

Comparing the Informational Content of Speech/Gesture and Sign Language

SARAH TAUB and PILAR PIÑAR
Gallaudet University

0. Introduction

Linguists have always wanted to compare how languages express information. Do users of different languages communicate essentially the same information, or does language play a critical role in shaping what is included and excluded from a narrative? The “null hypothesis” or simplest assumption might be that humans in general attend to and express the same conceptual elements universally. This paper presents a research methodology that should allow us to evaluate that hypothesis. Earlier work has suggested that the hypothesis fails—that spoken languages differ to a large degree in what is expressed, and that sign languages draw on different resources and may express more information (in certain domains) than spoken languages. Taking spatial motion events as a test case, this paper argues that it is not appropriate to compare languages based on speech alone, or to compare speech to sign language; rather, the speech/gesture complex produced in discourse and narrative is analogous to sign language and constitutes the appropriate level for cross-linguistic comparison. If speech/gesture is taken as the level of comparison, we predict more universal trends in expression of information. The technique presented in this paper should allow collection of quantitative data over a large range of languages.

Talmy (1985) provided an analysis of spatial events upon which much subsequent typological research has been based. He divided motion events into such categories as Figure, Ground, Motion, Path, and Manner, and then classified languages as to how they typically expressed each class of information. In particular, *verb-framed* languages such as Spanish express Path information through verbs, and *satellite-framed* languages such as English express Path through other members of the verb complex (“satellites”). As examples, consider (1), a typical English sentence in which a bird’s Path through a window is described with a verb particle and prepositional phrase, and (2), a typical Spanish sentence where the same Path is described with a verb.

- (1) It flew out of the window.
- (2) Salió por la ventana.
went-out:3SG through the window

Talmy noted that verb-framed languages are less likely to provide complex specifications of Path, as they would require a long series of verbs and thus many clauses (making the discourse feel “over-detailed”); as Manner requires an extra verb or gerund in these languages, it is often left out as well. On the other hand, satellite-framed manner-type languages such as English incorporate Manner easily in the main verb, then typically present long series of Path elements via several satellites. (3) demonstrates the use of a second verb in Spanish to specify Manner, and (4) demonstrates the use of multiple verb particles and prepositions in English to specify complex Paths.

- (3) Salió volando por la ventana.
went-out:3SG flying through the window

- (4) It flew right back out the window, across the street, and into the forest.

Slobin’s (1996) studies of Spanish and English written narratives indicate that differences between the two languages (exemplars of the verb-framed and satellite-framed types) persist over a longer time period than the individual clause. That is, Spanish narratives consistently present fewer explicit Manner and Path elements than English narratives; they do not “catch up” in the course of the story. This analysis, however, considers only written texts and not oral narrative or discourse. Studies show (e.g. Kendon 1986, McNeill 1992) that the gesture that accompanies speech also contains conceptual elements (though it is a matter of hot debate whether such gesture is intended to communicate those elements).

Galvan and Taub (forthcoming) used a similar method of counting conceptual elements to compare the information expressed in American Sign Language and English narratives. Narratives were elicited by the same stimulus (the wordless storybook *Frog, Where Are You?*) and so could be compared more easily. They found that in nearly every category (Ground elements being the only exception), ASL storytellers included more conceptual information; in general, the signed narratives relied on ASL’s highly iconic grammatical resources to compress a huge amount of spatial information into each sentence. But again in this study, analysis of the English narratives looked only at the speech produced by the subject; there was no record of gesture or prosody.

Many people have noted similarities between sign languages and speakers’ gestures; many others have noted differences (the debate has a political edge, since when ASL was thought to be “only gesture”, deaf signers were thought to be without language and mentally impaired). Liddell (2000) has created a precise explanation for this phenomenon based on conceptual blending. According to

Comparing Speech/Gesture and Sign Language

Liddell, both signers and speaking gesturers create a “blend” (Fauconnier and Turner 1996) between an imagined mental space and Real space (i.e. their conceptual model of the space in which they stand). In the blend, imagined entities are conceived of as located in the space around the person. Iconic and deictic gestures may be aimed toward those entities, or may track their progress through space.

For spoken languages, these gestures are loosely integrated with the speech signal: the emphatic stroke phase of the gesture occurs precisely with a spoken word or words that relates to its meaning (McNeill 1992), but the preparatory and refractory phases may vary in timing (indeed, McNeill notes that the precise timing of these other phases may reveal details of the speaker’s thought processes). For sign languages, on the other hand, these gestures are tightly constrained to unify with lexical and grammatical elements. Indeed, certain signs (e.g. pronouns, some verbs, classifier signs) are ungrammatical if they do not contain a gestural element. For one example, ASL pronouns must be placed in signing space so as to indicate the entity to which they refer; for another, verbs such as GIVE must indicate their subject or Source argument and object or Goal argument by moving from a space associated with the Source to a space associated with the Goal. We might describe these gestural elements of sign languages as “grammaticalized gesture”.

