When Disjunction looks like Conjunction: Pragmatic Consequences in ASL

Kathryn Davidson

University of California, San Diego
9500 Gilman Drive. #0108
La Jolla, CA 92093-0108
kdavidson@ling.ucsd.edu

Abstract. In American Sign Language (ASL), conjunction and disjunction are often conveyed by the same coordinators (transcribed as "COORD"). So the sequence of signs WANT TEA COORD COFFEE can be interpreted as "I want tea or coffee" or "I want tea and coffee" depending on contextual or world knowledge or other linguistic information such as prosodic marking and the addition of disambiguating lexical material. In this paper I show that general use coordinators appearing in ASL can be a test case for understanding the role of the lexicalization of scalar items in the semantic/pragmatic phenomenon known as scalar implicature by collecting quantitative data from 10 adult native signers of ASL and 12 adult signers of English using a Felicity Judgment paradigm. Results show that there is a significant difference in interpretation of the general use coordination scale from other lexically-based scales in ASL and the lexically-based coordination scale in English, suggesting that lexical contrast between scalemates is important for scalar implicature calculation.

Keywords: sign languages, experimental pragmatics, scalar implicature, conjunction, disjunction

1 Introduction

In natural languages such as English, the disjunctive coordinator "or" can sometimes be interpreted as conjunction ("and"), as shown by the paraphrase in parentheses in (1).

(1) You can have coffee or tea.
(You can have coffee and you can have tea.)

This paper focuses on a different type of relationship between these operators that is found in American Sign Language (ASL), where two very common strategies of coordination work as *general use coordinators* which can be interpreted as either disjunction or as conjunction in the very same sentence (unlike (1), where the paraphrase is structurally different).

Although the topic of this paper is general use coordination, it is important to note that there are multiple forms for different types of coordination in ASL, of which only a subset are general use coordination. For example, there is a sign *AND* which is typically used when translating titles into ASL directly from English, but is grammatical when used as a connective in its own right in ASL. There are also two ways to uniquely signal disjunction in ASL: (a) through fingerspelling *OR* using the manual alphabet letters "O" and "R" consecutively clearly showing its relation to English, and through a mostly antiquated sign that is homophonous with the Wh-question sign *WHICH*. In addition to these ways of conveying conjunction and disjunction, ASL very frequently employs a general use coordination strategy, which are described in more detail in section 2. In section 3, I present new data from a felicity judgment experiment showing how this way of lexicalizing coordination is accompanied by decreased calculation of scalar implicatures. Section 4 discusses consequences for pragmatic theory and concludes. All grammaticality judgments in this paper were provided from a deaf signer whose parents and grandparents were all deaf, and all signed in ASL. Each judgment was confirmed by at least one other fluent signer of ASL, although these signers varied more in their language background.

2 Two types of General Use Coordinators in ASL

2.1 COORD-shift

There are two different types of general use coordination in ASL, which I label COORD-shift and COORD-L, respectively. The first, COORD-shift, involves moving the body (a combination of torso, head, and/or eyes) slightly for each coordinated element and signing each of the coordinated items in separate places in the signing space (Fig. 1a). For ease of reading I have transcribed it in the way that manual signs are transcribed with the convention of using capitalized English words to represent a sign in ASL that can be roughly trsanslated with that English word. For COORD-shift, however, there is just a change in position from one side of the body to the other; the placement of the notation `COORD-shift' marks the timing of this change in location.

As shown in (2)-(3), COORD-shift is a *general use coordinator*: it can convey either disjunction (2) or conjunction (3), depending on the context.

(2) MARY HAVE COFFEE COORD TEA, DON'T-KNOW WHICH.
`Mary had coffee or tea, I'm not sure which.'

(3) MARY HAVE COFFEE COORD TEA, SHE THIRSTY.
`Mary had coffee and tea, she was thirsty.'

In (2), the clause containing the coordinator is followed by an elided clause, specifically, a clause whose complement is an embedded sluiced constituent interrogative introduced by a D-linked wh-word. This clause is compatible only with a disjunctive interpretation of the preceding coordination phrase. On the other hand,

in (3) the clause containing the coordinator is followed by a phrase biasing the interpretation of the coordinator towards a conjunctive interpretation.

