Sign language transcription at the level of meaning components

The Berkeley Transcription System (BTS)

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The Berkeley Transcription System (BTS) has been designed for the transcription of sign language videotapes at the level of meaning components. The system is based on efforts to transcribe adult-child interactions in American Sign Language (ASL) and Sign Language of the Netherlands (SLN). The goal of BTS is to provide a standard means of transcribing signed utterances, meeting the following objectives:

- compatibility with CHAT format and CLAN programs (CHILDES)
- linear representation on a continuous typed line, using only ASCII characters
- representation at the level of meaning components
- full representation of elements of polycomponential verbs
- representation of manual and nonmanual elements
- representation of gaze direction, role shift, visual attention
- representation of gestures and other communicative acts
- notation of characteristics of adult-child interaction (child-directed signing, errors, overlap, self-correction).

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1. Goals of transcription

The Berkeley Sign Language Acquisition Project has designed a system for transcribing videotapes of sign language interactions. The system was developed using data of adult-child interaction in American Sign Language (ASL) and Sign Language of the

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Netherlands (SLN); it is intended to be applicable to all sign languages and to all genres of signing. The Berkeley Transcription System (BTS) is modeled on extensive experience with computerized transcription and analysis of child speech, and is explicitly designed to be compatible with the accepted international standards in that field. At the same time, BTS strives to present an analysis on the level of **meaning components** of each sign language under study.

The full version of BTS is available for examination and use as part of CHILDES (the Child Language Data Exchange System). BTS can be accessed as Chapter 11 of the CHAT Manual (MacWhinney 2000), available on the web.[1] Here we present the rationale motivating the construction of BTS, with examples of the main features of the system. The Appendix to this paper summarizes all of the transcription conventions of BTS (as of October 10, 2000).

1.1 Transcription and analysis

The goal of all transcription is to produce a permanent, written record of communicative events, allowing for analysis and re-analysis. The goals of analysis are critical in determining the appropriate level and scope of transcription (Ochs 1979; Slobin 1993). BTS is designed to capture children's emerging grasp of meaning components and combinatorial possibilities in the exposure language. At the same time, the multi-tiered format allows investigators to add tiers for the transcription and coding of other levels, such as phonology, syntax, and pragmatics.

The most basic aim of every system of notation of behavior is to help researchers see patterns in the data — that is, to facilitate their human pattern-recognition devices. The task of transcription and subsequent data summaries is to present information in various forms, so that one may identify regularities that may not be evident while directly observing the behavior in question. In the domain of communicative interaction, the data must be amenable to both qualitative and quantitative exploration.

For purposes of **qualitative analysis**, one needs a transcript that makes it possible to follow the interaction as it unfolded in time, scanning for features that are relevant to one's guiding theoretical questions. Thus, the transcript must be **legible**, allowing the trained reader to mentally represent the actual behavior. At the same time, it must be sufficiently schematized to make it possible to scan the data in significantly less time than required to watch the original videotape. It must also highlight units of analysis that may not be immediately evident to the viewer of the video. (That is, every transcript is, by its very nature, theoretically driven.)

1. The North American site, organized by Brian MacWhinney, is at Carnegie-Mellon University: http://childes.psy.cmu.edu/. There is a European mirroring site organized by Steven Gillis in Antwerp, Belgium: http://cnts.uia.ac.be/childes/.

For purposes of **quantitative analysis**, the transcript must be divisible into units that can be automatically extracted, counted, and combined in various ways. Statistical summaries are necessary in order to reveal patterns that are only evident when one compares numerous instances of particular behaviors. This sort of pattern recognition cannot be evoked online or in sequential reading of a transcript, because it requires summing across numerous scattered instances. Some quantitative information can be extracted from transcribed utterances; however, all transcripts must also be coded for levels of analysis that are not evident on the lexical/morphological level. BTS does not include guidelines for coding of transcripts; these must flow from the needs of each individual research project.

1.2 Compatibility with CHILDES format

Our inspiration is the CHILDES system, developed by Brian MacWhinney and many colleagues for the transcription, storage, and analysis of spontaneous speech corpora (Sokolov & Snow 1994; see website [note 2] or MacWhinney [2000] for details and references). CHILDES consists of two major components: a standardized format for computerized transcripts (CHAT), and an extensive set of programs for automatic analysis of transcripts in CHAT format (CLAN). Our goal is to provide a transcription format for signed languages that is fully compatible with CHAT guidelines, and thereby accessible to analysis using CLAN programs. At every point, we have been working with Brian MacWhinney (Carnegie-Mellon University, Pittsburgh, Pennsylvania), in order to ensure that we have met these goals. MacWhinney has been supportive in guiding our efforts, placing the current version of BTS in the online CHAT manual (Chapter 11: Signed Languages — BTS, pp. 92–115), and working towards the design of additional CLAN programs to deal with sign-specific issues. In the long run, we hope that the CHILDES database will include corpora of child signing, eventually supported by digitized video archives. The current paper is an interim report of work in progress. We would appreciate feedback, especially with regard to the applicability of BTS to other signed languages and to a range of discourse types.

1.3 Consistent morphological representation

The CHILDES manual begins with a word of caution about "the dominance of the written word:"

> Perhaps the greatest danger facing the transcriber is the tendency to treat spoken language as if it were written language. The decision to write out stretches of vocal material using the forms of written language involves a major theoretical commitment. As Ochs (1979) showed so clearly, these decisions inevitably turn transcription into a theoretical enterprise. (MacWhinney 2000)

Paradoxically, this danger faces transcribers of signed languages as well. In this case, the danger is to treat the sign language in terms of the written language of the surrounding speech community. All too often, scientific studies of sign language are based on upper-case glosses (in English, Dutch, Italian, and so forth), supplemented by descriptions of handshapes or discursive notes when a spoken-language equivalent is not readily available. The result is a hybrid of different types of information: lexical, phonological, gestural, pragmatic. A transcript of this sort is not consistent with CHAT format, and is therefore not amenable to CLAN analysis. In addition, on the linguistic level, it all too often leads the analyst to treat the sign language in terms of the written language used in glossing, rather than in its own terms.

Sign language communication poses additional problems for transcription, due to the simultaneous presentation of manual and nonmanual information, movement through space, and the use of gestures along with conventional signs. These problems have been approached in various ways in the literature, but all current solutions require the use of varying font sizes, diacritics, special characters, superscripts and subscripts, and horizontal lines drawn across sequences of elements to indicate the scope of nonmanuals. None of these formats can be simply and directly reproduced on the keyboard, using only ASCII characters in a single font size and typeface. Nor are there any clear guidelines for using such notations, as indicated by inconsistency from publication to publication. An ASL classifier might be indicated as VEHICLE in one paper or as 3-CL in another; a nonmanual feature might be indicated with an English word or abbreviation if it corresponds to an English category (e.g. 'neg', 'nod', 'rhet.q'), or by a phonological notation if it does not easily map onto a single English word (e.g., 'th', 'puff.cheeks', 'tight lips'). Motion might be described geometrically (e.g., 'move to lf') or discursively (e.g., 'swerve to lf to miss rabbit'). Such heterogeneity of transcription impedes systematic linguistic comparison between reported data in various publications.

BTS requires a consistent notation for all manual, nonmanual, and movement components of utterances. The notation must be consistently on the level of **meaning components**, as discussed in detail below. Furthermore, an utterance must be represented in linear fashion, on a continuous typed line, using only ASCII characters in one font size and typeface. We will not present each of the BTS conventions here; they are readily available to the reader in the appended Manual or online in subsequent updated versions. Rather, we will point out the ways in which BTS is based on (1) linguistic analysis, and (2) discourse considerations.

1.4 Keyboard Conventions

All **content elements** (lexical items, specific meaning components) are given in capitals and bounded by spaces. A sign is represented by at least two upper-case letters. This

convention makes it possible to search for and count lexical items. Grammatical categories are indicated in lower-case, immediately bound to the content item. For example, *pm'VEH* indicates a 'property marker' (classifier) designating a vehicle. The upper/lower case distinction allows for separate searches for function and content elements. Within a complex item, components are separated by hyphens. When necessary, the underscore is used to keep all parts of an item together, as a unit bound by spaces, e.g., *PNT_1* 'point to self'. Information provided in parentheses is not included as part of an item, e.g., *SIGN(1h)* indicates that a normally two-handed sign was produced with one hand. Further conventions will be introduced in the discussion of specific topics, below.[2] See the appended Manual (available in the CD-ROM version of this issue) for a full listing of transcription elements.

