Signed language articulation

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adapted in part from Section 3.7 of Anderson et al. 2022

Learning objectives. After reading these notes, you should be able to:
- identify the joints used for manual articulation;
- explain how each of these joints typically do and do not move;
- identify examples of different types of joint movement;
- explain the importance of nonmanual articulation for signed languages;
- identify examples of different types of nonmanual articulation; and
- explain the difference between dominant and nondominant hands.

In signed languages, the basic independent meaningful unit, the equivalent of a spoken language word, is generally an individual **sign**. Signs are physically created by two main categories of articulators. The **manual articulators** are the arms, hands, and fingers, which are the primary articulators used for signing. However, most of the rest of the body is also used in signed languages, especially the torso, head, and facial features. All of these other articulators are called the **nonmanual articulators** or sometimes just **nonmanuals**.

1 Manual articulators for signed languages

The primary articulators used for signed languages are the **manual articulators**: the arms, hands, and fingers. Articulation of the manual articulators occurs at various **joints**, which are points where bones come together and move in relation to each other. The six joints used in the manual articulation of signed languages are shown in the following diagram.
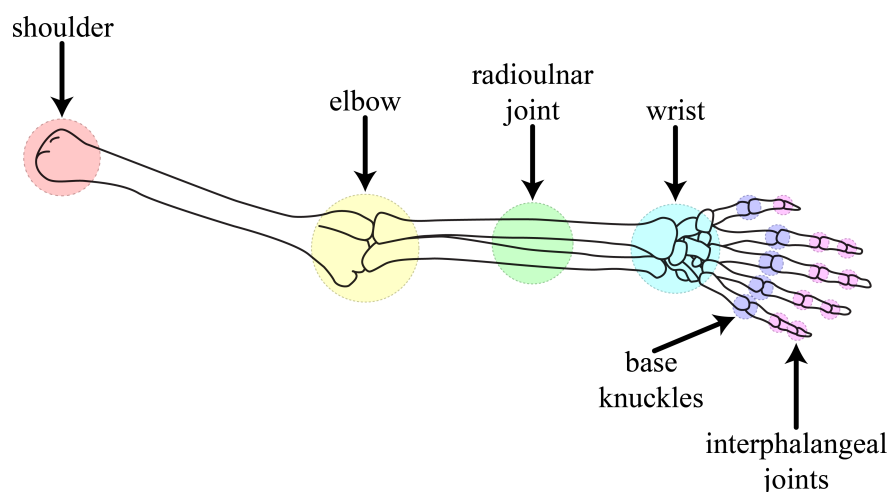

The **shoulder** joint is where the upper arm (a.k.a. the humerus) meets the shoulder blade (scapula). The shoulder swivels around inside the shoulder blade, allowing for the arm to move around in multiple ways, as shown in the figures below. Shoulder movements used for jumping jacks or making snow angels are shown in the figure below left. From a neutral position, with the arms hanging at the side, **abduction** of the shoulder results in movement upward and outward away from the torso. Bringing

