

# Degree Modification and Intensification in American Sign Language Adjectives

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**Abstract.** Scalar adjectives lacking closed upper boundaries (like *far*) can be coerced to have a closed upper boundary reading when combined with degree modification with *too*, e.g. *too far to walk*. Parallel to the mapping of event structure to scalar structure in adjectives [4], we observe that scalar adjectives are *end-marked* in ASL. These adjectives receive marking similar to telic verbs, indicating that, like the visibility of event structure in verbs, scalar structure, or at least the upper boundary, is also visible in ASL. The Event Visibility Hypothesis (EVH) was formulated based on the observation that telic verb signs are distinguished from atelics by end-marking reflecting final states of telic events. Here, it is extended to a general Visibility Hypothesis for sign languages.

**Keywords:** gradable adjectives, American Sign Language, degree modification, intensification.

## 1 Introduction

To date, adjectives in ASL have not received detailed investigation comparable to that of verbs and nouns. Two studies both focused on syntax [1-2]. MacLaughlin [1] explored the distinction between *attributive* and *predicative* adjectives and related word order. Bernath [2] investigated their syntax and suggested that different word orders result from movement of the noun. He further raised the question of whether adjectives like SICK<sup>1</sup> should be considered as adjectives at all, given that they can be aspectually modified, and suggested that they should instead be treated as verbs, e.g. BE-SICK. This project takes a different perspective by focusing on the semantics of the adjectives. In particular, it focuses on gradable adjectives and interaction with degree modification, reporting new observations on how such modification is marked.

Section 2 introduces gradable adjectives and degree modifications. Section 3 presents examples of ASL gradable adjectives and how they are marked under degree modification. Section 4 considers interaction of gradable adjectives with the semantics of *too* in the form *too Adjective to Verb* (e.g., *too hot to eat*, *too far to walk*). Section 5 ties the pieces together. We relate the marking of adjectives in *too A to V* to

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<sup>1</sup> The glosses for signs are traditionally written in capital letters.

marking of end-state boundaries in ASL signs denoting telic events, previously discussed under the rubric of the Event Visibility Hypothesis (EVH) [3]. This similarity of marking is not coincidence but related to the existence of scalar boundaries/limits in both cases. We extend the EVH to a more general Visibility Hypothesis (VH).

## 2 Gradable Adjectives, Scales, and Degree Modification

Following Kennedy and McNally [4], we take a relational approach and assume that gradable adjectives denote a relation ( $G$ ) between individuals ( $x$ ) and degrees ( $d$ ) on an appropriate scalar dimension for that adjective. For example, the adjective *expensive* could be represented as a relation between objects and degrees of cost so that the cost of  $x$  equals  $d$ .

$$[[\text{expensive}]] = \lambda d \lambda x. \text{expensive}(x) = d \quad (1)$$

This representation does not take into account the idea that an object could have a cost  $d$  that would not be considered expensive but rather normal, fair, or cheap. To decide that something should be called expensive, there needs to be a way of determining when a cost is big enough to be considered expensive.

The notion of a scale for a dimension such as cost requires that the degrees of cost be ordered in such a way that it is always possible to tell whether one particular degree is above or below another. The variation along this scale is what allows us to talk about an adjective being gradable. Let us assume that there is a **standard of comparison** value ( $s$ ) on the scale above which the cost of something is expensive. That is, the cost of  $x$  must be greater than ( $>$ ) the standard  $d_s$  on the scale of degrees of cost.

$$[[\text{expensive}]] = \lambda d \lambda x. \text{expensive}(x) > d_s \quad (2)$$

What is expensive for a cup of coffee is different from what is expensive for a new car, that is, the standard of comparison may vary by context. Thus, the application of a gradable adjective to an object (deciding to call something expensive) always requires a comparison, which is sometimes contextually dependent (*relative* adjectives) and sometimes fixed (*absolute* adjectives) [5], even if it is not overtly mentioned.

