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Watching language grow in the manual modality: Nominals, predicates, and handshapes

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ABSTRACT

All languages, both spoken and signed, make a formal distinction between two types of terms in a proposition – terms that identify what is to be talked about (nominals) and terms that say something about this topic (predicates). Here we explore conditions that could lead to this property by charting its development in a newly emerging language – Nicaraguan Sign Language (NSL). We examine how handshape is used in nominals vs. predicates in three Nicaraguan groups: (1) homesigners who are not part of the Deaf community and use their own gestures, called *homesigns*, to communicate; (2) NSL cohort 1 signers who fashioned the first stage of NSL; (3) NSL cohort 2 signers who learned NSL from cohort 1. We compare these three groups to a fourth: (4) native signers of American Sign Language (ASL), an established sign language. We focus on handshape in predicates that are part of a productive classifier system in ASL; handshape in these predicates varies systematically across agent vs. no-agent contexts, unlike handshape in the nominals we study, which does not vary across these contexts. We found that all four groups, including homesigners, used handshape differently in nominals vs. predicates – they displayed variability in handshape form across agent vs. no-agent contexts in predicates, but not in nominals. Variability thus differed in predicates and nominals: (1) In predicates, the variability across grammatical contexts (agent vs. no-agent) was systematic in all four groups, suggesting that handshape functioned as a productive morphological marker on predicate signs, even in homesign. This grammatical use of handshape can thus appear in the earliest stages of an emerging language. (2) In nominals, there was no variability across grammatical contexts (agent vs. no-agent), but there was variability within- and across-individuals in the handshape used in the nominal for a particular object. This variability was striking in homesigners (an individual homesigner did not necessarily use the same handshape in every nominal he produced for a particular object), but decreased in the first cohort of NSL and remained relatively constant in the second cohort. Stability in the lexical use of handshape in nominals thus does not seem to emerge unless there is pressure from a peer linguistic community. Taken together, our findings argue that a community of users is essential to arrive at a stable nominal lexicon, but not to establish a productive morphological marker in predicates. Examining the steps a manual communication system takes as it moves toward becoming a fully-fledged language offers a unique window onto factors that have made human language what it is.

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1. Nominals and predicates in established and emerging languages

Making a distinction between nominals (nouns) and predicates (verbs) is considered essential to the "life of language" by Sapir (1921:119) and the noun-verb distinction is one of the ten properties of language that Hockett (1977:181) includes in his list of grammatical universals. Distinguishing between nominals and predicates is, in fact, one of the few linguistic properties that has traditionally been accepted as a linguistic universal (e.g., Robins, 1952; Sapir, 1921) and whose status as a universal continues to be uncontested (e.g., Givon, 1979; Hawkins, 1988; Hopper & Thompson, 1984; Hopper & Thompson, 1988; Schachter, 1985; Thompson, 1988). Not surprisingly given its universal status, a distinction between nominals and predicates is also found in conventional sign languages produced in the manual modality (see Supalla & Newport, 1978, for evidence of a distinction based on sign movement) and is, in fact, a distinction acquired early in development (see Brentari, Coppola, Jung, & Goldin-Meadow, 2013, for evidence of a distinction based on sign handshape).

Sapir (1921) grounds the universality of the distinction between nominals and predicates in the basic fact that language consists of a series of propositions. In each proposition, there must be something to talk about (identified by a nominal) and something to be said (or to predicate) of this nominal once it is introduced. According to Sapir, this distinction is of such fundamental importance that languages emphasize it by creating a formal barrier between the two terms of the proposition – the subject of the discourse, the nominal, and the commentary of the discourse, the predicate.

Nominals and predicates thus serve different discourse functions, and those roles have structural consequences. For example, in American Sign Language (ASL), the handshape used in the predicate MOVE is modified as a function of the grammatical context – if an object, say a book, is moving on its own, an *object* handshape is used in the predicate (Fig. 1A, right panel), but if an agent is moving the book, a *handling* handshape is used in the predicate instead (Fig. 1B, right panel). Importantly, the nominal BOOK does not vary as a function of grammatical context and, in this case, uses an *object* handshape in both contexts (Fig. 1A and B, left panels; Benedicto & Brentari, 2004; Brentari, Coppola, Mazzoni, & Goldin-Meadow, 2012). Type of handshape thus varies as a function of grammatical context (no-agent vs. agent) in classifier predicates, but not in the nominals that accompany those predicates.[1]

What are the conditions that lead a language to make a distinction between nominals and predicates? This question is difficult to address in spoken language simply because spoken languages have long, intertwined histories (e.g., Atkinson, 2011) and, as far as we know, no new languages (i.e., languages that have not developed directly from an established language) are currently being developed in the oral modality. In contrast, new sign languages can, and do (Zeshan & de Vos, 2012), arise when deaf individuals live and work together in the same community, resulting in sign languages that have no historical relation to one another. There is, in fact, a sign language whose birth and development have recently been documented in Nicaragua – Nicaraguan Sign Language – and whose emergent linguistic structure did not originate in any pre-existing sign languages (Kegl & Iwata, 1989; Senghas, 1995; Senghas & Coppola, 2001; Kegl, Senghas, & Coppola, 1999). Our goal here is to explore the conditions that might lead a language to distinguish between nominals and predicates by charting the development of this distinction in Nicaraguan Sign Language (NSL); we look, in particular, at how handshape is used to make this distinction.

We observe three groups in Nicaragua whose circumstances allow us to explore the impact of different factors on the development of handshape use in nominals and predicates. In the late 1970s, the establishment of new schools for special education in Nicaragua brought together deaf individuals in numbers greater than ever before, and NSL was born (Kegl & Iwata, 1989; Senghas, 1995). Before that time, deaf children tended to socialize within their homes and neighborhoods, interacting exclusively with hearing speakers even as they grew into adulthood (Polich, 1998; Polich, 2005; Senghas, 1997). Previous work on American and Chinese deaf children who are unable to acquire spoken language and are not exposed to sign language has found that these children turn to gesture to communicate. The gestures they use, called *homesigns*, display many of the properties of natural language (Goldin-Meadow, 2003), even though the co-speech gestures that the children's hearing parents produce when interacting with them do not (Goldin-Meadow & Mylander, 1983; Goldin-Meadow & Mylander, 1984; Goldin-Meadow & Mylander, 1998).

The first group that we examine in this study are current day Nicaraguan homesigners who have relied on gesture to communicate with hearing individuals through childhood and into adulthood (e.g., Brentari et al., 2012; Coppola & Newport, 2005; Coppola, Spaepen, & Goldin-Meadow, 2013). Our goal is to determine whether these adult homesigners use handshape in nominal signs differently from handshape in predicate signs.

Presumably the first signers of NSL were also homesigners when they came together and began to construct a shared language (Coppola & Senghas, 2010; Senghas, Ozyurek, & Goldin-Meadow, 2010). The second group we examine is this first cohort of Nicaraguan signers, and our goal is to determine whether they use handshape in nominals vs. predicates differently from the adult homesigners. We assume that the various homesign systems that were produced by the first cohort of signers when they initially came together were no different from the homesigns used by present-day adult homesigners when they were children. Accordingly, homesign and NSL have similar origins, and have been developing for a similar number of years, but only NSL has been developing within a peer community of deaf signers. Studying the signers

[1] Straits Salish is a spoken language that creates a transitive-intransitive distinction in the syntax comparable to the distinction described in the text in ASL (Jelinek & Demers, 1994). Although many details of the grammars of ASL and Salish differ (e.g., ASL has a clear lexical distinction between nominals and predicates; Salish does not), Jelinek and Demers propose a pronominal account of the transitive-intransitive distinction for Salish complex predicates that is in accord with Benedicto and Brentari's (2004) account of complex predicates in ASL.

(A) BOOK: (*nominal*) flat-object: +MOVE (*predicate*)
'A book fell on its side.'

(B) BOOK: (*nominal*) handle-flat-object: +MOVE (*predicate*)
'[Someone] put a book on its side.'

Fig. 1. Handshape type in nominals and predicates in no-agent and agent contexts. An example of how handshape varies with grammatical context in classifier predicates, but not in nominals, in ASL. In the right panel in (A) the circled hand is an *object* handshape representing the shape of a book in the predicate MOVE used in a no-agent context, but in the right panel in (B), the circled hand is a *handling* handshape representing how the book is handled in the predicate MOVE used in an agent context (the hand not circled in both images represents a second book on the shelf). In contrast, in the left panels in both examples, an *object* handshape is used in the nominal, BOOK, which does not vary as a function of no-agent vs. agent context.

who originated NSL in relation to current-day homesigners thus allows us to explore the impact that a linguistic community has on language structure.