If Liddell’s proposal is correct, then sign language is more fully analogous to the speech/gesture complex than to speech alone. If co-speech gesture presents additional conceptual information, then comparison of speech/gesture across spoken languages may also prove more fruitful than comparison of speech alone. Elaborating on the null hypothesis above, if gesture is taken into consideration, cross-linguistically and cross-modally, in comparable narratives we may expect to see the following:

- A. Similar amounts of conceptual information
- B. i. Similar types of information in speech and lexical sign elements
ii. Similar types of information in gesture and gestural sign elements
- C. Similar rates of information presentation

Given the research of Talmy and Slobin, we may hypothesize more specifically the following:

- D. Spanish uses gesture to add more Path and Manner information.

1. Methods

The data presented in this paper are the first report on a larger ongoing typological study of English, Spanish, and ASL. This pilot study looked at two native users of each language. Each subject was paired with another native user of

his/her language. Subjects watched animated cartoons involving the adventures of a cat and a bird; they were instructed to tell what happened in the cartoon to their partner clearly enough so that the partner could then tell the story to a third person. All narratives were videotaped. Partners' narratives were recorded but not analyzed in this pilot study.

In the particular scene analyzed here, the cat and the bird are in high-rise apartments across the street from each other. The cat has been studying the bird through their windows. The cat swings from his window to the bird's window on a rope, but misses the window, crashes into the wall, and falls to the street below.

The researchers developed a list of conceptual elements present in the cartoon, including potential Figure, Ground, Path, Manner, and Instrument elements. The analysis compiled: (i) length of time to tell the scene, (ii) total number of conceptual elements expressed, (iii) number of elements expressed through speech or lexical sign elements, and (iv) number of elements expressed through gesture or gestural sign elements. Lexical and gestural sign elements were distinguished on the following criterion: if the element (e.g. hand shape, movement, location, complete sign) was conventionalized in the lexicon of ASL, then it was counted as lexical; if it was not, then it was counted as gestural. A number of signs contained both lexical and gestural elements.

2. Results

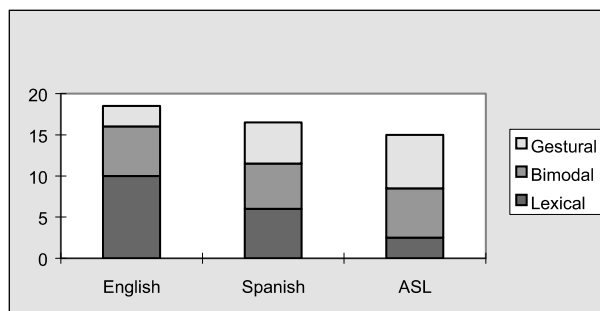
Table 1 summarizes the raw data for total conceptual items expressed by each subject. "Lexical" items are expressed through speech or lexical sign elements only; "gestural" items are expressed through gesture or gestural sign elements only; and "bimodal" items are expressed through both modes. Figure 1 gives the same information in bar graph form, with the two subjects' data averaged for each language.

Table 1. Data for each subject

| Language | Total items | Lexical items | Bimodal items | Gestural items | Time (sec) | Items/second |
|-----------|-------------|---------------|---------------|----------------|------------|--------------|
| English 1 | 19 | 9 | 7 | 3 | 31 | 0.61 |
| English 2 | 18 | 11 | 5 | 2 | 24 | 0.75 |
| Spanish 1 | 15 | 5 | 6 | 4 | 6 | 2.5 |
| Spanish 2 | 18 | 7 | 5 | 6 | 6 | 3.0 |
| ASL 1 | 17 | 4 | 6 | 7 | 10 | 1.7 |
| ASL 2 | 13 | 1 | 6 | 6 | 9 | 1.4 |

Comparing Speech/Gesture and Sign Language

Figure 1. Total conceptual items



Approximately the same amount of information was expressed by each narrator, though the amount of time taken to tell the story varied widely. English subjects expressed more information through speech than through gesture, Spanish subjects expressed approximately the same amount through each modality, and ASL subjects expressed more information through gestural elements than through lexical elements. Without gesture, Spanish subjects produced only 11 and 12 items per story, and English subjects only 16 per story; with gesture, the totals rise to 15 and 18 for Spanish and 19 and 18 for English.

