The Czech version of MAIN: adaptation, revision, pilot data from typically-developing and hearing-impaired children, and future steps

Miroslava Nováková Schöffelová[*]

Charles University, Czech Republic

Lucie Saicová Římalová

Charles University, Czech Republic

Marína Mikulajová

Pan-European University, Czech Republic

Kamila Homolková

Charles University, Czech Republic

The article introduces the latest Czech version of the Multilingual Assessment Instrument for Narratives (MAIN). The first Czech version of MAIN was published in 2020 and was piloted in 2020–2021. Subsequently, a revised Czech version of MAIN was created. This article introduces this latest version of MAIN, describes minor changes to the manual caused by typological features of Czech and a specific cultural context, and presents sample analyses of the pilot data collected from typically-developing and hearing-impaired children. The results from the pilot study indicate that MAIN functions properly in the Czech context, in particular for preschool children. The results show that MAIN can be fruitfully applied to assess speech and language skills in hearing-impaired children in the Czech context.

1 Narratives and their assessment in Czech

Narrative assessment provides a wealth of information about a child's linguistic, pragmatic, and cognitive abilities. As a research tool, it can be used to gain large amount of information regarding a person's language development from a relatively small language sample. In recent years, narrative assessment has been explored as a diagnostic tool for its considerable potential

[*] Corresponding author: mnere@centrum.cz

for clinical assessment (Botting, 2002). Narrative skills have been used for many years as a predictor for language and literacy abilities (Stothard et al., 1998) and can also be used to diagnose persistent language impairment (Bishop & Edmundson, 1987 in Norbury & Bishop, 2003).

In the Czech Republic, numerous Czech researchers have studied language skills across different fields (e.g., Chejnová, 2016; Klenková et al., 2014; Saicová Římalová, 2013, 2016; Seidlová Málková & Smolík, 2014; and others). However, research on narratives is relatively under-represented. In the Czech context, there are still no standardised tests aimed at the assessment of narrative development. In clinical practice, speech therapists sometimes create their own materials to monitor the development of narratives (e.g., a narration to a picture book chosen by the speech therapist) and then evaluate the development of this ability intuitively rather than in a standardised form. Although evaluating narratives by recording spontaneous speech production is a common method for obtaining information about language development in other countries, the practice is still little used in the Czech Republic (Seidlová Málková & Smolík, 2014).

The Multilingual Assessment Instrument for Narratives (henceforth MAIN; Gagarina et al., 2019) is a tool that has been developed for the assessment of both comprehension and production of narratives in children acquiring one or more languages. MAIN is based on six-picture sequences with carefully designed stories and allows for several methods of data elicitation, such as telling and retelling. MAIN is suitable for both research and clinical application and has the potential to provide a useful framework for eliciting semi-spontaneous speech, which could help both to maintain the advantages of spontaneous speech and to provide guidelines for its interpretation. MAIN has already been successfully used in many other languages, including languages close to Czech, such as Slovak (Kapalková & Nemcová, 2020) or Polish (Mieszkowska et al., 2020), but also typologically different ones, such as Turkish (Mavis et al., 2020) or Vietnamese (Trinh et al., 2020). The Czech version of MAIN thus has potential for both research and application and for broadening our knowledge of language and narrative development in Czech-speaking children, including research on bi-/multilingual children and children with communication disorders. In 2020, MAIN was therefore adapted to Czech.

In this article, we summarise the characteristic features of the Czech language (section 2) and describe the process of adapting MAIN to Czech, including changes in the manual compared to the first version of Czech MAIN (section 3). Subsequently, we present pilot data from Czech typically-developing children and discuss the research potential and clinical usefulness of the MAIN procedure for hearing-impaired children (section 4).

2 The Czech language

Czech is a west Slavic language, closely related to Slovak, Polish, and Upper and Lower Sorbian. It is the official language of the Czech Republic, which has a population of 10.7 million, and has approximately 12–13 million speakers (Sussex & Cubberley, 2006, p. 7; see also Lewis, 2009, p. 549).

Czech is a highly inflectional language with a rich nominal and verbal morphology. Grammatical information is typically expressed by inflectional suffixes that often combine several grammatical meanings and are frequently homonymous.[1] Word order is flexible. There is a strong tendency to organise utterances in such a way that information that is already known from the context tends to be expressed at the beginning, while new information comes towards the end. Word order allows for various subjectively motivated variations as well, for example, the speaker can place new information at the beginning of the utterance if s/he wants to stress it. Czech is a pro-drop language and typically omits pronominal subjects, except when emphasis or clarity demand otherwise. There are no definite or indefinite articles in Czech, but in informal contexts, demonstrative pronouns such as *ten* 'this/that' are sometimes used in a similar way to the way a definite article may be used in other languages. Czech often prefers a sentence with a finite verb form where some other languages (e.g., English) use more condensed constructions (e.g., constructions with a gerund or an infinitive).[2] Words are typically formed by derivation based on prefixes and suffixes (e.g., *ptáče* 'baby bird', *ptáčátko* the diminutive form of 'baby bird', and the adjective *ptačí* 'bird's' are all related to the noun *pták* 'bird' and derived by various suffixes); composition (e.g., *maloměsto* 'small town' formed from the adjective *malý* 'small' and the noun *město* 'town') is much less frequent. Czech has a well-developed system of diminutives, which are common in both child-directed speech and children's speech. In informal contexts, particularly in spoken Czech, non-standard varieties of Czech (e.g., the wide-spread non-standard variety called Common Czech or local dialects) are often preferred to standard Czech. The most salient differences between the standard and most non-standard varieties of Czech appear in morphology (especially in inflected forms of adjectives, nouns, some pronouns, some numerals, and verbs) and in pronunciation.[3] For many children, this non-standard variety becomes their L1; standard Czech is typically taught, and learned, at school.