Each year after NSL was born, a new wave of twenty to thirty deaf children entered the school. These children learned the emerging sign language from the models provided by the first cohort of signers and, in so doing, altered the language (Senghas, 2003; Senghas & Coppola, 2001; Senghas, Kita, & Özyürek, 2004). The third group we examine is the cohort of NSL signers that entered in the mid- to late-1980s. Our goal is to determine whether this second cohort introduced changes into how handshape is used in nominals vs. predicates. Studying successive cohorts of NSL signers allows us to explore the impact that passing a newly birthed language through new learners has on linguistic structure.

Finally, we compare the handshapes produced by all three Nicaraguan groups to those produced by native signers of American Sign Language (ASL), a conventional sign language that has had a relatively long history of approximately 200 years (Supalla, 2002).

2. Methods

2.1. Participants

Four adult deaf homesigners (1 female, 3 male) living in Nicaragua participated in the study (mean age 24, range 20–29 years). The homesigners had no congenital cognitive deficits, had not learned spoken or written Spanish, and had not acquired NSL. None had attended school regularly. The homesigners did not interact with one another and each developed a homesign system of his or her own (Coppola & Newport, 2005). They use homesign exclusively to communicate with the hearing individuals around them. Each homesigner works and interacts socially with hearing friends and family, and is not a member of the Deaf community.

Two groups of NSL signers also participated in the study: 4 who were members of the group that fashioned the initial stage of NSL before 1983, NSL cohort 1 (Senghas, 2003) (2 females, 2 males; mean age 37.5 years, range 33–43 years); and 4 who entered the Deaf community between 1983 and 1990 and learned NSL from the first cohort, NSL cohort 2 (2 females, 2 males; mean age 21.1 years, range 19–22 years). All the NSL participants entered the signing community before the age of 6 (mean age at entry 4.0 years, range 2.1–5.7 years), and have used NSL ever since as their primary, daily language in a wide range of settings.

In addition, 3 native ASL signers participated in the study (3 females; mean age 43.7, range 33–56 years); all had learned ASL as a native language from birth.

2.2. Stimuli and procedures

Our goal was to explore use of handshape in two contexts: (1) a no-agent context depicting a stationary item

or an item moving on its own without an agent; and (2) an agent context depicting an item being moved by the hand of an agent. We chose these two contexts because they elicit systematically different handshape types in classifier predicates in several sign languages (ASL, Benedicto & Brentari, 2004; Kegl, 1990; Sign Language of the Netherlands, NGT, Zwitserlood, 2003; Italian Sign Language, LIS, Mazzoni, 2009). To this end, the stimuli were short animated vignettes of items either stationary or moving by themselves (no-agent events) or the same items being moved in space (agent events). Eleven items were used in the vignettes (toy airplanes, books, coins, cigars, lollipops, marbles, pens, strings, tapes, television sets, and tweezers). We focused our analyses on two items whose citation forms in an ASL dictionary (Stokoe, Casterline, & Croneberg, 1965) have *object* handshape types (airplane, book) and two whose citation forms have *handling* handshape types (lollipop, pen); since the sign languages are unrelated, it was undetermined whether the handshape types for these nouns in NSL would be the same as those for the nouns in ASL. The items displayed in the events exhibited a range of colors, shapes, and sizes.

Each item was shown in no-agent contexts (5 vignettes for each item – object on table; object on table upside down; multiple objects on table in a row; multiple objects on table in a random arrangement; object falling), and agent contexts (5 vignettes for each item – put object on table; put object on table upside down; put multiple objects on table in a row; put multiple objects on table in a random arrangement; the object being manipulated as it typically functions, i.e., playing with a toy airplane, writing with a pen, reading a book, eating a lollipop).[2] There were thus 10 vignettes for each of four items, 40 vignettes in all. The design of the stimuli, along with typical handshapes in ASL nominals and predicates in no-agent and agent contexts, are displayed in Fig. 2.[3]

The vignettes were presented in blocks (all of the trials involving one item were presented together in a sequence, starting with no-agent contexts, followed by agent contexts); the same order was used for all participants. Participants were asked to relate the events they had seen to a conversation partner. Conversation partners for the NSL signers were other signers of their cohort; for the 3 ASL signers the interlocutor was author MC (a native ASL signer). For homesigners, partners were the family members who were their best communication partners. Data collection sessions were videotaped.

2.3. Coding

The videos of the participants' signs were captured using iMovie and clipped into individual files, one file for each vignette description. The video files containing the participants' responses were transcribed using ELAN, a tool developed at the Max Planck Institute for Psycholinguistics, Nijmegen for the analysis of language, sign language, and gesture (Crasborn & Sloetjes, 2008).

2.3.1. Coding nominals vs. predicates

Because homesign is a self-generated communication system and NSL is an emerging language, there is no *a priori* list of characteristics that we can use to identify nominal vs. predicate forms. We therefore needed to develop operational definitions for the two categories. To do so, we followed Sapir (1921) who, as mentioned earlier, grounds these two categories in the fact that there must be something to talk about, a nominal, and something to predicate of this nominal once it is introduced. Since the most common discourse subject is either a person or a thing, nominals tend to cluster around concrete object concepts; and since the commentary on the subject is generally an activity in the widest sense of the word, predicates tend to cluster around concepts of activity (Sapir, 1921:119; see also Bloom, 1990; Givon, 1979).

Accordingly, we divided signs that the participants gave for each vignette into signs used to label the object, which we call *nominals*, and signs used to describe the event in which the object participated, which we call *predicates*. Because all of the vignettes in our study show items on a table or being put on a table, we were able to use the location and orientation of the hand in a sign to categorize that sign as a nominal or a predicate. If the participant used an orientation and signing plane that corresponded to the orientation and plane of the arrangement or action in the vignette, the sign was considered a predicate; predicate signs were typically produced in a specific location within a single plane, or in relation to a secondary object, most often in the horizontal plane of the signing space (reflecting the fact that the objects in our stimuli sat or were placed on a table). If the participant produced the sign on the body or at a nonspecific location in one of the three planes of neutral space,[4] that sign was considered a nominal. Fig. 3 displays examples of responses for one no-agent and one agent vignette from a member of each of the four groups.

2.3.2. Coding specific handshape forms

We then classified each handshape used in a nominal or predicate on the basis of form, using the coding system developed by Eccarius and Brentari (2008). This coding system is based on the Prosodic Model of Sign Language Phonology (Brentari, 1998), and was developed using handshape forms from ten different sign languages. Handshape forms were classified according to selected (i.e., active) fingers and joints. In order to constrain the number of handshape forms, we did not include non-selected (i.e., inactive) fingers in the criterion for a handshape form. For example, a handshape in which the thumb and index finger formed an "O" would be coded as such whether the three non-selected fingers (the middle, ring, and pinky

[2] The contexts used for the object pen deviated slightly from those listed here. Because pen has no clear 'upside down' orientation, a pen was shown standing vertically upright on the table, and instead of *put object on table* we used *take object from table*.

[3] The citation form of the nouns LOLLIPOP and AIRPLANE are 1-handed, BOOK is 2-handed (in which the handshape is the same on both hands), and PEN has an acceptable 1-handed and 2-handed form (in which the non-dominant hand is the ground).

[4] There are three planes in the signing space: the horizontal plane, the vertical plane, and the mid-sagittal plane (Brentari, 1998).

