

HeSLEx: A novel online questionnaire for heritage sign language research

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Abstract

In this paper, we present *Heritage Sign Language Experience (HeSLEx)*, a novel online sociolinguistic questionnaire adapted from the heritage spoken language survey HeLEx (Tomić et al., 2023) to provide a standardized community profile prior to data collection. Heritage sign languages are minority sign languages used by Deaf signers in migration contexts and thus offer a unique window on bilingualism in the visual modality. HeSLEx is designed to be visual-first: most content is delivered as videos featuring signing in Russian Sign Language (RSL) by community member in a JavaScript/jsPsych interface. To accommodate heterogeneous RSL comprehension, each video includes optional Russian and German text hidden behind a “Show text” button. HeSLEx adds sign-specific modules, including participant and parental hearing status; modality-appropriate proficiency ratings (signing/comprehension for RSL and German Sign Language; reading/writing for Russian and German); educational histories and language(s) of instruction; interactional contexts central to Deaf life (including Deaf clubs); and Deaf-centered identity and language-attitude measures. Many items use slider scales to yield continuous predictors. The tool is designed to be adaptable to other sign language pairs in the framework of heritage language research and beyond.

Keywords: heritage sign languages, sociolinguistic survey, RSL, DGS, jsPsych

1. Introduction: community focus

Monolingual speakers are often treated as the gold standard in language research (Genesee, 2022). Yet neither monolingualism nor the auditory modality is intrinsic to the human language faculty. Heritage sign languages thus provide a particularly informative testing ground to explore an interface between the visual modality and bilingualism.

Heritage language can be loosely defined as a minority language, often (but not exclusively) used in migration contexts: families use a minority language (in migrant contexts, the language used in their home countries) at home and in the diaspora, while also using a dominant societal language in official contexts (at school, at work, etc.) or simply outside of the home setting (Montrul and Polinsky, 2021). Children in such families – either born in the country of residence or migrating before puberty – often acquire and use the minority (heritage) language primarily at home. Due to limited input and restricted contexts of use, the language of heritage speakers is often described as divergent from that of monolingual speakers.

It goes without saying that sign languages can also be heritage languages: deaf families may migrate to a new country and form a diaspora, while acquiring and using the local sign language alongside their heritage sign language. The pressure to use the societal sign language may be even greater for deaf signers than for speakers, as it may determine access to interpretation services in the country of residence.

To our knowledge, there have so far been no

comprehensive studies of heritage sign languages (but see Pichler et al. (2018) for a discussion of children of hearing adults as heritage signers). The present project focuses on one such heritage signing community, described in Section 1.1. At the same time, it is highly likely that other heritage signing communities exist beyond the one examined in this study.¹ Heritage Deaf communities in migration contexts present a unique opportunity to explore language at the intersection of bilingualism, migration, and the visual modality.

In exploring the language of heritage signers, whether through experimental or corpus-based methods, a necessary first step is a holistic description of their sociolinguistic profiles. This is especially important for heritage language users, as studies on heritage spoken languages have repeatedly shown that this population exhibits substantial variability in linguistic behavior, including variable acceptability judgments across participants and variable preferences for different grammatical patterns. This variability has been linked to the complexity and diversity of the social contexts in which heritage speakers are embedded (Nagy and Gadanidis, 2021; Özsoy and Blum, 2023; Rinke and Flores, 2025). In the case of heritage signers specifically, although dedicated research is still lack-

¹At least one additional community of heritage Russian Sign Language signers resides in Israel, formed within the same migration wave from the USSR (Svetlana Dachkovsky, p.c.). Potentially, a community of heritage German Sign Language signers may also be found in Israel due to the similar historical context.

ing, variability may be even higher for the following reasons:

- Unlike most investigated heritage languages, the great majority of sign languages, has no standardized school curriculum and, in many cases, no widely recognized linguistic standard or dedicated institution to safeguard it.² This is known to contribute to substantial variation even among monolingual language users (see Deumert (2001) and Ameka (2016), among others, for discussion on spoken languages) and may thus be enhanced in the heritage setting.
- Related to the point above, unlike most investigated heritage spoken languages, sign languages in general lack a writing system that would be widely used and suited to the needs of the language. Instead, signers use the writing system of the spoken language of surrounding. This fuels variation in already monolingual contexts (Sebba, 2007) and, arguably, even more so in heritage contexts, since (unlike hearing heritage speakers) heritage signers do not have access to a vast library of texts in their heritage language (with the partial exception of videos on social media), which further limits their input thus leading to divergent attainment and increase language viability.
- Deaf communities are always minority communities in their own countries. Consequently, a diaspora using a given sign language in another country is typically even smaller. This is not necessarily the case for all heritage communities; for instance, the community of heritage Turkish speakers in Germany is estimated in the hundreds of thousands, if not millions (Özsoy and Blum, 2023). While equivalent estimates for heritage signing communities are still lacking (see Section 1.1 for an approximation), there is no doubt that they constitute only a fraction of the size of most investigated heritage-speaking communities. Smaller communities may thus contribute to increased idiolectal variation (Raviv et al., 2019; Thompson et al., 2020).
- Almost all signers, even those who use a single sign language, are bilingual in the sense that many can read and write in the surrounding

²According to Fridman and Özsoy (2024), half of all heritage research is dedicated to heritage speakers of Spanish. Other frequent research targets include heritage Korean, Chinese, Russian, and Turkish. These are all highly codified languages with standard curricula and high availability of resources. Many of these languages are studied in English-speaking countries and Germany, where they are used in the contexts of large diasporas.

spoken language. This may itself contribute to variation, but the situation for heritage signers may be even more complex (Fricke et al., 2019; Benmamoun et al., 2013; Polinsky and Scontras, 2020). Depending on age of migration, these signers may or may not receive schooling in the country of origin and/or in the country of current residence, which affects which written languages they acquire and use. It is therefore possible that some signers are bilingual across both visual and written modalities. How such a complex situation influences linguistic outcomes is at present unclear, but it is plausible that a high degree of inter-signer variability should be expected.

The multitude of the factors listed above suggests that, to interpret heritage data, researchers should first document the sociolinguistic dimensions outlined above, and others discussed throughout the paper.

While heritage spoken language research (itself a relatively recent subfield) has developed survey instruments for community profiling, heritage sign language research lacks a standardized procedure for this stage. The present paper proposes one such instrument: the *Heritage Sign Language Experience* questionnaire (HeSLEx). HeSLEx builds on an existing heritage spoken-language survey – *Heritage Language Experience* (HeLEx) – but is adapted to the specific design requirements of research in sign language communities. The current version of the survey was developed in the framework of our project on deaf heritage signers of Russian Sign Language (RSL) living in Germany who are also fluent in German Sign Language (*Deutsche Gebärdensprache*, DGS). The present version is tailored to the RSL–DGS community described below, but it is designed to be easily adaptable to and comparable across other sign language dyads (i.e., pairs of sign languages, e.g., RSL–DGS in the present project).

1.1. Target community

The project investigates deaf RSL signers born into deaf families who migrated from the USSR/Russia to Germany. Migration largely took place in the 1980s. Many families settled in North Rhine–Westphalia and formed a local community. Although its size is not formally documented, community members estimate roughly 30–50 RSL signers in the region. We focus on two generations. The first generation (G1) acquired RSL before migration, learned DGS after arrival, and now uses DGS daily, while RSL is mainly restricted to family and community settings. The second generation (G2) consists of *heritage signers*: individuals born in Germany to RSL-signing families or who migrated

before puberty. Most of them would grow up using RSL at home but acquired DGS rather early on in local deaf schools.

2. Heritage Language Experience survey

HeLEx is a state-of-the-art comprehensive survey covering linguistic experience and related life-history factors (Tomić et al., 2023). It includes (a) self-assessed proficiency in heritage, societal, and other languages in speaking, listening, reading, and writing (Figure 1); (b) frequency of language use across social contexts (home, extended family, work/school, leisure, community); (c) self-reported code-switching and code-mixing in those contexts; and (d) self-identification and language attitudes. Together, these measures support descriptive profiling (including, e.g., *language entropy*, an estimate of exposure to different languages across social/communicative contexts (Gullifer and Titone, 2020)) and allow subsequent linguistic work to be related inferentially to sociolinguistic predictors, as has been done in prior heritage spoken-language studies (Montrul and Polinsky, 2021).