As disjunction, COORD-shift can appear in alternative questions (4a) as well as both inclusive (4b) and exclusive (4c) disjunctive statements, although signers report that ideally its use in alternative questions would also co-occur with further clarifying linguistic information, such as a sentence-final wh-word WHICH (4a').

(4) a. ?HER PARENTS WILL BUY HER CAR COORD-shift SHE WILL TRAVEL?
`Will her parents buy her a car, or will she [use the money to] travel?'

a'. HER PARENTS WILL BUY HER CAR COORD-shift SHE WILL TRAVEL, WHICH?
`Will her parents buy her a car, or will she [use the money to] travel?'

b. HER PARENTS WILL BUY HER CAR COORD-shift SHE WILL TRAVEL, (DON'T-KNOW WHICH)
`Her parents will buy her a car or she will travel, I'm not sure which.'

c. HER PARENTS WILL BUY HER CAR COORD-shift SHE WILL TRAVEL, (MAYBE BOTH)
`Her parents will buy her a car or she will travel, maybe both.'

Syntactically, COORD-shift can coordinate clauses (4), predicates (5) and noun phrases (6). When coordinating constituents of each of these types, COORD-shift can occur in alternative questions and inclusive statements as well, although in the case of alternative questions, these are usually also reported to be not as good as if WHICH were added at the end of the question, as in (4a').

(5) MARY SWIM COORD-shift RUN, (DON'T-KNOW WHICH).
`Mary swims or runs, I'm not sure which.'

(6) MARY HAVE COFFEE COORD-shift TEA, (DON'T-KNOW WHICH).
`Mary had coffee or tea, I'm not sure which.'

a. COORD-shift b. COORD-L

Fig. 1. COORD-L and COORD-shift, General Use Coordinators in ASL, from [1]

2.2 COORD-L

The second form of general use coordination in ASL, COORD-L, consists of the signer's dominant hand pointing with a G "extended index finger" (or sometimes a B "mitten-shaped") handshape to successive fingers on the non-dominant hand, beginning with the thumb. Possible number of fingers on the non-dominant hand range from two (the thumb and forefinger) to all five fingers, which is also the range of coordinated items that this strategy allows. An illustration of COORD-L can be seen in Fig. 1b. Another name for this strategy of coordination is List Buoy [2].

Like COORD-shift, COORD-L can convey either conjunction or disjunction, and when used as disjunction can occur in alternative questions and inclusive and exclusive statements. Syntactically, COORD-L can connect clauses, predicates and nouns. For some but not all signers (notated as %), the use of COORD-L is reported to feel too heavy prosodically to connect two small light nouns as shown in (8), contrasted with full clauses in (7).

(7) HER PARENTS WILL BUY HER CAR COORD-L SHE WILL TRAVEL, (DON'T-KNOW WHICH).
`Her parents will buy her a car or she will travel, I'm not sure which.

(8) %MARY HAVE COFFEE COORD-L TEA, (DON'T-KNOW WHICH).
`Mary had coffee or tea, I'm not sure which.'

Overall, COORD-L seems to share the syntactic and semantic properties of English coordinators, but may sometimes prefer a more restricted set of prosodic environments. Because of the potential interference of this prosodic restriction, COORD-shift is used as the general use coordinator in the experimental design in section 3, as the experiment involves coordination of small prosodically light nouns.

2.3 General Use Coordination in Other Languages

Both COORD-shift and COORD-L pattern semantically and syntactically much like English disjunction in coordinating all types of constituents and being used for various semantic purposes, and yet depending on the context they can also be interpreted as conjunction. Although this seems to be rare from the point of view of English, there are some reports of other languages in which conjunction and disjunction are similarly disambiguated by context. One is example is Maricopa, a Yunan language, which juxtaposes items for coordination ([3] as reported in [4]) similarly to COORD-shift in ASL. In (9) the verb is marked with the plain future tense, and it is believed with a higher certainly than the sentence in (10), in which the verb has the additional marking of a modal/evidential element. Consequently, (9) is interpreted conjunctively while (10) is interpreted disjunctively, even though in both cases the NP coordinates are simply juxtaposed.