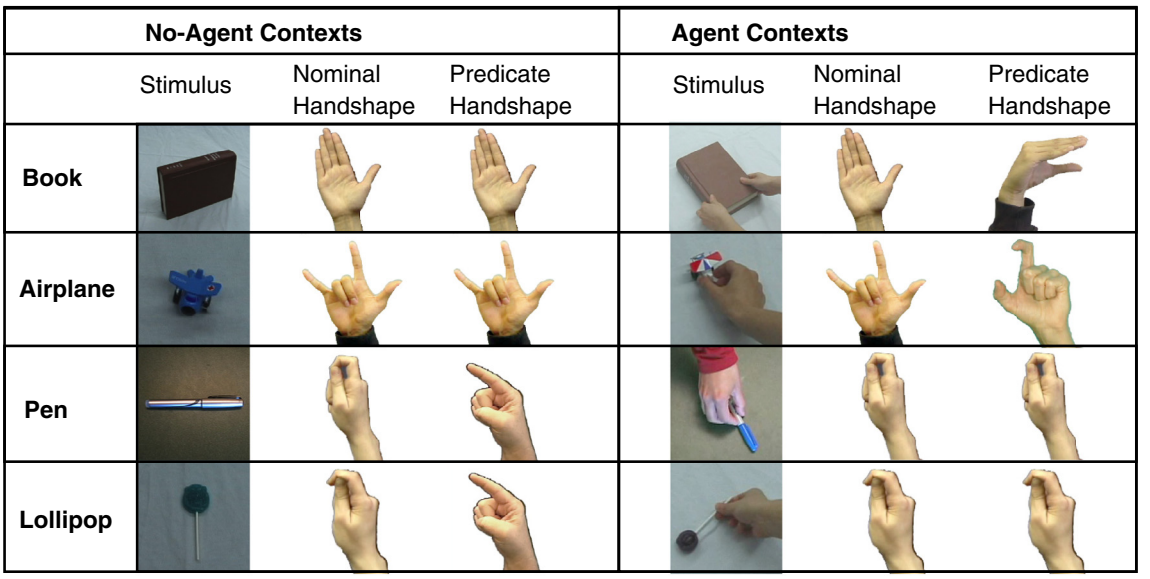

Fig. 2. Stimulus design and examples of handshape forms. Examples of the stimuli and typical handshapes in ASL for the four objects used in the no-agent trials ('object on table') and agent trials ('put object on table'); each trial displays the stimulus and the expected handshapes for the nominal and the predicate in ASL. Note that, for each object, the nominal handshape is the same in no-agent and agent trials, but the predicate handshape varies.

fingers) were curled into the palm or left loose. We identified 162 unique handshape forms in our data; by not including non-selected fingers in our criteria, we reduced the number of handshapes to 42 unique forms.

2.3.3. Coding handshape type: object vs. handling handshapes

Finally, we categorized each handshape according to type: (1) *object* handshapes captured properties of the object they represented, either the whole item or size and shape dimensions of the item, and (2) *handling* handshapes captured properties of the hand manipulating the object. We coded the few handshapes that could potentially represent either the handling of an object or the object itself as *ambiguous*; e.g., a hand shaped like a small "C" <, which could either represent the shape of a round object or how the hand holds the object. In addition, the following handshapes were classified as *other*: handshapes that "traced" the outline of the object or the path that it took in the vignette; handshapes that were fingerspelled letters (which applied only to ASL signers); and handshapes whose type could not be determined. Ambiguous and other responses accounted for less than 7.5% of the data.

2.3.4. Reliability

Second coders transcribed subsets of the data to establish reliability. Three pairs of coders agreed on an average of 80% of decisions classifying signs as nominals or predicates, 83% of decisions classifying handshapes according to form, and 80% of decisions classifying handshapes according to type, as object or handling. Disagreements were discussed until consensus was achieved.

3. Results

All of the signers responded to every vignette. However, they did not always produce a nominal sign *and* a predicate sign for every vignette. Given that our goal was to compare handshapes in nominals and predicates, we focused on only those responses that contained both a nominal and a predicate, which accounted for .78 of all responses (354 responses in total) for the 3 ASL signers, .84 (517) for the 4 signers in NSL cohort 2, .86 (388) for the 4 signers in NSL cohort 1, and .84 (585) for the 4 homesigners. If we include all of the handshapes that the groups produced in each of the analyses, the patterns described below are unchanged.

3.1. Consistency across grammatical contexts: is the same handshape form used across contexts in nominals vs. predicates?

Our first goal was to determine whether handshapes differed in signs for nominals and signs for predicates. As described earlier, handshape in ASL (and other mature sign languages) varies systematically as a function of grammatical context (agent vs. no-agent contexts) in classifier predicates but not in the nominal that accompanies the predicate (see Fig. 1A and B). To determine whether the three Nicaraguan groups displayed the same pattern, we developed a *handshape form consistency* score that measured how often a signer produced the same handshape form across no-agent and agent contexts in vignettes featuring a particular object. We first listed all of the different handshape forms that a participant used in vignettes for a particular object, e.g., the pen. We then asked whether that participant used each handshape form in both no-agent and agent contexts (as opposed to using the handshape form in only one of the two contexts). The handshape form consistency score for *pen* for that participant was then the number of different handshape forms the participant used to refer to the pen in both contexts, divided by the total number of different handshape forms the participant used

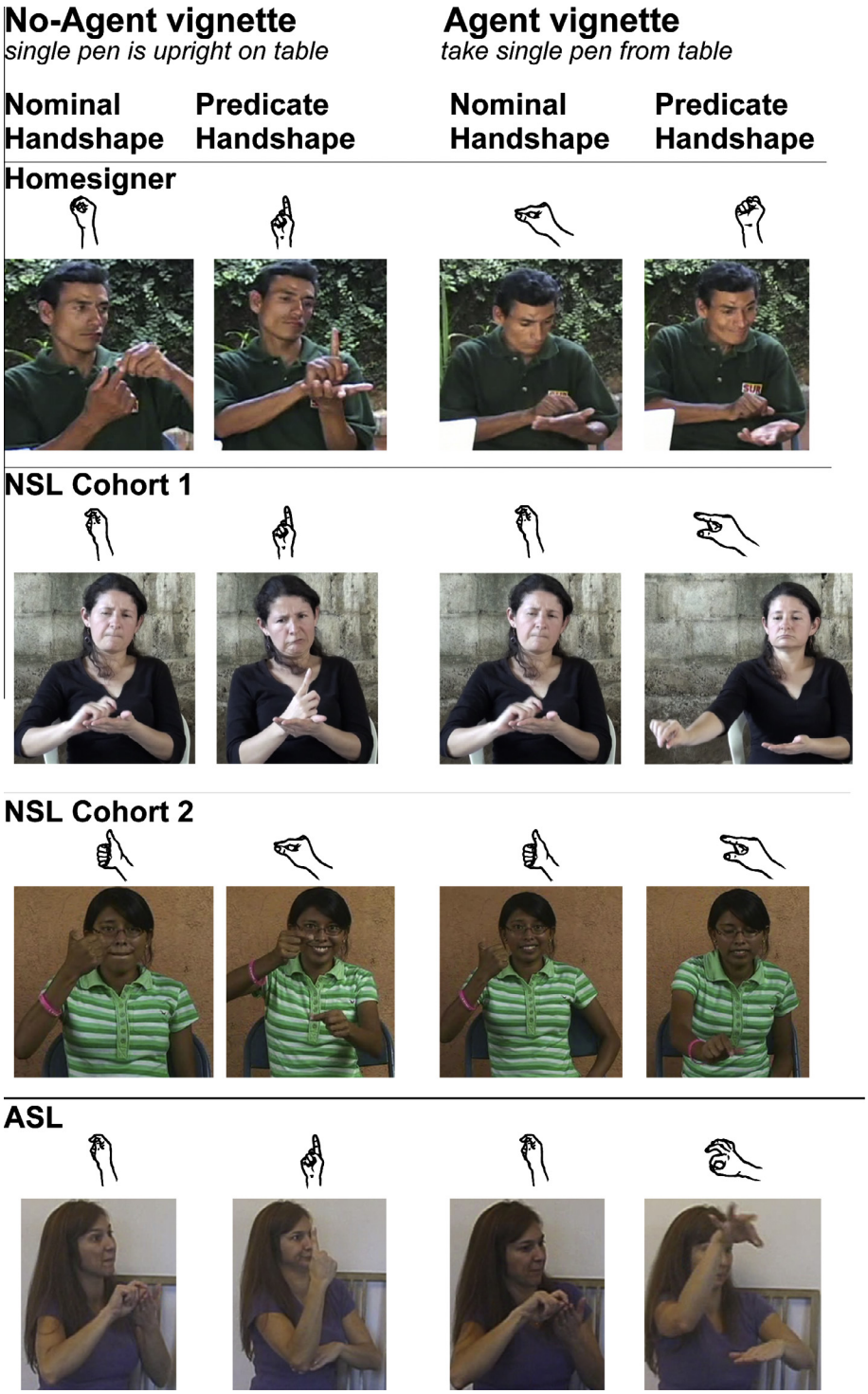

Fig. 3. Examples of handshapes in signs classified as nominals or predicates produced by a homesigner, an NSL Cohort 1 signer, an NSL Cohort 2 signer, and an ASL signer in response to a no-agent and an agent vignette.

for pen. We calculated a score for each of the four objects for each participant, and averaged together the four scores, which constituted that participant's handshape form consistency score.

