CDI VIGNETTES

The development of CDI instruments for various languages and cultures has been at the heart of the first ten European Network Meetings on Communicative Development Inventories, held in Dubrovnik from 2006 to 2026. Although development might have proceeded much faster if everyone had spoken a common language such as European, the richness that diverse languages and cultures have brought to the field would have been lost. Children's language is shaped by universal, language-specific, and individual features, and the many adaptations of the CDI instruments to specific languages provide opportunities to distinguish among these three levels. Moreover, the instruments are also useful alongside other measures in clinical work, which often includes various forms of bilingualism. This supplement presents descriptions of 26 CDI instruments adapted to different languages, including a brief background and the populations investigated.

Mårten & Jelena

THE ALBANIAN CDI

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Albanian language and Albanian-speaking populations

Albanian is an independent branch of the Indo-European family, spoken by over seven million people in Albania and the Republic of Kosovo, as well as in parts of North Macedonia, Montenegro, Serbia, and Greece (Rusakov, 2017). It is also spoken in old settlements in Italy, Greece, Ukraine, and Bulgaria, as well as in diaspora communities worldwide. Albanian has been described as a synthetic-analytic language with a particularly rich morphology, especially in its verbal and nominal systems (Agalliu et al., 2002). It has two main dialects - Gheg, which is spoken in north and central Albania, and Tosk, which is spoken in the South - in addition to a standard variety of Albanian that is mainly based on the Tosk dialect (Çerpja & Çepani, 2023).

Instrument

So far, the only instrument developed for Albanian is the CDI:W&S, whose initial form was evaluated based on a data from 130 children (ages 16-30 months) living within the territory of the Republic of Albania (Kapia et al., 2024). This instrument consists of several interrelated components: a lexical inventory, a paralinguistic development section, and specific tasks targeting very early morphology and syntax. It begins with a demographic questionnaire consisting of 15 background questions addressing key biographical and sociolinguistic variables such as age, gender, health status, exposure to foreign languages, daily routines related to reading and screen time, place of birth and residence, parental education, and so on.

The main body of the inventories is divided into two sections:

Part I. Paralinguistic section – this section examines the child's conceptualisation of different precursors to linguistic markings, i.e., past or future events and references to absent objects or persons.

Part II. Grammatical and lexical section – this section is more extensive and includes three components: a) *Word forms*, b) *Word groups*, and c) *Vocabulary checklist*. *Words forms* contains 27 questions that tap into the child's knowledge of different suffixes and word combinations, such as noun plurals, definiteness, case marking (nominative, accusative, dative), person and tense marking (present, aorist, future), and imperative forms in both active and passive voice, both with and without clitic pronouns. It also asks parents to list the three longest sentences recently produced by the child. *Word groups* includes 21 items that examine simple phrasal structures, such as those expressing location, direction, instrument, and accompaniment, as well as common negation patterns, dative and accusative clitic pronouns, genitive and possessive constructions, with the latter

examined in both singular and plural. *Vocabulary checklist* consists of 513 items across 22 semantic categories, including animal sounds, animals, vehicles, toys, food/drink, clothing, body parts, household and outdoor domains, places, people, games/actions, verbs, adjectives, temporal and locative terms, pronouns, question words, auxiliaries, conjunctions, and emotion words.

Population

The Albanian CDI:W&S is in the process of being normed based on a randomly selected sample of children from various state daycare centres across the Republic of Albania, as well as the national birth register of Albania. As of February 2026, relevant data has been collected from a total of 2200 children. More importantly, however, the initial form of the instrument has already been tested using several typical populations within the Republic of Albania, as reported in different studies (Dule, 2024; Kapia et al., 2024; Sehitaj, 2015; Zogaj, 2021).

Reliability and validity

Content validity of the vocabulary inventories was ensured by assessing the proportion of words included in the instrument that occurs in existing naturalistic datasets for a given age group (16-30 months). These proportions varied between 60-99%. Furthermore, the inventories were compared with the results of a pilot study involving over 100 children, which concluded that only the words between the 65-95% threshold were included in the checklist (Kapia et al., 2024).

Access

Access to the instrument (not yet normed) can be obtained from Prof. Enkeleida Kapia (Enkeleida.Kapia@lmu.de).

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THE BASQUE CDIs

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The Basque language

Basque is a European language spoken in a region called the Basque Country, which is located on the western part of the Spanish-French border. Although Basque is a minority language in this region, the revitalisation process that has occurred over the last few decades has resulted in a rise in the number of Basque speakers to around 300,000 between the years of 1991 and 2021 (Eusko Jaurlaritza, 2024). This agglutinative language with Subject-Object-Verb word order exhibits rich morphology in both the nominal (case system) and verbal (multi-argumental person and number inflection) domains. This contrasts with the simpler fusional nominal morphology of Spanish and French in these two domains. Despite this typological distance, Basque has incorporated many lexical borrowings from Latin, Spanish, and French - three languages with which it has been in contact over the centuries.

Instruments

The BCDI-1 (for children aged 8-24-month-olds) is the Basque version of the CDI: W&G, which was originally created for children aged 8-15 months living in the USA, and was later extended to 18 months (Fenson et al., 2007). It includes the following scales: first signs of understanding (3 items), comprehension of phrases (28 items), starting to talk (2 items), vocabulary comprehension and production over 19 semantic categories (397 items), and production of five types of gestures (63 items). (See Barreña et al., 2008 and Garcia et al., 2024).

The BCDI-2 is the Basque version of the CDI: W&S or CDI-II for ages 16-30 months as in the original (Fenson et al., 2007). It includes a checklist of vocabulary production over 21 semantic categories (654 items), the use of nominal (9 items) and verbal (37 items) morphemes, a grammar scale measuring the use of different combinations of words and syntactic structures (37 items), and finally, an open question asking for three examples of long sentences that the child has recently said (3 items) (Barreña et al., 2008).

The Short BCDI-1 (for children aged 8-15 months) includes a checklist of 90 words, which are assessed for both comprehension and production (Ezeizabarrena et al., 2024, Garcia et al., 2011).

The Short BCDI-2 (for children aged 16-30 months) includes a 100-word checklist for assessing production, as well as an open question asking for three examples of long sentences that the child has recently said (Garcia et al., 2011; Ezeizabarrena et al., 2024).

The Basque version of the CDI-3 (for children aged 30-37 months), the BCDI-3 (for ages 30-50 months), includes a 120-word checklist that assesses expressive vocabulary, and nominal (16 items) and verbal (20 items) morphemes. It also includes an open question that asks the informant to provide three examples of long sentences that the child has recently said (3 items), as well as a grammar scale that assesses the use of different suffixes and word combinations (29 items). The final section, Language use, consists of 12 questions that assess various aspects of comprehension, semantics, and syntax (Ezeizabarrena et al., 2024, Garcia et al., 2014).

The online version of all aforementioned BCDI instruments is currently undergoing pilot testing.

Samples

The BCDI-1 W&G was initially standardised using a sample of 442 parental reports on children (49.1% girls) between the ages of 8 and 16 months (Barreña et al., 2008). Subsequently, the age range was extended to 24 months, based on a total sample of 1,002 reports (49% girls) (See Garcia et al., 2024).

The BCDI-2 W&S was standardised using a sample of 975 reports on children aged 16 to 30 months (50.7% girls) (See Barreña et al., 2008).

The short-forms of the Basque CDI were standardised using 468 parental reports on children aged 8 to 15 months (for BCDI-1s) and 926 parental reports on children aged 16 to 30 months (for BCDI-2s) (See Ezeizabarrena et al., 2024 and Garcia et al., 2011).

The BCDI-3 was standardised using a sample of 1024 reports on children aged 30 to 50 months (51.4% girls) (Ezeizabarrena et al., 2024; Garcia et al., 2014).

Reliability and validity

Internal consistency, as measured by the coefficient alpha, ranged from .74 to .99. Intra-individual test-retest reliability (i.e., the words reported at a given time and once again six weeks later) varied between .88 and .99 (See Table 1).

To analyse the validity of the instruments, we calculated the correlation between BCDI-1 and BCDI-2 scores using the Battelle test. The correlations for the BCDI-1 were greater than .84, while those for the BCDI-2 were greater than .81.

In the case of the BCDI-3, the correlations were analysed using the Peabody test and they were found to be higher than .60. The correlation with the grammar scale was lower (.40).

The validity of the short forms was analysed by examining the correlations between the short versions and the long versions: in this case, the correlations for the BCDI-1 were greater than .76 and those for the BCDI-2 were greater than 0.82.

Access

- **BCDI-1 scales:** Barreña et al. (2008). https://www.ueu.eus/argitaletxea/liburuak/macarthur-bates-komunikazio-garapena-neurtzeko-zerrenda.
- **BCDI-1 questionnaire**: https://osf.io/sge3b
- **BCDI-2 scales:** Barreña et al. (2008). https://www.ueu.eus/argitaletxea/liburuak/macarthur-bates-komunikazio-garapena-neurtzeko-zerrenda.
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- **BCDI-1s scales** and **questionnaire:** Garcia et al. (2011). https://aldizkariak.ueu.eus/index.php/uztaro/article/view/4464/4573
- **BCDI-2s scales** and **questionnaire:** Garcia et al. (2011). https://aldizkariak.ueu.eus/index.php/uztaro/article/view/4464/4573

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Table 1. *Reliability of scales included in five Basque CDI instruments.*

Instrument	Scale	Internal consistency (Cronbach's alpha)	Intra-individual test-retest reliability
Basque CDI-1 W&G BCDI-1			
	Vocabulary comprehension	.99	.93
	Vocabulary production	.99	.83
	Total gestures	.95	.88
Basque CDI-2 W&S BCDI-1			
	Vocabulary production	.96	.98
	Syntax	.95	.99
Basque Short CDI-1 BCDI-1s			
	Vocabulary comprehension	.98	
	Vocabulary production	.98	
Basque Short CDI-2 BCDI-2s			
	Vocabulary production	.99	
	Examples	.98	
Basque CDI-3 BCDI-3			
	Vocabulary production	.98	.98
	Morphemes	.95	.96
	Syntax	.97	.96
	Language use	.74	.93

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THE CATALAN CDIs

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Catalan and Catalan-speaking populations

Catalan is a Romance language with Latin roots that is spoken by approximately 9 million people and it enjoys co-official status in parts of Spain. Despite historical periods of sociopolitical repression, Catalan has undergone a revitalisation and maintains a notable presence through institutional support in education, media, and public administration.

Catalan exhibits a moderately synthetic morphology. The verbal morphology is particularly rich, encompassing multiple tenses, moods (indicative, subjunctive, imperative), and aspects. Nominal inflection includes gender (masculine/feminine) and number (singular/plural), with relatively regular patterns. Moreover, the language makes extensive use of clitic pronouns.

Catalan syntax generally follows a subject-verb-object (SVO) order, though pragmatic factors often lead to topicalisation and different word order variations.

Phonologically, Catalan is characterised by a rich vowel system, including central and mid vowels, alongside a contrastive distinction between open and close variants. Dialectal variation affects both phonetics and lexicon, with notable differences observed between Eastern and Western Catalan varieties.

Instruments

The CDI:W&G (for ages 8-18 months) includes *the first signs of understanding* (3 items), *comprehension of phrases* (27 items), *starting to talk* (2 items), *first word* (2 items), vocabulary comprehension and production across 19 semantic categories (423 items), *actions with one object instead of another* (2 items), and finally, production of five types of gestures (69 items) (Serrat et al., 2022).

The CDI:W&S (for ages 16-30 months) includes *first word* (2 items), a checklist of vocabulary production checklist across 22 categories (678 items), *how children use and understand language* (5 items), *use of morphemes* (16 items), *irregular verb forms* (17 items), *surprising words* (2 items and an open question requesting three examples of over-regularisation), *word combination* (1 item), an open question of three examples of long sentences recently produced by the child (3 items), and a *morphosyntactic complexity* scale (40 items) (Serrat et al., 2022).

The Short CDI (for ages 16-24 months) includes a 100-word production checklist, *word combination* (1 item), an open question requesting three examples of long sentences recently produced by the child (3 items), and a *morphosyntactic complexity* scale (15 items).

Populations

The CDI:W&G was normed using a randomly selected sample of 590 parents of children aged 8 to 18 months. The CDI:W&S was normed using a randomly selected sample of 883 parents of children aged 16 to 30 months. In both cases, the sample was drawn from Catalonia, the Balearic Islands, Valencia, and Andorra.

The Short CDI is currently being administered for the purpose of norming using a randomised sample of children aged 16 to 30 months from Catalonia and the Balearic Islands.

Reliability and validity

The internal consistency was measured using Cronbach's alpha and test-retest reliability. Spearman's correlation indicates high reliability across both instruments (see Table 1).

Convergent validity for the CDI:W&S was assessed through the recording and analysis of spontaneous speech samples, focusing on lexical diversity (types) and mean length of utterance (MLU). Spearman's correlation tests conducted with measures of productive vocabulary, MLU3w, morphosyntactic complexity, and morphology yielded statistically significant coefficients, ranging from .534 to .783.

Regarding predictive validity, statistically significant correlations were observed within the CDI:W&G, between the CDI:W&G and the CDI:W&S, as well as within the CDI:W&S itself - the values range from .52 to .77. These findings support the adequate validity of the instrument.

The potential impact of exposure to another language was also examined. Monolingual children (n = 226 for CDI:W&G; n = 360 for CDI:W&S) were compared with children who had contact with another language (n = 262 for CDI:W&G; n = 612 for CDI:W&S). No significant differences were found in the measures analysed (vocabulary comprehension and production, gestures, MLU3w, and morphosyntactic complexity) (Serrat et al., 2022).

Access

The normed instruments can be accessed from the UOC repository: the CDI:W&G can be accessed here, and the CDI:W&S can be accessed here.

Table 1. *Reliability coefficients of the scales based on two standardised Catalan CDI-based instruments*

Instrument	Scale	Internal consistency (Cronbach's alpha)	Test-retest reliability (Correlation r_s)
Catalan CDI:W&G			
	Total gestures	.89	.94
	Vocabulary comprehension	.95	.97
	Vocabulary production	.94	.80
Catalan CDI:W&S			
	Vocabulary production	.96	.98
	Morphology	.92	.94
	Morphosyntactic complexity		.93

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THE CROATIAN CDIs

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Croatian and Croatian-speaking populations

Croatian is a South Slavic language spoken by around four million people in Croatia. There are more than three million additional speakers in neighbouring countries (Bosnia and Herzegovina, and Hungary), as well as in other parts of the world (such as Germany, Canada, and Australia). In addition to the standard variety, three major dialects are used in everyday communication: Kajkavian, Čakavian, and Štokavian, which differ in terms of phonology, lexicon, morphology, and syntax. Croatian is considered a morphologically complex language due to its extensive noun inflectional system that includes seven cases, three grammatical genders, and a complex verb morphology inflected for person, number, tense, and aspect (Kovačević et al., 2009; Hržica & Ordulj, 2013). Although word order is relatively free, the canonical subject-verb-object SVO pattern is preferred.

Instruments

For research and clinical use, all Croatian versions of the CDI were developed based on the original structure (i.e., the American and Swedish versions of the CDI) and were adapted to the Croatian language. The adaptation focused on inflectional morphology and the lexical composition of early vocabulary.

The first Croatian adaptation of the CDI, *Komunikacijske razvojne ljestvice* (abbreviated to KORALJE; Kovačević et al., 2007), comprises of two forms: The Words and Gestures form (for infants aged 8-16 months) is used to assess receptive and expressive vocabulary (396 lexical items divided into 19 semantic categories) and the use of gestures (63 gestures divided into five categories; see Kuvač Kraljević et al., 2014). The Words and Sentences form (for children aged 16-30 months) was developed to assess active vocabulary (717 lexical items divided into 22 semantic categories) and early grammatical skills, including inflectional morphology and syntax (150 items), reflecting the richness of Croatian grammar.

The short version of the KORALJE (Kuvač Kraljević et al., 2024) consists of two scales: KORALJE-ko: Words and Gestures comprising 87 items in the First Words section and seven items in the Actions and Gestures section, and KORALJE-ko: Words and Sentences comprising 104 items in the Words that Children Use section and four test items in the Grammar section.