Please rate how well you speak, understand, read and write in each language. Enter the names of other languages in the fields if you speak languages other than Bosnian and Norwegian.

	Bosnian	Norwegian			
How well do you read in these languages? Select "not relevant" if the language does not have a written form.	choose	choose	choose	choose	choose
How well do you write in these languages? Select "not relevant" if the language does not have a written form.	choose	choose	choose barely at all not very well pretty good very good not relevant	choose	choose
How well do you speak these languages?	choose	choose		choose	choose
How well do you understand these languages?	choose	choose	choose	choose	choose

Figure 1: An example of the HeLEx questionnaire for heritage speakers of Bosnian in Norway (Tomić et al., 2023); translated into English for illustrative purposes.

However, HeLEx cannot be used in signing communities without substantial adaptation: it is not designed for deaf participants and does not capture Deaf sociocultural factors relevant to acquisition and use. We therefore developed HeSLEx to better capture the specifics of Deaf migrant communities.

3. Heritage Sign Language Experience

Starting with the dimensions of inquiry already included in HeLEx (see above), in HeSLEx we implement the following changes.

3.1. Visual-first design

In HeLEx, all questions and instructions are presented in written form as also the case in Figure 1. In state-of-the-art sign language research, however, it is customary to minimize written text for multiple reasons. First, exposure to written text may bias signers toward using spoken-language-like structures (Morford et al., 2011). Although this may not straightforwardly affect responses to a sociolinguistic survey, it may become an issue if the survey is used immediately before linguistic data collection. Second, from an ethical standpoint, signers should be able to receive information in their native language. This is especially important in sign language research, which relies on participants' linguistic knowledge and therefore should respect their linguistic rights – including the right to have information presented visually and in sign language.³

In accordance with the considerations above, written content is replaced by videos containing signed versions of the respective texts. To enable this technically, we developed HeSLEx in `jsPsych`, a JavaScript framework designed for creating behavioral experiments that run in a web browser (de Leeuw, 2015). Unlike the Gorilla platform and similar platforms such as Qualtrics – which are user-friendly but slightly less flexible – `jsPsych` allows detailed customization and thus supports a highly visual, accessible layout for deaf users while preserving the original HeLEx template.⁴ More specifically, we use the `jsPsychSurveyHtmlForm` plugin, which supports a customized HTML layout, precise positioning of videos and response interfaces (e.g., scales, text windows, dropdown menus), and additional tools described in the following subsections.

3.2. Community-matched video delivery + optional text

Instructions, questions, and consent materials are recorded by a Deaf RSL signer from the target community (a G2 signer fluent in both RSL and DGS). However, heritage signers may vary in their comprehension of the home language (RSL in our context), especially with respect to technical terminology in the consent form and instructions. In order to provide participants with an optimal ex-

³In addition, from the standpoint of recruitment and data quality, participant comfort and ease (improved by using the native language as the primary *modus operandi*) may positively affect both responses and willingness to continue collaborating with the researcher.

⁴A further advantage of `jsPsych` is that we can develop a dedicated HeSLEx plugin so researchers can insert their own video materials via a template without detailed JavaScript coding; developing this plugin is a key future goal.

perience, each video is accompanied by Russian and German text. Both texts are collapsed under *Pokazat russkiy tekst/ Deutschen Text anzeigen* (*Show Russian/German text*) buttons so that participants who can complete the survey in sign are not forced to be exposed to the written language. The setup is illustrated in Figure 2.