2. Points, indexes, and pronouns (App. §2)[3]

BTS uses the symbol *PNT* (point) for all instances of pointing to a physically present referent or person, whether serving as signer (*PNT_1*), addressee (*PNT_2*), another person or object (*PNT_3*). *PNT_3* is followed by a parenthetical indication of the referent, e.g., *PNT_3(visitor), PNT_3(ball), PNT_3(picture_of_ball)*. The symbol *IX* (index) is reserved for reference to a spatial locus that represents a person or object in signing space. Section 2 of the Manual lays out the many possibilities for pronominal usage (i.e. points to persons) in signed languages. It is clear that the system is rich, including indications of number (singular, plural, multiple, selective) and inclusive/exclusive reference.

3. Polycomponential signs

A major strength of BTS is its attempt to represent each of the several components of a sign. However, we attend only to those components **that can be productively used to create meaningful complex signs** in the language. Consider three types of ASL examples:

(1) A 'plain' verb, such as 'love', is formed by crossed arms moving against the chest with two **S**-hands, palms inward. These components are fixed and do not vary to change the meaning of 'love'; that is, this sort of verb has no morphological components. Signs of this sort are represented in the usual manner in BTS, using upper-case letters: LOVE.

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2. A website has been established by Brenda Schick for ongoing updates and discussion across research groups and sign languages: http://www.Colorado.edu/slhs/btsweb/.

3. Sections of the manual are indicated as App. §.

(2) Another sort of verb demonstrates 'agreement' by moving in space, but, like LOVE, has no internal morphology. Consider ASL HELP, which consists of an **A**-hand resting on a palm-up base hand, moving between the 'helper' and the 'helpee'. The movement component is clearly meaningful, in that a variety of person-loci can fill the two roles. However, the configuration of the two hands consists of a single unit in the BTS analysis, because neither handshape can be substituted for another while still retaining the meaning 'help'. Again, an upper-case gloss for the lexical element is sufficient, but it will have affixed path morphemes, as discussed below: HELP-.

(3) Verbs of object transfer and manipulation (e.g. 'give', 'put') have path movement components and handshape 'classifiers' that can be substituted to specify the transfered or manipulated object. Such verbs are richly polycomponential ('polymorphemic' in Engberg-Pedersen's [1993] terms), and it would be grossly misleading to transcribe them as GIVE, PUT, and the like. For such verbs, BTS provides an expanded analysis, as discussed in detail below.[4]

3.1 Paths of movement (App. §3.2)

BTS has a uniform analysis of verbs that move from one spatial locus to another, whether that locus is conceptualized as a place (locative verb, verb of motion) or a person (agreement verb, dative case, recipient). Path is one of many potential verb components, each of which is indicated by an initial hyphen. A verb that is not monomorphemic (in contrast to a monomorphemic verb such as LOVE), consists of a collection of components. The format for all such components is a lower-case indication of the component, followed by an apostrophe and an upper-case indication of the particular instantiation of the component. Thus, for example, *-pth'Z* indicates a zigzag path.[5] Section 3.2. of the Manual lays out the full set of path elements (shape and directions). These elements can be combined — e.g., *-pth'ZUF* ('zigzag up forward'), but any combination still represents a single path component and is treated as a single content element.

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4. We prefer to use the term 'component' or 'meaning component', rather than 'morpheme', thus leaving us free to include a range of meaning components without prejudging their formal linguistic status. As indicated in examples below, and in the Manual, nonmanual components of affect, perspective, and the like, function as systematic meaning components in polycomponential verbs. We have also been uncomfortable with the term 'classifier'. We prefer to treat handshapes and body parts as meaning components that serve to specify referents on the basis of relevant properties. In BTS we use the term 'property marker' (*-pm*) in place of 'classifier.' Our position on the structure and acquisition of classifier constructions can be found in a recent conference paper (Slobin, Hoiting, Kuntze et al. in press).

5. We are limited in our choice of diacritics by pre-assigned functions of elements in the CHILDES system. Thus, while *-pth:Z* might be a more familiar or transparent notation, users of BTS must get used to an apostrophe for specification of content elements.

There are four types of path of movement: **Path,** the simplest, indicates motion without further specification of either source or goal, as in *-pth'ZUF*. When a path begins at a specified place (locus or contact), the **source** is noted as *-src'X*, where X indicates the starting point of the path. BTS conceives of *-src* as a type of path, and not just the starting point; that is, *-src'X* means 'move away from X'. When a path ends at a specified place (locus or contact), the **goal** is noted as *-gol'X*. Again, this is considered to be a type of path: 'move to X'. A path can move **relative** to a fixed referent object — that is, the moving figure can pass or pass through a landmark, barrier, or the like (doorway, bridge, tunnel, etc.). This sort of path is indicated by *-rel'X*.

3.2 Figures and grounds ('classifiers') (App. §3.3)

Verbs of motion (self-movement, caused-movement, object transfer) are polycomponential, including handshapes or body parts that indicate the figure and/or ground involved in the motion event. BTS considers signed languages in typological perspective, treating them as head-marking and polymorphemic. The transcription of 'classifier constructions' is richly detailed in BTS.

The element that specifies ('classifies') figure/ground is always indicated in semantic terms. We treat all sorts of 'classifiers' as **property markers** — that is, handshapes that identify a referent by indicating a relevant property of that referent (for justification, see Slobin, Hoiting, Kuntze et al., in press). That is, an 'inverted **v**' handshape is transcribed as ***pm'TL*** (two-legged animate being), and never as 'V-CL', 'inverted **v**', or the like. If both figure and ground are part of a verb, the order of notation is always **ground** before **figure**, following the logic of manual representation of such events.

In essence, verbs of motion in signed languages (at least in ASL and SLN, the languages we have worked with in detail), consist of components of ground, figure, path, and various additional movement elements indicating features such as aspect and manner. Such verbs cannot be directly glossed in English, or the other Indo-European, dependent-marking languages that are characteristic of the surrounding speech communities that have been most extensively studied. Consider, for example, an ASL verb with the following components: the non-dominant hand is held vertically, with flat palm, fingers extended forward (*pm'PL_VL* 'plane showing vertical length'); the dominant hand is in an inverted-V position (*pm'TL* 'two-legged animate being') and it moves to the top of the non-dominant hand (*gol'PL_VL_TOP* 'move to top of vertical plane') to straddle the hand (*pst'STR* 'posture straddle'). This verb could refer to a range of events, such as a cowboy mounting a horse or a boy sitting up on a fence. It can be represented as a verb with four meaning components ('morphemes'), as indicated in example (1) by four hyphens:

(1) *-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR.*

This is, in fact, a sufficient transcription linguistically, but it lacks legibility — at least for hearing readers. We would like to be reminded of a comparable English verb, **but we do not want such a gloss to influence our transcription or analysis**. To solve this problem, BTS allows the transcriber to begin a verb with a parenthetical, lower-case possible equivalent. Thus, one might type:

(2) *(mount)-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR.*

The parenthetical gloss is not a conventional part of the system, and each transcriber can provide a suitable equivalent. For example, this verb could also be glossed as (get_up_on_horse) or (mount_straddling), or whatever seems useful to the transcriber. The parenthetical glosses stand outside of the analyses, and function only to facilitate reading.

If more contextual detail is needed, it can be provided on a dependent tier, under the utterance line. For example, one could add a 'gloss' tier (*%gls*). Note that the utterance line begins with an asterisk and an identifying code for the speaker in three upper-case letters, while dependent tiers begin with a percent sign and lower-case ID:

**MOT: COWBOY (mount)-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR.*
%gls: the cowboy got up on the horse's back

The transcription is thus based on linguistic analysis, often resulting in initially non-obvious decomposition of complex signs. This work cannot be done without the active participation of native signers.[6] At almost every point in the development of BTS, the native signers have helped us to discover contrasts, nuances, and possibilities that may not have been evident to second-language signers.

Segmentation of a sign into meaning components depends on the availability of contrasts in the language. For example, our analysis of 'mount' is based on the possibilities of contrasting the **ground** (e.g. by use of a horizontal plane to indicate movement onto a different sort of ground), the **figure** (e.g. by reference to an animal, such as a cat, mounting a horse), and the **posture** (e.g. by contrast with a person standing on a horse's back). The search for contrasts is essential to the analysis, and contrasts are not always obvious without careful examination of a range of potential scenarios and their signed descriptions.

To continue the demonstration of this method, note that 'mount' is part of a collection of verbs that have a derivational relationship with one another, as revealed by the addition or removal of a meaning component.

6. There are three in our group: Marlon Kuntze, who is Deaf, and Jennie Pyers and Helen Thumann, who are CoDA's. Their insights have been essential to the creation of BTS.

