

DEVELOPING A VIDEO-BASED ADAPTATION OF THE MACARTHUR-BATES COMMUNICATIVE DEVELOPMENT INVENTORY FOR A SIGN LANGUAGE: CHALLENGES AND POTENTIAL SOLUTIONS

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Received: 30.09.2025

Accepted: 12.12.2025

ORIGINAL RESEARCH ARTICLE

UDK: 81'23:81'221

DOI: <https://doi.org/10.31299/hrri.62.si.7>

Abstract: *Designing a video-based adaptation of the MacArthur-Bates Communicative Development Inventory for Sign Language of the Netherlands (NGT-CDI), we faced three sets of challenges: technological, linguistic, and cultural challenges. We outline the potential challenges and highlight key considerations to keep in mind for anyone considering creating a video-based CDI-adaptation to a sign language. We suggest solutions that worked for us. However, these may not be available or preferable in all cases, for example if no database of signs is readily available. We argue that creating a video-based CDI is the ideal method for assessing a lexicon in a sign language, within its visual-gestural modality.*

Keywords: *sign language, NGT, video-based CDI, language acquisition, vocabulary development*

INTRODUCTION

When an inventory is being developed for new languages and cultures, the MacArthur-Bates Communicative Development Inventory (CDI) Board emphasises the following - *Adaptations, not Translations!*. This principle recognises that differences in linguistic structure, modality, and cultural context can shape children's early vocabularies in ways that simple translation cannot capture. For sign languages, the most important adaptation is the change from text-based to video-based materials. Sign languages do not have widely used written forms, and as a result, complete correspondence between written items and signs is often lacking. This means that a text-based CDI would potentially misrepresent children's

lexical knowledge, leaving the interpretation effort to the signing caregiver and risking the distortion of results. Therefore, we argue that a video-based CDI may represent an optimal approach for assessing the lexicon of a sign language within its visual-gestural modality, rather than through the written modality of another language. Our approach aligns with previous initiatives, for example, the American Sign Language adaptation, which has long been video-based and served as an important source of inspiration and guidance for our work. Additional sign language adaptations can be found among the adaptations listed on the official MacArthur-Bates website. Creating such a video-based tool comes with a number of unique technical challenges, as well as the typical linguistic and cultural challenges every adaptation

faces. This paper describes the challenges faced and the solutions identified during the process of adapting the inventory for Sign Language of the Netherlands (technical, linguistic, cultural).

Sign Language of the Netherlands

Sign Language of the Netherlands (*Nederlandse Gebarentaal*, NGT), along with its different regional variations, is the official sign language used in the Netherlands. In total, NGT is used by an estimated 10,000-15,000 deaf¹ users, as well as about 60,000 users of NGT in total, including deaf, hard of hearing, deaf-blind, and hearing language users (Klomp, 2021; European Union of the Deaf, n.d.; Cokart et al., 2019). The number of children learning NGT as (one of their) native language(s) is estimated to be in the thousands (Zoutenbier et al., 2016). Our current adaptation of the CDI for NGT is the first complete adaptation for NGT. It is based on a lemma-list developed for NGT by Schüller (2021), which was developed on the basis of a comparison of six sign language CDIs and two spoken language CDIs. The lemma selection was based on their relevance to Dutch culture, frequency in other lists, as well as lemmas relevant to Dutch and Deaf culture (for more details see Sander et al., this issue).

Technical challenges

Technical challenges determine the range of available options for addressing the remaining linguistic and cultural challenges. We faced three such challenges.

1. A video-database of signs has to be identified or created.

Solution: This depends largely on the options available for each (sign) language. During the development of the current instrument, we collaborated with the Deaf native NGT signing experts at the *Neder-*

lands Gebarententrum. All video vocabulary items were taken from their *Gebarenwoordenboek*². This online lexicon represents the largest video collection of NGT signs in the Netherlands, comprising over 18,000 signs. All additional items (e.g., gestures, small sentences), as well as instructions and consent information for this adaptation were recorded by native signers of NGT from the *Nederlands Gebarententrum*.