The CDI-III, also known as the KORALJE-III, is based on the Swedish version of the scale (Eriksson, 2017) and comprises the following sections: Level of Communication (6 items); Vocabulary (100 words divided into four semantic categories): Words about food (16 items), Words about the body (26 items), Mental words (30 items), and Emotion words (28 items); Grammar: Two subsections - Grammar (8 items) and Syntax complexity (10 sentence pairs); Metalinguistic awareness (9 items); and Pronunciation (6 items) (see Šmit Brleković and Kuvač Kraljević, 2022).

Norming populations

The KORALJE-I was standardised using parental reports on 250 children, while the KORALJE-II was standardised using reports on 377 children. All children in the norming population were typically developing Croatian-speaking children, aged between 8 and 30 months, who came from all over Croatia. Parents or primary caregivers (mothers, in 91% of the cases) completed the

questionnaires individually, based on daily observations of their child. Recruitment was carried out via paediatric clinics, day care centres, and parent networks.

The two scales of the shortened version of the KORALJE were standardised on a sample of 435 typically developing children aged 8 to 16 months, as well as 804 children aged 16 to 30 months, who were randomly selected from across Croatia. Parents were contacted via kindergarten networks and speech-language therapists.

For the standardisation of the KORALJE-III, assessment reports were collected from parents of 620 children (311 girls and 309 boys) who had typical language development. These children came from all parts of Croatia, and the parental reports considered all dialectal language and regional cultural differences.

Reliability and validity

All Croatian CDI forms showed high internal consistency, with Cronbach's alpha coefficients typically ranging from .83 and .99. The only exception was metalinguistic awareness in the KORALJE-III (see Table 1).

Table 1. *Reliability of scales included in four Croatian CDI-based instruments.*

Instrument	Scale	Internal consistency
KORALJE W&G		
	Vocabulary production	.96
	Vocabulary comprehension	.96
	Total gestures	.90
KORALJE W&S		
	Vocabulary production	.96
	Syntax	.83
Short KORALJE		
	Early gestures	.72
	Vocabulary comprehension	.99
	Vocabulary production	.94
KORALJE-III		
	Vocabulary production	.97
	Syntax	.84
	Metalinguistic awareness	.59

The Pearson correlation coefficients between the full and short versions of the KORALJE are extremely high and significant (e.g., .98 between the production sections), indicating that the short version accurately reflects the results of the full version.

The predictive validity of the KORALJE-III was determined using the Croatian version of the NRDLS-IV. The correlations were as follows:

- KORALJE-III Vocabulary with the NRDLS-IV Comprehension scale and Production scale: .38 and .47, respectively

- KORALJE-III Grammar with the NRDLS-IV Comprehension scale and Production scale: .38 and .55 , respectively

- KORALJE-III Metalinguistic awareness with the NRDLS-IV Production scale: .43.

Access

Access to the instruments can be obtained from Jelena Kuvač Kraljević (jelena.kuvac@erf.unizg.hr).

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THE CZECH CDIs

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Czech and Czech-speaking populations

Czech is the official language of the Czech Republic, which belongs to the group of the West Slavic languages, with its closest relatives being Slovak and Polish. Historically, Czech has been influenced primarily by Latin, German, and more recently by English, with many loanwords adopted from these languages. Today, it is spoken by more than 12 million speakers.

Czech morphology is complex, since the language is highly inflected and the creation of new word forms via derivation and compounding is common. The default word order in Czech is described as subject-verb-object; however, sentence structure is known to be flexible. The phonological system has 13 vowels and 26 consonants, including /r̝/, a sound that is rarely found in other languages. Ten of the vowels are monophthongs with a feature of distinctive length, while the other three are diphthongs.

Instruments

The CDI:W&G (known as DOVYKO I; for children aged 8 to 18 months) includes an introductory section (19 items, including questions regarding first signs of comprehension and production, such as whether the child reacts to their name), a lexical list (402 items across 19 semantic categories, assessing both comprehension and production), and a gesture production section (70 items in 7 subcategories) (Paillereau et al., 2023a).

The CDI:W&S (known as DOVYKO II; for children aged 16 to 30 months) consists of a lexical list assessing only production (607 items across 18 semantic categories), followed by a section addressing Sentences and Word forms. This section includes four parts: *Usage of sentences and words* (5 items), *Three longest utterances produced by the child* (open-ended), *Selection of sentences* (12 items), and *Word forms* (13 target words and their inflected forms). Parents are asked to indicate which forms their child has already used in spontaneous speech (Smolík et al., 2017; Paillereau et al., 2023b).

A short form based on DOVYKO II (part of the Czech adaptation of PARCA-R, intended for children aged 23 to 28 months) consists of a vocabulary checklist (100 items) and 18 sentence pairs used to assess the development of grammar (Hladíková, n.d.).

A short form based on DOVYKO I is currently being developed.

Populations

DOVYKO I was normed on a sample of 999 parents with children aged 8 to 18 months (50.75 % girls, 49.25 % boys). Sixty questionnaires were filled out during routine visits to paediatric clinics in the country, and the rest were collected online. Each parent filled out the form once. Parents were contacted via social media.

DOVYKO II was normed on a sample of 1044 parents with children aged 16 to 30 months (49.43 % girls, 50.57 % boys). For each child, the form was completed once. All data was collected online, and parents were contacted via social media.

The norming process for each of the long forms of the CDIs was carried out after careful consideration of the need to represent all population characteristics (e.g., levels of education, inclusion of parents from all regions of Czech Republic, and so on).

Reliability and validity

Concurrent and predictive validity were assessed for both long forms of the CDIs. Concurrent validity was evaluated through comparison with experimental data from three types of eye-tracking tasks, which differed in the number of items presented during test trials (40, 60, or 80 items). Children were categorised into four age groups (11-13 months, 15-17 months, 18-20 months, 24-30 months; N = 164) and assigned to an experiment based on their corresponding age group, with the youngest children being presented with the fewest items. For the age group 11-13 months (n = 30), predictive validity was measured: parents were asked to fill out DOVYKO I two months prior to the experiment (Paillereau et al., 2023a).

In all, but the youngest age group, statistically significant interactions between lexical scores and gaze direction were observed.

Internal consistency was measured using Cronbach's alpha, which ranged from .56 (between active and passive vocabulary in DOVYKO I) to .88-.91 (between different sections of DOVYKO II). Correlations between comprehension and gestures were weaker (.58), whereas correlations between production and gestures were high (.82). Test-retest reliability was measured using data collected from 30 children for DOVYKO I and 19 children for DOVYKO II, with an interval of 2-3 weeks between completions. Partial correlations across all sections of both long forms of the CDIs were high (≥ .82). Inter-rater reliability was tested using data from 66 children for DOVYKO I and 76 children for DOVYKO II, using fathers or grandmothers as the raters. High partial correlations were found for all sections of the questionnaires (≥ .72), except for comprehension (.45) (Paillereau et al., 2023a; Paillereau et al., 2023b).

Access

DOVYKO I and II are accessible online at www.dovyko.cz. The short form based on DOVYKO II can be obtained from Julie Hladíková (julie.zalmanova@volny.cz).

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THE DANISH CDIs

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Danish and Danish-speaking populations

Danish is an old Germanic language related to Norwegian and Swedish. Danish is a verb-second language. There are several ways to inflect verbs and nouns in Danish using suffixes and change of stem vowel. In contrast, inflections for definiteness and gender are highly regular. Compound words are common in Danish, and any number of lexemes may be combined challenging the speaker's creativity. First, Danish is characterised by a highly vocalic phonemic inventory (16 monophthongs - 13 of which have length contrasts, one schwa vowel, and 19 falling diphthongs). Second, Danish is characterised by pervasive lenition (i.e., weakening) of consonants. Third, Danish speech is characterised by a general assimilation of schwas ([ə]) in weak syllable position to neighbouring sonorant consonants or vowels, which often results in the complete loss of a syllable.

There are approximately 5.6 million people in the world who speak Danish. The vast majority of them live in Denmark, but Danish is also spoken to a lesser extent in the Faroe Islands, Greenland, and in Northern Germany (South Schleswig).

Instruments

The CDI:W&G (for ages 8-20 months) includes the first signs of understanding (3 items), comprehension of phrases (26 items), starting to talk (2 items), vocabulary comprehension and production over 20 semantic categories (410 items), and finally, production of five types of gestures (63 items) (Bleses et al., 2008).

The CDI:W&S (for ages 16-36 months) includes a checklist of vocabulary production over 22 categories (725 items), how children use words (5 items), a grammar scale that taps the use of different suffixes and word combinations (97 items), and finally, an open question regarding three examples of long sentences that the child recently said (3 items) (Bleses et al., 2008).

The Short CDI (for ages 34-39 months) includes a 100-word checklist assessed for comprehension and production (90 items) (Vach, Bleses, Jørgensen, 2010).

The CDI educator (for ages 18-34 months) includes a 70-word checklist assessing productive vocabulary, as well as questions concerning the child's use of decontextualised language with respect to objects and actions distant from the here and now. The items have been adopted for early childhood education settings (Bleses, Jensen, Højen & Dale, 2018).

The CDI can act as the basis for self-reported vocabulary input frequency. The combined word list of CDI:W&G and CDI:W&S (725 words) was used to estimate frequencies of parental use of CDI words (Bleses, Vach & Dale, 2018).

Populations

The CDI:W&G and CDI:W&S was normed on a randomly selected sample of 6,112 parents with children aged 8-36 months (51% girls). The response rate was 34% (Bleses et al., 2008). Furthermore, 183 children were followed longitudinally from 8 to 30 months (Wehberg et al., 2007).

The Short CDI was developed on the basis of cross-sectional and longitudinal CDI studies (Vach, Bleses & Jørgensen, 2010).

CDI was also used as the basis for self-reported vocabulary input frequency: 918 Danish-speaking parents of 12- to 36-month-old children estimated their frequency of use of a total of 725 words from the combined word list of CDI:W&G and CDI:W&S (Bleses, Vach & Dale, 2018).

Reliability and validity

Calculations of Cronbach's alpha yielded a coefficient of .98 for word comprehension, .97 for word production, and .91 for gestures in CDI:W&G. For word production in CDI:W&S, the value was .99.

Convergent validity was supported by a significant association with age for all scales.

To explore whether the words listed in the vocabulary section of the CDIs are representative (to a sufficient degree) of the vocabulary typically used by Danish children aged 8 to 30 months, several comparisons were made: (a) a comparison of word types used spontaneously by 12 Danish children in longitudinal spontaneous speech corpus shows that 91% of common words and 74% of less common words are included in the vocabulary lists; (b) the vocabulary development of Danish children as measured by the CDI is adequately correlated with the growth of word types in spontaneous speech, as measured in the spontaneous speech productions of four Danish children; (c) a comparison of the CDI vocabulary list and the vocabulary used in all the sentences reported by the parents in their response to the question about the three longest sentences that the child had produced shows that 75% of less commonly produced types and 91% of less common word tokens are included in the Danish CDI:W&S; d) a comparison with the CDI word list shows adequate correlation with the growth of word types in spontaneous speech, as measured in the spontaneous speech productions of four Danish children (Bleses et al., 2008). Furthermore, after controlling for a diverse set of child and family measures, CDI:W&S was able to predict a delay in reading and math in Grade 4 (early vocabulary contributed to 3.7-4.4% of the variance in language/literacy and 1.9% of the variance in numeracy/algebra; Bleses et al., 2018), as well as the grades received in Upper Secondary School Leaving Exams (early vocabulary contributed to 2.9% of the variance for Danish, 2.0% for English, 1.8% for Math, and 0.6% for Science; Dale et al., 2023).

Access

The instruments can be accessed on the homepage for the TrygFonden's Centre for Child Research (https://childresearch.au.dk/vaerktoejer/metoder/maaleinstrumenter-cdi/cdi-i-og-cdi-ii).

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THE ESTONIAN CDIs

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Estonian language

Estonian belongs to the Finno-Ugric language group. It is the mother tongue of approximately 1,107,000 people, 887,000 of whom live in Estonia. Typologically, Estonian is an agglutinative language, characterised by its extensive case system (14 productive cases), lack of grammatical gender (both in nouns and personal pronouns), absence of articles (definite and indefinite), and a three-way quantities distinction in both vowels and consonants.

Instruments

The norming and adaption of the MacArthur–Bates Communicative Development Inventories

(CDIs) for Estonian–speaking children began more than two decades ago (Tulviste, 2007).

The *ECDI–W&G* (for ages 8-16 months) includes first signs of understanding (3 items), comprehension of phrases (20 items), starting to talk (2 items), vocabulary comprehension and production across 19 semantic categories (386 items), and production of five types of gestures (60 items) (Tulviste, 2007; Schults et al., 2012).

The *Short ECDI:W&G* (for ages 8-18 months) includes first signs of understanding (3 items), starting to talk (2 items), vocabulary comprehension and production (100 items), and production of three types of gestures (25 items) (unpublished Kängsepp, 2024).

The *ECDI:W&S* (for ages 16-30 months) includes a checklist of vocabulary production across 21 categories (680 items), how children use words (5 items), and a grammar section (Tulviste, 2007; Urm & Tulviste, 2016).

The first Estonian version of the *CDI:W&S* short form was developed for inclusion in the PARCA_R to assess language development at 2 years of age in the EPICE (Effective Perinatal Intensive Care in Europe) study (Tulviste et al., 2020). To extend the cover to a wider age range (20-36 months), a revised version was developed (the *Short ECDI:W&S*), including a 100-word vocabulary checklist, children's use of language (5 items), word combinations (1 item), and a sentence complexity section of 12 sentence pairs (Urm & Tulviste, 2021).

The ECDI-III (for ages 30-48 months) includes a section on the child's communicative level (6 items), a vocabulary checklist with mainly verbs, adjectives, and abstract nouns from four semantic categories (food items, body parts, cognitive words, and emotion words; 100 items), a syntax scale (17 items), a meta-linguistic awareness scale (7 items), and a pronunciation scale (6 items) (Tulviste & Schults, 2020; Tulviste & Schults, 2023).

Populations

Participants were recruited through childcare facilities, clinics, parenting websites, and parent groups via posted advertisements.

The norming sample for the *ECDI:W&G* comprised 1070 children aged 8-16 months (49% girls).

The *Short ECDI:W&G* was normed on a sample of 455 children (8-18 months; 51% girls).

The norming sample for the *ECDI:W&S* comprised 1,235 children aged 16 to 30 months (52% girls).

The norming sample of the *Short ECDI:W&S* comprised 908 children aged 20 to 36 months (455 girls). The *ECDI-III* was normed on 848 children aged 30 to 48 months (49% girls) (unpublished Tulviste, 2025).

Reliability and validity

ECDI:W&G - Internal consistency (Cronbach's α) was calculated for each semantic category, as well as for comprehension (α ranged from .69 to .968) and production (α ranged from .45 to .91). Low internal consistency was observed in categories with few items or with words that young children rarely use (Schults, 2016).

Short ECDI:W&G – A total of 30 parents completed both the long and short ECDI:W&G within a period of two weeks. Strong correlations were observed: comprehension (r = .90) and production (r = .95) (unpublished Kängsepp, 2024).

ECDI:W&S - Cronbach's α for the overall vocabulary checklist was 0.961, indicating high internal consistency. Internal consistency (Cronbach's α) across semantic categories ranged from .821 to .989 (Schults, 2016; Urm & Tulviste, 2016).

Short ECDI:W&S (for ages 16-30 months) - The instrument demonstrated high internal consistency for expressive vocabulary (Cronbach's α = .99) and sentence complexity (α = .95), as well as acceptable consistency for how children use words (α = .73).

To assess reliability and validity, a subsample of parents (n = 131) completed the full *ECDI:W&S* within two weeks. Vocabulary scores demonstrated excellent consistency (ICC =0 .96, 95% CI [0.94, 0.97]), while sentence complexity (ICC = 0.92, 95% CI [0.83, 0.96]) and scores of how children use words demonstrated good consistency (ICC = 0.84, 95% CI [0.78, 0.88]) (Urm & Tulviste, 2021).