One Spanish speaker used a heavily “gesture-focused” style: the narrative is not comprehensible through the speech alone but requires gestural information. He referred explicitly to his gestures (e.g. “like this” or “here”) and used vocal gestures as well (e.g. “ñññ” accompanied the manual gesture representing the cat holding the rope and swinging across, “pom” accompanied the manual gesture representing the cat hitting the wall).

Tables 2-4 summarize the results for the major conceptual categories: Figure/Ground (lumped together here, since both represent “nominal” items), Path, and Manner. In these tables, the two subjects’ results are averaged for each language. Because the number of data points is so small, no statistical analyses were performed, but we observe that (just as in Table 1) the spread between the two subjects’ numbers is quite small. This information is also presented in bar graph form in Figures 2-4 below.

Table 2. Figure/Ground conceptual items

| Language | Lexical Items | Bimodal Items | Gestural Items |
|----------|---------------|---------------|----------------|
| English | 4.5 | 0.5 | 0 |
| Spanish | 1.5 | 1.5 | 1 |
| ASL | 2 | 2 | 0 |

Table 3. Path conceptual items

| Language | Lexical Items | Bimodal Items | Gestural Items |
|----------|---------------|---------------|----------------|
| English | 1.5 | 3.5 | 1.5 |
| Spanish | 1.5 | 1.5 | 3 |
| ASL | 0 | 1.5 | 4 |

Table 4. Manner conceptual items

| Language | Lexical Items | Bimodal Items | Gestural Items |
|----------|---------------|---------------|----------------|
| English | 4 | 1 | 0 |
| Spanish | 2.5 | 1.5 | 1 |
| ASL | 0 | 1 | 2 |

Figure 2. Figure/Ground conceptual items

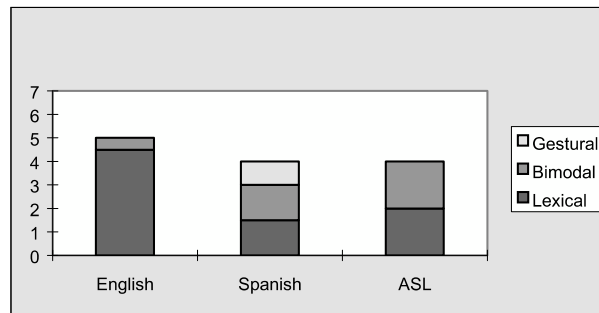


Figure 3. Path conceptual items

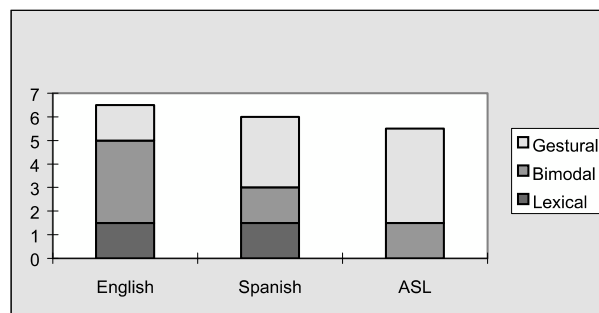
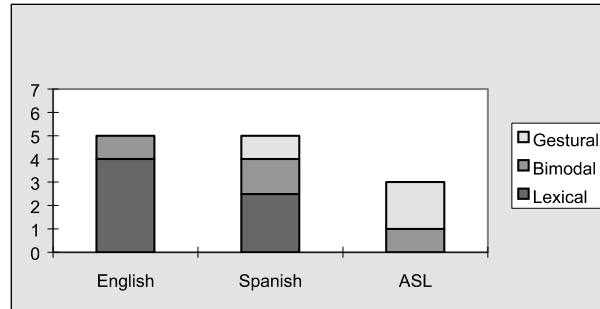


Figure 4. Manner conceptual items



To summarize, Figure/Ground information is expressed lexically in all languages, with slight supplementation from gesture in Spanish. Path information is expressed gesturally in all languages, with some supplementation from lexical items in English and Spanish. Manner information varies considerably: English expresses manner lexically, ASL expresses it gesturally, and Spanish seems to employ a mixed strategy.

3. Conclusions

The data suggest a significant role for gesture in equalizing the expression of information across languages and modalities. Let us go through the hypotheses one by one.

A. Similar amounts of conceptual information

This hypothesis is basically supported by the data. Subjects produced approximately the same number of items overall. If gesture were not considered, Spanish subjects would have produced significantly less information than ASL subjects and English subjects. English subjects also expressed additional items through gesture. Thus, gesture may be said to play a role in equalizing the amount of information expressed.