If the path component (*-gol-)* is replaced by a static component (*-loc-),* the result is a verb describing a static configuration:

(4) *(be_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR.*

Again, the parenthetical gloss is not part of the analysis. This verb could describe a man seated on a horse, a boy seated astraddle on a fence, etc.

If a movement pattern (*-mvt-*) is added to 'be_mounted' the resulting verb is dynamic: 'ride'. BTS is not concerned with a phonological description of this particular movement pattern, because it does not contrast with other movement patterns; its only function is to indicate that this configuration has the meaning of 'ride'. Therefore we simply designate the forward rotational movement of this verb as *mvt'LEX*, where *LEX* refers to the movement pattern that identifies this particular verb. That pattern is pointed to parenthetically: *mvt'LEX(ride).* (This is similar to transcription in English, such as 'walk-PAST' or 'run-PAST', where the reader can provide *walked* or *ran* on the basis of knowledge of the language.) With regard to the parenthetical gloss, note that ASL has a different verb for riding in a vehicle, so we indicate the verb we are transcribing here as 'ride_mounted':

(5) *(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride).*

Once we have a dynamic verb of motion, we can then add further components of **manner** and **aspect**. For example, the following extended notation indicates that the referent event was rapid (*-mod'RAP-*) and that it came to an end (*-asp'CES* 'cessive'):

(6) *(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride)-mod'RAP-asp'CES.*

Note that these relationships are not evident in the English glosses for each of the verbs discussed above. That is, if one relied on glosses as the central element of transcription, there would be no reason to see the regular relationships that hold between three verbs describing a human being mounting, straddling, and riding a horse: GET_ON, BE_LOCATED, and RIDE.

This sort of detailed morphological analysis is familiar to linguists who deal with comparable spoken languages, such as many American Indian languages. Consider, for example, Talmy's (1985) work on Atsugewi, a Hokan language of northern California. The verb roots in this type of language designate figures of particular shapes, postures, and consistencies, e.g.:

(7) a. *lup-* 'small shiny spherical object'
b. *caq-* 'slimy lumpish object'.

The roots take locative/directional suffixes, such as:

(8) a. — *ak* 'on the ground'
b. — *mi*̇*c* 'down onto the ground'.

Polymorphemic combinations are similar to those of ASL; for example, consider the Atsugewi construction *s-´-w-it^{u}-mi*̇*c*. The first three morphemes indicate a first person subject in factual mood. The last two identify the postural figure and movement:

(9) morpheme-by-morpheme analysis (cf. BTS):
it^{u}-mi̇*c*
linear_object_in_lying_posture' '-move_down_onto_ground

As in the BTS transcription, this would be sufficient to indicate the morphological components of the verb. In addition, following linguist practice, Talmy provides a gloss:

(10) gloss:
s-´-w-it^{u}-mi̇*c*
'I lay down onto the ground'

A transcription in BTS is **not** a gloss in the linguistic sense; that is, it does not correspond to an English paraphrase, such as 'I lay down onto the ground'. Rather, it is intended to be the equivalent of a morpheme-by-morpheme analysis, with a collection of abbreviations designed for signed languages.

The abbreviations of BTS are based on English, and equivalents will have to be found for transcriptions into other written languages. This is normal in linguistics, both for signed and spoken languages. For example, the dictionary of Argentinian Sign Language (Massone 1993) uses CM (*configuración de la mano)* for 'handshape', RNM (*rasgo no-manual)* for 'nonmanual feature', etc., and the upper-case representations of lexical items are in Spanish. The same is true, of course, for linguistic descriptions of spoken languages, according to the language of the publication. For example, 'singular/plural' can be represented as *sg/pl* in papers written in English, as *ed.ch./mn.ch.* in papers written in Russian, and as *tekil/çoğul* in papers written in Turkish. Users of BTS in other countries will face the challenge of devising abbreviated equivalents for each of the abbreviations of our system. Although many linguists will be able to work with the English-based system, it will be essential to prepare equivalents in other languages for the use of bilingual deaf co-workers who do not know English. Once this has been accomplished, it should be possible to design simple translation programs that would make it easy for researchers to study each others' transcripts. For example, a list of Dutch equivalents of BTS notation symbols, along with a glossary of Dutch lexical items used in a transcript, would be used to prepare an English-based transcript of a SLN corpus.[7]

7. A Dutch version of BTS has been prepared by Nini Hoiting and Baukje Bosma in Haren, The Netherlands; a German version has been prepared by Eva Pruss-Romagosa and Simone Fourestier in Hamburg.

Sign language researchers with experience in typological linguistics should not be surprized by the elaborateness of BTS transcriptions of polycomponential verbs. Such relatively opaque morpheme-by-morpheme glosses are familiar in papers dealing with a wide range of agglutinative and polysynthetic languages. Consider the following example from Inuktitut, spoken by a child of 2;5. Here we have an entire sentence in one polycomponential utterance (Crago & Allen 1998).

(11) *suna -tuq -juq -viniq -u -vunga*
what -consume -NOM -former -be -IND.1SG
'What did I have to eat before? [= I am one who had what to eat before].'

Note that the morpheme-by-morpheme gloss (what-consume-NOM-former-be-IND.1SG) is uninterpretable without knowledge of Inuktitut, just as BTS utterance-line transcriptions are uninterpretable without knowledge of the particular sign language. Because BTS is designed for investigators who know the sign language, however, the utterance line should generally be sufficient. The *%gls* line, like the line in single quotes above, is always available for clarification.

3.3 'Frozen forms' and morphological productivity

It should be evident to the reader that BTS relies heavily on criteria of **morphological productivity** for the analysis of a sign into components. To the extent that we have succeeded for a particular sign, this is a contribution to linguistic description. We are well aware, however, that children who are learning a language may not yet have carried out the adult analyses reflected in the transcription. This problem is a familiar one in child language, where it is well known that children's early forms may be 'amalgams' — that is, unanalyzed Gestalten that correspond to more complex adult forms. The only way to determine if a particular morphological analysis is productive for a given child is to seek evidence of productivity. Such evidence is available in two forms: (1) One searches the corpus for uses of a given morpheme across lexical items and contexts, especially for overgeneralizations. That is, when an English-speaking child says 'breaked' one has evidence for the productivity of the past-tense inflection. (2) One presents the child with new lexical items (often nonsense, or 'nonce' terms made up for experimental purposes), and puts them in contexts that should elicit the form. Thus, if an English-speaking child is presented with a nonce verb, *wug*, and says that someone 'wugged' yesterday, again, one has evidence for productivity.

The same issue of rote-learned versus productive forms applies to the acquisition of signed languages. The purpose of the detailed componential analysis embodied in BTS is to make it possible to discover, for a particular child, when there is sufficient evidence to credit the child with control of various components of signs. The advantage of detailed analysis is that it pushes us to describe the language carefully, and makes us sensitive to critical dimensions of acquisition.

Analyses of adult signing, however, often treat complex lexical items as if they were frozen or unanalyzed. Again, we appeal to our criterion of substitutability in a lexical frame. A simple example may help to clarify this central issue in the design and use of BTS. Consider the ASL sign **GIVE**, which is similar to signs for 'give' in other sign languages. In the 'frozen' or 'generic' or 'non-specific' form, the handshape (flattened-**o**, palm up) does not specify the nature of the transferred object. The path components (*-src-* and *-gol-*) indicate the giver and recipient. One might conclude that the handshape is not a 'classifier', because it does not 'classify', or that it is not a 'property marker' because it does not identify a particular property of the transferred object. However, in the BTS analysis, the generic handshape is just that: **a generic classifier**, corresponding to generic classifiers in many spoken languages. It is fully a meaning component of the verb. Furthermore, it contrasts with flattened-**o**, palm down, which means 'put' in ASL, using the same path component. In BTS such generic elements are labeled *LEX* — that is, their function is to indicate the particular lexical category (e.g. 'give' vs. 'put'). The transcription of generic 'give', in the frame 'from me to you', is therefore:

(12) *(give)-pm'LEX(give)-src'1-gol'2.*

LEX(give) should be read as 'the generic handshape that specifies the lexical item as 'give'.' Replacing *pm'LEX* with a specific 'classifier' handshape adds specification. For example, if the transferred object is a glass, *pm'LEX* is replaced by *pm'CYL* (cylinder). Thus, the notation would be:

(13) *(give)-pm'CYL-src'1-gol'2.*

We will not give further examples of the use of LEX here. But we wish to underscore the importance of searching for **contrasting examples**, with native-signing co-workers, in order to determine if a sign should be transcribed componentially or simply with an upper-case word in the corresponding written language. In our experience, this is often a difficult issue, requiring a good deal of exploration and discussion before a satisfactory analysis is reached for a particular lexical item or set of related items.