Fig. 4 (left graph) presents the mean consistency score that each group of participants received for handshape forms produced in nominals (black bars) vs. predicates (white bars). Beginning with the ASL signers, we see the

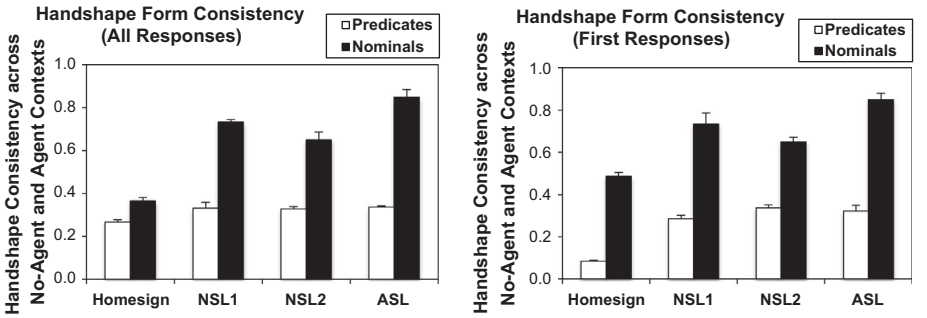

Fig. 4. Handshape form consistency in predicates and nominals (all and first responses). Handshape form consistency across no-agent and agent contexts in all responses (left graph) and in only first responses (right graph) produced by the Homesigners, NSL Cohort 1 signers, NSL Cohort 2 signers, and ASL signers in their predicates (white bars) and nominals (black bars). Error bars indicate standard errors.

expected pattern: Signers achieved higher consistency scores in handshape forms used in nominals than in handshape forms used in predicates. In other words, signers were more likely to use the same handshape form across no-agent and agent contexts in nominals than in predicates. Interestingly, we see the same pattern in all three Nicaraguan groups, although the difference between the consistency scores for nominals and for predicates is smallest for the homesigners (.10, SD = .21), increases for the Nicaraguan signers (.40, SD = .18, for NSL cohort 1; .33, SD = .11, for NSL cohort 2), and largest for the ASL signers (.51, SD = .11). All of the ASL and NSL signers and 3 of the 4 homesigners displayed more handshape form consistency in their nominals than in their predicates.

We conducted a 2 × 4 repeated measures ANOVA with one within-subjects factor, *sign type* (nominal, predicate) and one between-subjects factor, *group* (homesign, NSL 1, NSL 2, ASL), and with *handshape form consistency* as the dependent factor. We found a main effect of sign type, $F(1,11) = 61.26$, $p < .0001$, indicating that consistency was higher for nominals than for predicates; a main effect of group, $F(3,11) = 4.45$, $p < .03$, indicating that, overall, the homesigners had lower levels of consistency than the other three groups, p's < .05; and an interaction between factors, $F(3,11) = 4.21$, $p = .03$, showing that the difference between nominals and predicates was reliable for ASL signers and both cohorts of NSL signers (p's < .05), but not for homesigners.

Homesigners are conversing with hearing individuals who are familiar with the homesigner's signs but are not really users of the system (see Coppola et al., 2013; Richie, Yang, & Coppola, 2014). It is therefore possible that the homesigners' first inclination when describing a vignette was to be more consistent across contexts in their nominal handshape forms than in their predicate handshape forms (as in the ASL and NSL patterns), but that, over the course of their description of the vignette, they began to experiment (thus abandoning their initial strategy) in an attempt to convey their message to a listener who did not share their system. To explore this possibility, we recalculated the handshape form consistency score using only the handshapes that the signers used in their first response to a vignette, that is, the first handshape used as a nominal and the first handshape used as a predicate. The total number of responses containing both a nominal and a predicate included in the *first-response* analysis was 231 for the 3 ASL signers, 300 for the 4 NSL cohort 2 signers, 264 for 4 NSL cohort 1 signers, and 288 for the 4 homesigners; comparable numbers for the *all-responses* analysis were 354, 517, 388, and 585, respectively. The *first* responses were produced before the homesigner did any elaborations that might have been for the listener's benefit. Fig. 4 (right graph) presents the data.

Overall, the pattern is the same – higher handshape form consistency scores in nominals than in predicates, and all 15 signers (including the four homesigners) display the pattern. The interesting result is that the difference between the nominal consistency score and the predicate consistency score widens for the homesigners, from .10 (SD = .21) in all of their responses to .40 (SD = .12) in their first responses. The gap between all responses and first responses remains the same for NSL cohort 1 signers (from .40 to .45), for NSL cohort 2 signers (from .33 to .31), and for ASL signers (from .51 to .53). A 2 (*sign type*: nominal, predicate) × 4 (*group*: homesigners, NSL1, NSL2, ASL) repeated measures ANOVA conducted on *handshape form consistency* in first responses revealed a main effect of sign type, $F(1,11) = 67.67$, $p < .0001$, indicating that consistency was higher for nominals than for predicates in first responses (just like all responses); a main effect of group, $F(3,11) = 6.81$, $p < .01$, indicating that, overall, the homesigners had lower levels of consistency than the other three groups, p's < .05 (just like all responses); and no interaction, $F(3,11) = 0.72$, $p = .56$, indicating that the difference between nominals and predicates was reliable for all four groups, including the homesigners (unlike all responses).

We have found less consistency in *handshape form*, that is, more variation, in predicates than in nominals – even in homesigners, and particularly in their first attempt to convey information before doing any elaboration that might be for their communication partner's benefit. In the remaining sections, we ask two questions. Focusing first on predicates (Section 3.2), we ask whether the variability found in predicates across agent and no-agent contexts is systematic; we address this question by contrasting *handshape type* in predicates vs. nominals. Focusing next on nominals (Section 3.3), we ask whether an individual uses

the same *handshape form* every time he or she uses a nominal for a particular object (i.e., whether there is within-individual stability) and whether all members of each of our 4 groups use the same nominal for a particular object (i.e., whether there is within-group stability).

3.2. Variation in predicates: does handshape type vary systematically in no-agent vs. agent contexts?

As described earlier, the variation found in classifier predicates across agent and no-agent contexts is not random in ASL – handshape type varies systematically with grammatical context (*object* handshapes tend to be used in no-agent contexts; *handling* handshapes tend to be used in agent contexts, Fig. 1A and B, right panels). In our next analysis, we explore whether the three Nicaraguan groups also show this pattern in the handshape types they produce in no-agent and agent contexts.

For this analysis, we classified a handshape according to type – whether it displayed properties of the (moving or stationary) object (*object* handshapes), or properties of the hand as it moved or placed the object (*handling* handshapes). We calculated the number of *object* and *handling* handshapes an individual produced in no-agent contexts and in agent contexts, as a proportion of all handshapes that the individual produced in each of these contexts. *Handling* and *object* handshapes do not always sum to 1.00 because *ambiguous* and *other* handshapes (which account for less than 7.5% of the data) are included in the denominator. Fig. 5 displays the data.

The first point to note is that the distributions of *object* and *handling* handshapes in nominals produced in no-agent (Fig. 5, top left graph) vs. agent (bottom left graph) contexts are essentially identical; we see this pattern in all four groups. Note that there were differences across the groups in how often *object* and *handling* handshapes were used to label the four objects in our vignettes (i.e., the distribution of black and grey bars is not the same across groups). However, whatever distribution a group used for labeling objects in the no-agent context (top left graph), that group tended to use the same distribution in the agent context (bottom left graph). Half of the ASL signers' nominals had *handling* handshapes (for pen and lollipop) and half had *object* handshapes (for book and airplane), as would be expected given the way we selected the stimulus items (see ASL label examples in Fig. 2). In contrast, the two cohorts from NSL and the homesigners tended to display a slight bias for *handling* handshapes over *object* handshapes in their nominals.