2. A video-based adaptation usually needs to be online or at least digitally accessible. This involves the following technical requirements:
 - A suitable hosting platform or computer programme
 - In Europe, this service or programme must be compliant with the General Data Protection Regulations (GDPR)
 - The adaptation must be compatible with different devices, ideally, with the ability to function on mobile phones or tablets as well
 - The structure of the entire adaptation needs to be adjusted for the visual modality and the display of videos (e.g., lists do not work well)

Solution: We used an online platform that allowed us to customise the presentation of the inventory. Our online video-based adaptation is hosted on Qualtrics (Qualtrics XM, 2025). A key advantage of the platform was that it enabled us to do the following:

- Offer a computer-based interface with compatibility for mobile phone users (see Fig. 1)
- Adjust the screen size for different devices so that the buttons are always on the same spot (to allow for easier

¹ We use *deaf* (lowercase d) when referring to physical deafness. We use *Deaf* (capital D) only when referring to the Deaf community or its members. When discussing users of sign language more generally, we use *deaf* to avoid making assumptions about the individuals' cultural or community affiliations.

² Find the *Gebarenwoordenboek* online via <https://ow.gebarententrum.nl/>

identification and quicker and more reliable clicking behaviour)

- Maintain compatibility with GDPR regulations (in our case, via a data sharing agreement)
3. A video-based adaptation will be more time-intensive for participants, as video playtime must be considered.

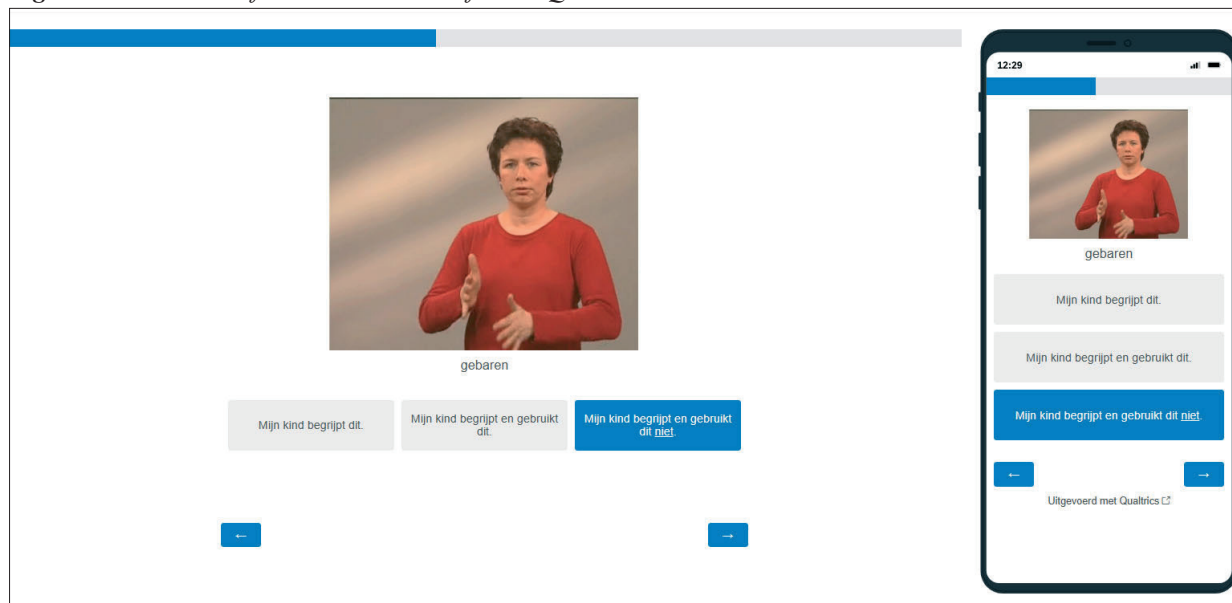
Solution: The speed was increased by:

- Using GIFs (these are set to play automatically and do not involve loading delays, making the entire assessment faster)
- Displaying one item at a time: Since the GIFs play automatically, lists (commonly used in written CDIs) became visually overwhelming, with many items moving simultaneously. Additionally, simultaneous playback of several GIFs also created a higher demand

on internet connections and access devices, which we attempted to reduce.

- Displaying items individually, however, required the introduction of a third clicking option to the usual menu of choices in the CDIs: *my child does not understand and does not use this sign*. This option facilitated automatic forwarding to the next item. Caregivers were introduced to all three options in NGT as part of the instruction section of the inventory.
- Using a function in Qualtrics that allowed us to generate links, enabling the participants to return at a later point in time and continue with the item where they left off (despite our efforts, the test still took over 2 hours to complete; this feature allowed participants to take breaks and return to the assessment whenever they wanted).

Figure 1. Screenshot of the NGT-CDI interface in Qualtrics.