Now assume that as the distance between the cost of  $x$  and the standard of comparison  $d_s$  becomes greater, we want to talk about larger degrees of expensive. In English, this can be done with degree intensifiers such as *very* and *too*. Kennedy and McNally [6] provide a semantic analysis of *very* as in (3).

$$[[\text{very}]] = \{\langle G, \langle d_{S(G)}, x \rangle \mid \exists d [G(x) \geq d_{S(G)} + d \wedge \text{LARGE}(d)]\} \quad (3)$$

*Very* applies to a gradable adjective and has the effect of increasing (*boosting*) its value by a contextually-determined large amount; in (3) *very* is a function  $G$  that applies to the value of the adjective to ensure that it exceeds the normal comparison  $d_s$  by a contextually LARGE degree.

### 3 ASL Gradable Adjectives and Their Marking Under Degree Modification

To begin, the signing of an ASL lexical adjective is similar to that of any other lexical sign, in that the sign components (handshapes, place of articulation, movement, etc.) are lexically specified (as outlined in [7]). There are prosodic contextual effects, so that actual production depends on position in its phrase (Phrase Final Lengthening), relative degree of stress or emphasis, and current signing rate [8].<sup>2</sup>

While there is a sign for *very* (Fig.1), it is considered ‘English register’ rather than ASL, and has extremely limited use. Except for discussion of it, it does not occur in our ASL corpus.<sup>3</sup> Intensification is seen in alternate ways.



Fig. 1. VERY *very*; rejected as ASL degree intensifier

#### 3.1 Plain Adjectives

The typical production of an adjective sign is the baseline against which intensified productions must be compared. Baseline production is the one in which the standard for application of the adjective has been met, as in (2) above. Typically, the signs are accompanied by mouthing of the English word or by mouth positions that do not change during the movement of the sign, as seen in FAR (Fig. 2).



Fig. 2. The sign FAR

Among the adjectives we investigated specifically for this paper are: BIG, CLOSE, FAR, HARD, HEAVY, LATE, LONG, NICE, OBVIOUS, SMALL, SOON, SORRY. Data includes elicited and natural productions, the latter coming from our lab archives, online videologs, published and youtube videos.

<sup>2</sup> We emphasize *lexical* here because there are also classifier-based constructions that are contextually-dependent. The form of the ASL translation of *thick* depends on whether one means *thick liquid*, *thick horizontal object* (book lying down), or *thick vertical object* (book standing up), and so on. That is, there is no lexical sign for *thick*.

<sup>3</sup> Our ASL data has been collected over 30+ years and includes more than 50 signers.

### 3.2 Phonological Marking of Intensification

An intensified ASL adjective must meet two criteria. First, it must contain the semantic degree *boosting effect* given in (3). Second, a sign language specific criterion: the intensified adjective must be visually distinct from the baseline form. This leads to a somewhat unusual topic in a semantics paper, namely phonological marking that represents degree morphology.<sup>4</sup> Our prior work in semantics-phonology interface of sign languages and the visibility of event structure in formation of predicate signs was formalized as the Event Visibility Hypothesis (EVH) [3] [9]. EVH, in its original formulation, was concerned only with the boundaries expressed in verbs, stipulating that the end-points (boundaries) of events were marked at points in space by rapid deceleration in hand movement. Experimental investigations of production and perception confirmed that in ASL, the boundaries are marked by kinematic properties of hand movement [14, 15]. The expressive means for boundaries in adjectival scales have not, to date, been considered in terms of their phonologico-semantic properties.

In our data, we observed modifications to adjective signs under intensification:

- Overall increase in tension of the hands and face;
- Movement modifications;
  - Add or enlarge movement trajectory;
  - [delayed release] of the start of the movement;
- Non-manual modifications (face, head, body);
  - Frown on face;
  - Head tilt away from neutral.

Many intensified adjectives with [delayed release] have a prefixal hold prior to the onset of movement and, if there is mouth position change, it occurs with the onset of hand movement.<sup>5</sup> To illustrate, Figure 3 presents a sequence of stills from the signing of FAR-intensified. Production is distinct from plain FAR in Fig. 2. Mouth and hand position are held at the beginning (pictures 1-2), hand and mouth movement begin, and the sign ends with the end of hand movement and no further change in the mouth position (it stays open). The head is tilted for the entire sign.



