

Mental verbs in Nicaraguan Sign Language and the role of language in theory of mind

E. Emory Davis
Barnard College

Introduction

- **Theory of mind (ToM)** is the ability to understand the minds and mental processes of others.
- Research has increasingly indicated that language is needed to facilitate this development, and that use of mental language and ToM develop in tandem. (Lohmann & Tomasello, 2003; Lohmann, Tomasello, & Meyer, 2005; Pyers, 2004; Astington & Jenkins, 1999; de Villiers & de Villiers, 2000; de Villiers, 2005)
- In particular, it has been shown that a mental lexicon is integral to ToM development. (Astington & Peskin, 2004)
- Nicaraguan Sign Language (NSL) emerged in the early 1980s in Nicaragua; starting in the late 1980s, there was some contact with other sign languages, including American Sign Language (ASL).
- Prior research has shown that adult members of the first cohort of signers, who created NSL and developed it in its first decade, lack a fully mature theory of mind. (Pyers, 2004; Morgan & Kegl, 2006; Pyers & Senghas, 2009)
- Members of this first cohort of NSL signers, who lacked exposure to full language until ages ranging from 4 years old to adolescence, have provided a unique chance to study the role of language in theory of mind development.

What were the consequences of this disrupted language and ToM development? What was the impact on the language these first cohort signers helped to create, as well as on their own use of mental language and talk about mental states?

Current project

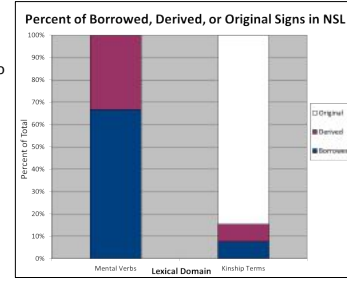
- **Hypothesis:** Two consequences of the first cohort's disrupted language and ToM development were:
 - NSL initially lacked a mental lexicon; significant lexical borrowing of mental verbs compared to other lexical domains would be evidence of this.
 - First-cohort signers have difficulty differentiating mental-state terms and do not always use mental verbs in the same way that they are used in the language they were borrowed from.
- **Data sources:**
 - Cross-linguistic study on NSL lexicon conducted by A. Senghas (in progress); study elicited signs in multiple lexical domains for NSL and contact languages.
 - Participants presented with flashcards with written words and pictures in Spanish or English, asked to sign equivalent in their sign language.
 - False-belief explanation task from Pyers (2004; see also Gale et al, 1996).
 - Participants shown short videos of people involved in unusual events (e.g. a woman accidentally eats a balloon string that has fallen into her spaghetti), and asked to describe what occurred and why.
 - NSL lexical items elicited from eight first-cohort signers and false-belief explanations from eight first-cohort signers; seven were in both studies.

Methods & Results

Lexical borrowing

Analysis

- Kinship terms selected as comparison lexical domain due to comparable abstractness of the referents, since kinship terms refer to relationships rather than individuals.
- Assessed borrowing of terms from ASL into NSL, looking at all known mental verbs in NSL and a sample of kinship terms.
- NSL signs for THINK, KNOW, UNDERSTAND, and FORGET strongly resemble the ASL signs; NSL signs for DOESN'T-KNOW and REMEMBER are similar and appear derived from ASL signs.
- **67%** (4 out of 6) of NSL signs for mental verbs are **borrowed** and **33%** (2 out of 6) **derived** from ASL; there appear to be no original signs.
- **8%** (1 out of 12) of NSL signs for kinship terms are **borrowed** (FAMILY) and **8%** (1 out of 12) are **derived** (GRANDPARENT – from ASL sign for OLD); all others appear original to NSL.



Mental verbs	NSL	ASL	Kinship terms	NSL	ASL
THINK			AUNT/UNCLE		
KNOW			CHILD		
UNDERSTAND			COUSIN		
REMEMBER			FAMILY		
FORGET			FATHER		
DOESN'T-KNOW			GODPARENT/GODCHILD		

The right 'I' hand of the signer is placed against the right cheek or temple.

Use of mental verbs

Analysis

- Examined all mental verbs produced by NSL first-cohort signers in conversation during false-belief tasks.
- Usage coded as **matching**, **broad**, or **unclear**.
 - Matching = usage matches how terms are used in source language (ASL) from which they were borrowed; e.g. *forget* used when there is a condition of prior knowledge.
 - Broad = term is used more broadly than how equivalent terms are used in source language; e.g. *forget* used to indicate a general lack of awareness or knowledge, without condition of prior knowledge.
- Also examined whether mental verbs were used to refer to one's own mental state vs. to refer to the mental state of another individual.
- Pyers' (2004) data includes **37 instances of mental verb use** by first-cohort signers in explanations of what occurred in false-belief videos they viewed; negated and non-negated forms considered together.
 - 25 instances of others' mental state uses.
- **40%** (10 out of 25) of mental verb uses coded as **broad for others' mental state uses**.
 - All broad uses occurred when referring to the mental states of others; there are no instances of broad use when mental verbs were used to refer the speaker's own mental state.

	Own mental state		
	Matching	Broad	Unclear
THINK	6	0	2
KNOW	3	0	0
FORGET	0	0	0
UNDERSTAND	0	0	1
TOTAL	9	0	3

	Others' mental state		
	Matching	Broad	Unclear
THINK	9	3	0
KNOW	5	0	0
FORGET	0	6	0
UNDERSTAND	1	1	0
TOTAL	15	10	0

Conclusions

- All mental verbs in NSL appear to be borrowed or derived from ASL, while kinship terms show very little borrowing, suggesting the first cohort's ToM ability affected the early stages of NSL's development.
- NSL signers were found to use mental verbs more broadly than they are used in the borrowing source language (ASL) when describing others' mental states, suggesting that these signers may make fewer distinctions between the terms and the mental states they refer to.
- Without the scaffolding of early language, mental states lacked salience as "objects" to be named in early NSL.
- First-cohort signers appear to divide the semantic space of mental verbs into two general categories: awareness/knowledge and lack of awareness/knowledge.

Future directions

Lexical borrowing

- Compare additional lexical domains in NSL to determine if other domains show similar degrees of borrowing.
- Explore alternative hypothesis that these signs may be derived from gestures common to both cultures and not truly borrowed.

Mental verb use

- Evaluate mental verb production and comprehension in more recent, younger NSL signers; does their usage differ from that of first-cohort signers?
- Can ToM ability and "mental talk" improve over time through language use? (See Pyers & Senghas, 2009.)
- Compare mental verb use of typically developing speakers/signers of other languages to that of NSL first cohort.

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Further information

Contact: e.emory.davis@gmail.com

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