4. Temporal components of signs (App. §4)

The temporal dimension is central to signed languages, thanks to the use of two moving articulators and simultaneous information conveyed by parts of the face, body parts, and shifts in gaze and posture. All such components are treated as meaning components in BTS, without deciding on the ultimate linguistic status of each dimension of signed communication. (Therefore we prefer the term 'component' or 'meaning element' to 'morpheme.')

4.1 Manual simultaneity (App. §4.1)

The two hands can do different things at the same time. For example, a child signs CANDY with the dominant hand, while pointing on a picture in a book with the non-dominant hand (*nh*). BTS indicates temporally co-occurring elements by enclosing them between curly brackets. This utterance would have the form:

(14) **CHI: { CANDY PNT(nh)(on_book) }.*
(For purposes of economy, the dominant hand is not explicitly indicated unless its use is exceptional in some way.)

4.2 Manual/nonmanual simultaneity (App. §4.2)

A central feature of signed languages is the use of the face and/or body to add meaning to ongoing manual signing. BTS marks four distinct types of nonmanual components. These can occur simultaneously with a single sign, or can have duration (scope) over several signs. The carat (^) is used to indicate onset and offset of a nonmanual feature which has scope (corresponding to the horizontal line drawn across glosses in most sign language transcriptions).

4.2.1 *Operators*

A grammatical operator has scope over a phrase or clause (negation, question, topic, relative clause, conditional, etc.). The notation is ^*opr'X* … ^. For example, the following indicates negation of a proposition:

(15) **CHI: ^opr'NEG WANT BOOK ^.*

Note that *opr* counts as a grammatical element, similar to *pm*, *pth*, and so forth; *NEG* counts as a content element — that is, a lexical or meaning-bearing element, along with other upper-case elements. The same is true of other nonmanual components.

4.2.2 *Modification*

Nonmanual components can also be employed to modify the referential meaning of a lexical item or proposition by adding a dimension through the articulation of the sign and/or accompanying facial expression such as augmented or diminished size or rate, intensity, and so forth. The notation is ^*mod'X* … ^. To give a simple example, an SLN-signing 2-year-old wanted her mother to draw a big house. She greatly extended the sign HOUSE (*AUG*=augmented):

(16) **CHI: HOUSE-^mod'AUG.*

In this example, the nonmanual component is part of a word. (There is no offset carat because such a nonmanual ends with the end of the word sign.) Modification, of course, can extend over longer stretches of signing as well.

4.2.3 *Affect*

Another use of mouth, face, and body is to provide affective accompaniment to an utterance, indicating the signer's attitudinal stance towards the situation being communicated (e.g. disgust, surprise, excitement). The notation is ^*aff'X* … ^. For example, in SLN, a teacher asks a child to do something and the child agrees, though with some worried concern:

(17) **CHI:* ^*aff'WORRIED CAN PNT_1* ^.

While it may seem unorthodox to treat such affective coloring on a par with other components of the language, we believe that such concerns are based on a narrow and conventional definition of what is 'linguistic.' In comparable situations in spoken languages, affective prosody has a marginal role in most linguistic analyses, while affective particles and inflections are considered more 'linguistic.' We do not have a reasoned argument to exclude some types of nonmanual components from our transcriptions; we leave it to individual researchers to decide how to present different types of components in their descriptions and theoretical accounts of the language and its course of acquisition.

4.2.4 *Discourse markers*

Non-manual markers are also used to regulate the flow of discourse, corresponding to discourse particles and intonation contours in spoken languages. Such markers have interpersonal functions such as checking if the addressee has comprehended, has agreed, and so forth. The format is ^*dis'X* … ^. In the following example, a deaf SLN-signing mother responds to her 2-year-old's labeling of the lights on a picture of an ambulance. Note that there are two types of nonmanual elements in this utterance. The first is an operator, indicating confirmation (*YES*); the second is a discourse marker checking whether the child agrees (*CONF*=confirmation check). The operator (repeated head-nodding) extends throughout the utterance, including the discourse marker (a sort of questioning facial expression). The offset timing of the two non-manuals coincides (^ ^).

(18) **MOT:* ^*opr'YES CAR* ^*dis'CONF LIGHTSIGNALS* ^ ^.

4.2.5 *Role shift*

A pervasive aspect of sign language communication is the subtle shifts of gaze and posture that allow the signer to convey the utterances, thoughts, or actions of other people. This part of sign language needs much more careful study, and BTS does not present a fine-grained analysis of role shift at this time. However, we do consider it to be a meaningful element, and one that follows conventional, linguistic patterns. At this point, we simply indicate role shift by *RS*. Note that we use capital letters for this

element, treating role shift as a meaning component in an utterance. We do not use the carat (^) to indicate onset and offset of role shift, because we want to search separately for nonmanual features and role-shifting. Instead, we use the reverse apostrophe (left single quote, grave accent) for this function: *'RS …'*. For example, in a book-reading activity, a deaf ASL-signing mother points out a picture of a dog, and then role shifts into the dog to indicate that the dog is excited. She signs EXCITE with an accompanying nonmanual indicating the dog's affect. The notation *'RS(dog)* indicates that she has taken on the role of the dog. Note that ^*aff* can co-occur with role shift. (§4.2. provides notation for cooccurrences of various types of nonmanual components, with various onset/offset timings.)

(19) **MOT: DOG 'RS(dog) EXCITE-^aff'INTENSE'.*

4.2.6 *Gaze*

Gaze direction is another aspect of signing that needs more careful analysis. BTS allows for indication of gaze direction, leaving it up to the transcriber to decide when this is relevant to the particular study at hand. Because we are concerned with the development of signing, and with the nature of caregiver-child interaction, we have developed means of noting direction and timing of gaze (§4.2.6. of the Manual).

5. Extralinguistic communicative behavior (App. §5)

Again, because we are studying the development of signing within the context of ongoing communication, BTS provides means of noting attention-getting devices (§5.2) and gestures and actions that are relevant to communicative events. As indicated in §5.1, gestures (*%ges*) and actions (*%act*) can be entered as part of the utterance line, or on a dependent tier, at the discretion of the transcriber. In our preliminary transcriptions of parent-child interaction with 2-year-olds, we have often found it useful to include such information on the utterance line. For example, an SLN-signing 2-year-old is looking for a pen:

(20) **CHI: [%ges: don't know] WHERE [%act: looks around room]?*
**MOT: [%act: shows pen to chi] FIND.*

6. Coding factors of performance and contextual situation (App. §6)

Finally, BTS provides means of indicating factors that are relevant to analysis of child signing. §6 describes notation conventions for errors, interruptions, and for the creation of dependent tiers for additional information and coding.

Errors are noted by [*], with further information on a dependent tier (*%err*). For example, an ASL-signing child of 1;9 signs HORSE with a handshape error. For this analysis, the transcriber is not concerned with the phonology of the error and simply notes on the error tier that there was a handshape error (*$hs*); however, another transcriber might have added a dependent tier for phonological notation (*%pho*).

(21) **CHI: HORSE [*].*
%err: HORSE $hs;

Dependent tiers (§7) provide for more extended commentary, including situational comments, error analysis, phonology, and so forth. For example, in (22) a hearing ASL-signing mother to a 3-year-old, the comment tier (%com) provides the transcriber's clarifications:

(22) *MOT: ^opr'Q SISTER ^?*
%com: asking if girl doll is sister
**MOT: SISTER PNT_3 WHO PNT_3?*
**MOT: ^opr'NEG NOT SISTER ^ NO.*
%com: commenting on mislabeling of doll as SISTER

7. Concluding remarks

We hope that this paper, in conjunction with the appended Manual, will provide the reader with sufficient information (and motivation) to try out BTS. We expect to receive many questions, objections, and constructive suggestions. Our aim is to continue to refine BTS, in international collaboration, to the point that it can serve as a standard, along with the CHILDES standard for transcription and analysis of spoken languages. We also hope that the practice of extending BTS will contribute to the morphological analysis of various sign languages. Please send comments to Dan Slobin at slobin@cogsci.berkeley.edu or to Department of Psychology, 3210 Tolman #1650, University of California, Berkeley, CA 94720–1650, USA. Comments will be shared with the BTS group, and a discussion should ensue.

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Manual: The Berkeley Transcription System (BTS)[1]

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1. Goals of transcription

The following conventions are intended to be consistent with CHAT and CLAN (with some necessary additions, given the nature of sign languages).[2] The goal is to represent utterances in a consistent morphological and semantic notation, following the grammars of ASL and SLN (and, potentially, other sign languages). We have avoided any sort of phonological transcription of utterances in the basic representation of turns. These conventions are thus intended for the speaker tier (*). Dependent tiers (%) will be addressed later. Manual and non-manual elements are represented in a single line, using ASCII characters only.