Note: This screenshot shows an example item of the NGT-CDI. The image on the left is the computer-based interface, while the image on the right is the compatible version for mobile phone users. The written item is displayed below the GIF (in this case, *gebaren* (to sign)). The following three options are provided for the caregivers to choose from: *Mijn kind begrijpt dit* (My child understands this), *Mijn kind begrijpt en gebruikt dit* (My child understands and uses this), and *Mijn kind begrijpt en gebruikt dit niet* (My child does not understand and does not use this).

Linguistic challenges

Adaptations of CDIs tend to face the following basic problem: the first step in most adaptations is translating a CDI from a closely related language, but there is often no one-to-one correspondence between words in the two languages. This was also the case during the adaptation of (written) Dutch lemmas to NGT signs.

1. Regional variations influence which signs a child and their caregiver know and use for a specific lexical item. There are not always standardised signs that can be recognised by all language users.

Solution: When no standardised sign was available, the most standard variant was used, or several versions of the sign were shown, based on the selection made in the *Gebarenwoordenboek*. This decision was made in agreement with native NGT signers from the *Nederlands Gebarencentrum*, who are experts in careful selection of such items. In addition, caregivers were instructed to consider an item as understood or used by the child, even if they knew/used a different variant of the sign; this is a common practice in CDI adaptations.

2. Synonyms in one language might not be synonyms in the other language. Some items in spoken/written Dutch translate

to several phonologically unrelated signs in NGT (e.g., *dragen* [English: *support/carry/wear*] in written/spoken Dutch translates to *carrying*, as well as *wearing clothes* in NGT). Some items in spoken/written Dutch translate to several phonologically related signs in NGT (e.g., *pulling forward over the shoulder vs pulling while leaning backwards*, see Fig. 2).

Solution: First the underlying concepts corresponding to each written lemma item were identified, followed by the corresponding signs for each concept of interest. If one concept had several highly context-dependent, but phonologically-related signs, we presented all those signs as synonyms. For these items, participants were presented with several GIFs depicting the sign in all its different contexts, instead of one GIF alone. However, this resulted in a technical challenge: to show several sign videos, we needed to present the GIFs in a way that ensures that the participants see all the GIFs. To solve this issue, we organised them in such a way that all GIFs appeared simultaneously on the screen next to each other, but only one GIF was animated at a time, while the others remained static. After all options have been presented, the GIFs replay from the beginning (see Fig. 2).

Figure 2. Image depicting the Item “Pulling” using two synonym signs.



Note: This screenshot shows an example item of a synonym GIF from the NGT-CDI. First, the GIF on the left (numbered 1) is animated, while the GIF on the right (numbered 2) remains static. Then, the GIF on the left is static, while the GIF on the right part is animated. After this, the entire sequence of GIFs repeats itself. The two signs illustrate the two synonym signs for pulling (Left Nr. 1 – pulling from the back over the shoulder; Right Nr. 2 - starting from the front and pulling backwards).

Cultural challenges

Finally, there are typical **cultural challenges** that any adaptation encounters:

- 1. Challenge:** Children are likely to encounter some items at a much earlier age in Deaf culture than children outside of the Deaf culture (e.g., signs related to deafness, Deaf culture and signing, specific games or fixed phrases, such as signs for *hearing aid*, *audiologist*, *deaf*). **Solution:** We discussed all such items with Deaf native signers and only included items that were appropriate for children using a sign language and growing up in the Deaf community. Items related to Deaf culture and sign language use were added (e.g., the signs for *deaf*, *hearing aid*, *audiologist* and so on), and items unsuitable for deaf and signing individuals were omitted (e.g., *asking whether the child reacts to their name being called*, and other sound-related items)

CONCLUSION

This paper aimed to introduce issues and challenges that could be encountered when adapting the MacArthur-Bates CDIs to a sign language using a video-based approach. We hope this paper will raise awareness of these challenges and offer some solutions.

More information on the NGT-CDI can be found in the CDI vignette in this special issue. The online video-based adaptation of the NGT-CDI is hosted on Qualtrics (Qualtrics XM, 2025) and can be used by other researchers in collaboration with the current NGT-CDI team. For access to the NGT-CDI or for advice on how to design a video-based CDI, please contact Jennifer Sander (jennifer.sander@mpi.nl). A mock-version for illustration purposes can be found here: <https://s.gwdg.de/UJnwqK>.

Acknowledgement

We acknowledge with deep gratitude the contributions of Anique Schüller, who passed away before the publication of this work.

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