(9) John-s Bill-s vʔaawuum.
John-NOM Bill-NOM 3.come.PL.FUT
"John and Bill will come."

(10) John-s Bill-s vʔaawuumsaa.
John-NOM Bill-NOM 3.come.PL.FUT.INFER
"John or Bill will come."

In Japanese, NPs can also be coordinated by juxtaposition, and in this case meaning also depends on the surrounding context or by adding *to* ('and') or *ka* ('or') to disambiguate [5]. Although [6] and [7] provide an extensive typological investigation of conjunction, very little attention is given to disjunction. The pattern in ASL presented here suggests that further investigation of disjunction in ASL and other languages like Maricopa and Japanese may lead to uncovering generalizations concerning the relationship between conjunction and disjunction, and especially the ways that these logical relationships can be conveyed by juxtaposing items in a list without the use of overt lexical items like English 'and' or 'or'.

3 Quantitative Measures of Scalar Implicatures based on General Use Coordination

This section presents data from an experiment involving native signers of ASL and native speakers of English using a Felicity Judgment Task. Included is a comparison of the disjunctive/conjunctive ("coordination") scale in ASL with the coordination scale in English, as well as a comparison of the coordination scale in ASL with a more prototypical scale in ASL (quantifiers). There are many examples in the literature testing scalar implicature calculation in languages other than English ([8][9][10], among others) and all find similar behavioral results among their participants with implicatures based on prototypical scales like quantifiers. So, we can expect that where ASL makes a similar lexical distinction to English, as in its quantifier scale (<ALL, SOME>), there should be a similar rate of scalar implicatures.

However, it appears that no previous work directly compares one language to another which makes a different lexical distinction of the same scalar items, and this is the first experiment testing a language that completely lacks a lexical distinction between potential scalar items. If calculation by deaf native signers on the coordination scale in ASL looks just like the quantifier scale in ASL, and like the coordination scale in English, then we can conclude that having contrasting lexical items is not an important feature of a semantic scale. On the other hand, if there is less scalar implicature calculation on the coordination scale in ASL than other scales in ASL, or than the coordination scale in English, this would suggest that lexical contrast is an important part of scalar implicature calculation. The experiment below tests these predictions, and finds that in fact there is less scalar implicature calculation based on coordination in ASL.

3.1 Methods

Participants were 22 adults from the greater San Diego area. Ten were adults who self-identify as deaf and have been learning and using American Sign Language from birth because they had at least one deaf parent. All were unable to hear normal speech, and all used ASL in their home, at work, or both. These participants were recruited directly through email requests from a laboratory database of interested participants or indirectly through recommendations by friends. All received reimbursement in cash or gift cards. These ten participants will be referred to as "native signers of ASL". The twelve remaining participants were typically hearing undergraduate students at the University of California who are native speakers of English and have had no exposure to ASL. These participants received course credit for participating in the experiment. These participants will be referred to as "native speakers of English".

3.1 Procedures and Stimuli

Each testing session lasted 30-35 minutes. Both the instructions and the task itself were presented on the laptop in video form, by a native signer of ASL (ASL version) or a native speaker of English (English version). Participants were instructed that for each trial of the experiment, a picture will appear on the screen, and that after looking at the picture, they should press the Space Bar key and a video description will begin to play next to the picture. Participants were told to press the smile face if they were "satisfied that the description matches the picture." If they were "not satisfied, and think that the description does not match the picture", they were instructed to press the frown face. It was impossible in both the ASL version and in the English version to replay a video.

Participants saw three practice trials to acquaint them with the task. These practice trials were followed by further instructions, and a confirmation that the task was understood. Finally, 48 experimental trials were presented. Of these, 24 were fillers used as experimental conditions for other studies, and 24 were experimental conditions in the current study. The current experiments' 24 trials consisted of 12 trials of each sentence type: (a) Quantifiers, which are a prototypical scale in ASL and in English and (b) Coordination, which has a lexical contrast in ASL but not in English. Responses were recorded using *Psyscope* experimental software.