Lexical items are written in capitals and bounded by spaces. Because of this distinctive use of capitalization, searches in CLAN must use the +k switch to recognize the distinction between upper/lower case. A sign is represented by at least two uppercase letters. There can be no spaces within a lexical item: The components of polycomponential lexical items are separated by hyphens (as discussed in Section 3, Polycomponential Signs); other elements are joined by underscore or parentheses without spaces. An utterance line ends with a period or question mark, preceded by a space.

Polycomponential signs and some other signs contain meaning components that fall into different categories. In this situation, the linguistic or meaning category is written in lowercase letters, followed by an apostrophe and the instantiation of that category in uppercase letters. For example, if one were transcribing a spoken language, a meaning category might be "number," and the instantiation of that category might be "singular." This would be transcribed as follows: number'SINGULAR. Similarly, a word that is marked for gender might be transcribed as: gender'MALE. An example from spoken English is the word "birds," which would be transcribed as follows: BIRD-num'PL. The unit category'INSTANTIATION is counted as a single meaning unit for the purpose of CLAN searches. See examples of this convention in Section 3, Polycomponential Signs.

1.1 Features pertaining to individual lexical signs

SIGN # SIGN	pause between SIGNs
SIGN(*2)	sign repeated twice, but only counted once (for analysis)
SIGN(*N)	sign repeated multiple times, but only counted once (for analysis)
SIGN_SIGN	two English words which represent a single sign, e.g. OH_I_SEE (one meaning component)
SIGN-SIGN	two signs combined to produce one new sign, e.g. NOT-NEED (two meaning components)

2. See the CHILDES website for the full set of required conventions: http://childes.psy.cmu.edu/.

SIGNSIGN	two signs combined to produce one new, compound sign, e.g. GOODNIGHT, WHITEHOUSE (one meaning component)
&SIGN	uncompleted SIGN
<SIGN> [?]	uncertain transcription
XX	unintelligible but definite sign, to be included in word counts
xxx	unintelligible sign or gesture, to be excluded from word counts
SIGN(fs)	SIGN is a fingerspelled loan sign
S_I_G_N(fs)	SIGN is fingerspelled, not a loan sign

1.2 Additional Specifications of Individual Lexical Signs

SIGN:	SIGN is held
SIGN-^mod'PRX	SIGN directed to close/proximate location
SIGN-^mod'MID	SIGN directed to intermediate location
SIGN-^mod'DIS	SIGN directed to distant location

SIGN(1h)	one-handed SIGN (if usually 2h)
SIGN(2h)	two-handed SIGN (if usually 1h)
SIGN(nh)	non-dominant-handed SIGN (if anomalous)
SIGN(dh)	dominant-handed SIGN (if anomalous)

Note: If marking both number of hands and which hand(s), the number of hands comes first. e.g., SIGN(1h)(nh). If SIGN is (1h), only mark which hand if the non-dominant hand is used.

SIGN(v)	SIGN is a verb (if ambiguous)
SIGN(n)	SIGN is a noun (if ambiguous)
SIGN	citation form
SIGN2	alternative form (e.g., WHERE, WHERE2)
X@ns	name sign (with X handshape)
X@is	idiosyncratic/invented sign (with X handshape)
X@hs	home sign (with X handshape)
SIGN@in	initialized sign

1.3 Numerical signs

Signs which incorporate a number into the handshape are indicated using the numerical sign followed by an underscore and the incorporated number:

ORD_1	ordinal sign ("first item")
AGE_1	age sign ("one-year-old")

WEEK_1	week sign ("one week")
MONTH_1	month sign ("one month")
PLACE_1	competition place sign ("first place")

2. Points, indexes, and pronouns

PNT_1	point to self
PNT_2	point to interlocutor
PNT_3(person)	point to third person, if present
PNT_3(obj)	point to object, if present
IX_3(person/object)	index a person or object in signing space, if not present
PNT_1_2	1st & 2nd person singular ('me and you')
PNT_1_3	1st & 3rd person singular ('me and him/her', 'two of us')
PNT_1+	1st person plural ('me and somebody', generic 'we')
PNT_S	Selective: specific points to each of the people or objects being referenced. This is used either to emphasize the individual referents or if the people being referenced are not physically near each other.
PNT_M	Multiple: The referents are indicated using a "1" handshape (index finger extended) and a sweeping motion. This can be used for any number of referents greater than 1.
PNT_N	Numbered: The number of people (or objects) being referenced is incorporated into the handshape of the pronoun (for 1–5 referents).
PNT_1_2_S	1st & 2nd person plural, selective ('me and specific others of you')
PNT_1_2_M	1st & 2nd person plural, multiple/sweep ('me and all of you')
PNT_1_2_N	1st & 2nd person plural, numbered ('me and a certain number of you')
PNT_1_3_S	1st & 3rd person plural, selective ('me and specific others')
PNT_1_3_M	1st & 3rd person plural, multiple ('me and all others')
PNT_1_E	1st person plural, exclusive ('we', excluding addressees)
PNT_1_I	1st person plural, inclusive ('we', including addressees)
POSS_1	1st person singular, possessive
POSS_2	2nd person singular, possessive
POSS_3	3rd person singular, possessive
POSS_1+	1st person plural, possessive
POSS_2+	2nd person plural, possessive
POSS_3+	3rd person plural, possessive

SIGN_S	fingerspelled S for possessive (e.g. MOM_S = Mom's)

Examples of more complex pronouns:

PNT_1 PNT_2	1st person, 2nd person, in succession ('me, you')
PNT_1_2*2	1st & 2nd person (2) ('me and you two')
PNT_1_2*3	1st & 2nd person (3) ('me and you three')
PNT_2_3*2	2nd & 3rd person (2) ('you and them two')
AREA	sign produced when an open-5 hand, face down, makes small circles in neutral space.
AREA-loc'X	sign AREA produced somewhere other than neutral space. The -loc'X component is added to indicate the location of the area being indexed, e.g. AREA-loc'CHEST'B or AREA--loc'L.

3. Polycomponential signs

In the fullest possible elaboration, a polycomponential construction includes:

1. a gloss, indicated in lower case letters enclosed in parentheses to avoid counting it as a lexical item
2. paths of movement in the form -pth'X (also -src, -gol, and -rel)
3. property markers (figures and grounds) in the form -pm'X
4. locations in the form -loc'X
5. posture in the form -pst'X
6. movement patterns in the form -mvt'X
7. non-manual elements in the form -^mod'X (also -^opr, -^aff, and -^dis)
8. aspect in the form -asp'X

Only the gloss and one property marker are obligatory. Locations, movement patterns, and paths of movement may be absent or may have several entries. There can only be one aspect entry. These component morpheme types are indicated in lower case, followed by an apostrophe and specification of the content component; e.g., -pm'TL indicates a two-legged animate being. The order of the components is: parenthetical gloss, property marker(s), (ground/figure), location/movement, modification, aspect (see examples).

Each of the eight possible components of polycomponential verb transcription is presented below, with examples at the end of this section.

3.1 Gloss

The first symbol in the verb transcription is the approximate English gloss (e.g. jump, dismount, ride_seated, ride_mounted). The elements within a gloss are separated by underscores, in order to retrieve them as units.

3.2 Paths of movement

-pth'X	path of movement, when semantically meaningful
-src'X	movement from a place or from contact
-gol'X	movement to a place or to contact
-rel'X	movement relative to a fixed referent object

The components "source" and "goal" can be combined with the component "locative relations" (see Section 3.4.1) to indicate which part of the figure and ground are in contact, e.g. (jump)-pm'PL_H-pm'TBL-src'PL_H_TOP-pth'A ('two-legged figure jumps from the top of a horizontal plane in an arc path'). The components of path, source, and goal are indicated by uppercase letters from the following list. (The locative components of referent points in relative movement are the same as those for locative relations, and are listed in Section 3.4.1.)