the arm back down to neutral position is accomplished with **adduction** of the shoulder. Adduction from neutral position results in movement across the front of the torso toward the opposite side, and abduction would bring the arm back to neutral position. Similar movements made in front of the body are shown in the figure below centre. From a neutral position, **flexion** of the shoulder results in movement upward and forward. Bringing the arm back down to neutral position is accomplished with **extension** of the shoulder. Extension from a neutral position results in backward movement, and flexion would bring the arm back to neutral position. Finally, the shoulder can keep the upper arm in a fixed location while changing the position of the forearm through **rotation** (below right), as in patting your stomach. Movement at the shoulder joint can be any combination of these three kinds of movement.
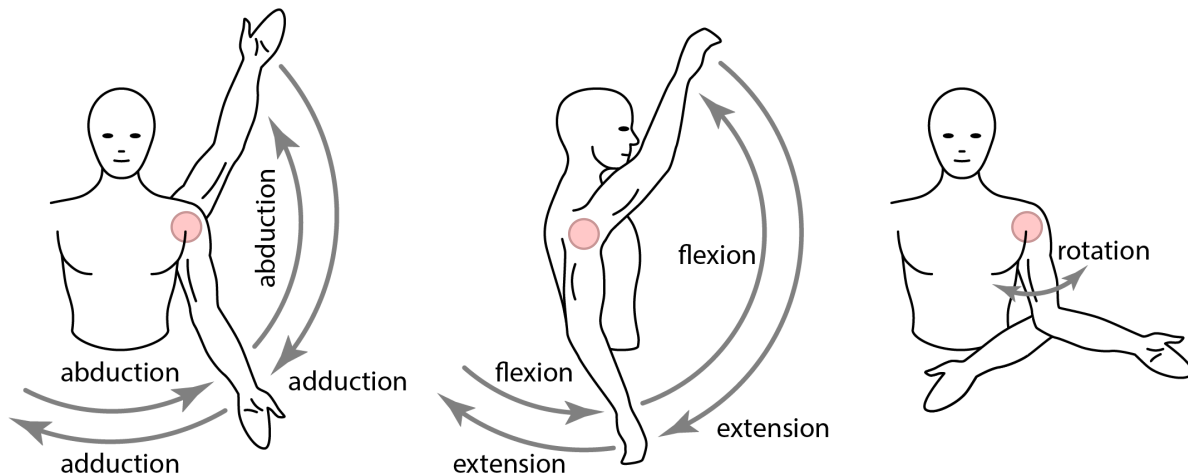

The **elbow** is a joint which connects the upper arm and the forearm. The elbow has a more restricted range of motion than the shoulder, allowing only flexion (bending to bring the forearm closer to the upper arm) and extension (the opposite movement), as shown in the following figure. Other kinds of movements at the elbow are heavily restricted or impossible. Note that unlike the shoulder, the elbow cannot typically extend backwards from a neutral position, only from a flexed position.
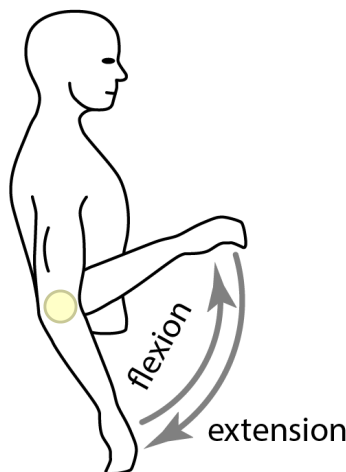

The forearm contains two large bones, the **radius** (which is on the thumb side of the arm) and the **ulna** (on the pinky side). The radius and ulna come together in three different places for three dif-

ferent kinds of movement: at the elbow, at the wrist, and in the middle of the forearm. All three of these points of movement are considered **radioulnar joints** biologically and have separate names (the superior radioulnar joint at the elbow, the inferior radioulnar joint at the wrist, and the medial radioulnar joint inside the forearm), but in the context of signed language phonetics, we normally only need to talk about them as a unit, since their movements are all connected. By convention and to avoid confusion with the elbow and wrist joints, radioulnar movement is often identified at the medial radioulnar joint, in the middle of the forearm where the radius and ulna pivot around each other, allowing the forearm to rotate, as shown in the following figure.
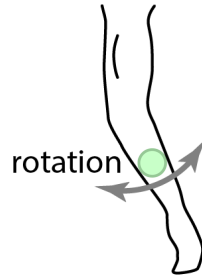