ECDI-III: The Cronbach's alpha for the entire list of words was .97 at age 3. At age 4, there were too many items with null variance to calculate the Cronbach's α for the entire list of words. Cronbach's α for the syntax section was .92 at both three and four years, while for pronunciation accuracy, it was .72 at age 3 and .75 at age 4. For metalinguistic awareness, Cronbach's α was .66 at age 3 and .57 at age 4. All subscales were moderately to significantly associated with each other (except for metalinguistic awareness and pronunciation at age 3 (ranging from r = .37 to .69 at age 3, and from r = .45 to .66 at age 4). The correlations between the ECDI-III and the New Reynell Developmental Language Scales IV (NRLDS) total scores were r = .73 at age 3, and r = .69 at age 4 (Tulviste & Schults, 2023).

Access

Access to the instruments can be obtained from Tiia Tulviste (Tiia.Tulviste@ut.ee), Astra Schults (Astra.Schults@ut.ee), and Ada Urm (Ada.Urm@gmail.com).

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THE EUROPEAN PORTUGUESE CDIs

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European Portuguese and Portuguese-speaking populations

Portuguese is a Romance language with the status of being an official language, not only in Portugal, but also in other countries in different regions of the world, namely Brazil, several African countries, and East Timor. According to Reto et al. (2016), the Portuguese-speaking countries had a population of 274.9 million in 2015; in the same year, Portugal had around 10 million inhabitants. Different national varieties of Portuguese present different characteristics. European Portuguese, the national variety spoken in Portugal, is a null subject language, with rich verbal morphology, including inflected infinitives. The various CDI questionnaires presented here were developed for European Portuguese, therefore, adaptations would be required if the instruments were to be used to assess linguistic development in other varieties.

Instruments

The PT-CDI:W&G (for ages 8-15 months) includes *the sections first signs of understanding* (3 items), *sentence comprehension* (32 items), *starting to talk* (3 items), word comprehension and production (317 items), and actions and gestures (60 items) (Viana et al., 2017).

The PT-CDI:W&S (for ages 16-30 months) includes the following sections: (a) word production (checklist with 639 items); (b) how the child uses and understands language (4 items); (c) regular morphology, auxiliaries used to refer to future and ongoing events, and copula verbs (15 items); (d) irregular morphology (32 items); (e) over-regularisations and non-standard forms (20 items); (f) mean length of utterances of the three longest utterances; and (g) sentence complexity (26 items) (Viana et al., 2017).

The PT-CDI-III (for ages 30-48 months) includes two sections: (a) a 166-item vocabulary checklist; and (b) a 26-item scale to assess syntactic complexity (Cadime et al., 2021).

Populations

The PT-CDI: W&G was normed based on a sample of 1,314 parents of children aged 8-15 months (47.4% girls; 42.7% of the mothers had a higher education degree). The sample was stratified across the country, proportionally representing the distribution of the Portuguese population across the six regions: North (35.6%), Centre (18.6%), Lisbon (27.8%), Alentejo (5.4%), Algarve (4.9%), Azores (3%), and Madeira (4.7%) (Viana et al., 2017).

The PT-CDI: W&S was normed using the responses of 3,012 parents of children aged 16-30 months (47.3% girls; 39.2% of the mothers had a higher education degree). This sample was also stratified across the six regions of Portugal: North (36%), Centre (19.4%), Lisbon (27.4%), Alentejo (5.3%), Algarve (6.5%), Azores (2.5%), and Madeira (3%) (Viana et al., 2017).

The PT-CDI-III was normed using a sample of 739 parents of children aged 30-48 months (45.6% girls; 52.9% of the mothers had a higher education degree) (Cadime et al., 2021).

Reliability and validity

Internal consistency ranged from .85 for the over-regularisations scale of the PT-CDI:W&S to .99 for the word production and word comprehension scales of the PT-CDI:W&G and the PT-CDI:W&S (Silva, Cadime, Ribeiro, Acosta,

et al., 2017; Silva, Cadime, Ribeiro, Santos, et al., 2017). Relative stability was observed for the PT-CDI:W&S scores, with correlations over time ranging from .63 to .94 for word production, as well as from .37 to .80 for mean length of utterance, and from .01 to .69 for sentence complexity (Cadime et al., 2019). For PT-CDI-III, the correlations between parents' and teachers' scores were high, ranging between .54 and .66 (Cadime et al., 2021).

Significant associations with age across all scales (ranging between .33 and .74) provided evidence of score sensitivity. Convergent validity was supported by high intercorrelations among all scales (Table 1 and 2). For PT-CDI-III, the correlation between word production and syntax was .66. For the PT-CDI:W&G, significant longitudinal interrelationships in cross-lagged models were also found (Cadime et al., 2017). Regarding evidence of validity based on relationships with other variables, girls outperformed boys in all subscales of the PT-CDI:W&S (Silva, Cadime, Ribeiro, Santos, et al., 2017). In the PT–CDI–W&G, gender differences were found only for the actions and gestures scale (Silva, Cadime, Ribeiro, Acosta, et al., 2017). For the PT-CDI-III, maternal education had a significant effect on both vocabulary and syntax. Significant correlations were observed between the PT-CDI:III scores and the language scale of the Griffiths Mental Development Scales (ranging between .37 and .53), thus providing additional evidence of convergent validity (Cadime et al., 2021)

Access

The PT-CDI:W&G and the PT-CDI:W&S are available as appendices in the technical manual (Viana et al., 2017). The PT-CDI-III is available as supplementary online material in Cadime et al. (2021). Additional questions can be addressed to Irene Cadime (irenecadime@psi.uminho.pt), Ana Lúcia Santos (anas@edu.ulisboa.pt), or Fernanda Leopoldina Viana (fviana@ie.uminho.pt).

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Table 1. *Intercorrelations among scales included in the PT-CDI: W&G (long forms)*

Scale	1.	2.	3.	4.
1. Sentence comprehension	1	0.68	0.51	0.63
2. Word comprehension		1	0.58	0.63
3. Word production			1	0.60
4. Total gestures				1

Note: all $p < 0.001$

Table 2. *Intercorrelations among scales included in the PT-CDI: W&S (long forms)*

Scale	1.	2.	3.	4.	5.	6.
1. Word production	1	0.89	0.79	0.49	0.74	0.78
2. Regular morphology, auxiliaries and copula verbs		1	0.78	0.51	0.73	0.78
3. Irregular morphology			1	0.55	0.62	0.76
4. Over-regularisations				1	0.38	0.40
5. MLUs					1	0.73
6. Sentence complexity						1

Note: all $p < 0.001$

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THE FINNISH CDIs

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Finnish

Finnish is a Finno-Ugric language, spoken by roughly 5 million people as their native language. Words are inflected by adding inflections to the word stems. Finnish has 8 vowels and 13 consonants: the meaning of words can change based on long and short vowels, as well as consonants. Regarding morphology, Finnish has a complex inflectional system for both nominals (i.e., nouns, adjectives, pronouns, numerals) and verbs. Nominals are inflected using 15 cases. The following fixed order is used for nominal inflections: stem + number + case + possessive. There is no grammatical gender marking. Subject-verb agreement is used for verbs. For finite verbs, the inflections are used to mark voice (active, passive), mood (indicative, imperative, conditional, potential), and tense (past, non-past). The order of suffixes used for the verb inflections is stem + tense/mood + person/number. Although word order is relatively free, the subject-verb-object structure is most typical.

Instruments

The Finnish long form versions of the CDI (FinCDI-LF; Words and Gestures, W&G; Words and Sentences, W&S) were adapted and validated roughly 25 years ago (Lyytinen, 1999). The W&G (for ages 8-16 months) includes the following sections: *First signs of understanding* (3 items), *Comprehension of phrases* (27 items), *Starting to talk* (2 items), *Vocabulary checklist* organised under 19 semantic categories (380 items for comprehended and expressed words), and *Actions and gestures* (56 items). The following sections are included in the W&S (for ages 16-30 months): *Vocabulary checklist* organised under 20 semantic categories (595 items for expressed words), *How children use words* (5 items), and *Inflections and sentences* (use of inflections - 16 items; a question on the use of word combinations; an open question on the three longest utterances produced by the child, which are used to calculate the mean length of three longest utterances -value (M3L) in morphemes.

The short form versions of the FinCDIs (FinCDI-SF; Stolt & Vehkavuori, 2018) consists of two versions, an Infant (for ages 9-18 months) and a Toddler version (for ages 18-24 months). Both versions include vocabulary checklists to assess lexical development: the Infant version includes 89 items to screen receptive and expressive lexical skills, while the Toddler version includes 100 items to screen expressive lexical skills. A question on the use of word combinations is included in the latter version.

The FinCDI-III (for children between the ages of 2.6 and 4.2 years; Stolt, 2023) includes the following sections: *General level of communication* (6 items), *Vocabulary* (100 items for expressed words), *Language structures* (Phonology - 6 items; Morphology - 8 items; Language complexity - 10 items), and *Meta-linguistic awareness* (7 items).

Populations

The FinCDI-LFs and the FinCDI-SFs have been normed and validated using longitudinal samples (*FinCDI-LF:* N = 95, 5 data collection points between 12 and 30 months, 475 observations; Lyytinen, 1999; *FinCDI-SF:* N = 82, 6 data collection points between 9 and 24 months, 492 observations; Stolt & Vehkavuori, 2018). The norming and validation data for the FinCDI-LFs were collected from the Jyväskylä district in middle Finland, whereas the norming and validation sample for the FinCDI-SFs were collected from randomly chosen well-baby clinics in the Turku city area. The validation sample for the FinCDI-III included 155 children, and the sample was

collected from randomly chosen day-care centres in the Helsinki city area. All the children in the samples were healthy and came from monolingual families (where at least 70% of the spoken language was Finnish).

Validity and reliability

All FinCDIs have been validated (Table 1). The Reynell Developmental Language Scales (RDLS III) and Bayley Scales of Infant Development (BSID II) were used to validate the FinCDI-LFs (Lyytinen, 1999). Multiple instruments (FinCDI-LFs, RDLS III, BSID III) were used to validate the FinCDI-SFs (Stolt & Vehkavuori, 2018) and the FinCDI-III (Boston Naming Test, Finnish Phonology Test, Finnish Morphology Test, Lukiva Test, RDLS III; Stolt, 2023). Internal consistency values were calculated for the FinCDI-SFs, as well as for the FinCDI-III.

Access

The FinCDI-LFs and the FinCDI-SFs have been published by Niilo Mäki Instituutti and the forms and manuals can be ordered from there (further information https://nmi.fi)

The validation study of the FinCDI-III was published in 2023 (Stolt, 2023). For further information, please contact Prof. Suvi Stolt (suvi.stolt@helsinki.fi).

Table 1. *Validity and reliability of different versions of the Finnish Communicative Development Inventories (FinCDIs).*

Instrument	Scale	Validity* r-values	Internal consistency Cron bach's alpha
FinCDI-LF			
W&S	Expressive words at 2 years	.71	-
	M3L at 2 years	.73	-
FinCDI-SF			
Infant version	Receptive words at 1 years	.89	.94
	Expressive words at 1 years	.87	.81
Toddler version	Expressive words at 2 years	.92	.98
FinCDI-III	Expressive words	.59	.93
	Phonology	.70	.69
	Morphology	.32	.84
	Language complexity	.42	.87
	Metalinguistic skills	.63	.72
	Total score	.68	.91

*Cross-sectional (FinCDI instrument vs other assessment method) correlation co-efficient value;
M3L, mean length of the three longest utterances value calculated in morphemes.

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THE GALICIAN CDIs

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Galician language and its use

Galician is a Romance language spoken in the autonomous community of Galicia, in northwestern Spain, which is north of the border with Portugal. Galicia has a population of over 2,720,000 inhabitants. Galician is spoken in varying degrees by over 70% of the Galician population and understood by 97%. In relation to Spanish, Galician has lower status and prestige. Approximately, 42.2% of Galicians learned Galician as their first language, and 23.7% learned both Spanish and Galician simultaneously. The number of speakers who use Galician as their primary language has shown a slow, yet progressive decline, although written proficiency has increased. Since 1983, both Galician and Spanish have been official languages in Galicia, and they are employed as languages of instruction in the education system within the framework of maintaining bilingualism.

Galician is closely related to Spanish and Portuguese, with significant Spanish influence over the past 500 years. It has a rich morphological system, including regular gender and plural marking, as well as derivational morphology on nouns and adjectives. Verbal morphology is complex, marking person, number, tense, aspect, and mood. Subject specification is not mandatory. Other grammatical features include subject–verb agreement and some enclitic placement of pronouns after verbs, as seen in Portuguese. Galician also shares a high degree of lexical similarity with Spanish.

Instruments

The development of the scales began in 1998 and continued over several years. The Galician version, titled *Inventario para o Desenvolvemento de Habilidades Comunicativas* (IDHC), includes the following forms:

The *IDHC-Palabras e Xestos* (for children aged 8-15 months) includes the following sections: initial language comprehension (3 items), sentence comprehension (27 items), ways of speaking (2 items), word comprehension and production (384 items in 19 categories), early communicative gestures (12 items), games and routines (8 items), actions with objects (17 items), doing what parents do (13 items), imitation of the actions of other adults (15 items), and objects used as if they were others (1 item) (Pérez-Pereira & García-Soto, 2003; Pérez-Pereira, 2008a, 2008b; Pérez-Pereira, in press).

The *IDHC-Palabras e Oracións* (for children aged 16-30 months) includes the following sections: word production (700 items in 22 categories), how the child uses and understands language (5 items), word endings 1 (regular suffixes; 9 items), word forms (irregulars; 15 items), word endings 2 (over-regularisations), a question about the child's initiation of word combinations, and three examples of the child's three longest utterances for MLU3 calculation, and sentence complexity (37 items) (Pérez-Pereira & García-Soto, 2003; Pérez-Pereira, 2008; Pérez-Pereira, in press).

The *IDHC Short Form Level I* (for ages 8-15 months) comprises a word list used to assess vocabulary comprehension and production (90 items). The *IDHC Short Form Level II* (for ages 16-30 months) includes a list (100 items) to assess word production, plus a question about the child's initiation of word combinations and three examples of the child's three longest utterances (Pérez-Pereira & Resches, 2007).

All versions include a final page to collect information about the child and the family.

In addition, a website (https://underisk.gal/t/idhc/) has been developed, where parents can complete the appropriate form for their child and obtain raw scores and corresponding percentiles.

Population studied

The final normative sample comprised 649 parents of children aged 8 to 15 months (50.2% girls) and 1,084 parents of children aged 16 to 30 months (50.7% girls). The children resided in 202 municipalities distributed across the four Galician provinces.

For the short form, the sample consisted of 347 parents of children (52.7% girls) aged 8 to 15 months, and 806 parents of children (50.2% girls) aged 16 and 30 months.

The IDHC was also administered to a longitudinal cohort of preterm children, originally consisting of 151 participants, along with a control group of 49 full-term children. Assessments using the IDHC were carried out at the ages of 10-, 22-, and 30-months (Pérez-Pereira et al., 2014).

Reliability and validity

Internal consistency (Cronbach's α) ranged from .79 (*Games and Routines*) to .99 (*Word List* and *Sentence Complexity*) (Pérez-Pereira & García-Soto, 2003).

Concurrent validity of the IDHC *Words and Sentences* was assessed by examining correlations in a longitudinal sample of 42 participants evaluated at 18 and 24 months. Specifically, vocabulary production scores and MLU3 from the IDHC (full and short forms) were correlated with lexical diversity and MLUs derived from 30-minute recordings of spontaneous child–mother interactions. The correlations between IDHC vocabulary scores and lexical diversity at 18 months were .86 for the full form and .89 for the short form, while at 24 months, the correlations were .80 for the full form and .74 for the short form. The correlations between MLU3 and MLU were .53 at 18 months and .73 at 24 months ($p < .001$ in all cases).

Predictive validity was established at 48 months using the RDLS-III. Vocabulary production at 24 months correlated with RDLS-III *Comprehension* scores at .52 (full form) and .50 (short form), as well as with *Production* scores at .58 (full form) and .55 (short form) (Pérez-Pereira & Resches, 2011).

Correlations between vocabulary production measured with the full and short forms of the IDHC were .95 at 18 months and .91 at 24 months (Pérez-Pereira & Resches, 2007).

Access to the instrument

The instrument can be accessed via the website (https://underisk.gal/t/idhc/) or by contacting Miguel Pérez-Pereira (miguel.perez.pereira@usc.es, miguel3524@gmail.com).