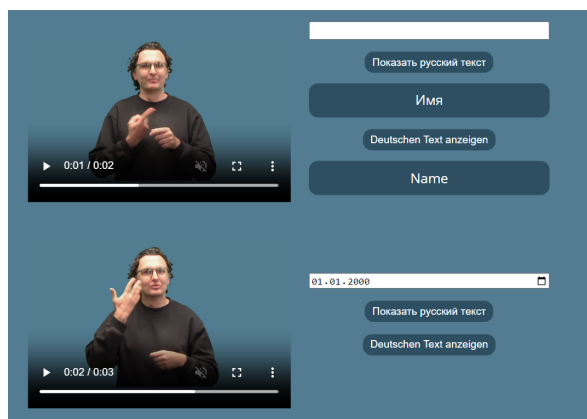


Figure 2: An example of the HeSLEx questionnaire for heritage signers of RSL in Germany. The featured questions concern the name and date of birth of the participants. For illustrative purposes, the Russian and German texts are expanded for the first question; the second question shows how participants usually see the questions – i.e., with the texts collapsed.

In a future version of the survey, it will also be possible to choose between RSL and DGS versions of the questionnaire (this choice will be recorded as a separate variable), with the possibility of changing the selection during completion.

3.3. Family hearing status and language background

Although the original HeLEx includes questions on the language background of parents/caregivers, it predictably does not include questions about their hearing status. At the same time, parental hearing status (recorded separately for the mother and father, or two caregivers) and language repertoire are known to potentially impact sign language acquisition (e.g., age of onset, properties of the input such as native vs. L2 input, and regional variants) (Mayberry and Kluender, 2018). This parameter is especially important in the context of heritage signers, as the family is often the primary language source, while contact with the larger community may be limited. Participant identity (hearing, deaf, hard of hearing, CODA) is also recorded as explained below. See also Crasborn and Hanke (2003) for a more extended list of adaptations proposed for metadata collection for sign language corpora.

3.4. Education and other institutions as key sociolinguistic predictors

Educational context – specifically deaf schools and their types – is a salient factor in sign language acquisition. The particular deaf school may determine the sign language variant preferred by an individual, including dialectal patterns (Quinn, 2010; Stamp et al., 2014; Eichmann and Rosenstock, 2014), while the type of school – i.e., oralist, bilingual, or sign-language-medium – may greatly influence sign language proficiency (Meristo et al., 2007; Hall et al., 2017).

In migration contexts, the situation may be even more complex, since heritage signers born in the country of origin may attend multiple deaf schools that differ in language policy and in the signed and spoken languages used.

To do justice to these parameters, participants are asked to select a language for different levels of education: RSL, DGS, Russian, and German. Free-choice text windows are provided in case none of these languages are applicable. The education levels include primary school, secondary school, vocational school/colleges, and university. Selecting multiple languages is possible, allowing identification of bilingual education. The question for the first two education levels – i.e., primary and secondary school – is illustrated in Figure 3.

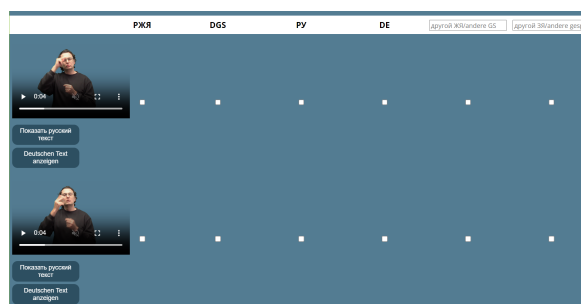


Figure 3: An example of the HeSLEx questionnaire for heritage signers of RSL in Germany. The featured question concerns the language used across education levels.

Another institution that plays a particular role in Deaf communities (and especially in migrant Deaf communities) is Deaf meeting centers/clubs. Most major cities have at least one such meeting center, which serves as an epicenter of social life for Deaf people. Migrant Deaf communities also have their own Deaf clubs or regular meetings, and these are essentially the main ways for heritage signers to communicate in their heritage language outside of the family context. To account for this, we add Deaf clubs/meeting centers as a distinct interactional context alongside home/family/work/leisure/official affairs already specified in HeLEx. In addition, so-

cial media is added as another context, since heritage signers (especially younger generations) may consume signed content in various sign languages and International Sign on social media platforms.

3.5. Deaf-centered identity and attitudes

In addition to language profiling, the original HeLEx puts emphasis on the identity of the heritage speaker, their attitudes toward the heritage and societal languages, and their perception of societal attitudes toward their heritage language use. Identity (e.g., as Russian or German) and language attitudes may influence daily language use and the desire to keep the language active or pass it on to children.

