</i>	<i>good cat</i>	<i>good soup</i>

Regular noun class agreement overt on most vowel initial verbs, adjectives and adverbs

Noun Internal Distributional Information

Class 1	Class 2	Class 3	Class 4
all male humans	all female humans	all other animates	many other things
only male humans	many other things	many other things	
~13% of nouns	~12% of nouns	~41% of nouns	~34% of nouns

(3) Hypotheses & Predictions

Hypothesis	Predictions
External Only Hypothesis (EOH): Only noun external distributional information is necessary for noun class acquisition	<ul style="list-style-type: none"> • noun external distributional information abundant in the input • sensitivity to noun internal distributional information appears later and mirrors adult system
Hybrid Hypothesis (HH): A combination of noun external and noun internal distributional information is used to acquire noun classes	<ul style="list-style-type: none"> • both noun external and noun internal distributional information abundant in the input • sensitivity to noun internal distributional information appears early and could differ from the adult system due to properties of the learning mechanism
Internal Only Hypothesis: Only internal information would be used	<ul style="list-style-type: none"> • incoherent

(4) Learning Schemata

Experience	Lexicon	Stages of Acquisition
word 1 -> Class 1	w1[+cl1, sem1, sem2, ph1, ph2]	EOH
word 2 -> Class 1	w2[+cl1, sem1, sem3, ph4, ph5]	(1) Acquire this lexicon
word 3 -> Class 1	w3 [+cl1, sem1, sem9, ph6, ph11]	(2) abstract out rules like sem1 -> cl1
word 4 -> Class 1	w4 [+cl1, sem1, sem4, ph1, ph12]	
etc...	etc...	HH
		(1) use generalizations like sem1 -> cl1 to acquire this lexicon

(5) Corpus: What information is actually available to the learner?

~3,000 lines (10 hours) of Tsez child directed speech (CDS), transcribed with the help of native speakers

How frequent are agreeing adjectives and verbs in CDS?

84% of verb tokens, 77% of adjective tokens

Do nouns in CDS have information predictive of class?

Yes: See features selected for experiment in table in (6)

How frequently do Internal and External information cooccur?

Class 1: 100%, Class 2: 52%, Class 3: 51%, Class 4: 45%

(6) Classification Experiment: what noun internal distributional information are adult and child Tsez speakers sensitive to?

Predictive cues to noun class used in classification experiment listed with conditional probabilities of class given each cue.

Class	Semantic	Weak Semantic	Phonological	2 conflicting
1	male human p(C11male) = .99 p(male C11) = .99	-----	-----	male human & b-initial: p(C11male) > p(c13b-)
2	female human p(C12female) = .99 p(female C12) = .22	paper, clothing p(C12cue) = .52 p(cue C12) = .04	-----	female human & r-initial: p(C12female) > p(c14r-)
3	animate p(c13animate) = .98 p(animate c13) = .13	-----	b- initial p(C13b-) = .51 p(b- C13) = .10	animate & r-initial: p(C13animate) > p(c14r-) animate & i final: p(C13animate) > p(c14i-)
4	-----	-----	r-initial p(C14r) = .61, p(r C14) = .09 i final p(C14i) = .54, p(i C14) = .41	b-initial & C14 real words: p(C13b-) < p(C14C14)

Subjects: 32 Native Tsez speakers in Shamkhal and Kizilyurt, Dagestan
(10 young children (~ 6yr), 12 older children (~ 9yr), 10 adults)

Eat/Don't Eat Task: -iš (*eat*, intransitive), and -ac'o (*eat*, transitive) show overt agreement with the subject and object respectively. Assistant introduces each character and item, participant tells the character to eat, then what to eat/not eat. Class assignment is evident in the agreement.

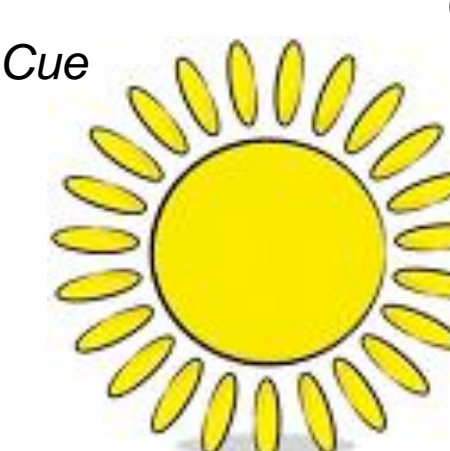
kid (*girl*)

Class 2, Semantic Cue



buq (*sun*)

Class 3, Phonological Cue



k'uraj (*onion*)

Class 4, no Cue



zamil (*nonce*)

Class 3, Semantic Cue



(7) Summary of Results

Classification of **real words** was compared to the words' actual class

- for most real words, classification coincided with class
- children misclassified real words with conflicting cues more often than words without conflicting cues

Classification of **nonce words** with cues was compared to a base distribution of classification of nonce words without cues

- Classification of nonce words without cues mirrored noun class frequency
- Semantic and phonological cues were used to classify by all age groups
- Weak semantic cues were not used by children, moderately by adults
- Children used phonological rather than semantic cues when the two conflicted (even though the semantic information is more reliable)

Percent of words classified according to statistically strongest cues

(young children, older children, adults)

	Semantic	Weak Semantic	Phonological	Conflicting
Real	79, 86, 87	71, 58, 75	84, 94, 92	42, 47, 71
Nonce	54, 65, 53	08, 09, 23	61, 63, 61	38, 53, 55

(8) Major Findings

Early use of predictive informations that differs from adult use of the same information supports the **Hybrid Hypothesis**: that both noun internal and noun external distributional information are important in noun class acquisition

Classification without any information about noun class reveals a **default probability distribution** of nouns into classes, rather than a default class

Children used less resalible phonological rather than more reliable semantic cues when the two conflicted

Children use information **out of proportion with its predictive reliability**, suggesting important differences in the **input** (how reliable cues are) and the **intake** (the way that information is gated by the learning mechanism)