3.2.1 *Shape (path only):*

I	line
A	arc
C	circle
W	wandering
Z	zigzag
R	rotating

3.2.2 *Vertical direction:*

U	up
D	down

3.2.3 *Front/back direction:*

F	forward
B	backward

3.2.4 *Lateral direction:*

S	side

3.2.5 *Body-oriented direction:*

R	right
L	left

3.2.6 *Oscillating direction:*

BF	back-and-forth

3.2.7 *Other directions:*

TOG	two property markers moving towards each other
AP	two property markers moving apart from each other
OBJ(ref)	real-world object referent (e.g., -gol'OBJ(paper))
X_pm'X	location/direction in relation to property marker (e.g. L_pm'CYL 'left of cylindrical object')
OUT	out
IN	in

3.3 Figures and grounds

The notation -pm'X indicates a property marker of type X. The following list of property markers is partial, and is open to refinement; handshape pictures are provided with this section. Note that property markers are given semantic (e.g. 'two-legged animate being') rather than phonological (e.g. 'V') definitions. However, in some cases (as in HOLD property markers), the general semantic category (HOLD) is followed by an abbreviation for the specific handshape used. Sometimes there is no single English word that summarizes the semantic content of a property marker; and in many cases the meaning range of a property has not yet been fully determined. Therefore the abbreviations should be treated as mnemonics for the category indicated by the handshape. When two property markers are part of a single verb, the order of notation is **ground** followed by **figure**. When specification is required regarding which property markers represent the figure and ground, this is indicated in parentheses following the property marker (e.g. pm'STK(F), for a stick property marker that acts as a figure). If the two hands represent two entities (e.g. a cup and its lid), use two separate pm's. If the two hands represent a single entity, use one pm (e.g. pm'HO_C(2h)).

3.3.1 *Entity property markers:*

LEX: Lexical property marker for a specific polycomponential sign
LEX(x): Lexical property marker with x handshape

AIR:	Air
AIRPLANE:	Airplane
BULK:	Bulky mass, such as a block

BOX:	Box-shaped object
CIR:	Circular object
CN :	Container
CYL:	Cylindrical object
FBL:	Four Bent Legs (e.g. four-legged animal)
FD:	Flat Disk or Hole
FL :	Four-Legged erect being (two-hands)
GUN:	Gun-like object
LID:	Lid (to be used in conjunction with ground pm)
OBJ:	Real object (specified in parentheses)
PW:	Parallel walls
PL:	Plane (non-specific posture)
PL_D:	Declining plane
PL_H:	Horizontal plane (palm down)
PL_G:	Generic plane (horizontal, palm up)
PL_I:	Inclining plane
PL_ N:	Narrow plane (horizontal)
PL_VH:	Plane showing vertical height (fingertips up)
PL_VL:	Plane showing vertical length (fingertips forward)
PTH:	Path property marker, used to show the path that a figure travels (shown: to the left, forward, uphill)
SPHERE:	Spherical object (e.g. ball, balloon)
STK:	Stick-like object
TBL:	Two Bent Legs (e.g. small animal, seated person, chair)
TL:	Two-Legged animate being
TREE:	Tree
TRIGGER:	Trigger finger
VEH:	Vehicle property marker

3.3.2 *Handle property markers:*

HO_* Handle property marker, where * is a label for the handshape.

Handshape labels follow the ASL manual alphabet (e.g. HO_S represents a closed fist as in the S handshape). In addition, there are handshapes which do not match a letter in the manual alphabet. These are labeled following Tenant & Brown (1998).

BO:	Baby O
FO:	Flattened O
FF:	Flattened F
BL:	Bent L
ON:	Open N

WON: Wide Open N
OO: Open O
WC: Wide C
WSC: Wide squarish C
BF: Bent 5
BT: Bent 3
OB: Open B
XA: Thumb on side of bent index finger (2 views)
OXA: Thumb off side of bent index finger
OT: 1 Tip (pad of index finger)
OAT: Open A Tip (pad of thumb)
OF: 1 Face (face of index finger)
AOB: Arms, open B (whole arms, including hands)

3.3.3 *Tracing property markers*

TR_* Tracing property marker, where * is a label for the handshape.

Tracing property markers are transcribed as pm'TR_*-trc'X, where * is the handshape used to do the tracing and X is the shape traced, e.g. pm'TR_STRIP-trc'LONG. The following trace handshapes have been defined:

PLANE
CS: Curved surface
STRIP
BROAD_STRIP
THIN_STRIP
THREE_D_STRIP
TUBE
THIN_TUBE
LARGE_TUBE
INSIDE_TUBE
THREAD
OUTLINE
HALLWAY

3.3.4 *Body part designation:*

If the signer uses an actual body part, rather than a manual sign to designate a body part, use the following notations:

pm'B_BODYPART referential use of the signer's body to represent an actual body part, e.g. pm'B_HEAD.

Note: In a polycomponential construction, the body often serves as the ***ground*** *when used in this way.*

pm'OBJ(bodypart) a sign articulated towards another person or object, in which case body parts are treated like other objects. It is possible to specify whose body the sign was directed towards, e.g. gol'OBJ(mouth_2) to represent a sign articulated on the addressee's (2nd person) mouth

3.4 Locative relations

The notation -loc'X indicates a locative relation between figure and ground of type X. Locative components are used to indicate the location of the figure property maker with respect to the ground property marker. The following is a partial list:

INT	interior ('inside')
SUP	superior ('above')
INF	inferior ('below')
TOP	top ('upper surface')
BOT	bottom ('under surface')
EDG	edge
FRO	front
BAC	back
PAR	parallel
NXT	two property markers articulated at the same time and are articulated next to each other, but do not indicate a figure/ground relationship.
BHD	behind
AHD	ahead
RSP	referent space: discourse implied, previously established
0	referent space: frame implied, not previously established

Note: Two locative components can be combined; e.g., FRO_EDG *(front edge).*

The notation loc'CON is used to describe two property markers which do not have a figure/ground relationship but are in contact. To add further information about where the two pm's make contact, use a parenthetical description to indicate where on the HANDS the two pm's were in contact:

loc'CON	contact without a figure-ground relationship
loc'CON(x)	contact at x location on the hands, e.g. loc'CON(fingertips)

3.5 Posture

The component "posture" (pst'X) indicates the posture of the figure for the subset of polycomponential verbs which indicate posture. Examples of such verbs are sit, stand, lie, mount, and ride. The following posture components have been defined:

ERC	erect	STR	straddling
RCL	reclining	SIT	sitting
RCL_V	reclining ventrally	RCL_D	reclining dorsally

3.5.1 *Orientation*

The component "orientation" is used to indicate the orientation (relative to the signer) of either the figure or the ground. In a polycomponential construction, information about orientation and posture should follow the property marker to which it refers. Orientation is only marked when it differs from the default orientation for that property marker in that referent situation. It is possible to define orientation by the direction in which the palm and fingertips are facing (e.g., ori'FF = palm forward, fingertips forward):

Palm:

F	forward
B	back
S	side
U	up
D	down

Fingertips:

F	forward
S	side
B	back

Orientation information can be written as two letters, one for palm orientation and one for fingertip orientation. If the orientation component does not add meaning to the construction, add orientation as part of the figure or ground property marker (e.g., pm'VEH_SF is a vehicle property marker with the palm sideways and the fingertips forward).

3.6 Movement patterns

The notation -mvt'X indicates the movement pattern of a verb. Lexical movement (mvt'LEX) indicates the movement pattern that identifies the particular verb. The lexical movement pattern does not contrast with other movement patterns; its only function is to indicate that the configuration has the meaning of the particular verb.

-mvt'LEX(verb)	movement which defines a lexical item but gives no further meaning; e.g., the ASL verb 'ride' (on an animal) consists of property markers indicating the configuration of ground (vertical plane), figure (two-legged creature), and posture (straddling), plus a non-directional component of movement (rotating). Because this movement does not contrast with any other movement using this pattern of components, it is simply transcribed as -mvt'LEX(ride).
-mvt'WIG	wiggling movement
-mvt'BOUNCE	bouncing movement
-mvt'SHAKE	shaking movement
-mvt'WAVE	waving movement
-mvt'CLOSE	hand closing movement
-mvt'OPEN	opening movement
-mvt'JAB	short, jabbing movement
-mvt'LONG	showing long object, e.g. shelf of bed
-mvt'BEND	bending movement
-mvt'CP	change in posture
-mvt'CO	change in orientation
-mvt'WANDER	wandering movement
-mvt'ALT	alternating movement (single-handed or between hands)

3.7 Tracing

The notation trc'X indicates a construction in which the shape of an object is traced. This is used primarily for SASS's and descriptive signs. When tracing is used, the transcription includes a pm'TR_* (tracing handshape) component as well as a trc'X (shape of tracing) component. For example:

pm'TR_STRIP-trc'F_A	(an object indicated using a STRIP handshape follows a forward arc)

(Refer to Section 3.3.3., Tracing property markers, for a partial list of tracing handshapes.)

3.8 Non-manual components

See Section 4.2 for an explanation of nonmanual components and a list of nonmanual components that may be included as part of a polycomponential construction.