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THE GEORGIAN CDIs

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Georgian language

The Georgian language is a Kartvelian language with a unique script, a rich inflectional morphology, and an agglutinative structure, spoken by about 3.7 million people in Georgia (Hewitt, 1995).

Georgian is generally classified as a Subject-Object-Verb (SOV) language, although it exhibits considerable flexibility in word order due to its rich case marking system (Harris, 1981). In contrast to languages with fixed-word-order, elements in Georgian can be rearranged according to information structure, stress, or pragmatic context. Georgian is a highly inflected language with both agglutinative and fusional features (Hewitt, 1995). Words, particularly verbs, consist of several morphemes that indicate tense, aspect, mood, agreement, and syntactic relationships. Language exhibits polypersonal agreement, which means that verbs can contain both subject and object markers (Hewitt, 1995). This level of inflection makes Georgian much more complex than isolating languages, where such distinctions require separate words (Shanidze, 1973).

Despite the increasing recognition of the need for standardised developmental assessments, there is currently no adapted version of the MacArthur-Bates Communicative Development Inventories (CDI) in Georgian. The motivation for adapting the CDI arises from both research and clinical perspectives: researchers want to understand the trajectory of lexical and grammatical growth in an agglutinative language, while clinicians highlight the urgent need for an instrument that can be used for the early characterisation of language features in children who show a delay in early language development.

Plan for developing the Georgian CDI

The adaptation of the Georgian CDI will follow international guidelines, which emphasise that CDI instruments cannot be translated directly, but must be culturally adapted through expert review, item replacement or deletion, and pilot testing with parents (Dale & Penfold, 2011). The initial dataset will be the Georgian Child Language Corpus (two typically developing, monolingual children recorded at 12-36 months of age; 1 hour/day, one week/month, in naturalistic contexts; See Tchintcharauli et al., 2024). From each monthly dataset, a structured sample of 100 spontaneous utterances per child will be complied to create comparable monthly snapshots for lexical analysis, which is considered a reliable threshold for linguistic analysis (Tomasello & Stahl, 2004). Using these samples, we aim to (a) identify the first 500 words produced by each child, and (b) label the items by parts of speech, semantic domain, and grammatical features relevant for CDI-II, such as the onset of multi-word combinations, inflectional morphology, and verb agreement patterns, with the goal of establishing an initial picture of Georgian children's developing language.

The most important phases in the creation of the Georgian CDI will be the systematic comparison with existing CDI instruments, in order to ensure both cross-linguistic comparability and cultural validity. The initial lexical inventory derived from the Georgian Child Language Corpus will be compared to the word list of the American English CDI (Fenson et al., 2007), which serves as an international standard, as well as to the Croatian adaptation Komunikacijske razvojne ljestvice – KORALJE (Kovačević, Jelaska, Kuvač Kraljević, & Cepanec, 2007), which provides a model for adaptation in a small European language with similar challenges in terms of cultural specifici-

ties. Through this process, items that are not culturally or linguistically relevant in Georgia will be removed, while new items that reflect the daily experiences of Georgian children will be added.

By following established best practises, the Georgian CDI will not only provide a culturally appropriate tool for use in Georgia, but it will also maintain cross-linguistic comparability with other CDI instruments, thus enabling integration into the broader EUNM-CDI network, as well as contributing to cross-cultural research on early lexical development.

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GERMAN AND AUSTRIAN GERMAN CDIs

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German and German-speaking populations

German is a West Germanic language, genetically related to Dutch and English, and it is characterised by a comparatively robust system of inflectional morphology. Nouns are inflected primarily for case and number, with grammatical gender determining agreement patterns, while verbs show distinctions in person, number, tense, and mood. German is also a verb second language, where word order is central to the grammatical structure. German frequently forms compound words (Komposita) by combining two or more lexemes, which allows for highly specific expressions, but also creates long, complex word forms. Standard German is spoken by approximately 95 million people as a first language, primarily in Germany, Austria, and parts of Switzerland, as well as in smaller communities worldwide.

Austrian German is a recognised national variety of German. While it shares the core grammatical system with Standard German, it exhibits distinct lexical and semantic features, particularly in everyday vocabulary, along with some grammatical differences. These systematic particularities warrant the development of separate parent questionnaires for Austria to ensure that regionally specific usage is appropriately captured.

There are different parent questionnaires for assessing early (Austrian) German language skills. Among these, FRAKIS is considered the 'official' standard German CDI version, while the ACDI represents the licensed variant for Austria. The other questionnaires outlined below were developed and standardised separately using different methodological approaches.

(Austrian) German Communicative Development Inventories

ELFRA-1 (for children aged 12 months): The *Elternfragebogen für die Früherkennung von Risikokindern* (ELFRA-1; Grimm & Doil, 2006) consists of a checklist of 181 words and sound productions used to assess expressive and receptive vocabulary, 30 items on gestural behaviour, and 13 items on fine motor development. Normative data, provided for each of the four subscales, are based on 131 children. Internal consistency is high, with Cronbach's α ranging between .84 and .98.

ELFRA-2 (for children aged 24 months): The ELFRA-2 (Grimm & Doil, 2006) assesses expressive vocabulary, syntax, and morphology. It contains 256 items across ten semantic categories for vocabulary, 25 items for syntax, and 11 items for morphology. Parents indicate active word use and select sentence examples that best match their child's speech. A short version includes 260 vocabulary items. Norms were established based on 140 children, and the reported internal consistency is high (Cronbach's α, .84 to .98).

ELAN-R (for ages 18-26 months): The *Eltern Antworten – Revision* (ELAN-R; Bockmann & Kiese-Himmel, 2012) assesses expressive vocabulary and early grammar in children between the ages of 18 and 26 months. It includes 319 words across 18 lexical categories, a question on continuity of word learning, and one grammar question on utterance length, supplemented by parental examples of child sentences. Norms were derived from 512 children across three age groups, with both percentile ranks and T-scores available. Internal consistency and split-half reliability are excellent (Cronbach's $\alpha = .99$, $r = .99$).

FRAKIS and FRAKIS-K (for ages 18-30 months): The *Fragebogen zur frühkindlichen Sprachentwicklung* (FRAKIS; Szagun, Stumper, & Schramm, 2009; 2023) has been standardised for 18- to 30-month-old children, covering expressive vocabulary (600 items across 22 categories) and grammar (79 items addressing inflectional morphology and sentence complexity). A short form, FRAKIS-K, comprises 102 vocabulary items and three grammatical items. Normative data are available from over 1,200 children, with percentile ranks and T-scores provided. Reliability is excellent, with Cronbach's α up to .99 and re-test reliabilities between .87 and .95.

SBE-2-KT (for ages 21-24 months): The *Sprachbeurteilung durch Eltern – Kurztest für die U7* (SBE-2-KT; von Suchodoletz & Sachse, 2009) is a brief screening tool, especially developed for a paediatric routine examination around the second birthday (children aged 21-24 months). It includes a checklist of 57 expressive vocabulary items and a single grammar question on multiword utterances. The SBE-2-KT was normed on 685 children (349 boys, 336 girls) aged 21-24 months, with gender-specific and combined norms provided for two age groups (21-22 and 23-24 months). Reported reliability is high, with Cronbach's α and split-half reliability of .98.

SBE-3-KT (for ages 32-40 months): The *Sprachbeurteilung durch Eltern – Kurztest für die U7a*; von Suchodoletz, Kademann, & Tippelt, 2009) is a screening tool designed for use within paediatric routine examinations. It consists of a checklist of 82 expressive vocabulary items and 15 questions addressing grammatical abilities. Norm tables and percentiles are provided, based on 1743 children in three age groups (32-34, 35-37, and 38-40 months).

The Austrian Communicative Development Inventories (ACDI-1 and ACDI-2) represent the licensed adaptation into Austrian German (Marschik et al., 2007). In total, there are three versions of the ACDI. The ACDI-1 (for ages 12-18 months) targets gestures, receptive skills, and productive vocabulary development, and it contains 701 lexical items and a total of 733 items across three main categories. The ACDI-2 (for ages 18-36 months) includes an additional comprehensive grammar section and the productive lexicon. The ACDI-2 comprises 693 lexical and grammatical items, as well as early naming behaviour (identical to ACDI-1) and cognitive strategies, resulting in a total of 787 items across these four categories. The ACDI-3 is a short version comprising 100 lexical items. The instruments were primarily designed for research purposes, documentation of developmental trajectories in lexical acquisition, without representative standardisation.

Reliability and validity

All instruments show high reliability (mostly in terms of internal consistency). Cronbach's α ranges from .84 to .99, with split-half reliability and re-test coefficients (where reported) ranging between .87 and .99. Convergent validity is supported for several instruments by age-related increases in vocabulary and grammar scores.

Szagun et al. (2009) used cross-sectional FRAKIS data of 1240 children in 13 age groups to demonstrate age related changes (e.g.,) in expressive vocabulary, inflectional morphology, as well as in sentence complexity. The screening tools, SBE-2-KT and SBE-3-KT (von Suchodoletz et al., 2008; von Suchodoletz & Sachse, 2008), identified age-related changes for two resp. three age groups.

Regarding concordant validity, for a dataset of 60 children, Szagun et al. (2009) found correlations between FRAKIS and spontaneous speech measures such as MLU, ranging between .90 and .93. For the ELFRA-2, Sachse & von Suchodoletz (2007) compared parental report data of 167 children with data of a child administered test (SETK-2, Grimm, 2000). As hypothesised, the productive subtests showed high correlations (r = .69 to .88), with the highest values observed for the word production subtest. In contrast, the receptive subtests was associated with lower correlations (r = .43 to .53). Another study (Sachse et al., 2007b) used the RDLS (Edwars et al., 1997) and revealed similar correlations: the highest correlations were observed between the productive scale and the expressive vocabulary score of the parent questionnaire, while the lower correlations were related

to the receptive score (r = .52 to .76). Language abilities that were measured one year later could be predicted better with direct language measurement, rather than with the parent report ELFRA-2 (Sachse & von Suchodoletz, 2008).

The ACDI documented developmental trajectories in a longitudinal design, emphasising the need for multiple assessments to differentiate between consistent and transient late-talkers (Marschik et al., 2007).

Table 1. *Overview of German parental report instruments*

Instrument	Authors	Age range	Content / structure	Items	Reliability
ELFRA-1	Grimm & Doil (2006)	12 months	Expressive & receptive vocabulary, gestures, fine motor skills	181 words, 30 gestures, 13 motor	α = .84 to .98
ELFRA-2	Grimm & Doil (2006)	24 months	Expressive vocabulary, syntax, morphology (short version: vocabulary only)	256 vocab, 25 syntax, 11 morphology (short: 260 vocab)	α = .84 to .98
ELAN-R	Bockmann & Kiese-Himmel (2012)	18-26 months	Expressive vocabulary, grammar (utterance length, examples)	319 vocab + one grammar question	α = .99; split-half = .99
FRAKIS	Szagun et al. (2009)	18-30 months	Vocabulary, inflectional morphology, sentence complexity (short version: 102 vocab + 3 grammar items)	600 vocab, 79 grammar (short: 105)	α = .97 to .99; re-test = .87 to .95
SBE-2-KT	von Suchodoletz & Sachse (2008)	21-24 months	Expressive vocabulary, multiword utterances	57 vocab + 1 grammar	α = .98; split-half = .98
SBE-3-KT	von Suchodoletz, Kademann & Tippelt (2009)	32-40 months	82 expressive vocabulary items; 15 grammar questions	97 items total	specificity ≈ 92%, r = .42 to .63
ACDI-1 / ACDI-2	Vollmann, Marschik & Einspieler (2000)		Austrian German adaptation; gestures, vocabulary, complex grammar assessment		Consistency checks (pilot only)
		12-18 months	ACDI-1: receptive & productive); gestures, vocabulary + grammar	733 items	
		18-36 months	ACDI-2: productive vocabulary; gestures, vocabulary, complex grammar assessment	787 items	
			ACDI-3: short form -expressive vocabulary	100 items	

Access

The parent questionnaires SBE-2-KT and SBE-3-KT can be downloaded via the following link. : https://www.ph-heidelberg.de/hochschule/organisation/fakultaeten/fakultaet-i/institut-fuer-psychologie/forschung-und-projekte/elternfrageboegen-sbe-2-kt-sbe-3-kt.html

The A-CDI can be obtained directly from Peter Marschik: peter.marschik@medunigraz.at. The parent questionnaires ELFRA, ELAN and FRAKIS can be obtained from the respective publishers.

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THE HEBREW CDIs

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Hebrew and Hebrew-speaking populations

Hebrew is a Semitic language. It uses a rich inflectional, non-concatenative morphology of consonantal "roots" and melodic "templates" (Kastner, 2019). The lexicon follows a root system where most of the words are derived from three consonant roots, which carry the core meaning of the words. The roots are modified through various vowel patterns and affixes to create different meanings and grammatical forms (Kastner, 2019). Hebrew sentences follow a verb-subject-object word order, though this can be flexible. It is spoken by approximately 9-10 million people worldwide.

Instruments

The *CDI:W&G* (for ages 8-24 months) includes the first signs of understanding (3 items), comprehension of phrases (25 items), starting to talk (2 items), vocabulary comprehension and production (18 semantic categories and 430 items), and production of five types of gestures (63 items) (Gendler-Shalev & Dromi, 2022).

The *CDI:W&S* (for ages 16-36 months) includes a checklist of vocabulary production in 20 categories (600 items), how the children use words to describe things that are not there (5 items), as well as a grammar scale tapping use of word combinations (8 items) (Maital et al., 2000; Frank et al., 2017).

The *CDI-III* (for ages 30-60 months) includes a question on the child´s communicative level (1 item), a vocabulary checklist with mainly verbs, adjectives, and abstract nouns from four semantic categories (food items, body parts, cognitive words, and emotion words; 100 items), a morpho-syntactic section (9 items), a sentence complexity section (8 items), a meta-linguistic awareness scale (7 items), and a single item on pronunciation (Gendler-Shalev, in preparation).

In the *Short IRT- and ML-based CAT-CDIs* (for ages 12-24 months), two different Computer Adaptive Testing (CAT) schemes were used to predict the final score of lexicon size: 1) Item Response Theory models (IRT), and 2) Machine Learning models (ML). The CAT models iteratively select words adapted to each individual response, thus reducing assessment to a few words per individual, while maintaining its accuracy. The models were based on data from the full CDI Hebrew adaptation (Saker et al., 2025).

Participants

The *CDI:W&G* was adapted to Hebrew and tested on a cross-sectional sample of 118 parents to children aged 12 to 24 months (68 boys). It was later normed on a sample of 881 parents to children aged 12 to 24 months (464 boys) (Gendler-Shalev & Dromi, 2022). Today, it is distributed to parents of younger children, between the ages of 8 and 16 months, in order to collect normative data from this age range (Gendler-Shalev, in preparation).

The *CDI:W&S* was adapted to Hebrew and tested on a cross-sectional sample of 253 parents to children aged 18 to 24 months (128 boys; Maital et al., 2000). Additional data was collected for norming purposes from 558 parents to children aged 16 to 36 months (298 boys; Gendler-Shalev, in preparation).

The *CDI-III* was adapted to Hebrew and tested on a cross-sectional sample of 276 parents to children aged 24 to 59 months (145 boys). Additional data is currently being collected for norming purposes (Gendler-Shalev, in preparation).

The *Short IRT- and ML-based CAT-CDIs* (for ages 12-24 months) were developed and tested on a cross-sectional sample of 1094 parents to children aged 12 to 24 months (587 boys; Saker et al., 2025).

Reliability and validity

CDI:W&G - Cronbach's alpha was calculated, and coefficient scores were found to be high in all categories of the questionnaire (Table 1).

Table 1. *Internal consistency of the Hebrew CDI:W&G (N = 118)*

Category	Cronbach's α
Comprehension of phrases	.93
Vocabulary comprehension	.99
Vocabulary production	.99
Total gestures	.96

CDI:W&S - Calculations of Cronbach's alpha yielded an overall coefficient of .98 (Maital et al., 2000).

CDI-III - Cronbach's alpha coefficient scores were found to be high in all categories of the questionnaire (Table 2).