The quantifier scale was used as the baseline case for scalar implicature calculation in this experiment for ASL, both compared to the coordination scale in ASL and compared to the quantifier scale in English. ASL has multiple signs which can be translated into English as "some" or "all"; in this experiment, the version of the quantifiers SOME and ALL that are shown in Fig. 2 were used. These quantifiers can serve as a prototypical scale in ASL because they contrast lexically in the same way in ASL as they do in English.

SOME ALL

Fig. 2. SOME and ALL used in the Quantifier sentence type.

In Quantifier trials, each picture consisted of a set of three objects of which either some of the objects or all of them fulfilled a characterization about that object (e.g. red cans, lit candles, full glasses, etc.). Under the Match condition (a total of 4 trials), the characterization applied to all of the objects (e.g. three cans, all red), and the description was accurate (e.g. CANS, ALL RED "All of the cans are red."). Under the Mismatch condition (4 total trials), the characterization applied to only two of the objects (e.g. three cans, only two are red), and the description was not accurate (e.g. CANS, ALL RED "All of the cans are red."). Finally, under the Test condition (4 total trials), the characterization applied to all of the objects (e.g. three cans, all red), and the description was not maximally informative (e.g. CANS, SOME RED "Some of the cans are red."). In this way, the weak scalar term SOME was only evaluated by participants in the Test condition, so that they were never directly comparing this condition to use of the term when it was maximally informative. Trials for all sentence types were counterbalanced so that each sentence frame (e.g. red cans) appeared in only one trial type (Match, Test, Mismatch) for each participant, and each third of participants saw the sentence frame in a different trial type.

COORD-shift was used as the general use coordinator. When interpreted as disjunction, there was additional brow-raising nonmanual marking on the disjuncts (see Fig. 3) and I labeled this use of the coordinator COORD-shift(or). The other use, without brow-raising and conveying conjunctive meaning, was labeled COORD-shift(and). In each of the Coordination trials, the picture consisted of two different objects (e.g. a mug and a bowl), and then either one or two of the same type of object (e.g. spoons) in relation to the first objects.

COORD-shift(or) COORD-shift(and)

Fig. 3. COORD-shift(or) and COORD-shift(and) used in the Coordination sentence type.

In the Match condition in these trials, each of the two different objects were related to one of the similar objects, and the description was accurate (e.g. HAVE SPOON IN CUP COORD-shift(and) SPOON IN BOWL. "A spoon is in the mug and a spoon is in the bowl."). Under the Mismatch condition, only one of the two different objects were related to one of the similar objects, but the description said that they both were equally related (e.g. HAVE SPOON IN CUP COORD-shift(and) SPOON IN BOWL. "A spoon is in the mug and a spoon is in the bowl."). Finally, under the Test condition, each of the two different objects were related to one of the similar objects, but the description was not maximally informative due to the disjunctive nonmanual marking on the general use coordinator (e.g. HAVE SPOON IN CUP COORD-shift(or) SPOON IN BOWL "A spoon is in the mug or a spoon is in the bowl")

3.3 Results

Concerning prototypical scales based on lexical contrast, native speakers of English showed no significant difference in their acceptance of the Test conditions for the Quantifier scale and the Coordination scale (in fact, the mean accuracy rate (rejection) for each scale was each 0.77, with a standard deviation of 0.36 for coordination and 0.38 for quantifiers). Both were also accepted (i.e. indicated with a smile face) significantly less often than the control Match sentence in each sentence type ($t(11)=7.10$, $p<0.0001$ for quantifiers; $t(11)=6.76$, $p<0.0001$ for coordination), indicating that scalar implicature calculation was occurring for both scales in English, at the same rate, which is what we would expect from previous research. Native signers of ASL also accepted the Test condition of the prototypical quantifier scale in ASL significantly less often than the Match condition of the quantifier scale ($t(9)=15.38$, $p<0.0001$), indicating that scalar implicatures were being calculated for the Test condition, as expected because they were based on a prototypical scale. Moreover, they behaved just like their English counterparts: there was no significant difference on scalar implicature calculation in the quantifier scale between native signers of ASL and native speakers of English ($t(20)=1.03$, $p>0.1$). This indicates a typical rate of scalar implicature calculation by this group of signers on a prototypical scale in ASL.