Turning next to predicates, we see a very different pattern. The distribution of *object* and *handling* handshapes in the no-agent context (Fig. 5, top right graph) was markedly different from the distribution of *object* and *handling* handshapes in the agent context (bottom right graph); we again see this pattern in all four groups. Note first that, as we would expect from ASL, participants in all four groups used *object* handshapes (grey bars) rather than *handling* handshapes (black bars) in their predicates in no-agent contexts (top right graph). In contrast, participants in all four groups used *handling* handshapes and *object* handshapes equally often in their predicates in agent contexts (bottom right graph). We had expected ASL signers to primarily use *handling* handshapes in their predicates in agent contexts (as in Fig. 1B, right-hand image). However, it is acceptable in ASL in agent (but not in no-agent) contexts to produce a *handling* handshape to describe the act of moving the

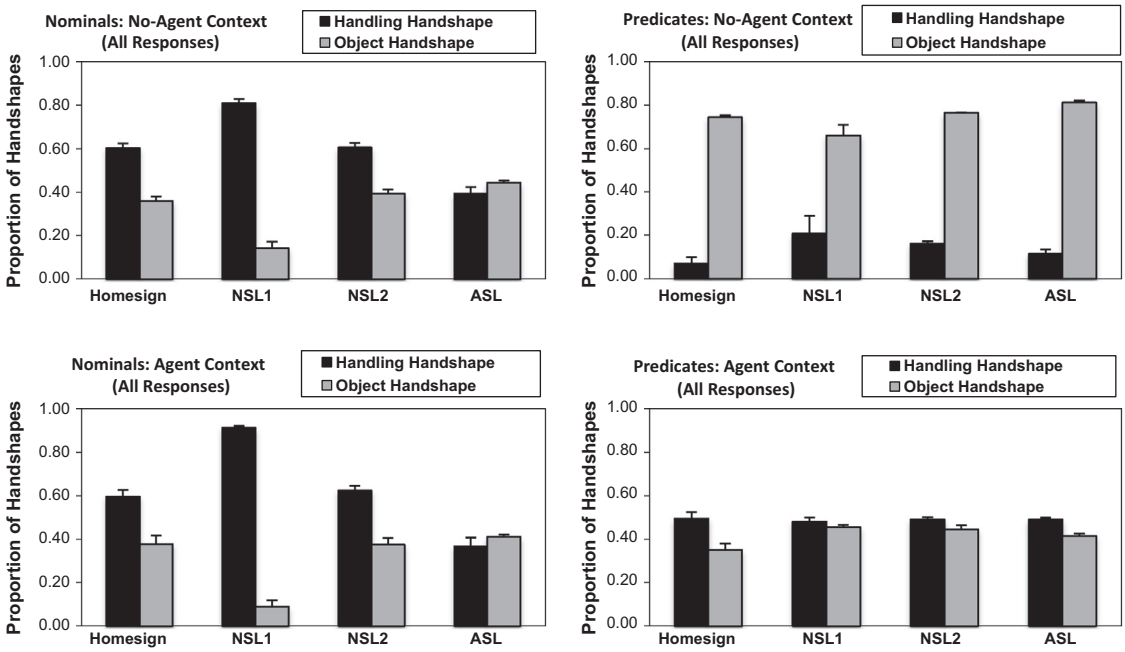

Fig. 5. Handshape type in nominals and predicates (all responses). The proportion of *Handling* (black bars) and *Object* (gray bars) handshape types in Nominals (left graphs) and Predicates (right graphs) that the Homesigners, NSL Cohort 1 signers, NSL Cohort 2 signers, and ASL signers produced in no-agent (top graphs) and agent (bottom graphs) contexts in all of their responses. Error bars indicate standard errors.

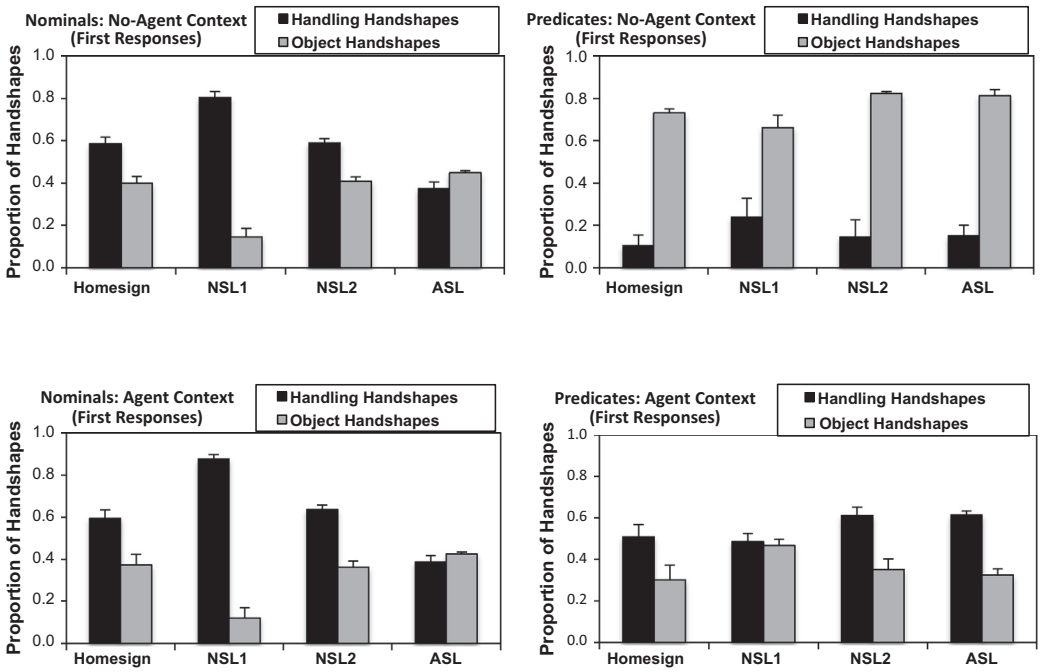

Fig. 6. Handshape type in nominals and predicates (first responses). The proportion of *Handling* (black bars) and *Object* (gray bars) handshape types in Nominals (left graphs) and Predicates (right graphs) that the Homesigners, NSL Cohort 1 signers, NSL Cohort 2 signers, and ASL signers produced in no-agent (top graphs) and agent (bottom graphs) contexts in their first responses. Error bars indicate standard errors.

object, along with an *object* handshape describing the end-state of the move. It appears that our ASL signers, as well as the other three groups, all used this strategy when producing predicates in agent contexts.

We examined the data a second time, looking only at first responses (Fig. 6), and found precisely the same pattern for all four groups. The distribution of *object* and *handing* handshapes in nominals was the same across no-agent and agent contexts (even though, as in all responses, the distribution was slightly different for each group). In contrast, the distributions across contexts were different in predicates, as they were in all responses: All four groups used *object* handshapes almost exclusively in no-agent contexts, and used both *handling* and *object* handshapes in agent contexts. There was only one notable difference between all responses and first responses. NSL cohort 2 and ASL signers produced more *handling* handshapes than *object* handshapes in their predicates in agent contexts in first responses, but not all responses (NSL cohort 1 and homesigners showed no difference between first and all responses, and homesigners already showed a preference for *handling* handshapes in all responses). The first pattern is one we might expect if the signer initially describes the act done on the object (a *handling* handshape) and then describes the final state of the object (an *object* handshape).

To determine the reliability of these patterns, we conducted a repeated measures ANOVA with one between-subjects factor, *group* (homesigners, NSL cohort 1, NSL cohort 2, ASL) and two within-subjects factors, *sign type* (nominal, predicate) and *context* (agent, no-agent), and the *proportion of responses that were object handshapes* as the dependent measure (we used only *object* handshapes because, for the most part, the proportion of *object* handshapes and *handling* handshapes summed to 1.00). We found no main effect of group, either for all responses, $F(3,11) = 1.98$, $p = .18$, or for first responses, $F(3,11) = 1.10$, $p = .39$.[5] However, there was a main effect of sign type for all responses, $F(1,11) = 73.54$, $p < .0001$, and first responses, $F(1,11) = 33.44$, $p < .001$; a significant main effect of context for all responses, $F(1,11) = 37.82$, and first responses, $F(1,11) = 33.58$; and a significant interaction between sign type and context for all responses, $F(1,11) = 15.15$, $p = .003$, and first responses $F(1,11) = 18.44$, $p = .001$. *Object* handshapes were used significantly more often in no-agent contexts than in agent contexts for predicates (p's = .001), but not for nominals (*ns*).