**Fig. 3.** FAR-intense with [delayed release], mouth opens with start of hand movement (3), mouth open at end (5); note head tilt, frown eyes and forehead

<sup>4</sup> A kindred phenomenon from spoken languages is vowel lengthening (“faaaaaar away”) – we thank an anonymous reviewer for the example.

<sup>5</sup> Some forms such as HEAVY prefix additional movement rather than the hold seen in e.g. FAR, CLOSE, LITTLE. Both types constitute delay of onset. Adjectives without path movement, e.g. HARD or SMALL, are modified by the intensification adverb Y–OO (section 3.3. below).

While [delayed release] and mouth change timing are reasonably regular, we observed the same head tilt behavior noted by Liddell [19], namely that variation in intensity depends on how much contrast the signer wants to provide.

### 3.3 Adverbial Intensifiers

Intensifier semantics can also be conveyed by combining adjective signs with adverbial intensifiers and/or non-manuals. Observations show that some adjective signs are produced with the simultaneous mouthing of *too*. Other adjectives are preceded by the loan sign #TOO (derived from fingerspelling the English word *too*). We are unable to predict which adjectives take which form, nor can we rule out both markings occurring with the same adjective. These two forms occur in both elicited and corpus examples, but only in intensification contexts, not in the *too A to V* discussed below.

Our investigation led to the realization that there is another sign in ASL that could be considered to have the meaning of *so*, *very* (Fig. 4). This sign has no known conventional gloss, and since we have not fully tested its semantics, we have dubbed it Y-OO, reflecting its use of Y handshape and circling movement.<sup>6</sup> Y-OO can be made with one or both hands. One observation is that Y-OO cannot modify all gradable adjectives. For example, it cannot occur with the sign SORRY, which readily takes the intensification modifications described in 3.2. But it does occur with HARD, FAST, HEAVY, BRIGHT/CLEAR/OBVIOUS, AWESOME, among others, covering a range of phonological forms with and without path movement.



Fig. 4. The adverb sign Y-OO *so*, *very*

Furthermore, with adjectives accompanied by Y-OO, we did not see [delayed release], which might mean the two are in complementary distribution; we do not have enough data to fully substantiate this possibility. Another adjective structure we investigated was *Adj like a N*, for example, *hard like a brick*. This translated as Y-OO HARD SAME-AS BRICK *so/very hard like (a) brick*.

## 4 ‘Too Adjective to Verb’

To understand the interesting behavior of ASL adjectives in the context *too A to V*, we need to consider the meaning of *too*, and the role of the infinitive *to V*. *Too* is often described as a form of degree morphology, along with English *-er*, *more*, *so*, and

<sup>6</sup> This sign should not be confused with the sign glossed SILLY, which has diagonal linear movement or bending at the wrist.

others. In one sense, like other intensifiers, it implies a greater degree. But *too* differs in containing the notion of excess, that is, beyond a limit, especially in the context *too A to V*. Meier [10] analyzes this construction by treating *too* as a comparative quantifier relating two values, the extent of the gradable adjective and an incomplete conditional provided by the complement *to V* (treated as *extent* predicates [11-12]). Consider (4).

The food is too good to throw (it) away. (4)

Meier argues that (4) has the form in (5), where two values are compared, the actual goodness of the food, and the maximal value of food-goodness to be allowed to throw it away (from the sentential complement represented as modalized proposition).

$x$  is too adjective MODAL  $p$ . (5)

The paraphrase she suggests for *too good to throw away* is “the value  $v$  such that the food is  $v$ -good is *greater* than the maximum of all values  $v^*$  such that if the food is  $v$ -good, we *are allowed* to throw it away”. Note that this paraphrase has (a) a statement that the food is  $v$ -good, (b) a statement that this value is greater than the maximum of the conditional, (c) the conditional in the form *if food is  $v$ -good, we are allowed to throw it away*, and (d) the modal *be allowed to*. Similarly, for negative adjectives, e.g. *too young to date*, the paraphrase would be the same but the comparison in (b) would require that the value be smaller than the minimum of the conditional. The paraphrases in (c) and (d) provide the contribution of the complement ‘to V’.