3.9 Aspect

The notation -asp'X indicates an aspect of type X. Various aspects can be superimposed on a verb. A full list is not yet ready. Example codes are:

CES	cessive (includes a sudden stop or cut off)
ITR	iterative (continuous with clear pauses or stops)
ITR_CUM	iterative cumulative (e.g. stacking of blocks, one on top of the other)
CONT	continuous
DIST	distributive
DEL	delayed inceptive (about to do something)

3.10 Other features of polycomponential constructions

3.10.1 *Configurations as units*

A configuration of property markers can act as a unit with respect to another component, including real-world objects. Curly brackets are used to indicate simultaneity. With regard to verbs, a configuration can move to a new location; for example, a doll on top of a board is moved to be located on a table:

(put){-pm'PL_H-pm'TL-loc'PL_H_TOP}-gol'OBJ(table)

3.10.2 *Continuation from previous utterances*

In a series of utterances, a configuration can be held or continued from a previous utterance. For example, if the doll-on-board had already been set up in a previous utterance, the tilde (~) is used for each component which is continued, to indicate that this component was not created anew in the following utterance:

(put){-~pm'PL_H-~pm'TL-~loc'TOP}-gol'OBJ(table)

In addition, the component may serve as a different element in the second utterance, e.g., src'INT can become -~loc'INT in a subsequent utterance. This means that the element with the tilde is continued from the end-product of the previous utterance.

If part or all of an entire polycomponential construction is continued from a previous construction, this is indicated using a tilde (~) before the whole construction. This may happen when one motion is continued across several constructions.

3.10.3 *Continuation with handshape change*

The percent sign (%) is used when the handshape changes to form a new sign which adds meaning, yet the configuration is held over from the previous utterance. In the following example, in the first construction — (head_move) — pm'HEAD is formed with one handshape, but in the second construction — (look_around) — the index and middle fingers are extended forwards to form pm'%LOOK:

(head_move) -pm'CN-pm'HEAD-src'INT-pth'U-gol'OUT-pm'HEAD'B- mvt' ULR'B-^aff'B .
(look_around) -~pm'CN-pm'%LOOK-~loc'INT_SUP-mvt'LR- pm'HEAD'B- mvt' LR'B ~^aff'B

3.10.4 *Shorthand for figure and ground*

When property markers or other elements are repeated more than once in a polycomponential construction (e.g. first as pm and then as src or gol), the later instance(s) of the element can be notated using the shorthand F (for Figure) or G (for Ground). For example:

(put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'PL_G(book_G)_TOP

could be written as:

(put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'G_TOP

3.11 Examples of polycomponential signs

The following are examples of polycomponential verbs, with possible translations in parentheses. (Note that this analysis reveals derivational relationships between verbs of location and verbs of movement.)

(sit_on)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR = 'sit on a horse'
(mount)-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR = 'get on a horse'
(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride) = 'ride a horse'
(dismount)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-src'PL_VL = 'get off of a horse'
(mount_seated)-pm'CN-pm'TBL-gol'CN-pst'SIT = 'get into a car'
(ride_seated)-pm'CN-pm'TBL-loc'CN_TOP-pst'SIT-mvt'LEX(ride) = 'ride in a car'
(jump)-pm'PL_G-pm'TL-pst'ERC-mvt'LEX(jump) = 'jump up and down'
(jump)-pm'PL_G-pm'TL-pst'ERC-src'PL_G = 'jump off of a horizontal plane'
(jump)-pm'PL_G-pm'TL-loc'PL_G_TOP-pst'ERC-src'PL_G-gol'PL_G = 'jump from one point to another on a horizontal plane'
(get_on)-pm'PL_H-pm'TBL-gol'PL_H_TOP-pos'USL = 'cat gets on high, side, left table'
(give)-pm'LEX(give)-src'3-gol'1 = 'give from her to me'
(give)-pm'CYL-src'3-gol'1 = 'give cylindrical obj from her to me'

3.12 Verb agreement

Verb agreement is indicated by the same conventions as used for transcribing directionality in verbs of motion (i.e. by use of src/goal and numeric indications, as in the examples of 'give', above). For example, 'you show me': (show)-pm'LEX(show)-src'2-gol'1.

4. Temporal components of signs

4.1 Manual simultaneity

4.1.1 *Simultaneity within an utterance*

Single curly brackets surrounded by spaces enclose elements that co-occur in an utterance. For example, a child signs CANDY while pointing on a book with the non-dominant hand:

*CHI: { CANDY PNT(nh)(on_book) } .

Note: Indicate which sign is on the non-dominant hand; the default is the dominant hand.

Curly brackets that enclose more than one sign are surrounded by spaces. To indicate earlier onset of one sign in curly brackets, append (o) to the sign, e.g.:

*CHI: { CANDY(o) PNT(nh)(on_book) } .

Curly brackets that indicate simultaneity within a complex sign are not surrounded by spaces, as in the the following example, given in Section 3.10.1 (configurations as units):

(put){-pm'PL_H-pm'TL-loc'PL_H_TOP}-gol'OBJ(table)

4.1.2 *Simultaneity between utterances*

Overlaps are coded in the standard CHAT fashion:

*CHI: WANT < BOOK > [>] PNT_2 ?
*MOT: < WANT > [<] .

Note on utterance segmentation: *If a signed utterance is grammatical, break the utterance by proposition or clause boundaries. If a signed utterance is ungrammatical, break the utterance by prosody (indicated by pauses, placing the hands down, etc.).*

4.2 Manual/non-manual simultaneity

Non-manual elements are indicated by a carat (^). There are four types, as described below: operator (^opr), modification (^mod), affect (^aff), and discourse marker (^dis). Such an element can be added to a single sign; however, if the nonmanual element has scope over several signs, this is indicated using the following conventions:

SIGN-^opr'X	nonmanual element associated with a single sign
^opr'X SIGN SIGN ^	nonmanual element has scope over several signs

If two different non-manuals are superimposed on a single sign or utterance, each has its own carat, using the following conventions:

{ ^opr'X ^mod'X } SIGN	simultaneous onset of two nonmanuals
^{ opr'X ^mod'X } SIGN SIGN ^	two simultaneous nonmanuals over two signs
SIGN ^ ^	simultaneous offset of two nonmanuals
^opr'X ^mod'X SIGN	sequential onset of two nonmanuals
^aff'X ^opr'X SIGN opr^ SIGN aff^	sequential offset of two nonmanuals
SIGN-^opr'NEG	nonmanual which adds a component to a sign
SIGN-^opr'NEG-^aff'X	simultaneous onset of two nonmanuals w/in a sign

4.2.1 *Operators*

^opr'X	grammatical operator which operates on a whole phrase or clause (e.g. negation, yes/no question, wh-question, topic marker, relative clause marker, conditional marker) (partial list)
^opr'NEG	negation
^opr'YNQ	yes/no question
^opr'WHQ	wh-question
^opr'TOP	topic marker
^opr'REL	relative clause marker
^opr'COND	conditional marker
^opr'AFR	affirmation (head nod)
^opr'RHQ	rhetorical question

4.2.2 *Modification*

^mod'X	modifies the referential meaning being expressed by adding a dimension (e.g. augmented/diminished size, rate, intensity) (partial list)
^mod'RAP	rapid movement

^mod'DUR	durative activity, situation
^mod'AUG	augmented size, rate, or intensity
^mod'EFF	with exaggerated effort
^mod'CARE	with care or caution
^mod'FADE	fading movement or articulation

4.2.3 *Discourse markers*

^dis'X	markers which regulate the flow of discourse (e.g. checking for agreement, comprehension, confirmation) (partial list)
^dis'CONF	confirmation check
^dis'AGR	agreement
^dis'PRMPT	prompt

4.2.4 *Affect*

Affect is added to signs in different ways. When a signer is talking about his or her own experience, or is acting as a narrator describing his or her own view of someone else's experience, affect is transcribed as a component in the form aff'X:

^aff'X	freely varying affective accompaniment to a lexical item or utterance to indicate the signer's attitudinal stance towards the situation being communicated (e.g. disgust, surprise) (partial list)
^aff'DISGUST	disgust
^aff'SURPRISE	surprise
^aff'ANGER	anger

Alternatively, when a signer takes on the affect of another character for a specific sign, or of his or her own affect at a different point in time (e.g. telling a narrative about one's self), the signer uses a form of role shift. This can occur as a component of a polycomponential sign, or as an added meaning component to an individual sign, and is transcribed as follows:

^aff'RS_X	freely varying affective accompaniment to a lexical item or utterance to indicate the affect of the character being represented, e.g. ^aff' RS_SCARED(baby).

(See Section 4.2.5., Role Shift, for transcription of role shifting which has scope over several signs or utterances.)