Table 2. *Internal consistency of the Hebrew CDI-III (N = 276)*

Category	Cronbach's α
Vocabulary production	.97
Morpho-syntactic section	.87
sentence complexity section	.84
Metalinguistic awareness	.69

The *Short IRT- and ML-based CAT-CDIs* were developed to shorten the *CDI:W&G* by adapting the sequence of words to the subject's responses, while reliably predicting the final score of the *CDI:W&G*. The accuracy of vocabulary production is presented in Table 3. The mean absolute error (MAE) and the percentage of error decrease with the number of words administered, across all models.

Table 3: *Mean Absolute Error (and percentage error) of IRT-based CAT-CDI and ML-based CAT-CDI across different numbers of administered words.*

Method	Number of words			
	11	**24**	**37**	**46**
IRT-CAT-CDI	18.76 (4.43%)	16.2 (3.83%)	15.23 (3.6%)	14.4 (3.40%)
ML-CAT-CDI	16.93 (4.0%)	13.49 (3.19%)	11.58 (2.73%)	10.67 (2.52%)

Acknowledgement

The development of the ML-CAT-CDI was supported by a grant from the University of Haifa Data Science Research Center (DSRC).

The *CDI:W&G* and the *CDI:W&S* were developed and normed at Tel Aviv University, supervised by Prof. Esther Dromi. The development of the *ML-CAT-CDI* was supported by a grant from the University of Haifa Data Science Research Center (DSRC).

Access

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THE HUNGARIAN CDIs

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Hungarian and Hungarian-speaking populations

Hungarian is a Uralic language, more specifically Finno-Ugric, which is distantly related to Finnish and Estonian. It has been shaped by extended historical contact with Turkic, Slavic, German, and Latin, as well as, contact with English in modern times. Hungarian is an agglutinative language: grammatical functions are expressed mainly through suffixes attached to word stems. Nouns primarily inflect for case (over a dozen), number, and possession, while verbs inflect for person, number, tense, mood, and definiteness. The language does not have grammatical gender. Vowel harmony is a central feature: suffix vowels adjust according to the frontness or backness of the stem vowel. Hungarian has 14 distinct vowel phonemes, differentiated both by quality and length. Compounding of words is common and productive. Hungarian is spoken by about 9.6 million people in Hungary, about 2 million people in neighbouring countries (Romania, Slovakia, Serbia, Ukraine, Croatia, Austria, Slovenia), as well as by diaspora communities in Western Europe, North America, and elsewhere.

Instruments

The CDI:W&G (for ages 8-16 months) includes *the first signs of understanding* (3 items), *comprehension of phrases* (28 items), *starting to talk* (2 items), vocabulary comprehension and production over 19 semantic categories (455 items), and finally, production of five types of gestures (70 items) (Kas, 2025).

The CDI:W&S (for ages 16-30 months) includes a checklist of vocabulary production over 23 categories (802 items), how children use words (5 items), word endings (inflections; 18 items), inflected words (6 nouns, 9 verbs), overgeneralised inflected words (18 nouns, 12 verbs), an open question on three examples of long sentences that the child recently said (3 items), and sentence pairs (28 items) (Kas et al., 2010; Kas & Lőrik, 2024; Kas, 2025).

The CDI-III (for ages 30-48 months) includes a checklist of vocabulary production (124 items) with nouns, verbs, adjectives, and function words, sentence pairs (12 items), a section on language use (14 items), overgeneralised inflected words (12 items), and an open question on three examples of long sentences that the child recently said (3 items) (Kas et al., 2022).

Populations

The CDI:W&G has not been normed to date. It was administered in a longitudinal research project aiming to explore various factors influencing early language development in a sample of 103 randomly selected healthy infants in Budapest. Parents completed the forms five times: when their child was 9, 12, 14, 16, and 18 months old. The results are presented in Kas (2025), Harmati-Pap et al. (2025), Balázs et al. (2024), Nagy et al. (2024), and Tóth et al. (2025).

The CDI:W&S was normed on a cross-sectional sample consisting of 390 children aged 15 to 32 months (median age = 24 months, 44.8% girls; Kas & Lőrik, 2024). This form has also been used during a follow-up of the above-mentioned longitudinal research project involving 103 healthy infants in Budapest. The results are presented in Kas (2025) and Balázs et al. (2024).

The CDI-III was normed on a cross-sectional sample of 1424 children aged 24 to 50 months (49% girls) and introduced into national practice as a screening instrument for language delay (Kas et al., 2022).

Reliability and validity

Validity studies have been conducted on selected sections of the Vocabulary and Word endings parts of the CDI:W&S based on samples of 50 and 27 infants (aged 16 to 30 months), respectively. The validity study of the vocabulary checklist compared parental judgments in the Animals section with the children's performance in a picture naming task. The correlation between the number of animal names produced by the children and those reported by the parents was very high and significant (.98; $p < .001$), similar to the correlations between parental judgments and children's naming calculated separately for each item in the section (.88 - 1.0).

The validity study of the grammatical morphemes section compared parent report data for 6 case marking morphemes with locative meaning, such as 'in', 'into', 'out of', with the children's performance in an elicited production task with toy animals. The correlation between the number of grammatical morphemes used by the children and reported by the parents proved to be very high and significant (.85; $p < .001$), which reveals the broad validity of parental reports in this regard. The correlations for each morpheme were also significant, but showed greater variability, from .51 (moderate) to .86 (very strong) (Kas et al., 2010; reviewed in Kas et al., 2022).

The reliability of the CDI-III was assessed using Cronbach's alpha, showing good levels of reliability for the Vocabulary (.99), the Sentences (.87), and the Language use (.87) sections. In the Productive errors section, Cronbach's alpha including all items was .62, which is too low for a reliable scale.

Access

Access to the Hungarian CDI instruments can be obtained from Bence Kas (kas.bence@barczi.elte.hu).

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THE ISRAELI SIGN LANGUAGE CDI

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Israeli Sign Language (ISL) and ISL-signing populations

Sign languages are natural languages: similar to spoken languages, each sign language has its own vocabulary and grammar. Deaf and hearing children of deaf parents, who are exposed to sign language from birth, acquire it naturally as their mother tongue, with milestones similar to spoken languages (Novogrodsky & Meir, 2020). Importantly, deaf children of hearing parents, who are exposed to sign language from an early age with adequate quality and quantity, show similar language development to that of native signers. For example, children who are deaf or hard of hearing and those who have hearing parents who received early exposure to American Sign Language developed age-appropriate vocabulary skills. Using an American Sign Language CDI, research found that such children developed age-expected vocabulary growth when exposed to the language by six months of age (Caselli et al., 2021).

Israeli Sign Language (ISL) is the primary language of the Israeli Deaf community. It emerged in the 1930s to 1940s with the establishment of Deaf communities in Israel and it is now in its fourth generation. Approximately 10,000 people use ISL today. Similar to other sign languages, ISL is independent of the spoken language of the surrounding community (Hebrew) and exhibits unique lexical and grammar distinctions. For example, in the domain of vocabulary, the Hebrew verb *leehov* ("to love") corresponds to two ISL signs - one for animate beings, and one for inanimate objects (Novogrodsky & Meir, 2020).

Instruments

The ISL-CDI was adapted from the Hebrew CDI and consists of 563 video clips organised into 17 lexical-semantic categories (e.g., animals, toys, food). It was designed as a video-based parental questionnaire to avoid confusion between written Hebrew glosses and ISL signs (Morgan et al., 2022a; Novogrodsky & Meir, 2019).

Participants and procedure

Deaf parents of 34 bimodal-bilingual deaf children who were exposed to ISL from birth (ages 8-86 months; 20 boys, 14 girls) filled the ISL-CDI questionnaire. The toddlers used hearing aids or cochlear implants, and they were exposed to both ISL and Hebrew. Thus, they were considered as bimodal (sign and spoken language)-bilingual (ISL and Hebrew) (Novogrodsky & Meir, 2020).

In addition, iconicity ratings for the signs were collected from 41 Hebrew-speaking non-signer adults and 11 native ISL signers, all exposed to ISL from birth. These two groups rated the ISL signs on a 1–7 scale. There was a strong correlation between the ratings of sign-naïve adults and native signers ($r = .71$, $p < .001$). Research shows that children may learn highly iconic signs earlier or more easily, because the form of the sign and its meaning is more transparent in these signs than in arbitrary signs (not iconic). For example, the sign EAT in ISL is signed at the location of the mouth with the five-finger handshape (for details of the handshape characteristics of ISL, which is part of the language phonology, see Academy of the Hebrew Language). Iconicity ratings can give researchers and educators a measurable way to understand how visual similarities affect language learning and processing. Frequency ratings of the signs were collected from 19 native ISL signers. They ranged from 2.3 to 6.7 on a 1–7 scale. This data is useful in understanding the effect of input on language acquisition (Morgan et al, 2022a; Novogrodsky & Meir, 2019). Details of iconicity and frequency of the CDI signs are available in Morgan et al. (2022b).

Reliability and validity

The ISL-CDI showed strong concurrent validity. ISL vocabulary size was highly correlated with age ($r = .85$, $p < .001$), as well as with parental ratings of ISL skills ($r = .70$), and with naturalistic type–token ratio scores ($r = .60$). Children's ISL vocabularies ranged from 0 to 557 signs, with younger children (8-36 months) producing 0-460 signs and older children (46-86 months) approaching ceiling (M = 495/563).

Access

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THE ITALIAN SIGN LANGUAGE CDI

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Italian Sign Language and Italian Sign Language users

Italian Sign Language (LIS) is a natural, minority, and non-territorial language, which is perceived and expressed mainly through vision and bodily elements. It is used in Italy by members of the signing community, who may be deaf or hearing. LIS has a lower degree of sequential organisation than spoken Italian and it makes greater use of simultaneity, i.e., the simultaneous transmission of multiple units of meaning, conveyed using different articulators. LIS was recognised by the Italian Parliament on May 19, 2021. Identifying the number of users is a complex challenge. There are no reliable estimates of the number of people who use LIS. Some children (deaf or hearing) acquire it from birth in a family environment because they have at least one deaf parent who uses this language. Some deaf children and young people with hearing parents learn it later, in formal settings, sometimes even as teenagers or adults, when they join the signing community and start spending time with other deaf people. Some hearing children and young people learn LIS because they have schoolmates or friends who use this language, while some hearing adults learn it for professional or personal reasons. These differences in age, context of acquisition, and language use make it difficult to define who can be considered a native speaker. In LIS expressions, as observed with all sign languages, frequent contact is evident with the spoken majority language of the territory (in our case, spoken Italian) for several reasons. For example, deaf LIS users frequently communicate with hearing people who do not know LIS at all. All deaf and hearing people who use LIS are bilingual and also know spoken Italian, albeit with varying degrees of proficiency.

Instruments

The adaptation and development of the Mac Arthur Bates-Communicative Development Inventory in Italian Sign Language (LIS-MB-CDI; from now on LIS-CDI) started in the early 2000s. Similar to several CDI questionnaires in sign languages (e.g., Anderson & Reilly, 2002; Rodríguez-Ortiz et al., 2020), the LIS-CDI is comprised of the Words and Gestures Forms, and the Words and Sentences Forms. It is suitable for use with parents of signing children between the ages of 8 to 36/38 months. The vocabulary checklist of the preliminary version of the LIS-CDI comprises of 538 items to assess both comprehension and production. The LIS signs were glossed in written Italian and parents were asked to fill out a printed version of the questionnaire. After having distributed the questionnaire, the team received some feedback raising concerns about filling in the printed version of the form, as well as the clarity of the specific sign corresponding to some glosses. After further discussions based on this feedback, the team noted that the LIS-CDI considered mainly LIS elements known as lexical units (Volterra et al., 2022), without considering some specific linguistic aspects of LIS. Subsequently, the team decided to follow the specific properties of LIS more closely. In particular, some signs were added, because more than one sign can be produced starting from a (glossed) word written in Italian. For example, considering the gloss "to eat", different signs can be produced depending on what a person is eating, e.g., a sandwich, pasta, cookies, and so on (see Figures 1-2); for the gloss "small", different signs can be produced depending on "what" is small, with differences in the meaning (see Figures 3-4). Furthermore, a new category was created for "verb inflections", in order to study and evaluate the acquisition of

the inflections of a particular class of verbs that change the location of execution, depending on the subject and object of the sentence (e.g., to give, to tell, and so on). The entire questionnaire, along with the instructions on how to complete it were video recorded in LIS and made available on a web-based platform: this was a crucial aspect to guarantee that deaf signing persons have complete access to the procedure of filling in the questionnaire and to the items. A written version (in Italian) of the instructions, but not of the lexical items, is also provided. The current version of the LIS-CDI comprises 656 lexical signs (comprehension and production) organised into 20 categories, 24 questions on Early Understanding, one question on the use of fingerspelling, and one question on the production of sentences. Responses are automatically saved in a database and the final score of the child is automatically generated.

Population

Fifty-one questionnaires from parents (all deaf parents, but 1) of 14 deaf children aged 12 to 38 months old (7 males and 7 females) were collected using the first version of the LIS-CDI. Data collection with the current web-based version will start soon.

Reliability and validity

Reliability and validity will be explored after data collection.

Access

The LIS-CDI can be accessed on the website https://www.volis.it.

More details about the questionnaire are available from https://www.volis.it/piattaforma-volis/guida-operator1#pvblis

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Figure 1: *A frame of the LIS sign corresponding to the meaning "TO EAT PASTA"*

Figure 2: *A frame of the LIS sign corresponding to the meaning "TO EAT A SANDWICH"*

Figure 3: *A frame of one of the LIS signs corresponding to the meaning "SMALL", representing the length of an object of small dimension*

Figure 4: *A frame of one of the LIS signs corresponding to the meaning "SMALL" representing several dimensions of the concept (e.g., a 'small' child, a 'small' amount of something)*

THE ITALIAN CDIs

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Italian and Italian-speaking populations

Italian is a Romance language directly descended from Latin and closely related to Spanish, French, and Portuguese. Word order in Italian is flexible due to its rich morphology. Verbs are inflected for person, number, tense, and mood through suffixes, while nouns and adjectives vary in number and gender. Inflections for gender and number are highly regular, though verb conjugation shows significant irregularity. Italian is spoken by around 60 million people in Italy, about 4 million people in Switzerland, and significantly large communities in countries such as Argentina, the United States, and Australia.

Instruments

The MacArthur Bates-Communicative Development Inventories (MB-CDIs; from now on CDIs) parental questionnaires were developed in Italian language in 1995 (Caselli & Casadio, 1995), and they have been extensively used over the past 30 years for research and clinical purposes. The normative data for the original complete forms (CFs) Words and gestures - W&G; (Words and Sentences - W&S) were updated in 2015, and normative data for the short forms (SFs) have been also provided (Caselli et al., 2015).

The CDI:W&G CF (for ages 8-24 months) includes the first signs of understanding (3 items), comprehension of phrases (28 items), starting to talk (2 items), vocabulary comprehension and production over 19 semantic categories (408 items), and finally, production of five types of action/gestures (63 items).

The CDI:W&S CF (for ages 18-36 months) includes a checklist of vocabulary production over 23 categories (670 items), comprehension and production of past and future events (6 items), how children use singular and plural of nouns (3 items) and adjectives (3 items), how children conjugate verbs (6 items for 3 verb conjugations), a question about word combination, an open question regarding three examples of the longest sentences that the child recently said (3 items), a grammar scale tapping complexity and morphosyntactic completeness (37 pairs of sentences), and finally, a grammar scale tapping the use of pronouns (12 pairs of sentences).

The CDI:W&G SF (for ages 8-24 months) includes a word checklist assessed for comprehension and production (100 items), an action/gestures checklist representative of the five types of action/gestures (18 items), followed by 18 questions grouped into 9 areas, in which parents are asked about their child behaviours related to language acquisition. The form was originally developed for language screening in 8- to 18-month-old children. However, due to the lack of evidence of the usefulness of language screening in this age group, it has later been used as a short scale for children up to 2 years old.

The CDI:W&S SF (for ages 18-36 months old) includes a checklist of vocabulary production (100 items), a question about word combination, a grammar scale tapping complexity and morphosyntactic completeness (12 pairs of sentences), followed by questions about abilities related to language acquisition (7 items), and an open question on the longest sentences that the child recently said (1 item).