The **wrist** is the joint connecting the forearm and the hand, and it is almost as mobile as the shoulder, allowing for abduction (sideways towards the thumb), adduction (sideways movement towards the pinky), extension (bending backwards), and flexion (bending forwards), but no rotation. Note that what we might initially think of as rotation at the wrist is actually due to radioulnar articulation. Like the shoulder, the wrist can typically extend backwards from a straightened position.
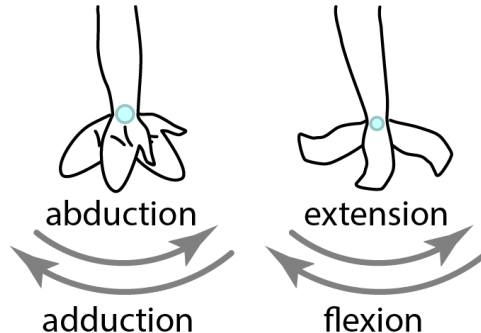
The **base knuckles** are the joints where the fingers connect to the palm of the hands. Like the wrist, these joints allow for abduction, adduction, extension, and flexion, but no rotation, and like the elbow, the base knuckles cannot typically extend very far backward from a straightened position. Each base knuckle can generally move independently of the other, though some movements are more difficult than others.
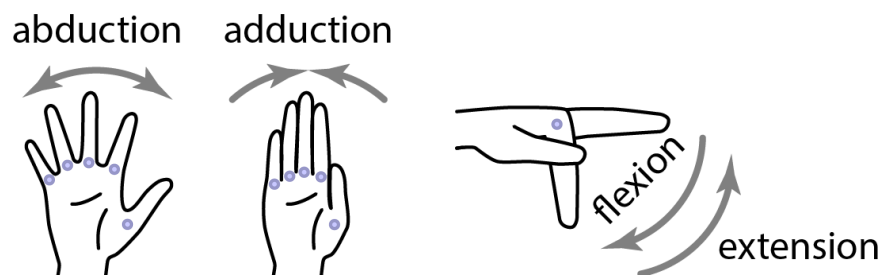
The **interphalangeal joints** are the various joints between the individual bones within the fingers. The thumb has only one interphalangeal joint, while the other four fingers have two interphalangeal joints each. Most humans cannot easily articulate the two interphalangeal joints of the same finger separately, so they are usually analyzed together for the purpose of describing signed language articulation. Like the elbow, the interphalangeal joints can only extend and flex, and they typically cannot extend backward very much from a straightened position.
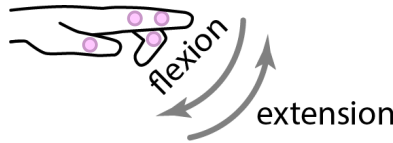
2   Nonmanual articulators for signed languages

Signed languages are not purely manual. Most of the rest of the body is also used in signed languages, especially the torso, head, and facial features. All of these other articulators are called the **nonmanual articulators** or sometimes just **nonmanuals**. The nonmanual articulators, especially the torso and the parts of the face, have complex and varied movement, such as eye gaze changes, eyelid narrowing and opening, eyebrow raising and lowering, torso leaning and rotation, head tilting and rotation, cheek puffing, lip rounding and spreading, teeth baring, etc. Nearly any other body part can be a nonmanual articulator, even the feet and buttocks in some signed languages, such as Adamorobe Sign Language in Ghana (Nyst 2007) and Kata Kolok in Indonesia (Marsaja 2008).

Nonmanual articulation is largely beyond the scope of these introductory notes, but it plays a crucial role in signed languages and cannot be ignored in a full analysis of signed languages. This is why, for example, tools like "signed language gloves" cannot translate signed languages fully (not to mention their many other flaws, such as not actually being useful to deaf people; Hill 2020).

Nonmanual articulations often convey grammatical information, conversational structure, or expressive information. For example, in ASL and many other signed languages, **eyebrow movement** is used grammatically to distinguish question types, with raised eyebrows used for polar questions (also called *yes-no* questions, which have a binary *yes* or *no* response, such as *is it raining?* or *do you like boba tea?*), while lowered eyebrows are used for open questions (also called *wh*-questions, because they involve an interrogative word that usually begins with *wh* in English, such as *when did it rain?* or *who likes boba tea?*) (Zeshan 2004).

Conversational structure in ASL can be indicated with **torso or head movement**. For example, when describing a conversation between two people, rather than signing *Kaoru said X* and *Vanja said Y*, a signer can instead **role-shift** by using one torso position to indicate they are signing as if they were Kaoru, and a different torso position to indicate they are signing as Vanja. Then, they only need to sign X alone in Kaoru's position and Y alone in Vanja's position.

Nonmanual articulations, especially **facial features**, are also often used to add expressive information, such as emotional states or size. Smiling may be used with happy signs, frowning may be used with sad signs, widened eyes may be used to express surprise or large size, sucked in cheeks or pursed lips may be used to express unpleasantness or small size, etc.