In addition to comparing handshapes in agent vs. no-agent contexts for nominals and for predicates, it is also worth comparing handshapes in nominals vs. predicates, particularly within the no-agent context (Figs. 5 and 6, top two graphs). *A priori* we might have guessed that participants would use an *object* handshape in the nominals they produce to label objects. But this guess would be wrong – all four groups used both *handling* and *object* handshapes in their nominals in the no-agent context (Figs. 5 and 6, top left graphs). Strikingly, however, all four groups did use the *object* handshape almost exclusively in

[5] There was also a significant interaction between group and sign type for all responses, $F(3,11) = 4.61$, $p = .025$, and for first responses, $F(3,11) = 3.53$, $p = .053$, but none of the pairwise comparisons was significant in post hoc analyses of these data.

their predicates in the no-agent context (Figs. 5 and 6, top right graphs). This finding highlights two points: (1) Participants did not merely take the handshape that they used in the nominal and carry it over to the predicate accompanying that nominal. In other words, handshapes in a nominal and its accompanying predicate were independently generated. (2) If participants were choosing the form that was the best (for them) iconic representation of an object to use as a label for that object in their nominals, that iconicity was overridden in their predicates – they always used the *object* handshape to represent the object when indexing its role in a no-agent event. In other words, iconicity was overridden when the handshape served as a morphological (grammatical) marker.

3.3. Stability in nominals: is there stability within an individual and within a group?

Our last question concerns nominals. We have found that signers in all four groups were more consistent in their use of nominal handshape forms across no-agent and agent contexts than in their use of predicate handshape forms (Fig. 4). But how many different handshape forms did an individual use in nominals for an object? In ASL, an established sign language, typically only one or two alternatives are produced as the citation form for a particular object. An ASL signer would accordingly be likely to use a small number of different handshapes when producing nominals for a particular object (within-individual stability), and a set of ASL signers would all tend to use the same handshapes when producing nominals for the object (within-group stability).

3.3.1. Within-individual stability

To explore within-individual stability in the handshape forms the signers used in their nominals, we counted how many different handshape forms each participant used in all of his or her nominals for a particular object (both no-agent and agent contexts) and then took the average of that score across the four objects for that participant, which constituted that participant's within-individual stability score. Fig. 7 (left graph) presents the mean within-individual stability scores for each of the four groups. We calculated the score twice, once using all responses (black bars) and once using only the participants' first responses (white bars). Note that, in Fig. 7, the greater the number of different handshape forms an individual used, the less stability that individual displayed in his or her nominals.

As expected, the ASL signers used between one and two different handshape forms in their nominals for a particular object in all of their responses ($M = 1.42$, $SD = .38$) and also in their first responses ($M = 1.42$, $SD = .38$). We see a similar pattern for NSL cohort 2 for all responses ($M = 1.50$, $SD = .35$) and first responses ($M = 1.44$, $SD = .38$), and for NSL cohort 1 for all responses ($M = 1.40$, $SD = .31$) and first responses ($M = 1.21$, $SD = .25$). In contrast, the homesigners used on average 3.63 ($SD = .14$) different handshapes per object in all of their responses, and reduced the number somewhat for first responses ($M = 2.44$, $SD = .12$), but not to the ASL and NSL signers' level. An ANOVA with *group* as the independent factor and *within-individual stability score* as the dependent factor revealed an effect of group for all the responses, $F(3,11) = 50.15$, $p < .0005$, and even for first responses, $F(3,11) = 13.96$, $p < .0001$; all three groups of sign-language signers displayed significantly more stability than the homesigners in both analyses (all p's < .01).

To put these patterns in perspective, we conducted the same analyses on the number of different handshape forms each individual used in predicates involving a particular object (Fig. 7, right graph). Not surprisingly given the lack of consistency across agent and no-agent contexts that we saw in predicates in Fig. 4, we found that, on average, individuals used more different handshape forms in their predicates than in their nominals (i.e., the bars are higher in the right graph than in the left graph in Fig. 7, reflecting the fact that different handshape types, and thus different handshape forms, were used across agent and no-agent contexts in predicates, but not in nominals, Figs. 5 and 6). However, the overall pattern across groups for predicates was the same as for nominals in all responses: homesigners used more different handshapes in their predicates involving a particular object ($M = 7.2$, $SD = 1.8$) than ASL signers ($M = 5.0$, $SD = 1.5$), NSL cohort 2 signers ($M = 4.7$, $SD = 1.8$) and NSL cohort 1 signers ($M = 3.7$, $SD = 1.4$). We found the same pattern in first responses: Homesigners

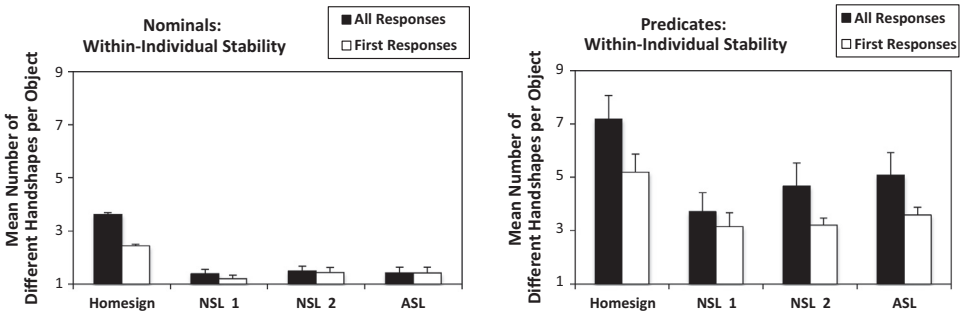

Fig. 7. Within-individual stability in nominals and predicates. The mean number of different handshape forms that each member of the Homesign, NSL Cohort 1, NSL Cohort 2, and ASL groups produced per object in Nominals (left graph) or in Predicates (right graph) in all responses (black bars) or in first responses (white bars). The greater the number of different handshape forms an individual used, the *less* stability that individual displayed in his or her nominals or predicates. Error bars indicate standard errors.

(M = 5.2, SD = 1.4) vs. ASL signers (M = 3.6, SD = 0.5), NSL cohort 2 signers (M = 3.2, SD = 0.5) and NSL cohort 1 signers (M = 3.1, SD = 1.0). An ANOVA with *group* as the independent factor and *within-individual stability score* as the dependent factor revealed a marginal effect of group for all responses, F = 3.30, p=.06, and a significant effect for first responses, F = 4.00, p = .04, although only some pairwise comparisons were reliable (NSL cohort 1 vs. homesign in all and first responses, p's = .05); NSL cohort 2 vs. homesign in first responses, p = .058).

An individual homesigner thus does not have a stable handshape form that he or she routinely uses, either when using a nominal to label an object, or when using a predicate to describe the object's role in an event. In contrast, an individual signer, even a signer in the first NSL cohort, does.

3.3.2. Within-group stability

In addition to finding stability within an individual, we would expect to find stability across individuals within a group for a mature, established sign language like ASL. We might also expect to find within-group stability in a newly emergent sign language like NSL, since the successive age cohorts are in the process of forming a communal language. In contrast, each of our homesigner participants is developing his or her language alone, without any contact among the four homesigners. We therefore would expect to see stability within this "group" only when a specific handshape is iconically motivated and each individual independently arrives at the same sign for a particular object.

To explore within-group stability for nominals, we first listed all of the different handshape forms that the members of the group produced for a particular object, and then counted how many of those handshape forms were used by all members of the group for that object. We calculated a stability score (the number of handshape forms used by all members of the group divided by the total number of handshape forms used by the group) for each object (i.e., for pen, book, airplane, lollipop), and then averaged the stability scores for the four objects to get the within-group stability score for each of the groups. Fig. 8 (left graph) presents the within-group stability score for nominals for each group calculated twice, once using all responses (black bars) and once using only the signers' first responses (white bars). Note that, in Fig. 8, the greater the proportion of handshape forms used by all group members, the *greater* the stability within the group.