In sign language research, Deaf identity is an additional important variable, as it may similarly influence the use of sign language. We therefore probe signers' identity as deaf, hard of hearing, CODA, or hearing. Note that we ask about *identity*, not objective hearing status, since these do not always overlap, yet both matter for language use.

Similarly, the perceived societal attitude toward the use of a heritage sign language conflates attitudes toward minority language use and toward sign language use, adding another level of complexity. One may hypothesize that DGS signers may be more sympathetic to heritage RSL signers than hearing speakers of German are toward heritage Russian speakers, due to shared experiences related to deafness. At the same time, heritage RSL signers may receive less governmental support for services in heritage RSL than heritage speakers of Russian receive for services in Russian. The survey is therefore adapted to the intersectionality between migration and deafness, including attitudinal questions addressing both.

3.6. Minor adjustments

3.6.1. Modality-appropriate proficiency measures

Instead of inquiring about self-reported speaking and listening proficiency in heritage and societal languages, we add parallel questions about signing and comprehension. This is implemented both for self-assessment and for questions concerning frequency of language use. It is important to consider these aspects separately, as comprehension in heritage signers may be significantly more advanced than production. We do, however, retain the questions about reading and writing in the spoken languages used in the country of origin and in the country of residence (e.g., Russian and German). It would be interesting to examine how exposure to these spoken/written languages interacts with the use of heritage sign language and with language

identity and attitudes. Additionally, heritage signers (as well as heritage speakers) often do not read or write in the minority language at all (or do so very little) (Benmamoun et al., 2013). It is therefore of interest to examine how limited exposure to the spoken/written heritage language relates to signing practices in heritage sign language.

3.6.2. Response format optimization

On a more technical note, although not directly related to the sign language context, some changes have been made to the response format. Instead of many multiple-choice items in HeLEx (see Figure 1), we use slider scales in HeSLEx (Figure 4). This has two advantages. First, scalar results are continuous, thus being more informative for descriptive summaries and better suited to inferential models (e.g., linear mixed-effects regression) (Schütze and Sprouse, 2013). Second, scales are generally more visual and usually require less text, thus being more suitable for a sign language survey.

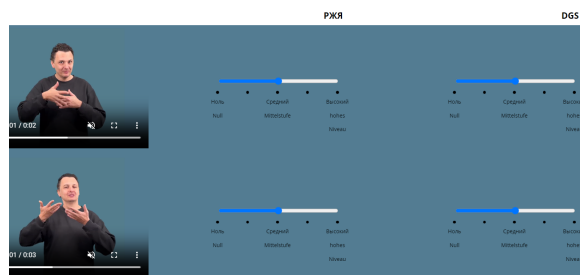


Figure 4: An example of the HeSLEx questionnaire for heritage signers of RSL in Germany. The featured question concerns self-reported proficiency in comprehension and production in RSL and DGS; the response is represented as a scale from “Null” to “High level”; the slider can be placed anywhere on the scale, including between the ticks.

3.7. Planned development

As mentioned previously, it is desirable in sign language research to limit exposure to written text. Accordingly, typed responses are also undesirable. For items that currently require typed responses (e.g., occupation or name), we aim to add an option for participants to provide video responses stored in the dataset (e.g., as base64-encoded media). In the current version of `jsPsych`, this is not yet implemented. There is a dedicated `jsPsychExtension-RecordVideo` extension in addition to the `jsPsychInitializeCamera` plugin, which together allow recording video responses. However, using these plugins does not allow HTML-based customization; consequently, the layout structures, scales, and multiple answers per window would be lost. Second, video

recording does not allow previewing the recorded video or even viewing the webcam output during recording, making the recording essentially blind. This format is suboptimal. Our goal is therefore to create a customized extension allowing video recording with a webcam view and a preview, enabling typed answers to be replaced.

A further long-term goal is to create a dedicated plugin based on `jsPsych` that can be easily reused for other sign-language dyads in heritage sign language research. Currently, all videos, translation texts, and response tools are included directly in the code of each *trial* (one full window of questions submitted by clicking the “Continue” button). A plugin would allow researchers to simply provide video files and translation texts, and to select the desired response format. In other words, a plugin would make HeSLEx reusable for further bilingual sign language research on any sign language dyads within heritage language contexts (including research on CODAs as heritage signers) and beyond.