Separate from these three kinds of common uses, nonmanual articulations can also sometimes be an inherent part of a sign, even distinguishing two different signs that are otherwise articulated the same way. For example, the ASL signs for NOT-YET and LATE have the same manual articulation (one arm bent out to the side with the hand pointing down and the palm facing backwards, with the wrist flexing repeatedly), but NOT-YET also has additional nonmanual articulations, with a headshake and the tongue covering the lower teeth.

NOT-YET	https://www.handspeak.com/word/index.php?id=2445	(ASL)
LATE	https://www.handspeak.com/word/index.php?id=1236	

Another example comes from German Sign Language (Deutsche Gebärdensprache, DGS), in which the signs for BROTHER and SISTER have the same manual articulations, with the two hands having the index finger pointing out and the hands touching together twice. These signs are distinguished by a special kind of nonmanual articulation called **mouthing**, which is an imitation of (at least part of) the oral movements used for the corresponding word in the ambient spoken language. In this case, the mouthings imitate the spoken German words *Bruder* 'brother' and *Schwester* 'sister'.

BROTHER	https://media.spreadthesign.com/video/mp4/9/14225.mp4	(DGS)
SISTER	https://media.spreadthesign.com/video/mp4/9/14229.mp4	

3   Dominance and handedness

Many signs require only one hand to move, and for most signers, that hand will be the hand they would use to write. For example, the ASL signs NOT-YET and LATE would normally be signed with the right hand by right-handed signers and with the left hand by left-handed signers. Whichever hand is used for this is called the **dominant hand**, and the other hand is the **nondominant hand**. In two-handed signs, both hands may move (as in the DGS signs BROTHER and SISTER), but sometimes, only the dominant hand does, as in the sign for SLOW in Turkish Sign Language (Türk İşaret Dili, TİD), in which the dominant hand slides across the top of the nondominant hand.

SLOW	https://media.spreadthesign.com/video/mp4/11/354428.mp4	(TİD)

For the vast majority of signs, right-handed and left-handed signers will have mirror image articulations. For example, in ASL BLACK, a right-handed signer would move the hand to the right, while a left-handed signer would move the hand left. However, a few signs require a certain absolute direction of movement regardless of the dominant hand. For example, ASL RIGHT and EAST always move to the right, while ASL LEFT and WEST always move to the left, regardless of the dominant hand.

BLACK	https://www.signingsavvy.com/media2/mp4-ld/7/7145.mp4	(ASL)
RIGHT	https://www.signingsavvy.com/media2/mp4-ld/22/22624.mp4	
EAST	https://www.signingsavvy.com/media2/mp4-ld/6/6863.mp4	
LEFT (right-handed)	https://www.signingsavvy.com/media2/mp4-ld/22/22754.mp4	
LEFT (left-handed)	https://www.signingsavvy.com/media2/mp4-ld/22/22625.mp4	
WEST	https://www.signingsavvy.com/media2/mp4-ld/29/29597.mp4	

References

Anderson, Catherine, Bronwyn Bjorkman, Derek Denis, Julianne Doner, Margaret Grant, Nathan Sanders, and Ai Taniguchi. 2022. *Essentials of linguistics.* Toronto: eCampusOntario, 2nd ed. https://ecampusontario.pressbooks.pub/essentialsoflinguistics2/.

Hill, Joseph. 2020. Do deaf communities actually want sign language gloves? *Nature Electonics* 3(9): 512–513.

Marsaja, I. Gede. 2008. *Desa Kolok — a deaf village and its sign language in Bali, Indonesia.* Nijmegen: Ishara Press.

Nyst, Victoria. 2007. A descriptive analysis of Adamorobe Sign Language. Doctoral dissertation, University of Amsterdam, Amsterdam.

Sanders, Nathan, Lex Konnelly, and Pocholo Umbal. 2021–2025. LEDIR: Linguistics Equity, Diversity, and Inclusion Repository. https://ledir.ling.utoronto.ca.

Zeshan, Ulrike. 2004. Interrogative constructions in signed languages: Cross-linguistic perspectives. *Language* 80(1): 7–39.