Note: In a polycomponential construction, the body often serves as the ***figure*** *when used in this way.*

4.2.5 *Role shift*

When a signer takes on the perspective of the character being represented for an extended period of time, this is transcribed as a role shift:

'RS(char) SIGN'	role shift: The entire signed utterance contained within the role-shift marker is produced from the perspective of the character being represented. Onset and offset of role shift are indicated by a reverse apostrophe (left single quote, grave accent) and indication of the person represented by the role shift is indicated in parentheses. Note: RS is in capital letters, since it is a meaningful element.

4.2.6 *Gaze*

It is often essential to know where signers direct their gaze while signing. Gaze direction is indicated by an asterisk (*) and an indication, in lower case, of the object of gaze; e.g.:

*mot	looks at mother
*book	looks at book

Gaze direction is indicated only when the transcriber considers that it is relevant to analysis of the interaction. Special notations are used to indicate a recipient's view of particular signs, indicated by backslashes (\). Such information is especially important for assessing a child's comprehension.

\- SIGN \	recipient does not see SIGN
\q SIGN \	unsure whether recipient sees SIGN

Note: For any modification other than the extension of neutral signing space, insert a %com *line to explain how the SIGN is modified.*

4.2.7 *Modification of signs*

\@ SIGN \	signer modifies location of SIGN outside its normal location
\@\- SIGN …	simultaneous onset of two recipient markings (gaze and modification markings may occur simultaneously)
… SIGN \\	simultaneous offset of two recipient markings
… SIGN @\ -\	sequential offset of two recipient markings

5. Extralinguistic communicative behavior

5.1 Gestures and actions

If part of an utterance consists of non-signed but meaningful activity, notation of such activity is included as main line commentary in square brackets, as follows:

[%ges: identification] identifies the gesture and lexical interpretation for gestures occurring without the use of any object or prop, and/or outside of typical signing space, e.g. [%ges: write] (See Section 3.3.3. for gestures which are reported actions of another person or object.)

[%act: identification] identifies the activity that replaces some or all of an utterance, performed with or on some object, e.g. [%act: throws doll]

[%mim: description] mimed gesture: the signer is reporting the actions of another person or object and these actions include mimed gestures, e.g. [%mim: wave]

5.2 Attention-getting devices

Various means are used to get the attention of the recipient. These devices are indicated by @ag. The @ag is part of the utterance line. The following attention getting-devices have been identified:

t@ag	tap on person
w@ag	wave at person
g@ag	grab person
f@ag	touch face of person
p@ag	pound on surface
l@ag	person flashes light

6. Performance and contextual situation

6.1 Errors and unconventional signs

An error is indicated by [*], in the standard CHAT fashion. If an entire utterance is ungrammatical, with no localizable error within the utterance, [*] is placed at the beginning of the line. If an error can be localized, the intended SIGN is given in square brackets with an equal sign, followed by [*]; e.g.:

*CHI: DAD CHAIR [= SIT] [*] HERE .

Explanations of errors are given on a %err dependent tier, using codes including the following:

$dir	directional error
$pm	property marker error (wrong pm used)
$hs	handshape error
$lex	sign error (wrong sign used)
$loc	location error
$mvt	movement error
$po	palm orientation error
$syn	syntax error (ungrammatical utterance)

If there is more than one error on a line, separate each explanation with a semicolon bounded by spaces. For example, if a child used the wrong handshape for DAD and signed CHAIR with a movement pattern that means SIT, the transcription and error coding would be as follows:

*CHI: DAD [*] CHAIR [= SIT] [*] HERE .
%err: DAD $hs ; CHAIR $mvt = SIT ;

In words with multiple components, use the [*] with a number to indicate which component has the error. However, if the child confuses src and gol, mark this as an error with the * symbol only on the first component, and then add [*] at the end of the classifier construction to mark the error, e.g:

CHI: BOY (grab)-pm'HOLD-mvt'CLOSE-src'3-gol'1 [*] .
%err: src'3-gol'1 $agr = src'1-gol'3 ;

Additional error notations:

[*q]	possible error
[*u]	unspecified error somewhere in the utterance, but not tied to one particular SIGN
[*g]	a sign that is gestural in nature but incorporates conventional sign language handshapes, seen in second language learners and signers using manual codes for spoken language

Note: For phonological errors, the utterance line should represent what is semantically meant by the sign, i.e., what the addressee should get from the message, and not a phonological representation of what the signer signed. The notation of phonological errors will depend on the transcriber's specific research question.

Note: Some "errors" may in fact be creative uses of signs by non-native language users or users who have limited native language models (e.g. hearing parents, children, individuals exposed only to signed systems). In these cases, the transcriber must decide how to notate

the errors. Some may wish to transcribe them as true errors, while others may want to invent new conventions to represent these creative or non-conventional uses of signs.

6.2 Empty utterance line

If a turn consists of a definite, but non-signed response, use the standard CHAT convention of beginning the utterance line with zero (e.g. *CHI: 0). The zero is used when the interlocutor uses only an attention getter (*CHI: 0 t@ag), action, and/or gesture.

6.3 Continuation across utterances

If a sign is continued or held from the previous utterance, the tilde (~) is used to indicate that this sign was not created anew in the following utterance, e.g. ~SIGN.

6.4 Interruption

Interruption and continuation after interruption are coded in the standard CHAT fashion. For example:

*MOT: WANT +/ .
*CHI: PNT_3(on_book) .
*MOT: +, READ BOOK .

6.5 Retracing

Standard CHAT conventions are used for retracing and retracing with correction, as in these examples:

*CHI: <MOTHER> [/] MOTHER LEAVE .
*CHI: <BEAR> [*] [//] BEAR .
%err: BEAR $mov

6.6 Repeated, compressed constructions

Sometimes a signer will repeat a construction that has been previously produced in order to re-instate a perspective from which the signer had temporarily shifted. In this type of repetition, the construction is produced in a compressed form, without the set-up or explanation that was required the first time. This is indicated as:

^cmp UTTERANCE ^ the utterance contained within the carats is a repeated, compressed version of a previous utterance.

7. Dependent tiers

The following is a partial list of dependent tiers for analysis of sign language. Other tiers can be added, based on the particular research question being addressed.

%act	modifies the preceding utterance line, describing actions of signer or recipient that are necessary for the understanding of the transcription
%att	describes participants' attention (e.g. CHI and MOT not attending to one another)
%com	comment
%fg	description of figure/ground relationship
%ges	phonological description of gesture
%gls	gloss (written-language paraphrase for particular complex utterance lines)
%mor	morphology
%pho	phonology
%sem	semantics
%spa	speech act

8. Examples

8.1 SLN (Sign Language of the Netherlands)

This is a segment of joint drawing activity between a mother and her daughter of 2;8 (data of Nini Hoiting):

*MOT: PNT(nh)(with_pen_on_slate) < FATHER > [>] .
*CHI: < MAN > [<] FATHER PNT_3(on_slate) .
*MOT: t@ag MAN .
*CHI: MAN .
*MOT: PNT_3(at_drawing) .
*CHI: PNT_3(at_drawing) PNT_1 [%ges: long ears] .
*MOT: PNT_2 PNT_3(on_slate) .
*CHI: PNT_3(on_slate) GRANDPARENTS .
*MOT: GRANDMOTHER .
*CHI: PNT_3(on_slate)(*N) < A_LOT(*N) > [>] .
*MOT: <^dis'CONF A_LOT FACES > [<] A_LOT FACES ^ .

8.2 ASL (American Sign Language)

This is a segment of book reading between a mother and her daughter of 1;9 (data of Reyna Lindert):

*MOT: t@ag(*2) w@ag ^opr'WHQ SEE WHAT(1h) ^ ?
*CHI: MOUSE(*N) .
*MOT: t@ag g@ag(nh): \- ^opr'WHQ WHAT(1h) ^ \ ?
*CHI: 0 [%act: lifts panel in book] *mot .
*MOT: ^opr'WHQ WHAT(1h) ^ ?
*CHI: < PNT_3(on_book) *mot > [>] .
*MOT: < ^opr'WHQ WHAT(1h)(*2) ^ > [<] ?
*MOT: ^opr'YNQ \- CAT \ t@ag(nh) CAT PNT_3(at_cat_in_book) ^ < CAT > [>] ?
*CHI: < ^opr'NEG 0 ^ > [<] [%ges: don't know/not me] .
%ges: open 5s, wrists rotate out
*MOT: ^opr'WHQ WHAT(1h) ^ ?
*CHI: <BEAR> [*] [//] BEAR .
%err: BEAR $mvt

Reference

Tennant, R.A., & Brown, M.G. (1998). *The American Sign Language handshape dictionary*. Washington, DC: Gallaudet University Press.