4. Pilot usage and subsequent edits

HeSLEx was piloted with three deaf participants, one on site and two online. In addition to completing the questionnaire, pilot participants were asked to provide informal feedback, in written or signed form, on their experience with the questionnaire from the user’s perspective.

Pilot participants reported that HeSLEx was visually legible and well aligned with the needs of Deaf bilingual communities. The on-site participant and one of the online participants completed the questionnaire on a laptop using the Chrome browser. These participants reported no problems with the layout, but noted that the text on the scale ticks could be larger or bolded; this change has been implemented in the current version of the survey. The second online participant completed the survey on a smartphone. This participant reported that the layout on some pages (e.g., the informed consent page) became distorted on a smartphone, with page elements appearing “crumbled together”. The participant noted, however, that this did not significantly hinder use of the questionnaire. The necessary adjustments will therefore be implemented in the next version of the survey.

The two online participants, as well as the reviewers, noted that a button allowing participants to return to the previous page would be useful. The `jsPsychSurveyHtmlForm` plugin primarily used in the experiment does not include a built-in option for such a button. In the current version of `jsPsych` (v8.2.3), the only plugin that supports returning to the previous page is the dedicated instruction plugin `jsPsychInstructions`. However, this plugin cannot serve as the basis for the ex-

periment, since it does not allow customized HTML code or other forms of user input. To address this issue, we implemented backward navigation by replacing the original fixed sequence of separate `jsPsychSurveyHtmlForm` trials with a controller, `surveyPages`, that displays questionnaire pages from an indexed list. Whenever the page changes, the script saves the current responses and restores them when a participant returns to an earlier page by pressing the “Back” (“Nazad / Zurück”) button. In other words, the button moves to the previous page in the list and re-renders it with the previously entered responses, allowing participants to review and, if necessary, revise their answers. The corresponding JavaScript code is available via the OSF link below.

With respect to the languages used in the questionnaire, all participants found the videos containing the questions in RSL clear and reported that, for them, consulting the written text was unnecessary. One participant mentioned double-checking the German and Russian texts in the informed consent section of the survey, which arguably contains the most technical signs in the questionnaire. We would like to reiterate, however, that greater variability in RSL comprehension is to be expected in a larger participant group.⁵

Importantly, as anticipated, participants found the scales intuitive to use and used them in a graded way, placing the slider not only on the pre-determined ticks but also between them.

On the technical side, an important outcome of the pilot was the confirmation that data from questionnaires completed on different types of devices and browsers could be successfully uploaded from

⁵We are grateful to the anonymous reviewer who drew our attention to the fact that, in the previous version of the survey, many drop-down menu responses were labelled only in Russian. Although implementing signed drop-down menu options is, unfortunately, technically suboptimal, in the current version of the questionnaire we have added German equivalents for all drop-down menu options. Additionally, the reviewer rightly pointed out that having the first option in the drop-down list pre-selected by default may create ambiguity as to whether this option was actively chosen by the participant or whether the participant skipped the question. To address this issue, we added a default “...” option at the top of each list; the appearance of this option in the responses is treated as indicating that the participant skipped the question. Although no straightforward equivalent solution is available for the scales, we are currently working on recording not only the slider position, but also whether the participant interacted with the slider at all. This is not a complete solution, since a participant may judge the midpoint of the scale to be the most appropriate response and therefore leave the slider untouched. Nevertheless, this approach provides a somewhat better basis for disambiguating the survey output.

the server. This was indeed the case.⁶

An offline demo version of HeSLEx (in RSL, Russian, and German) in HTML and .js formats can be downloaded from the following link: <https://osf.io/jgdxv/>.

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⁶If a questionnaire is exited before completion on a computer, the data entered up to that point remain recorded. This is not the case when the questionnaire is completed on a phone, where all data are lost if the browser window containing the unfinished questionnaire is closed. In the context of an online questionnaire, this is only a minor issue, since a partial dataset, even if recorded, is unlikely to be included in the analysis.

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