

Haug, T., Herman, R. & Woll, B. (2015). Constructing an online test framework, using the example of a sign language receptive skills test. *Deafness and Education International*, 17(1), pp. 3-7. doi: 10.1179/1557069X14Y.0000000035



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**Original citation:** Haug, T., Herman, R. & Woll, B. (2015). Constructing an online test framework, using the example of a sign language receptive skills test. *Deafness and Education International*, 17(1), pp. 3-7. doi: 10.1179/1557069X14Y.0000000035

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Published in Deafness & Education International, 2014

DOI: <http://dx.doi.org/10.1179/1557069X14Y.0000000035>

## Constructing an Online Test Framework, Using the Example of a Sign Language Receptive Skills Test

by

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### **Abstract**

This paper presents the features of an online test framework for a receptive skills test that has been adapted, based on a British template, into different sign languages. The online test includes features that meet the needs of the different sign language versions. Features such as usability of the test, automatic saving of scores and score reporting have been implemented. The background information of the children and the test results are saved in a secure databank. When consent has been granted, these data can be used for cross-linguistic research in the future. This will not only help us to broaden our understanding of deaf children's sign language development, but will also help us to further improve sign language testing. Furthermore, implications for research and practice will be discussed.

## **Introduction**

Sign language tests have been developed for different areas of application, such as to assess the development of deaf children with a sign language as their first language (L1) and subsequently monitor their progress (for example for British Sign Language (BSL): Herman et al., 1999; Sign Language of the Netherlands: Hermans et al., 2010) or for research purposes, e.g., how phonetic complexity affects the perception and articulation of handshapes and movements in BSL (Mann et al., 2010). Most of the existing assessment instruments are tests of L1 development (Haug, 2008). Only very few of these tests are available for use in schools. The format of test delivery among different sign language tests varies, e.g., as a local format on DVD, or Web-based test formats (for a detailed discussion see Haug, 2013). Developing or adapting a sign language test poses methodological challenges to ensuring the reliability and validity of the test instrument. Some of the challenges are grounded in the current state of research, i.e. many sign languages are under-documented with respect to their linguistics and acquisition (e.g., Haug, 2012; Haug & Mann, 2008).

One of the few tests that is available for use in schools is the BSL Receptive Skills Test (Herman et al., 1999)<sup>1</sup>, which assesses receptive morphology and syntax in deaf children aged 3-11. The BSL Receptive Skills Test has served as a template for other sign languages, including Australian (Johnston, 2004), German (Haug, 2011a) and American Sign Language (ASL; Enns & Herman, 2011). In the process of adapting an existing sign language test into another sign language linguistic and cultural differences need to be taken into account (Haug, 2011b; Haug & Mann, 2008).

That the same sign language test has been adapted into different signed languages offers the opportunity to use the same test framework to implement the different versions of this test, e.g. ASL, BSL and German Sign Language. The goal of this paper is to present the features and goals of this online test framework.<sup>2</sup>

## **The test template: BSL Receptive Skills Test**

The BSL Receptive Skills Test (Herman et al., 1999) is designed for children aged 3 to 11 years. Following a pilot study on 41 deaf and hearing children (28 children with at least one deaf parent, and 13 hearing children with a native signing background), the test was revised and standardized on 138 children. The BSL Receptive Skills Test focuses on selected aspects of morphology and syntax of BSL. It consists of a vocabulary check and a video-based receptive skills test.

*Vocabulary check:* The children confirm their knowledge of 22 vocabulary items used in the main test, through a simple picture-naming task.

*Receptive skills test:* The video-based Receptive Skills Test consists of 40 items, which are ordered by level of difficulty. The children see a signed stimulus and are then asked to select the right answer among the four multiple-choice answers that are provided as color drawings in a booklet. Because of regional variation in signs, there are two versions of this task, one for the North and one for the South of the UK.

*Testing procedure of the BSL Receptive Skills Test:* The BSL Receptive Skills Test is presented to participants as video on DVD. In addition to the test items, it also includes signed instructions. This format facilitates a standardized presentation of the test and reduces demands on the tester. The vocabulary check, however, is administered live and requires some BSL skills on the part of the tester.

*Psychometrics of the BSL Receptive Skills Test:* In order to establish test-retest reliability for the receptive task, 10% of the sample on which the test was standardized were retested. The test scores improved on the second testing, but the rank order of scores was preserved. There was also a high correlation (.87) between the test and retest scores. Split-half reliability analysis for the internal consistency of the receptive test revealed a high correlation (.90) and, therefore, represents a high internal consistency.