Let us turn now to the ASL structure of interest. What happens to an adjective like FAR when it is put into ‘too far to walk’ and why does it happen? Given that *too* is a degree intensifier, we should not be surprised to find that TOO-FAR exhibits the [delayed release] of the hand movement identified in section 3 (Fig. 5).<sup>7</sup>



**Fig. 5.** 'Too far to walk' : TOO-FAR with [delayed release] (pictures 1-2), mouth opens at *end* of hand movement (picture 5)

However, there are at least three differences in the *too A to V* productions compared to the A-intensified productions seen in Fig. 3. Note first that the head tilt seen in Fig. 3 is not used.<sup>8</sup> Second, there is a striking difference in the mouth behavior, with the mouth opening at the start of the hand movement in Fig. 3 but not until the *end* of the

<sup>7</sup> [5] refers to *too* as a sufficiency morpheme, while [10] separates it from sufficiency *enough* and refers to it as a morpheme of excess.

<sup>8</sup> Optionality follows observations in [19]. When it does occur, it can be easily represented by merging the EVH with the phonological representation of articulators on independent tiers in Brentari [7]; here, we do not go further into the topic for considerations of space.

hands movement in Fig. 5. Third, what cannot be seen in a sequence of still pictures is the sharp ending of the adjective sign movement in the *too A to V* contexts. The mouth position change at the end of the movement and the sharp ending of the movement itself caught our attention, because we have seen these two linguistic features together before, namely at the end of movements in verb signs that denote a telic event [9][13]. The mouth position change is referred to as a *transition non-manual* (TNM). The sharp ending of the movement is due to a rapid deceleration from the peak velocity to the end stop [14-15]. This end-marking is considered to reflect the end state of a telic event, and led to the formulation of the Event Visibility Hypothesis: In the predicate system, the semantics of event structure is visible in the phonological form of the predicate sign. Its presence in the *too A to V* context suggests that it may have a broader function.

Kennedy and McNally [4] discuss the parallelism between adjectives derived from verbs (e.g., *closed*, *written*) and aspectual properties with respect to their common scales, noting there is a general correlation between event structure and scale structure. Their suggestion is that deverbal adjectives inherit scale structure either from the event denoted by the source verb or from the entity to which the adjective applies. In particular, deverbal gradable adjectives derived from state and activity denoting atelic verbs tend to be associated with scales that are open on the upper end (have no maximum value) because atelic events have no natural endpoint. In contrast, deverbal adjectives derived from achievement and accomplishment (those with incremental themes) denoting telic verbs are associated with closed upper scales (do have a maximum value) because telic events have endpoints reflecting the end state of the event.<sup>9</sup> Thus, their work on derived deverbal adjectives uses event structure analysis of boundaries in spoken languages, and establishes linguistic significance of the adjectival scale, that is, of the structure of ordered set of degrees in adjectival comparison.

What we have found is that our gradable adjectives display the same end marking that we observe on telic predicates in ASL. That is, they behave as though they had end states, or for adjectives, closed upper boundaries. Yet only one of our current adjectives, *HARD*, passes the tests for closed upper boundary,<sup>10</sup> and indeed it is totally closed [6] [16]. The other adjectives, e.g., *FAR*, which themselves have open upper scales, display the behavior of a closed upper scale in the *too A to V* context even though alone they do not have maximum values.

## 5 Putting the Pieces Together

How do we compose *too A to V*? Viewing *too* as a quantifier relating two extent values, the adjective and the complement verb, Meier [10] requires there to be a maximum value for the adjective scale which she suggests is provided through the hidden incomplete conditional analysis. Thus, scalar adjectives lacking closed upper

<sup>9</sup> The ASL adjectives that we investigated for this report are not deverbal, but it would be interesting to see how ASL adjectival predicates behave in this regard.

<sup>10</sup> Adverbial modifiers like *half* and *mostly* or *most of the way* are only acceptable with adjectives that have a closed scale (boundary), and unacceptable with those that do not.

boundaries (like *far*) must be coerced to have a closed upper boundary reading with a type of measure phrase providing the limit in the construction *too A to V*.

Beginning with sentence (6), we use rule (2) and treat the distance of the restaurant as being greater than a distance that justifies the use of *too*.