As expected, the ASL group had high within-group stability for nominals on all of their responses (M = .75, SD = .50) and their first responses (M = .75, SD = .50). The scores for the NSL cohorts were also relatively high for all responses (M = .58, SD = .50, for cohort 2, M = .75, SD = .43, for cohort 1) and for first responses (M = .63, SD = .48, for cohort 2, M = .67, SD = .57, for cohort 1). In contrast, as we would expect given that the homesigners do not form a group, their within-group stability score was extremely low for all responses (M = .10, SD = .16) and for first responses (M = .09, SD = .12).

We conducted the same analysis on predicates and found much less stability overall (Fig. 8, right graph). Within-group stability was somewhat higher for ASL signers (M = .23, SD = .09) than for NSL cohort 2 signers (M = .13, SD = .09), NSL cohort 1 signers (M = .08, SD = .10) and homesigners (M = .09, SD = .07) in all responses. We see the same pattern in first responses: ASL signers (M = .39, SD = .20) vs. NSL cohort 2 signers (M = .11, SD = .07), NSL cohort 1 signers (M = .04, SD = .07) and homesigners (M = .06, SD = .08). However, within-group stability in predicates was not particularly high for any of the groups. Unlike nominals, where members of each of the three groups of signers (but not the homesigners) converged on a set of shared handshape forms, there was much more choice in the handshape forms group members could use to index a particular object playing an argument role in an event. The commonality in handshape within each group appears to be at the level of *handshape type* for predicates (see Figs. 5 and 6, right graphs), rather than at the level of *handshape form* (Fig. 8, right graph). This lack of commonality at the level of handshape form reflects the fact that a variety of object characteristics can be highlighted in the handshape of a predicate (e.g., the shape of the object, its size, how it is handled). In other words, when handshape serves as a morphological form that is incorporated into the predicate, there is a fair amount of choice in the handshape forms that can be used – far more choice (at least in established languages) than in the handshape forms that appear in a nominal.

4. Discussion

Our goal was to examine the stages a manual language goes through in developing a linguistic property found in

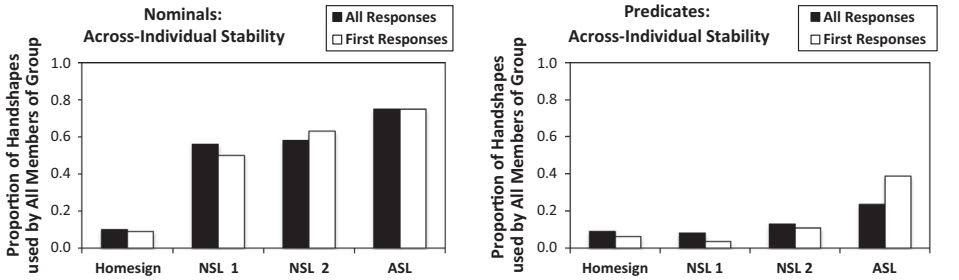

Fig. 8. Within-group stability in nominals and predicates. The proportion of handshape forms that were used by all four Homesigners, by all four NSL Cohort 1 signers, by all four Cohort 2 signers, or by all three ASL signers in Nominals (left graph) or Predicates (right graph) produced in all responses (black bars) or in the first response (white bars). The greater the proportion of handshape forms used by all group members, the *greater* the stability within the group.

established sign languages – handshape distinctions between terms that identify what is to be talked about (nominals) and terms that say something about this topic (predicates). We found that handshape is used differently (and systematically) for these two roles not only in an established sign language like ASL, but also in NSL, an emerging sign language.

NSL began when deaf individuals who had no contact with one another were brought together for the first time. These deaf individuals had been interacting with the hearing individuals in their worlds and had likely used their own home-made gestures – homesigns – to do so. To understand the homesigns that are likely to have formed the basis for the first stage of NSL, we observed current-day homesigners in Nicaragua, who had no contact with other deaf individuals, and interacted only with hearing individuals using their homesigns. We found that homesigners too used handshape to distinguish between nominals and predicates, displaying more consistency across contexts in handshape form for nominals than for predicates, and systematically varying handshape type with grammatical context for predicates but not for nominals. The seeds of this type of grammatical structure – systematic variation between two types of predicates – can thus be found in a linguistic system even before that system becomes communal. This is the first discussion point we turn to in the next section (Section 4.1).

Interestingly, however, the homesigners did *not* exhibit the within-individual and within-group stability found in the nominal lexicons of NSL and ASL. The fact that the variation found in the homesigners' nominals decreased in the first cohort of NSL, and then remained relatively constant in the second cohort, suggests that pressure from a community of signers may be necessary, and sufficient, for this type of lexical structure to develop. This is the second point in our discussion (Section 4.2).

Finally, we end with a discussion of three findings that add to the homesign literature: (1) Handshape type (*handling* vs. *object*) marks agent vs. no-agent contexts in homesign and thus builds on previous work showing that these types of handshapes are categorical and, in this sense, morphological (Goldin-Meadow, Mylander, & Butcher, 1995; Goldin-Meadow, Mylander, & Franklin, 2007). (2) Homesign is a non-shared phenomenon in that there was almost no overlap in the handshapes individual homesigners used as nominals. (3) A homesigner's first inclination (before elaborating more extensively for a hearing communication partner) was to produce a pattern comparable to the signers' pattern, suggesting that communicating with hearing partners may make a homesigner's system less structured.

4.1. Structure that appears in the earliest stages of an emerging language: grammatical use of handshape in predicates

All four groups of signers that we studied displayed more consistency across no-agent and agent contexts in the *handshape forms* they used for nominals than in the handshape forms they used for predicates. Even a homesigner who is generating a communication system without the benefit of a linguistic community seems to know, at some level, that nominal signs do not vary with grammatical context, whereas predicate signs do vary. Moreover, the variability in predicates was systematic at the level of *handshape type* – all four groups of participants used *object* handshapes in no-agent contexts, and both *handling* and *object* handshapes in agent contexts. The participants in these four groups thus appear to treat handshape as a systematically varying morphological feature in predicates, but as an unvarying phonological feature in nominals (cf. Brentari et al., 2013). We suggest that these constructs are resilient properties of language (Goldin-Meadow, 1982), properties so fundamental to language that they can be developed even under a wide range of environmental conditions.

However, it is important to point out that the difference between the handshape-form consistency scores for nominals and the handshape-form consistency scores for predicates was wider for ASL and NSL signers than for homesigners, particularly when all of their responses (as opposed to just their first responses) were considered. In other words, the effect was more pronounced for individuals using a shared sign system than for homesigners who did not. Moreover, signers displayed more consistency than homesigners overall, in both all and first responses. These findings suggest that there is fine-tuning yet to be done by the homesigners for this phenomenon. The fact that the homesigners communicated only with hearing individuals who were familiar with their signs but did not themselves use those signs (at least not in the way the homesigners did, Coppola et al., 2013) may have allowed for, and even promoted, sloppiness in the homesign systems. Cleaning up the systems may require a community where a homesigner not only produces his or her system, but also receives it from others, a condition that became available for the first cohort of signers of NSL.

4.2. Structure that requires a community before it appears in an emerging language: lexical use of handshape in nominals

We found that all four groups of participants displayed more consistency in the particular *handshape forms* that they used for nominals than for predicates (Fig. 4). Moreover, all four groups used the same *handshape type* (either *object* or *handling*) across no-agent and agent contexts in their nominals (Figs. 5 and 6); handshape type was thus relatively stable across contexts in nominals in all four groups. However, the groups differed in whether they used the same *handshape form* for a particular object (Fig. 8, left graph); in other words, they differed in whether they had an agreed-upon lexical item for the object. The same handshape form was very likely to be used as a nominal for a particular object by all members of the ASL group and all members of each of the NSL cohorts. In contrast, very few handshape forms were used by all homesigners as a nominal for a particular object – which may not be surprising given that the homesigners did not interact with one another and thus did not form a group.

Along the same lines, Israel and Sandler (2011) found little variation across signers in the handshape form used in the lexical sign for an object in ASL, the most mature

sign language they studied; more variation across signers in Israeli Sign Language, a less mature sign language; and the most variation across signers in Al-Sayyid Bedouin Sign Language, a new sign language that arose spontaneously in an isolated desert community in Israel about 75 years ago. It is important to point out, however, that Israel and Sandler were interested only in within-group stability and not in within-individual stability, as each individual signer in their study was asked to label each object only once.