## **Test delivery of the adapted sign language versions**

The different adapted language versions (e.g. German and American Sign Language version) of the BSL Receptive Skills Test make use of different formats for test delivery. For example, in the version for ASL<sup>3</sup> (Enns & Herman, 2011) a signed stimulus is presented on a DVD as video followed by the answer choices (pictures). The German version of the test (Haug, 2011a)<sup>4</sup> makes also use of a local test format, but as a stand-alone application (see Figure 1). The test results are saved automatically in the German version, i.e. once a picture has been selected and the participant has proceeded to the next item, the results are saved and can be exported to a statistics application later.

INSERT FIGURE 1 HERE

Figure 1: Example of the computer-based version of the German Sign Language Receptive Skills Test (Haug, 2011a)

Based on the German version, the author developed this online test version with more features that can serve different purposes for practitioners and researchers.

## **The online test**

### *Background*

The online test framework<sup>5</sup> was programmed with CakePHP<sup>6</sup>. The author developed the features and the structure of the online test framework that served as the basis for the programmers. A preliminary version of the online test was reviewed with colleagues<sup>7</sup> from University College London and City University London in November 2012. Most of the features that are presented here are already fully implemented. In spring 2014 more sign language versions will be added to the online test (American and British Sign Language). The German and the British version will be piloted with teachers and deaf children in spring 2014.

### *Goals of the online test framework*

The overarching goal of this test framework is to provide a technical infrastructure that can be used for the different sign language version of the BSL Receptive Skills Test (Herman et al., 1999).

While developing the online test conceptually, it was important to consider different aspects of usability for the test administrator (e.g., teachers) and test participants (i.e., children), but also to keep in mind that the test can be used for research purposes, e.g., using the test results for cross-linguistic research. This resulted in different needs that had to be taken into account in the implementation of the online test.

### *Different user groups*

The basic idea of the online test is to have different user groups, and these groups have different levels of access/rights to the test.

At the top level is the *superadministrator*, the technical administrator of the test who has access to the different language versions of the test. S/he can, for example, implement a new language version of the online test. The *test developer* has full access to only one specific language version. S/he has to implement the whole test, for example for Australian Sign Language, by uploading the test materials (see also *Upload Management*) and adding other users, such as the test administrator.

The profile of the *test administrator* (e.g., teacher, educational psychologist) is always linked to a particular school/institution. The test administrator is able to add new test participants. Before testing a child, s/he needs to fill out a background questionnaire of the child and check that a parent consent form is available. The test administrator can view the test results and also search the databank interface (see *Databank interface*).

The *researcher* “only” has access to the databank and to the test. Test participants do not have a profile of their own since the test will only be conducted in the presence of a teacher (test administrator).

### *Structure of the test*

The British template consists of three different parts: a general introduction to the test, the vocabulary check (see *The test template: BSL Receptive Skills Test*) and the receptive skills test (including practice items). While in the British version the tester decides, based on the results of the vocabulary check, whether to use the Northern or Southern variant of the BSL Receptive Skills test (Herman et al., 1999), the German version uses a different approach. In the German version a “training session” was introduced whereby the four signs that show a regional variant, but could not be assigned to a specific region, are taught (Haug, 2011a). Both the British and the German version test different linguistic structures that also needed to be considered for the development of the test framework. This has been realized by allowing the addition or removal of structures/parts within a particular language version.

### *Test participants*

The adding of a new participant requires the teacher to fill out a short background questionnaire that is implemented in the online test. The questionnaire covers, among other things, date of birth, the linguistic experiences of the deaf child, degree of hearing loss, and the parents’ hearing status. This questionnaire has “default” questions across all language versions in order to enable a comparison of the cross-linguistic data later on. In addition, some questions are country-specific to reflect the differences in the educational systems. Technically speaking, it is possible to retest a child in yearly intervals and thus have the chance to follow a child longitudinally

### *Upload management*

The test developer is responsible for uploading all files (videos, pictures) to create the test items. Only s/he is able to edit the uploaded materials. There are certain requirements for the quality, size and format of the pictures and videos. The test developer is also able to “manage” files, i.e. to delete them, rename them etc.

### *Creating items and item categories*

The test developer can start to create items, a process that includes assigning an item to an item category (see next paragraph). An item consists of a signed stimulus (video) and 3-4 answer choices (pictures). The test developer has to assign a video to the item and pictures to the answer choices. The order of the items, which are ordered by their level of difficulty, can be changed when it becomes clear that e.g., a certain item is more difficult than expected and should thus be moved to the end of the test.

The British template tests specific morpho-syntactic structures of BSL which are represented in different items. For example, there are five items that test negation. This group of items constitutes an item category. The test developer can create item categories. This is also interesting for the reporting of the results, because participants' scores can be reported not only as the total score but also as the score by grammatical category.

#### *Conducting the test*

Once the entire test has been set up and a test participant has been added, the test can start. After watching the instructions, the participant undertakes the training session (depending on the language version), followed by practice items and the test items. Once the participant has selected a picture by clicking on it using the mouse and proceeded to the next item, the results are saved automatically in the databank. In case of fatigue or inattention of the child, the test administrator can interrupt the test, save the results and continue from the same point at a later date.