Overall, the data suggest that English conveys more information through lexical means, ASL conveys more information through mapped items, and Spanish conveys equal amounts through both modes.

- B. i. Similar types of information in speech and lexical sign elements
- ii. Similar types of information in gesture and gestural sign elements

These hypotheses are partially supported. We seem to find that certain types of conceptual items are preferentially expressed through one mode or the other: Figure/Ground information always shows up in lexical elements, and Path infor-

mation always shows up in gestural elements. Languages vary as to how much these types show up in their non-preferred mode. Thus, for example, all subjects support Figure/Ground information with some gestural elements, but this is more prevalent for ASL and Spanish. Similarly, ASL only rarely supports Path information with lexical elements, while English and Spanish do this to a considerable degree, adding non-gestured Path items in their speech. These two tendencies make a great deal of sense. Identification of things (Figure/Ground elements) is most easily accomplished through memorized lexical elements or category names, while the details of Paths are more easily shown through free gesture than through fixed lexical categories.

On the other hand, Manner shows no overall mode preference. English subjects express it largely lexically, adding no new information through gesture; ASL subjects show the opposite pattern; and Spanish subjects present new information through both modes, though there may be a trend toward lexical expression. This may be related to differences in English and Spanish lexicalization patterns, as discussed below.

C. Similar rates of information presentation

This hypothesis is not supported. We see wide variation in rate of presentation, with English the slowest, ASL faster, and Spanish the fastest. This result may be an artifact of the pilot study conditions, in which Spanish speakers watched seven minutes of videotape before telling the stories, while users of the other languages watched one minute or less at a time. The larger study will have uniform conditions for all subjects.

D. Spanish uses gesture to add more Path and Manner information.

This hypothesis is supported, strongly for Path items and more weakly for Manner items. Were gesture not considered, Spanish speakers would be judged to express less Path information than either other language; with gesture, they express roughly the same amount. Some Manner information is also added by gesture, but this effect may not be significant.

4. Summary

We find that in both of the spoken languages, subjects express a significant amount of additional information through gesture; this amount is greater for the verb-framed language (Spanish) and seems to offset the constraints of the verb-framed language type. The contribution of gesture produces a rough equalization of amount of information expressed. As mentioned above, there is no consensus among researchers on the function of co-speech gestures. They may communicate information, help the speaker think about a topic, facilitate access to a lexical item, or some combination of these. Our results show that gestures do not simply

Comparing Speech/Gesture and Sign Language

reinforce the information presented through speech; rather, new information is presented through the gestural modality.

We note as well that particular categories of conceptual items appear universally in speech or universally in gesture, optionally supported by the other mode. This pattern would not have been apparent had we not separated gestural and lexical elements within sign language, and brought in gesture as well as speech for cross-modal comparisons. We conclude that the methodology of comparing speech/gesture complexes with each other and with sign languages produces interesting results, and we recommend it as the standard for future typological investigations.

References

- Galvan, Dennis, and Sarah F. Taub. Forthcoming. The Encoding of Motion Information in American Sign Language. In R. Berman, D. Slobin, S. Strömquist, and L. Verhoeven (eds.), *The Frog Story Revisited*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Fauconnier, Gilles, and Mark Turner. 1996. Blending as a Central Process of Grammar. In Adele Goldberg (ed.), *Conceptual Structure, Discourse, and Language*. Stanford, CA: CSLI, 113-130.
- Slobin, Dan I. 1996. Two Ways to Travel: Verbs of Motion in English and Spanish. In M. Shibatani and S. A. Thompson (eds.), *Essays in Semantics*. Oxford: Oxford University Press.
- Kendon, Adam. 1986. *Some Reasons for Studying Gesture*. Amsterdam: Mouton de Gruyter.
- Liddell, Scott. 2000. Blended Spaces and Deixis in Sign Language Discourse. In D. McNeill (ed.), *Language and Gesture*. Cambridge: Cambridge University Press.
- McNeill, David. 1992. *Hand and Mind: What Gestures Reveal about Thought*. Chicago: University of Chicago Press.
- Talmy, Leonard. 1985. Lexicalization Patterns: Semantic Structure in Lexical Forms. In T. Shopen (ed.), *Language Typology and Syntactic Description, Vol. III: Grammatical Categories and the Lexicon*. Cambridge: Cambridge University Press.

Department of Linguistics
Gallaudet University
Dawes House
800 Florida Avenue, NE
Washington, DC 20002

Sarah.Taub@gallaudet.edu

Department of Foreign Languages
Gallaudet University
Hall Memorial Building
800 Florida Avenue, NE
Washington, DC 20002

Pilar.Pinar@gallaudet.edu