Populations

The CDI:W&G CF was normed on a randomly selected sample of 648 Italian monolingual children (45.7% girls) between the ages of 8 and 24 months.

The CDI:W&S CF was normed on a randomly selected sample of 752 Italian monolingual children (50.1% girls) between the ages of 18 and 36 months.

The CDI:W&G SF was normed on a randomly selected sample of 583 Italian monolingual children (46.3% girls) between the ages of 8 and 24 months.

The CDI:W&S SF was normed on a randomly selected sample of 816 Italian monolingual children (49.3% girls) between the ages of 18 and 36 months.

Reliability and validity

The internal validity of the CDI:W&G CF and SF was measured using Cronbach's alpha and Guttman split-half coefficients. Cronbach's alpha coefficients varied between .92 for action/gesture production in the SF to .99 for word comprehension and word production in the CF. Guttman split-half coefficients varied between .92 for action/gesture production in the SF to .99 for word comprehension and word production in the CF (Rinaldi et al., 2026; *See Table 1*).

The concurrent validity across the four different forms of the Italian MB-CDI was measured using Pearson's r (for bivariate correlations), Intraclass Correlation Coefficients (for agreement between measures on the same scale, i.e., centiles), and multiple R (to assess correlation after adjusting for other variables). All the coefficients were very high, indicating good concordance (Rinaldi et al., 2019; Lasorsa et al., 2021; Rinaldi et al., 2026; *See Table 2*). Concurrent validity of three scores from the W&S SF (i.e., vocabulary size, number of sentences produced, and percentage of complex sentences) was computed against scores obtained by children in a lexical naming task. Pearson's coefficients (controlling by age) ranged from r = .30 to .50 (Bello et al., 2012). Convergent validity was supported by a significant association with age for all scales.

Access

The instruments can be accessed from the following website - https://www.istc.cnr.it/it/group/lacam/risorse/PVB_it

Table 1. *Internal validity of scales included in the Italian CDI Word and Gestures complete and short forms.*

Instrument	Scale	Cronbach's alpha	Guttman split-half coefficient
CDI:W&G CF			
	Word comprehension	.995	.996
	Word production	.995	.996
	Action/gesture production	.964	.972
DI:W&G SF			
	Word comprehension	.987	.988
	Word production	.991	.994
	Action/gesture production	.916	.921

Table 2. *Concurrent validity of scales included in the Italian CDI assessed with multiple R, Pearson's r, and Intraclass Correlation Coefficients.*

Scales	W&G CF Word production	W&G CF Action/gesture production	W&G SF Word comprehension	W&G SF Word production	W&S SF Word production
W&G CF Word comprehension	.70[a]	.85[a]	.953[b] .775[c]		
W&G CF Word production		.58[a]		.940[b] .819[c]	
W&G SF Word comprehension				.83[a]	
W&G SF Action/gesture production		.893[b] .709[c]	.81[a]	.65[a]	
W&S CF Word production					.92[b] .80[c]
W&S SF Word production				.93[b] .87[c]	

a, multiple R to take into account linear and non-linear relationships between variables
b, Pearson's r computed based on vocabulary size
c, Intraclass Correlation Coefficients computed based on percentiles

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THE MALTESE-ENGLISH ADAPTATION OF THE CDI: W&S VOCABULARY CHECKLIST

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Maltese language: typology and use

Maltese is a Semitic language that incorporates extensive Romance influences and English borrowings. It is written in Roman script, but its word building and verb roots are strongly associated with North African vernacular Arabic. Maltese is characterised by a rich inflectional and derivational morphology, as well as free word order, and optional subject forms. Pronouns may be free or suffixed to nouns, verbs, and prepositions. Maltese is spoken by approximately 405,000 Maltese individuals living in Malta, as well as in immigrant communities in Australia, Canada, and the United States, among others.

Maltese is Malta's national language, holding official language status alongside English and Maltese Sign Language. Bilingualism in Maltese and English is nationwide, with Maltese individuals showing varying degrees of proficiency in both languages. Spoken Maltese is generally identified as the preferred home language, with a tendency to attribute a higher social status to English-speaking Maltese individuals. Spoken Maltese often shows idiosyncratic use of English words, phrases, and sentences, apart from the established English borrowings that compensate for unavailable Maltese words. English language mixing tends to be even more prominent when Maltese-dominant individuals address young children.

Instrument

A bilingual Maltese-English adaptation of the CDI:W&S vocabulary checklist was developed for 12- to 30-month-old Maltese children raised in Maltese-dominant households. It consists of 24 semantic categories comprising 916 words, of which 627 are Maltese and 215 are English, while 39 are designated as 'non-specific language', or cognate, terms (Gatt, 2010). Of the Maltese words, 65 are established borrowings from English (e.g., *toothpaste, teddy bear)*, necessitated by lexical gaps in Maltese. These 65 items would be coded as English words if the vocabulary checklist is employed with children raised primarily with English. Since no other vocabulary assessment tools are currently available for young Maltese children, this slight adjustment allows for the bilingual checklist to be extended to children at both ends of the bilingual exposure continuum. Instructions for caregivers completing the checklist are provided in both languages.

Populations

In the absence of normative data, reference measures for a randomly selected sample of 44 typically-developing Maltese children are available (Gatt et al., 2013). The children, who are between the ages of 12 months (n = 11), 18 months (n = 12), 24 months (n = 11), and 30 months (n = 10), were all raised in Maltese-dominant homes. Means and score ranges are given for the full samples at each age point, as well as for boys and girls separately. Given their preliminary nature, these measures cannot be employed as clear cut-offs for language difficulties. For each age point, performance at the lower end of the range would indicate the need for further assessment and follow-up.

Reliability and validity

Concurrent validity of the instrument has been demonstrated through moderate and significant correlations between checklist scores and other vocabulary measures for the above-mentioned

dataset, with Pearson's correlation coefficients (two-tailed) ranging between .56 and .64. Gatt et al. (2014) showed that the checklist scores of 12- to 30-month-old children correlated moderately with the numbers of different words they produced spontaneously during free play with their primary caregivers (r = .64, p < .001), as well as with their picture naming performance on a non-standardised task (r = .56, p < .001), when age effects were controlled. In an item-based analysis, Gatt et al. (2023) identified the checklist words reported for at least 50% of children aged 12 to 30 months (N = 44), comparing them to the word types more commonly sampled among the same set of children. The numbers of Maltese and English words identified for checklist and sample measures showed a very high and significant correlation when controlling for age effects (r = .94, p < 0.001).

Access

Access to the Maltese-English vocabulary checklist can be obtained from Daniela Gatt Ph.D. (daniela.gatt@um.edu.mt).

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THE SIGN LANGUAGE OF THE NETHERLANDS CDI

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Sign Language of the Netherlands and its users

Sign Language of the Netherlands (Nederlandse Gebarentaal (NGT)), with its different regional variations, is the sign language used in the Netherlands, recognised as an official language in 2021. There are estimated to be about 15 000 deaf users and about 60 000 users of NGT in total, including deaf, hard of hearing, deaf-blind, and hearing language users (European Union of the Deaf; Cokart et al., 2019).

There are no estimates of the number of children acquiring NGT as (one of their) native language(s) but estimates regarding deafness in children report a prevalence of about 17 children per 10 000 newborns in the Netherlands, resulting in about 287 children being born per year with reported unilateral or bilateral hearing loss of 40dB or more (Zoutenbier et al., 2016). However, not all deaf children acquire a sign language, and not all native users of a sign language are deaf. Based on the numbers of signers and children being born deaf, it is reasonable to assume that the number of children learning NGT is in the thousands.

Instruments

Until now there has been no full adaptation of a MacArthur-Bates communicative development inventory (CDI) for NGT. The aim of this vignette is to introduce the first video-based CDI for NGT (NGT-CDI).

The vocabulary section of the new CDI was based on a written lemma-list for NGT developed by Anique Schüller (2021) and the most recent version of the spoken Dutch CDI (unpublished update of Zink & Legaergere, 2002). The gestures and phrases sections were based on the most recent version of the spoken Netherlands-Dutch CDI only. The researchers involved in creating the original NGT lemma-list, researchers working on sign language acquisition at the Max Planck Institute (MPI) for Psycholinguistics, and deaf native NGT signing experts at the *Nederlands Gebarencentrum* collaborated to develop the instrument. Vocabulary items were taken from the *Gebarenwoordenboek* of the *Nederlands Gebarencentrum*[1]. This online lexicon represents the largest lexicon of NGT signs in the Netherlands, with over 18 000 signs enlisted. Additional items (e.g. gestures, small sentences), as well as instructions, consent and other video-based elements of the instrument were recorded by native signers of NGT from the *Nederlands Gebarencentrum*.

The written lemma-list developed by Schüller was developed on the basis of a comparison of six sign language CDIs and two spoken language CDIs. Lemma selection was based on relevance to Dutch culture, frequency in other lists, and lemmas relevant to Dutch and Deaf culture were added. The list indicated age discrimination in a small pilot study. Based on this written lemma-list, the

[1] Find the Gebarenwoordenboek online via https://ow.gebarencentrum.nl/

vocabulary section of the current adaptation consists of a total of 857 sign items across 19 semantic categories. As written lemmas do not fully correspond with signs, signs and videos had to be selected carefully: written items referring to semantically unrelated concepts in NGT were split into separate items (e.g., dragen [English: support/carry/wear]), written items with several synonym signs were merged (e.g. *eating* and *food*), and context-dependent items were shown in several variants (e.g., *pulling forward* and *pulling backwards*). The vocabulary items were displayed using GIFs (more details in the thematic paper Sander et al., this issue). The online video-based adaptation is hosted on Qualtrics (Qualtrics XM, 2025; see here for a mock-version for illustration: https://s.gwdg.de/UJnwqK

Population

The NGT-CDI was piloted as part of a bigger study conducted at the MPI for Psycholinguistics, yielding 22 assessments from twelve children between 13.5 and 64 months at up to three points in time (approx. 6 months between assessments). Families were recruited via advertisement in a magazine, social media advertisement, flyers, posters, and word of mouth. The instrument showed age discrimination for NGT comprehension as well as production in the current sample (see Figure 1).

Reliability and validity

No norming or validation has yet been conducted. The next goal is to collect enough data to develop a Computerized Adaptive Test (CAT)-CDI, reducing the time needed to fill in the instrument in the future.

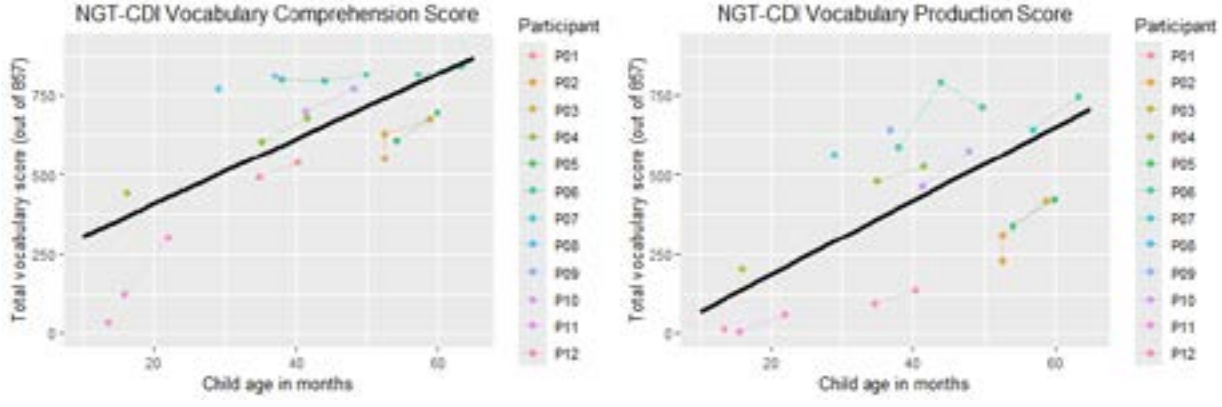
Access

The instrument can be used by other researchers in collaboration with the current NGT-CDI team. Please contact Jennifer Sander (jennifer.sander@mpi.nl).

Acknowledgement

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

Figure 1. *Age Discrimination of Comprehension and Production Vocabulary Scores of the NGT-CDI as a function of Child Age*



Note. Dots represent individual children's total vocabulary scores (out of 857 possible items) at different ages in months. Colored lines connect repeated measures from the same participant across time. The solid black line depicts the linear regression fit across all participants. The left panel shows comprehension scores, while the right panel shows production scores.

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THE NORWEGIAN CDIs

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Norwegian

Norwegian is a North-Germanic language closely related to Swedish and Danish. It is spoken in Norway with a population of 5.6 million, of whom about 4.6 million use Norwegian as their first language. The USA also has some Norwegian speakers. There are several extensively used Norwegian dialects, varying in vocabulary, phonology, and morphology, with Urban East Norwegian being the most widespread. Norwegian has two official written norms (Bokmål and Nynorsk).

Norwegian vocabulary mostly consists of mono- and di-syllabic words, with a smaller proportion of polysyllables. Phonologically, Norwegian has lexical tones, distinguishing between accent 1 and accent 2 in di- and poly-syllabic words. Morphologically, Norwegian is relatively simple with three classes of nouns (masculine, feminine and neuter), and three main classes of verbs: two weak and one strong class. Nouns are inflected for number and definiteness, adjectives for noun class (gender), number, definiteness, and comparison, and verbs for tense, mode, and voice. In contrast to English, Norwegian is a V2 language.

CDI-I, CDI-II, and CDI-III

The CDI:W&G (CDI-I) and CDI:W&S (CDI-II) were adapted to Norwegian from the US original version in 2006, then they were revised in 2007 and in 2008, and normed in 2008-2009 (Kristoffersen & Simonsen, 2012). The CDI-I comprises 396 words in 20 categories, as well as 5 sections on gestures, play and imitations. The CDI-II comprises 731 words (including all the CDI-I words) in 22 categories, as well as six sections on grammar (morphology and syntax). Mayor & Mani (2019) created a short version of CDI-II in several languages, including Norwegian. The CDI-III, aimed at three-year-olds, was first designed by using the most difficult items from CDI-II, following the US model. This version showed ceiling effects for vocabulary and lacked correlations between vocabulary and grammar (Sunde et al., 2014). The current Norwegian CDI-III is an adaptation of the Swedish form by Eriksson (2017), and it contains 100 words from four categories: food, body, ideas and emotions, and questions on pronunciation, metalinguistic awareness, and grammar.

Population, recruitment, and design

The CDI-I was normed based on data from children aged 8 to 20 months, while the CDI-II was normed based on data from children aged 16 to 36 months. Recruitment was population-based and it was carried out through Statistics Norway by mailing a random sample of 20,400 families. The parental reports were collected through the Internet (the first CDI to collect data in this way; Kristoffersen et al., 2013). The entire process of collection, coding, and norming took only four months. A total of 7555 forms were collected – 2699 for CDI-I and 4856 for CDI-II – with a response rate of 37%. The main design was cross-sectional, with a subset of longitudinal data from about 500 children. The CDI-III has been used in studies on 100 children in the age range 30 to 48 months, recruited through preschools, family, and friends (Holm et al., 2023).

Reliability and validity

For the CDI-I and CDI-II, reliability was measured through internal consistency (Cronbach's

alpha, all values high) and test-retest reliability based on 329 (CDI-I) and 397 (CDI-II) pairs of parental reports with a two-month lag. For CDI-I, Spearman test-retest correlations were acceptable, and somewhat lower for production than for comprehension and gestures, while for CDI-II, correlations were high (Simonsen et al., 2014; see Table 1). In terms of validity, the vocabulary in CDI-II was compared to frequently used words in a longitudinal corpus of three Norwegian children aged 2 to 4 years, with over 75% overlap. The CDI vocabulary was also compared to the words in the three longest sentences reported. For words produced at least 18 times, the overlap ranged from 94 to 100% (Kristoffersen et al., 2013). Reliability for CDI-III was measured based on data from 100 children through internal consistency (Cronbach's alpha), showing high values for grammar and vocabulary, and moderate values for metalinguistic awareness (Holm et al., 2023; see Table 1). External validity was measured based on 28 children, showing significant correlations between measures from CDI-III and measures from CDI-II, as well as from spontaneous speech (Garmann et al., 2019). Reliability for the short version of the CDI-II (Mayor & Mani, 2019) was measured based on real-data simulations of the norming data from the CDI-II, showing correlations ranging from .96 to .97 for the 50-words list with the full version, with a reliability of .998 (see Table 2).