Because our participants saw the same object in a variety of vignettes and thus produced a number of nominal responses for the same object, we were also able to examine within-individual stability. The surprising result was that each homesigner displayed so little stability within him or herself in the handshape forms used as a nominal for a particular object (Fig. 7, left graph). The ASL and NSL signers tended to use 1 or 2 different handshape forms as a nominal for a given object; homesigners used between 3 or 4 in their responses overall, and between 2 and 3 in their first responses. Individual homesigners thus had not each formed a stable lexicon of nominals.

These results accord with Richie et al. (2014), who used an agent-based computational model to explore convergence in lexical forms over time within the NSL community and within homesigners' individual households (i.e., between the homesigner and his or her hearing communication partners). Not surprisingly, Richie and colleagues found that conventionalization of lexical items proceeded faster, and went further, in NSL than in homesigner households. Although the lexical forms used by homesigners and their communication partners did converge over time to some degree, they did not converge fully even after 25 years of interaction. In contrast, during the same period of time, NSL signers all converged on a set of lexical items. Richie et al. then incorporated differences in the structure of communicative interactions into their model. Specifically, in a typical linguistic community setting such as NSL, all users (in principle) communicate with all other users. In contrast, in the homesign setting, the homesigner uses the homesign system with each of his or her hearing communication partners, but none of the communication partners uses it with anyone besides the homesigner. These differences accounted for the different rates and degrees of conventionalization found in the two types of social networks (NSL vs. homesign households).

A priori, we might have thought that because an individual homesigner does not have to negotiate lexical items with other individuals (since the homesigner is, in a sense, the keeper of the system), homesigners would be completely consistent within themselves. Our findings suggest that this is not the case – individual homesigners display little stability within themselves even in nominal lexical forms, suggesting that the give-and-take that comes with a community is necessary to develop a stable lexicon not only within the group, but also within an individual. Importantly, however, our findings also suggest that a community is *not* necessary to develop a division between nominals and predicates – even homesigners display a distinction between nominals and predicates at the level of both handshape form (Fig. 4) and handshape type (Figs. 5 and 6).

Note that none of the participants displayed much within-group stability in the handshape form used to index a particular object in a predicate (Fig. 8, right graph). This lack of commonality, even in an established language like ASL, reflects the fact that there is choice in the particular characteristic of an object that can be highlighted in the handshape of a predicate; that is, in handshape when it serves as a morphological form incorporated into the predicate. There is much less choice allowed (at least in signers, Fig. 8, left graph) in the handshape of a nominal; that is, in handshape when it is an unchanging component of the nominal form that accompanies the predicate.

One final point deserves mention in relation to developing a lexicon. Recall that we found a slight bias to use *handling* handshapes rather than *object* handshapes in nominals for the four objects in the three Nicaraguan groups in our study (Figs. 5 and 6; the ASL signers show no bias because we chose the objects so that two had *handling* handshapes – pen, lollipop – and two had *object* handshapes – book, airplane – in their citation forms). Padden et al. (2013) have found that sign languages tend to have instrument noun forms that are biased toward either *handling* handshapes (which capture how an object is manipulated) or *object* handshapes (which capture how an object looks). For example, New Zealand Sign Language displays a *handling* bias; ASL displays an *object* bias. Interestingly, Padden et al. have found that ABSL, a new sign language currently emerging in Israel, displays an *object* bias. Although four objects are far too few to establish a bias, our findings suggest that Nicaraguan signers could be behaving differently from ABSL signers, indicating that it would be interesting to explore this question in Nicaragua.

4.3. What we have learned about homesign

Previous work has found that homesigns have structure at word (Goldin-Meadow et al., 1995; Goldin-Meadow et al., 2007) and sentence (Feldman, Goldin-Meadow, & Gleitman, 1978; Goldin-Meadow & Feldman, 1977; Goldin-Meadow & Mylander, 1984) levels, as well as the grammatical relation of subject (Coppola & Newport, 2005), the grammatical categories of noun, verb, and adjective (Goldin-Meadow, Butcher, Mylander, & Dodge, 1994), complex nominal constituents (Hunsicker & Goldin-Meadow, 2012), nouns that function as generics (Goldin-Meadow, Gelman, & Mylander, 2005), plural devices (Coppola et al., 2013), recursion (Goldin-Meadow, 1982), and prosodic structure (Applebaum, Coppola, & Goldin-Meadow, 2014). Our study adds to this work by fleshing out the morphological structure previously described in homesign.

Child homesigners in the United States (Goldin-Meadow et al., 1995) and in China (Goldin-Meadow et al., 2007) have been found to use signs composed of morphemes – handshape forms that map onto categories of object meanings, and motion forms that map onto categories of action meanings. Handshapes are divided into two types, handshapes that represent a hand as it *handles* an object, and handshapes that represent the *object* itself. Importantly, however, in previous work, no structural

differences were reported to depend on these two types of handshapes. Our findings here suggest that handshape type (*handling* vs. *object*) is used systematically in homesign to mark different types of events (events in which an agent acts on an object vs. events in which an object acts on its own) and, in this sense, serves as a morphological marker, as it does in ASL (Benedicto & Brentari, 2004) and Italian Sign Language (Brentari et al., 2012; Mazzoni, 2009).

Our findings also contribute to our understanding of homesign in that they confirm that homesign is an individual phenomenon. Homesigners are not part of a linguistic community, as evidenced by the fact that few of them used the same handshape form in their nominals or predicates (Fig. 8). The findings in Fig. 8 also underscore the fact that there are many iconic forms that can be used to represent a particular object. The homesigners tended to use forms that were transparently related to the meanings they intended to convey, yet they did not all use the same forms. There can be variability across communication systems even when they are iconic.

Finally, there is some suggestion in our findings that communicating with hearing partners may make a homesigner's signs less structured. We found that the handshape-form consistency patterns for the homesigners resembled the NSL and ASL signers' patterns more closely when we looked at their first responses (that is, the responses they produced before being influenced by their partner's reactions) than when we looked at all of their responses. There was a disparity between "first" and "all" responses in homesigners that was not seen in NSL and ASL signers, suggesting that the homesigners (but not the NSL and ASL signers) may go outside of their systems in an attempt to clarify their message to someone who does not share that system. Recall that each homesigner in this study was interacting with the communication partner who understood him or her the best. These findings accord with other research demonstrating that homesigners' communication partners display relatively poor comprehension even for descriptions of simple events (Carrigan & Coppola, 2012). Interestingly, even though NSL is in its early stages of development, signers are already cognizant (at least at this level) that their system constrains their communications. As a methodological point, the fact that homesigners were more likely to display the signers' patterns on their first response before they made more extensive accommodations for their hearing communication partners suggests that homesigners' initial communicative attempts reflect their grasp of linguistic structure better than subsequent responses.

Our findings make it clear that adult homesigners can use handshape form systematically to distinguish between nominals and predicates, and, for predicates, can use handshape type to distinguish between no-agent and agent contexts. A question for future research is whether child homesigners can make the same distinctions. Given that a distinction between nominals and predicates based on handshape is an early emerging property in evolving sign systems, we might expect that children who are exposed to a linguistic model containing this distinction would acquire it early in development. And they do – deaf children as young as 4 years of age who are learning ASL from their deaf parents can use *handling* and *object* handshapes systematically in their nominals and classifier predicates (Brentari et al., 2013). But additional research is needed to determine the age at which a child who is *not* exposed to a language model can make these distinctions. Making the distinctions without a language model could require the cognitive maturity of an adult.

5. Conclusion

We have watched language grow from a set of systems used by unconnected individuals (homesign) to a communal system used by a community (NSL). Following work done on established sign languages, we focused on the way handshape is used in nominals and predicates. We found, first, that at all stages of signed language emergence, handshape was used differently in nominals and predicates, with more consistency across contexts in the handshape forms used for nominals than for predicates. Moreover, the variability we see in predicates was systematic – all of our participants used different types of handshapes in no-agent and agent contexts in their predicates, suggesting that handshape is functioning as a morphological marker in their systems. In contrast to this grammatical use of handshape, already present in the earliest stages of an emerging language, stability in the lexical use of handshape in nominals does not seem to emerge unless there is pressure from a peer linguistic community. We found very little overlap across homesigners, and little stability within a homesigner, in the handshape forms used in nominals for a particular object, unlike ASL signers and even NSL signers. Examining the steps a manual communication system has taken as it moves toward becoming a fully-fledged language gives us a unique window onto factors that have made human language what it is.

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