The restaurant is too far to walk (to). (6)

$$\lambda d \lambda x \text{far}(x) > d_{\text{too}} \quad (7)$$

This needs to be combined with the value that is *walkable*, which we get from the modalized conditional suggested by [10], ‘possible walkable distance’.

If  $x$  is  $d$ -distance, we can walk to it. (8)

The distance to the restaurant exceeds this maximum value:

$$\lambda d \lambda x \text{ too-far } (x) > \text{MAX } d \text{ such that if } x \text{ is } d\text{-distance, we can walk to it.} \quad (9)$$

That is, the distance is greater than the maximum value of the scale of *walkable*, and this maximum is where the closed upper boundary comes from in *too far to walk*. Thus, following [10], *the restaurant is at a distance that is greater than the maximum distance that we can walk (to) or at a distance that is so far that we cannot walk to it*.

The ASL structure has the following pieces. The adjective FAR takes the prefix [delayed release] for intensification; this affects both the hand movement and the non-manual (mouth) change. [7] notes that [delayed release] in the *delayed completive aspect* attaches to the first timing slot of a telic verb; here we suggest that it attaches to the first timing slot of the adjective.<sup>11</sup> The adjective also takes *end marking*, a sharp movement to a stop, and the T-NM [closed -> open]. The end marking attaches to the second timing slot of telic verbs, and here to the second slot of the adjective, and is aligned to the right edge. Thus, the mouth does not open until the end of the movement. The sharp movement is the result of earlier peak velocity and greater deceleration than in plain signs. This end marking indicates the upper boundary/limit of the extent to which the complement verb (e.g. *walk*) is possible. Thus, the extent of the walkable distance stops at a boundary that the restaurant is located beyond. As [10] notes, the modal ‘possible’ is contributed by the hidden incomplete conditional; this can be epistemic or deontic but is usually covert. When signers were offered *too A to V* with explicit modals (TOO-FAR WALK CAN’T, TOO-HARD EAT CAN’T), they accepted them but did not produce them on their own. One paraphrase structure was suggested: CAN’T LIFT WHY, BOX HEAVY-intens *I can’t lift the box because it’s too heavy*, but this is a different structure - the wh-cleft. In all cases in the data so far, there is no intensity placed on the complement verb itself nor is there any indication of negation.

The end result is that the adjective has the same motion characteristics as a delayed completive telic verb (but without the tongue wagging that [7] notes). This same form is seen with other open scale adjectives in our set, e.g. HEAVY, but not with HARD,

<sup>11</sup> The typical sign is monosyllabic, consisting of two timing slots associated to the movement.

which is a closed scale adjective and which already ends with contact of the two hands. Instead, HARD is modified by Y-OO, and there is no mouth change or noticeably different movement pattern compared to its plain form. A more systematic investigation is needed but it may be that final contact as in HARD or final deceleration as added to other adjectives both mark a closed boundary.

However, the parallel between end-marked verb signs and end-marked *too-A-to-V* adjectives suggests that the original formulation of the Event Visibility Hypothesis, based on verbs only, is too narrow. We propose an extended version, the Visibility Hypothesis, which reflects the idea that sign languages have grammaticalized resources from physics and geometry for perceptual and production purposes to convey meanings that humans wish to express. Extension of the EVH to adjectival scales yields specific predictions for how sign languages express scalar boundaries, and the (modality specific) impact on the grammatical system of sign languages. The Visibility Hypothesis formulation for the manual component of the sign follows:

*Sign languages express the boundaries of semantic scales by means of phonological mapping.* (10)

However, this is not the ‘iconicity’ that many people think is there. The semantics-phonology interface goes well beyond the typical notion of ‘iconicity’ (‘guessability’) [9]. End-marking is an example of grammaticalization of physics (deceleration) for linguistic purposes. Thus, whereas [4], among others, noted the parallel between event predicates and scalar adjectives in spoken languages, in ASL and probably other sign languages, it is, in fact, *visible*.<sup>12</sup>

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<sup>12</sup> Visible to a signer – as multiple perceptual studies suggest, signers’ visual perception differs from that of non-signers in multiple dimensions, including ability to attend to the visual periphery and high spatial frequencies [17, 18].

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