Information on how the instruments can be accessed

The instruments can be downloaded from the MacArthur Bates CDI webpage – https://mb-cdi.stanford.edu/ (Go to *Adaptations – Search for available adaptations here! – Norwegian*).

Table 1. *Reliability of scales used in the Norwegian CDIs*

Instrument	Scale	Internal consistency (Cronbach's alpha)	Intraindividual test-retest reliability
CDI-I			
	Number of gestures	.90	.60-.95
	Receptive vocabulary	.98	.62-.95
	Productive vocabulary	.98	.47-.97
CDI-II			
	Productive vocabulary	.99	.74-1.00
CDI-III			
	Productive vocabulary	.97	-
	Sentence complexity	.92	-
	Grammatical constructions	.89	-
	Metalinguistic awareness	.66	-

Table 2. *Reliability of scales used in the short version of the Norwegian CDI-II (Mayor & Mani, 2019)*

Length	Females			Males		
No. of words	***r* with Full CDI**	**Avg. SE**	**Rel.**	***r* with Full CDI**	**Avg. *SE***	**Rel.**
50	.958	.05	.998	.972	.04	.998
25	.919	.06	.996	.945	.06	.996
10	.829	.10	.990	.876	.10	.990

SE, Standard Error; Rel., reliability of the test in terms of precision ($1 - SE^2$)

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THE POLISH CDIs

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Polish and Polish-speaking populations

Polish is a West Slavic language closely related to Czech and Slovak, with strong historical influences from German, Latin, and more recently, English. It is a highly inflected language with complex systems of case marking, verbal aspect, and agreement, most of which children acquire early in their language development. In contrast, word order is relatively flexible and used mainly for pragmatic purposes. Diminutives and augmentatives are frequent in child-directed speech, often formed with productive suffixes. Polish has a rich consonant system with palatalised and affricate sounds that can pose acquisition challenges.

When the work on the Polish CDI adaptations began at the end of the 20th century, Poland was still a predominantly monolingual country (around 38 million Polish speakers). The situation has since changed considerably, especially due to the large influx of Ukrainian families. Additionally, from the onset of the 21st century, the Polish diaspora in countries such as Norway and the UK have grown considerably, with many Polish-speaking children growing up in multilingual contexts.

Instruments

CDI:W&G (for ages 8-18 months) Inwentarz Mowy i Komunikacji: Słowa i Gesty (IRMIK:SIG): The vocabulary checklist addressing comprehension and production individually consists of 380 items grouped into 19 semantic/and or grammatical categories. The *Actions & Gestures* section consists of 63 items grouped into 5 categories. It also includes the following short sections: *First Signs of Understanding* (3 items), *Phrases* (24 comprehension items), and *Starting to Talk* (3 items concerning various aspects of imitation). Additionally, there is an optional question about combining words and another one asking to provide up to 10 typical utterances if the child already combines words (at least sometimes). The Polish adaptation of the CDI:W&G was prepared by Smoczyńska in 1999, and after minor updates (e.g., adding "mobile" as a variant to the "phone" item), it was normed in 2014 (Smoczyńska et al., 2015).

CDI:W&S (for ages 18-36 months) Inwentarz Mowy i Komunikacji: Słowa i Zdania (IRMIK:SIZ): The vocabulary production checklist consists of 670 items, grouped into 25 semantic/and or grammatical categories. The *Starting to Talk* section contains 3 items concerning various aspects of imitation (different from the W&G items). The current section on grammar is limited: there is a question about combining words (not yet, sometimes, always), a question about three longest utterances (mean length of utterance, MLU3), and another one about 10 typical utterances (Smoczyńska et al., 2015). The Polish adaptation of the CDI:W&S was prepared by M. Smoczyńska in 1999, and after minor updates (see section above and paragraph below), it was normed in 2014 (Smoczyńska et al., 2015).

The original adaptation (developed in 1999) contained a grammar section that was not included in the norming study (except for MLU3 and 10 examples of multiword utterances). Currently, the work on a revised grammar section is in progress. Sections on deixis (*Beyond here and now*), inflections (grouped into noun cases, comparative and superlative adjective forms, and tense and person verb forms), and a complexity section (on complex sentences) are being piloted.

CDI-III (for ages 34-48 months) IRMIK-III: The vocabulary checklist contains 100 items, including nouns, verbs, and adjectives, across 5 categories: Food, Body, Mental and Emotion words, as well as Child World category for other items.

The grammar part consists of the complexity section (16 alternatives) and 8 grammar questions, and focuses mostly on complex syntax and some particularly difficult inflections. The CDI-III norming study is currently in progress.

Short CDI (for ages 24-36 months) KIRMIK-A & KIRMIK-B: Two alternative lists of 100 words were chosen from IRMIK:SIZ based on their psychometric properties, thus mirroring the distribution of IRMIK:SIZ categories.

Computer Adaptive Testing CDIs: Norming datasets were used to develop short CAT-CDIs, where parents answer one item at a time and the algorithm adaptively estimates the child's score and chooses the best next item until reaching sufficient precision. Polish (and Norwegian) CAT-CDIs have been created from CDI:W&G (all subscales) and CDI:W&S. These adaptive CDIs were implemented using an open source web app, CDI-Online (Krajewski et al., 2022); details on the methods and validation results are forthcoming (Muszyńska et al., under review).

Populations

The CDI:W&G, the CDI:W&S, and the short CDI (A&B) were normed on a sample of 6,069 Polish monolingual children between the ages of 8 and 36 months, who were recruited through random sampling from the national register (Smoczyńska et al., 2015). In a recent study, data were collected from 234 Polish-Norwegian bilingual children (ages 18-36 months) in order to explore different ways to identify children at risk for language difficulties, including the use of regression-based bilingual norms (Krajewski et al., in prep.). We are also developing a Ukrainian adaptation of the CDI-III to be used, among others, in research studies with Polish-Ukrainian children. Polish CDIs have also been used in studies with Polish-English bilingual populations (Miękisz et al., 2017).

Reliability and validity

Reliability was high for all CDI scales across the relevant age ranges. Cronbach's alpha coefficients ranged from .98 to .99 for CDI:W&G comprehension, .68 to .99 for CDI:W&G production, .86 to .94 for CDI:W&G gestures, and .991 to .999 for CDI:W&S production. The Polish CDI forms also demonstrated high temporal stability over intervals of up to 45 days. Test-retest correlations (Spearman's *rho*) were .90 for CDI:W&G comprehension, .85 for CDI:W&G production, .94 for CDI:W&G gestures, and .97 for CDI:W&S production.

Predictive validity was similarly strong. Correlations between CDI scores at baseline and four months later (Spearman's *rho*) were .68 for CDI:W&G comprehension, .76 for CDI:W&G production, .80 for CDI:W&G gestures, and .89 for CDI:W&S production.

Access

Some of the Polish CDI instruments are available online: https://multilada.pl/en/mb-cdi/.

The archived code of the now deprecated web app (for adaptive and full CDI administration) can be accessed here: https://github.com/gkrajewski/CDI-online (the code of the new web app will be published soon). For details on instruments, data, and other queries, please contact Grzegorz Krajewski (krajewski@psych.uw.edu.pl).

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Norming of IRMIK:SIG and IRMIK:SIZ as well as development and norming of KIRMIK-A and KIRMIK-B were funded as part of the project 'Quality and Effectiveness of Education - Strengthening of Institutional Research Capabilities', funded by the European Social Fund within the framework of Priority III of the "Human Capital" Operational Programme - 'Quality of the education system' and 3.1.1. 'Creation of tools and the environment for monitoring, evaluation and research in the education system' (2010–2015).

IRMIK-III and Polish CAT-CDIs were developed within the StarWords project 2018/31/B/HS6/03916 funded by the National Science Centre, Poland. The new grammar part of the CDI:WS was developed within Od słowa do zdania project 2022/47/D/HS2/00392 funded by the National Science Centre, Poland.

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THE SERBIAN CDIs

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Serbian and Serbian-speaking population

Serbian is a South Slavic language spoken by over 5.6 million people in Serbia (Statistical Office of the Republic of Serbia, 2023). A comparable number of Serbian speakers can also be found in other countries. In Bosnia and Herzegovina, Serbian holds official language status, while in Montenegro, Croatia, North Macedonia, Romania, Hungary, Slovakia, and the Czech Republic, it is recognised as a minority language (Council of Europe, 2024). Serbian is also spoken within Serbian diaspora communities worldwide. There are two principal pronunciations of the standard Serbian language, Ekavian and Ijekavian (Radovanović, et al., 1996). Ekavian is spoken by the majority of the population in Serbia, whereas Ijekavian is predominantly used among Serbian communities in other ex-Yugoslav countries (the Republic of Srpska in Bosnia and Herzegovina, Croatia, and Montenegro), as well as in parts of south-western Serbia. Serbian is a morphologically complex language with seven cases for nouns, adjectives, and pronouns, and four types of noun declension. Serbian regular and irregular verbs have many different forms: seven conjugational classes differing in formal complexity, which are morphologically marked for tense, number, person, and gender. Word order is relatively flexible, with syntactic structure often determined by pragmatic factors such as emphasis or focus.

Instruments

Both instruments, adapted for Serbian (CDI:W&G and CDI:W&S), are available in two versions of the standard Serbian language (Ekavian and Ijekavian). The adaptation pursued two main objectives: The first was to align the inventories with the morpho-syntactic characteristics of the Serbian language. Next, a dialogic method of communication was employed to minimise difficulties parents might encounter in recognising the variety of morphological word forms presented in the item list outside of sentence context. In this approach, word forms were embedded within sentences and communicative contexts (Anđelković et al., 2017).

The CDI:W&G (for ages 8-18 months) includes *First signs of understanding* (3 items), *Phrases* (comprehension) (28 items), *Starting to talk* (2 items), and a *Vocabulary checklist* consisting of 20 semantic categories (483 items). Due to its developmental relevance for the transition to full verbal expression in children, the production of five types of actions and gestures has been expanded to include one group of items that describe the occurrence of words accompanied by gestures (Anđelković et al., 2017).

The CDI:W&S (for ages 16-30 months) includes a *Vocabulary checklist* (production of 20 categories and 732 items). Significant adjustments of grammatical parts of the inventory were also made due to the morpho-syntactic complexity of the Serbian language: *Derivational morphology* (3 items), *Noun morphology* (plural, case, prepositions in combinations with nouns - 36 items), *Pronouns* (32 items), *Verb morphology* (tense, person, number, gender, negation, auxiliaries – 20 items), *Hypergeneralisation* (3 items), an open question regarding three examples of long sentences that the child recently said (3 items), and *Complexity* (14 items) (Anđelković et al., 2017).

Samples

Pilot data were collected based on a convenience sample of 123 mothers (61 mothers of girls) from Belgrade (Serbia) and Banja Luka (Re-

public of Srpska, Bosnia and Herzegovina). The sample comprised 62 mothers who completed the CDI:W&G (for children aged 8-18 months) and 61 mothers who completed the CDI:W&S (for children aged 16-30 months). Participants were evenly distributed across age groups. In terms of parental background, the majority of mothers (over 70%) reported having completed secondary education, while the remainder had obtained higher or university-level education. Although the pilot data provides useful preliminary insights, the instrument must be normed on a representative sample of native Serbian-speaking children.

Reliability and validity

For the purpose of adaptation of the original inventories to Serbian language, two sources of data were used to provide the basis for selection of items and evaluation of their content validity (linguistic, cultural, and developmental): a) Serbian Corpus of Early Child Language (SCECL, Anđelković et al., 2001), and b) focus group discussions with parents and experts (linguists, psychologists, a speech therapist, a preschool teacher, and a paediatrician; Anđelković et al., 2023).

The internal consistency of items showed that reliability coefficients varied between .69 for the *How children use words* section in the SERCDI:W&S and .99 for the SERCDI:W&S and the SERCDI:W&G *Vocabulary checklists*, as shown in Table 1 (Anđelković et al., 2020, 2022).

Table 1. *Reliability of scales included in four Serbian CDI-based instruments.*

Instrument	Scale	Internal consistency (Cronbach's alpha /Kuder-Richardson Formula 20)
SERCDI:W&G		
	Comprehension of phrases	.94
	Action and gestures	.98
	Vocabulary comprehension	.99
	Vocabulary production	.99
SERCDI:W&S		
	Vocabulary production	.99
	How children use words	.69
	Morphosyntax	.98
	Complexity	.93

Access

Access to the instruments can be obtained from Darinka Anđelković (darinka2211@gmail.com).

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THE SLOVAK CDIs

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Slovak and Slovak-speaking populations

Slovak is a West-Slavic language. It is basically an inflective language (mostly in declension) with some introflective (as a secondary feature of declension), analytic (in conjugation), and agglutinative (in gradation) features. It has 6 short vowels, 5 long vowels, 4 rising diphthongs, and 29 consonants. Nominal morphology is based on relatively regular declension in 6 cases (in singular and plural) according to three grammatical genders. Verbal morphology has regular conjugation: three persons in singular and plural in three tenses (present, preterit, and future). Slovak has imperfective/perfective aspectual distinction in verbs. Syntactically, it is a pro-drop language with relatively free word order. It is used by approximately 4.5 million people within the borders of the Slovak Republic and less than 1 million people living outside Slovakia. It is official language of the Slovak Republic, as well as of the Slovak minority in Voyvodina (Serbia).

Instruments

The CDI: W&G (TEKOS I, for ages 8-16 months) includes the first signs of understanding (3 items), comprehension of phrases (32 items), starting to talk (2 items), and vocabulary comprehension and production in 17 thematic categories (331 items). The assessment of the area of gestures includes the production of individual gestures, as well as their combination in terms of complementary or supplementary connections (32 items), and finally, the play activities (52 items) with one open question about replacing one object with another in the game (Kapalková et. al., 2010).

The CDI: W&S (TEKOS II, for ages 17-30 months) includes two parts - the vocabulary comprehension and production in 20 categories (610 items), and a question about how children use words (7 items). Moreover, it includes grammar through verb conjugation and noun declension paradigms with emphasis on suffixes (31 items), with the addition of a qualitative assessment of morphological developmental generalisations (32 pairs of correct and incorrect grammar implementation items), as well as an open question on three examples of the longest utterances that the child has recently said (3 items). Finally, there are 8 items assessing sentence complexity and open questions about how the child uses objects in play (4 items) (Kapalková et. al., 2010).

The short CDI (Skrátený TEKOS II, for ages 17-36 months) includes a checklist of words assessing understanding and production (81 items), a grammar scale tapping use of different suffixes (12 items), and an open question about the three longest utterances that the child recently said (Kapalková - Kaletová, 2020). The short version is used by Slovak paediatricians as part of the guidelines recommended by the Slovak Ministry of Health (Matušková et al., 2021).

The short CDI, in cooperation with the Omama programme for poor marginalised communities (https://cestavon.sk/en/omama/), was also prepared for the Romani language. Currently, it serves as a screening and research tool for Romani children.

Populations

The CDI: W&G (TEKOS I) was normed on a sample of 653 children aged 8 to 16 months old (324 girls). Printed questionnaires were sent to parents by mail on the basis of the Central Population Registration Office: the response rate was 30%. As a second source, an online questionnaire was used, which was filled out by 25% of the remaining normed sample. After a period of 12 months, a total of 99 parents completed the CDI: W&G (TEKOS I) forms once again.

Apart from the quantitative data of the CDI: W&G (TEKOS I), a qualitative comparison of its lexical part was made between boys and girls (Slančová, 2018).

The CDI: W&S (TEKOS II) was normed on a sample of 1062 children aged 17 to 30 months (526 girls). The same methods were used as in the normative process for the CDI: W&G. 92% of questionnaires were filled out by mothers of children. Parents of children with Down Syndrome (13 children), and children with Developmental Language Disorders (16 children) were compared with typical children as a control group for language profile (Polišenská & Kapalková, 2014a).

The short CDI (Skrátený TEKOS II) was normed on a sample of 1092 children aged 17 to 36 months (502 girls). Online (64%) and printed versions of the questionnaire were used for collecting data.