#### *Saving of results and score reporting*

After completing the test it is possible to access the score report online via the databank interface and/or to receive a score report by email as a PDF, not only with the total score, but also an analysis by grammatical categories. Once a test of a sign language version has been standardized and norms are available, they can be implemented into the analysis of the score report. The information on the score report then informs how a child performed compared to his/her peers.



### *Databank search interface*

The information about the test participants (background questionnaire, test results) is collected in the online test's databank and can also be accessed through the databank search interface. The test developer and administrator are only able to access the data of the test participants within their sign language version of the test or their school, respectively. The databank search interface allows them to search for, for example, the test results of the children, combined with variables such as age, age of acquisition of a sign language, hearing status of the parents, gender etc.

A researcher will have access, when granted by the test developer of different language versions, to the data across the different sign language versions or can use a test version for a research project. This will allow researchers to conduct cross-linguistic research that will not only help us to broaden our understanding deaf children's sign language development, but will also in turn help us to further improve sign language testing. This test format also allows us to test children longitudinally.

### *Security of the online test framework*

Technically speaking, the online test framework is secured by a standard security measure for websites by implementing a Secure Socket Layer certificate, which is often used for the secure processing of credit card information when purchasing products online. In terms of access to the data, only a very limited number of people will have access to it and most importantly, no names of children will be saved on the server. The child will receive an alpha-numeric code as ID - the child will be assigned that same ID on subsequent testing occasions.

### *Resource subsite*

Within the online test framework is a resource subsite where the test developer can for example upload the test manual, the checklist for the vocabulary check, the parent consent form and maybe any other materials that are relevant for conducting the test.

## **Implications for practice**

It is important to consider what the consequences of the test results are for the children and for educational practice. A test only serves its purpose when the results inform/are the basis for educational decisions or interventions. It is important that practitioners and researchers work together to develop sign language interventions that are based on the test results in order to improve the children's language proficiency. In this way the question "What is happening with the test results?" can be answered and the test will not stand on its own, but be part of the educational practice in schools.

A child should not be tested more frequently than once a year using a sign language test like the BSL Receptive Skills Test (Herman et al., 1999). Children should not be "trained" in doing a test, this will conflict with its purpose and provide a misleading picture of the child's progress. The test should not be used to "teach to the test".

## **Implications for research**

The databank of this test framework offers the opportunity to collect data over time and for different sign languages. We do not know exactly how "close" or different the various versions of the receptive skills are (e.g., for BSL: Herman et al. 1999; for ASL: Enns & Herman, 2011; for German Sign Language: Haug, 2011a), e.g., the order of the items might be not be exactly the same across tests, but might show a similar pattern. Cross-linguistic research cannot be undertaken on the basis of comparing single-items or the exact test scores across sign languages, but to see if comparable pattern across languages and groups of language learners at different ages and different linguistic experiences emerge. In order to be able to conduct cross-linguistic research, we also need to check the similarities and differences between the sign languages under investigation (for example, for a comparison of BSL and German Sign Language structures see Haug, 2011a) and the exact nature of items and the order of items involved.

The following research questions are amongst those that could be addressed: (1) What are the similarities and differences between the different sign language test versions?, (2) What are the patterns of development across sign languages in different groups of language learners?, and (3) What is the effect of age of acquisition on the development of specific linguistic constructions (e.g., negation)? Furthermore it will be possible to collect more data over time to set up language profiles of the heterogeneous group of deaf signing children.

## **Conclusion**

The goal of this test framework was to provide an online test platform that hosts different adapted sign language versions of the BSL Receptive Skills Test and offers an effective way regarding setting up a test, test administration and the handling of the test results. Furthermore, it has been emphasized that the online test platform can be used by practitioners and researchers alike.

An eye will be kept on the latest technical developments such as implementing a responsive design so that the test could be conducted on a regular desktop but also on tablet computers in the future.

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<sup>1</sup> Examples of the BSL Receptive Skills Test can be accessed at: <http://www.signlang-assessment.info/index.php/british-sign-language-receptive-skills-test.html>

<sup>2</sup> The online test is accessible at [www.signlanguagetest.com](http://www.signlanguagetest.com)

<sup>3</sup> <http://www.signlang-assessment.info/index.php/american-sign-language-receptive-skills-test.html>

<sup>4</sup> <http://www.signlang-assessment.info/index.php/german-sign-language-receptive-skills-test.html>

<sup>5</sup> Thanks goes to the two computational linguists Hiko Schamoni, Heidelberg University, Germany and Heli Uibo, University of Tromsø, Norway who realized the programming part of the test framework.

<sup>6</sup> <http://cakephp.org/>

<sup>7</sup> Thanks to Kate Rowley for very useful feedback on the preliminary version of the test framework.