However, Coordination in ASL exhibited a different pattern: native signers show significantly less calculation of scalar implicatures based on the coordination scale in ASL compared to native speakers on the Coordination scale in English ($t(20)=25$, $p<0.01$)(Fig. 3). Since there was no difference between the acceptance of the Quantifier scales in both languages, we cannot attribute this to a general behavioral difference in the populations of native ASL signers and native English speakers. Furthermore, within ASL there was significantly less scalar implicature calculation on the Coordination scale than on the Quantifier scale ($t(9)=7.57$, $p<0.0001$). These results are striking, considering that they are both responses to the same trial type (the underinformative Test conditions) by the same set of native signers; nonetheless, there were more rejections (i.e. pragmatic strengthening) in the Quantifier sentence type than the Coordination sentence type. Together with the difference seen between ASL and English on the coordination scale in the two languages, this supports the

view that the instantiation of scale members as separate lexical items is important for a high rate of scalar implicature calculation.

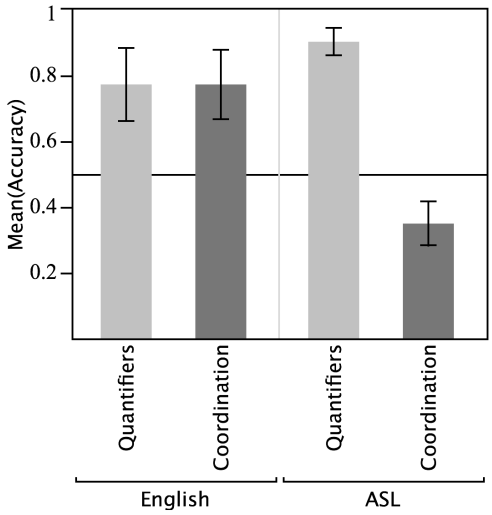

Fig. 3: Calculation of implicatures (i.e. rejection rates for underinformative descriptions) based on quantifier and coordination scales in ASL and English

Recall that the general use coordinator COORD-shift is ambiguous between disjunction or conjunction. So, one explanation of the data presented so far could be that signers chose to interpret the coordinator in the most charitable way: they were accepting the Match sentences, but also the Test sentences, which had disjunctive nonmanual marking but which under a coordination interpretation would be felicitous. For this we can turn to the Mismatch data, where under a charitable interpretation the participants would be expected to accept the descriptions. Instead, participants overwhelmingly reject the descriptions in the coordination Mismatch case ($M=0.83$, $SD=0.17$), which is not significantly different from the percent of accepted trials in the Match case ($M=0.80$, $SD=0.20$)($t(9)=0.29$, $p>0.1$), but is significantly different from rejections in the Test case ($M=0.35$, $SD=0.21$)($t(9)=5.02$, $t<0.001$). We can conclude that while participants are not likely to reject Test trial descriptions, this is specific to underinformative descriptions not triggering a scalar implicature, and not due to an overall charitable answering strategy for coordination in ASL.

4 Conclusions

General use coordination in ASL is similar to strategies reported in Maricopa and in Japanese in allowing both disjunctive and conjunctive interpretations, depending on the surrounding context, while ASL is unique among these language in having

multiple forms of general use coordination, COORD-shift and COORD-L, and in being a signed language.

The existence of general use coordination allows for a test of the role of lexical contrast in the calculation of scalar implicatures. In many studies of scalar implicature, coordination is a frequently studied scale, due to its status a prototypical scale in English, allowing for a comparison of the calculation on this scale in ASL with the same scale in English, which showed less implicature calculation on the ASL scale. Furthermore, within ASL the coordination scale triggered less implicatures than the lexically-contrastive quantifier scale. Together, these suggest that the semantics relationship of the scalemates is not enough to order items on a scale. In addition to "in salient opposition: of the same form class, in the same dialect or register, and lexicalized to the same degree" [11], scalemates seem to also be required to be separate lexical items that are linked to each other via a scalar relationship. Further testing on similar structures in Japanese, or even Maricopa, as well as more complex structures within these languages and in ASL can indicate further the role that this property plays in scalar implicature calculation.

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