Reliability and validity

The internal consistency measured using Cronbach's alpha in CDI: W&G (TEKOS I), after considering productive and receptive vocabulary, gestures, and play items altogether, was .81. In CDI: W&S (TEKOS II), the Cronbach's alpha was .79 for vocabulary items (both production and reception), but after adding the grammar items, Cronbach's alpha was lower (.65). Reliability was measured in a sample of 20 children by asking their mothers and fathers to complete the CDI: W&S (TEKOS II) separately; the agreement between two raters of the same child was measured. Correlations ranged from 0.73 ($p < .001$) for play items to 0.98 ($p < .0001$) for vocabulary.

The Cronbach's alpha was .99 for receptive vocabulary and .99 for production, as measured for the short CDI.

Content validity was ensured by selecting items from a longitudinal study of 5 Slovak children. Items were selected from the analyses of transcripts of video-recorded children (Slančová, 2008).

Convergent validity was supported by a significant relationship between CDI: W&G (TEKOS I) and spontaneous samples of 16 children: for vocabulary, $r = .70$ ($p < .01$); for semantic categories, $r = .78$ ($p < .01$); and for gestures, $r = 55$ ($p < .05$).

The CDI: W&S (TEKOS II) and the Non-word repetition task (NWR) were compared using a sample of 14 children. A significant relationship was observed between vocabulary and NWR, $r(12) = .70$, $p = .005$; the NWR scores also significantly correlated with grammar items, $r(12) = .79$, $p = .001$ (Polišenská & Kapalková, 2014b).

Access

Access to the instruments can be obtained from Svetlana Kapalková (kapalkova@fedu.uniba.sk).

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THE SLOVENIAN CDIs

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Slovenian and Slovenian-speaking populations

Slovenian (pronounced [sloˈʋenʃtʃina]) is the official language of Slovenia, and it is spoken by approximately 2.5 million people, predominantly in Slovenia, as well as in smaller communities in Austria, Italy, Hungary, Croatia, and across various diasporic settings worldwide. It belongs to the South Slavic branch of the Indo-European language familly and it is among the few Indo-European languages that have preserved the grammatical dual. Slovenian is typologically notable for its three grammatical numbers, three genders, and a complex case system that comprises six cases. The language also exhibits substantial dialectal variation, with an estimated 48 dialects and regional varieties documented to date.

Instruments

The CDI-Words & Gestures (CDI: W&G; for ages 8-16 months) consists of two parts (Marjanovič-Umek et al., 2011). Part I includes four sections: *First Signs of Understanding* (3 items), *Phrases* (28 items), *Beginning to Talk* (2 items), and *Vocabulary* (a checklist of 394 words categorised into 19 groups). Part II focuses on Actions and Gestures and includes six sections: *First Communicative Gestures* (12 items), *Games and Routines* (6 items), *Actions with Objects* (17 items), *Imitating Adult Actions* (13 items), *Pretending to Be a Parent* (15 items), and *Object Substitutions* (1 item).

The CDI-Words & Sentences (CDI: W&S; for ages 16-30 months) also consists of two parts (Marjanovič-Umek et al., 2011). Part I - Words Used by Toddlers - comprises two sections: *Vocabulary* (a checklist of 680 words categorised into 22 groups), as well as *Past and Future Activities, and Absent Things or Persons* (5 items). Part II - Sentences and Grammar - includes the following sections: *Word Form and Meaning* (4 items), *Overgeneralization of Syntax Rules* (40 items), *Mean Length of Utterance* (1 item), and *Sentence Complexity* (37 items).

One version of the Slovenian CDI-III (for ages 30-48 months; Marjanovič-Umek et al., 2011) retains the structure of the American CDI-III (Fenson et al., 2007) with adaptations to vocabulary, syntax, and meta-linguistic items. The *Vocabulary subscale* consists of a list of 100 words. The Syntax section includes three subscales: *Sentence Complexity* (12 items), *Using Language* (14 items), and *Mean Length of Utterance* (1 item). Metalanguage is the final section, and it includes two subscales, *Metavocabulary* (16 items) and *Meta-linguistic Awareness* (4 items).

Another version of the Slovenian CDI-III (CDI-III-SI) is based on the Croatian version (Kuvač Kraljević et al., in press), which was in turn derived from the Swedish CDI-III (SC-DI-III; Eriksson, 2017). The CDI-III-SI comprises five subsections in the following order: Level of Communication, Vocabulary, Grammar, Meta-linguistic Awareness, and Pronunciation. In the first subsection, parents rate their child's *level of communication* (6 items). The second subsection contains a list of 100 words divided into four semantic categories: *Food words* (16 items), *Body words* (26 items), *Mental words* (30 items), and *Emotion words* (28 items). The Grammar subsection consists of two parts: *Grammar-Morphology* (8 items) and *Syntax Complexity* (10 items). The *Meta-linguistic Awareness* subsection (9 items) relates to phonological and orthographic awareness. The Pronunciation subsection contains one general question about the child's speech, followed by five questions related to *pronunciation*,

phonological errors, and the intelligibility of the child's speech.

Populations

The CDI: W&G was standardised on 152 infants (ages 8-16 months; 72 boys and 80 girls), and the CDI: W&S was standardised on 360 toddlers (ages 16-30 months; 186 boys and 174 girls). The Slovenian CDI-III, based on the American version, was validated on 301 children (ages 30-48 months; 151 girls and 150 boys), while the CDI-III-SI, based on the Croatian and Swedish versions, was validated on 337 children (ages 30-48 months; 167 girls and 170 boys). All children were monolingual Slovenian speakers without known developmental delays. Recruitment was conducted via preschools and speech and language therapists working in various settings. A cross-sectional design was used in the study.

Reliability and validity

Psychometric analyses indicate a high degree of reliability for all instruments. The Cronbach's alpha internal consistency coefficients ranged from .79 to .99 for the CDI: W&G, and from .88 to .98 for the CDI: W&S. The Slovenian CDI-III, based on the American version, showed excellent reliability (α = .97 for vocabulary, α = .86 for meta-vocabulary), although no evidence regarding validity has been reported. For the CDI-III-SI, based on the Croatian and Swedish versions, reliability varied between subdomains, with vocabulary (α = .96; ω = .97) and grammar (α = .86; ω = .87) showing high consistency, while meta-linguistic awareness was lower (α = .66; ω = .65). Content validity was confirmed by five speech and language therapists who reviewed the scale's content. Convergent validity was supported by a trend of progress with age across all language subsections. In addition, concurrent validity was assessed based on a subsample of 91 children using The New Reynell Developmental Language Scales (NRDLS-SI). All language subsections of the CDI-III-SI showed statistically significant correlations with children's performance in terms of both the Comprehension and Production Scales of the NRDLS-SI.

Availability of instruments

Access to the Slovenian CDI:W&G, CDI:W&S, and CDI-III can be obtained from Dr. Ljubica Marjanovič-Umek (ljubica.marjanovic@ff.uni-lj.si) and Dr. Urška Fekonja (urska.fekonja@ff.uni-lj.si).

Access to the CDI-III-SI can be obtained from Mag. Barbara Penko (barbara.penko@pef.uni-lj.si), Dr. Damjana Kogovšek (damjana.kogovsek@pef.uni-lj.si), and Dr. Jerneja Novšak Brce (jerneja.novsakbrce@pef.uni-lj.si).

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THE SPANISH SIGN LANGUAGE CDI

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Spanish Sign Language and Spanish signers

Spanish Sign Language (LSE) is a visual, spatial, and gestural linguistic system with its own grammatical rules linked to its visuospatial nature. In Spain, LSE is legally recognised as the language of the signing deaf community by Spanish law (Ley 27/2007, 2007). The profile of LSE users and their levels of proficiency are highly diverse due to factors such as age of acquisition and whether the family signs or not.

According to the latest report on the status of LSE (CNLSE, 2020), only 30.6% of deaf people surveyed acquired this language in a family setting, with educational and community association settings being the usual contexts for LSE transmission, especially if the deaf person's family is hearing. In the case of deaf families, the report shows that 35% of deaf children acquired LSE between the ages of 0 and 3 years.

Instrument

In the process of adapting the Spanish CDI inventory (López- Ornat et al., 2005) to Spanish Sign Language, full authorisation was obtained from the authors of the original instrument (CDI Advisory Board). The authors also took into account the two previous adaptations to sign languages - ASL by Anderson & Reilly (2002) and BSL by Woolfe et al., (2010). Similar to the above-mentioned versions of sign languages, in the LSE-CDI, the two original scales from the Spanish CDI inventory were merged into a single inventory that encompasses the age range of 8 to 36 months.

The necessary modifications were implemented to ensure that it was culturally and linguistically suitable for communicative development in Spanish-signing children. The final LSE inventory included 27 sentences related to early comprehension, as well as 569 signs divided into 20 categories: games and routines (28 signs), animals (42), people (29), toys (17), vehicles (14), food and beverages (62), clothing (30), places to go to (21), outdoor objects (24), little things from home (41), furniture and rooms (22), signs of action (96), descriptive signs (64), time (15), pronoun (16), signs for asking (8), prepositions and locatives (17), quantifiers (11), auxiliary verbs (9), and connection signs (3).

The questionnaire was presented in written form and made available on a website, which included videos linking each word from the inventory to its corresponding LSE sign.

Populations

The sample comprised of 55 participants (32 boys and 23 girls), who participated in the assessment every four months and provided a total of 170 records. This sample consisted of a group of native deaf signers (n = 17; 12 boys and 5 girls) and a group of native hearing signers (n = 38; 20 boys and 18 girls). All participants had at least one deaf signer caregiver.

Participants were enrolled through outreach to deaf community associative organisations, paediatric and otolaryngology consultants from hospitals and clinics, as well as child education and early intervention centres.

Reliability and validity

The study used a subsample of participants to assess two types of reliability:

- The inter-rater reliability was high. A subgroup of participants (22%), covering all age intervals, were recorded in a situation of play interaction. The signs produced by the children were coded individually by two different coders. The results reported by both coders for expressive and receptive vocabulary were highly consistent (r = .996 and r = .975, respectively).
- Test-retest reliability was also high. The researchers administered the questionnaire to 20% of the children (ensuring that all age intervals were included) at two different times, about 1 to 1.5 months apart. The results for both receptive (r = .935) and expressive vocabulary (r = .980) were highly correlated, indicating that the questionnaire produced consistent scores over time. This consistency was similar to the oral Spanish version of the CDI.

The study also used two methods to validate the instrument:

- The signs reported by the parents through the questionnaire were significantly correlated with the signs observed during a recorded play session, both for expressive (r = .815) and receptive vocabulary (r = .969).
- The study also found a high degree of agreement between the signs parents reported on the questionnaire and the signs used by the children during the recording, considering the common signs between the two sources. A ratio between two scores was calculated: the first score was provided by the number of signs used by the child during the videotape and reported by the parent on the LSE-CDI, and a second score was obtained from the total number of signs used by the child that the parent may or may not have reported on the LSE-CDI. An average validity score of .87 for expressive vocabulary and .88 for receptive vocabulary was obtained, confirming that parental reports accurately reflected their children's use of LSE.

Access

The instrument can be accessed on this website: http://www.fundacioncnse.org/cdi/.

More information on its adaptation can be found in Rodríguez-Ortiz et al. (2020).

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THE SWEDISH CDIs

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Swedish and Swedish-speaking populations

Swedish is an old Germanic language related to Norwegian and Danish. It was also influenced by French during the 17th century, and more recently, by English. Swedish is a verb second language. There are several ways to inflict verbs and nouns in Swedish, including using suffixes and stem-vowel changes. In contrast, inflections for definiteness and gender are highly regular. Compound words are common in Swedish, and any number of lexemes may be combined. There are nine different vowels in Swedish, where each can take either a long or a short form. Swedish is spoken by around 10 million people in Sweden, 0.3 million people in Finland, and by a diminishing population in the USA.

Instruments

The Swedish Early Communicative Development Inventories: Words & Gestures (SECDI:W&G, for ages 8-16 months) includes *the first signs of understanding* (3 items), *comprehension of phrases* (27 items), *starting to talk* (2 items), vocabulary comprehension and production over 19 semantic categories (370 items), and finally, production of five types of gestures (63 items) (Eriksson & Berglund (1999).

The Swedish Early Communicative Development Inventories: Words & Sentences (SECDI:W&G, for ages 16-30 months) includes a checklist of vocabulary production over 21 categories (711 items), use of feedback morphemes (8 items), how children use words (6 items), a grammar scale tapping the use of different suffixes and word combinations (12 items), and finally, an open question on three examples of long sentences that the child recently said (3 items) (Berglund & Eriksson, 2000a).

The Swedish short Communicative Development Inventories (SSCDI, for ages 18-24 months) includes the first item from *first signs of understanding* and 12 gestures from the first communicative gesture section (13 items), followed by a 90-word checklist used to assess comprehension and production (90 items). The form was originally developed for language screening in 18-month-old children. However, while screening at 18 months gained no support, the form has later been used as a short scale for children up to the age of 2 years (Eriksson et al., 2002).

The Swedish CDI-III (SCDI-III, for ages 30-48 months old) includes a section on the child´s communicative level (6 items), a vocabulary checklist with mainly verbs, adjectives, and abstract nouns from four semantic categories (food items, body parts, cognitive words, and emotion words; 100 items), a grammar scale (18 items), a meta-linguistic awareness scale (7 items), and a single item on pronunciation (Eriksson, 2017).

Populations

The SECDI: W&G was normed on a randomly drawn sample of 228 parents of children aged 8 to 16 months (52% girls) from the county of Dalecarlia. The response rate was 46%. Parents completed the forms up to five times as their children reached different ages, summing up to a total of 470 observations.

The SECDI: W&S was normed on a randomly drawn sample from the birth register of all children born on two specific dates. The response rate was 88%. Parents of 336 children aged 16 to 28 months (53% girls) participated one to three times, adding up to a total of 900 observations. This form was also distributed to parents of 330 children with Down syndrome (ages 16-72 months, 38% girls; Berglund, et al., 2001), which

corresponded to about 50% of the children in this age range.

The SSCDI was administered to the catchment area of half of all Child Health Care Centers (CHCC) in Uppsala County. Parents of 1021 children aged 16 to 21 months (48% girls), who attended these CHCCs, agreed to participate in the study, which corresponded to a response rate of 88%.

The SCDI-III was normed on a randomly drawn sample from the national birth register. Parents of 1134 children aged 30 to 48 months (51% girls) agreed to participate, corresponding to a response rate of 18%.

Reliability and validity

The internal consistency measured using the Cronbach's alpha coefficient varied between .56 for early gestures in the SSCDI and .97 or higher for the vocabulary scales. Intra-individual test-retest reliability – here, measured as the words that an individual child was reported to produce at one time point that were subsequently reported again after 1-3 months - varied between .59 for the vocabulary of 8- to 10-month-old children and .97 for the vocabularies reported by older children (Berglund & Eriksson, 2000b). See Table 1.

Content validity of the vocabulary scales was examined by assessing the proportion of words in existing Swedish child diaries at a given age that were also included in the instruments. These proportions varied between 58 and 95%. The children's reported vocabularies were further compared with examples of long sentences also reported by the parents in SECDI: W&S. This analysis showed that 85% of the words included in more than one example were found in the checklist (Berglund & Eriksson, 2000a).

Convergent validity was supported by a significant association with age for all scales.

Access

Access to the instruments can be obtained directly from Mårten Eriksson (marten.eriksson@hig.se) or under Mårten Erikssons profile at Researchgate.

Table 1. *Reliability of scales included in four Swedish CDI-based instruments.*

Instrument	Scale	Internal consistency (Cronbach alpha)	Intra-individual test-retest reliability
SECDI:W&G			
	Comprehension of phrases	.90	-
	Total gestures	.89	.91 - .97
	Vocabulary comprehension	.99	.82 - .93
	Vocabulary production	.99	.59 - .77
SECDI:W&S			
	Vocabulary production	.99	.86 - .94
	How children use words	.81	.88 - .96
	Syntax	.83	.93 - .94
SSCDI			
	Early gestures	.56	.89
	Vocabulary comprehension	.96	.89
	Vocabulary production	.97	.97
SCDI-III			
	Vocabulary production	.97	-
	Syntax	.93	-
	Meta-linguistic awareness	.70	-

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