3 The adaptation of MAIN into Czech

In this section, we describe the process of adapting MAIN into Czech in general (section 3.1) and discuss several issues that seem to be specific of the Czech context (section 3.2).

3.1 The process of adaptation

The first version of MAIN in Czech was created in 2020 based on the revised English MAIN (Gagarina et al., 2019). This first Czech MAIN was a translation of the English version and was kept as close as possible not only to the macrostructure, but also to the microstructure of the

[1] Inflectional suffixes can express, for example, a) case and number in nouns; b) case, number, and gender in adjectives, some pronouns, and some numerals; c) person, number, imperative mood in active voice, and indicative mood in active voice in verbs. Some verbal grammatical meanings, such as the past tense or the passive voice, are expressed by a combination of inflectional suffixes and specific forms of auxiliary verbs that are also inflected.

[2] For example, the common Czech translation of the English utterance 'He warned the cat not to do it' would be a compound sentence with two finite verb forms, such as *Varoval kočku, aby to nedělala*.

[3] For example, the standard Czech instrumental plural form of *svoje velké tlapy* 'one's big paws' is *svými velkými tlapami*, the common Czech form is *svejma velkejma tlapama*.

revised English MAIN (e.g., in the repertoire of specific construction and in the number of examples in the scoring protocols). It was not piloted before it was published but was reviewed by two native Czech speakers: a linguist and English teacher, and a professional English-Czech translator. The published version was subsequently piloted in 2020–2021 with 94 typically-developing children (TD) and 39 children with various communication disorders (CD). The collected data were transcribed and scored and we listed typically recurring or frequent children's statements in production (telling), reproduction (retelling), and in their answers to comprehension questions. Below (see section 4), we report results from 83 TD children aged 3;0–5;11 (which is the pre-school age in the Czech Republic) and 3 children with hearing impairment. The remaining data awaits further analysis.

Our analysis of the collected data and the experience of those who administered the tests led us to the decision to thoroughly revise the first Czech version of MAIN. The original Czech translation was once more compared to the English original and revised by a linguist, who is specialised in both Czech and English. The examples of correct and incorrect answers in the scoring protocols were checked against the pilot data. Any discrepancies between the examples offered in the scoring protocols and the answers typically given by Czech-speaking children were resolved. In some cases (e.g., various expressions of purpose), solutions used by the authors of the Slovak version (Kapalková et al., 2020) were consulted, as Czech and Slovak are typologically and culturally similar languages.

Many of the children's answers were difficult to score, both for us and for the test administrators (and speech therapists). In some cases, ambiguities arose as to whether certain answers should be scored as correct, because they were quite different from the English examples. In some cases, using our knowledge of Czech child language (see section 3.2 as well), we evaluated these answers as correct.

Our interviews with the speech therapists and students who collected the pilot data focused on parts of the manual, which appeared unclear, on typical responses from the children, and on answers that were difficult to score. These issues were discussed with the authors of the Slovak version of MAIN, Monika Nemcová and Svetlana Kapalková. Using information gained from the data collection and the interviews, we propose some changes to the manual and we have introduced some changes to the examples given in the scoring protocols (see section 3.2). The revised version corresponds in meaning to the revised version in English, but is also authentic to Czech language and culture. The revised Czech version was finally back-translated into English and checked against the original.

3.2 Issues specific to the Czech context

While creating the revised Czech version, we encountered, and therefore needed to consider, several issues that are specific to the Czech language and culture, as well as to diagnostics and intervention practices. Because of certain typological features of Czech, as a Slavic language with rich morphology, the four story scripts are naturally different from the English original, e.g., texts are shorter. The same is true for the scripts in the typologically related Slovak version (Kapalková et al., 2020). Because of the existence of standard and non-standard Czech (see section 2), we also added a footnote to the scoring protocols which states that both standard and

non-standard forms are acceptable, provided that they convey the same meaning. Where it seemed more natural from the perspective of Czech culture, we selected diminutive forms for certain characters from the stories (e.g., *ptáčátka* 'baby birds' in diminutive form; *maminka koza* 'mother goat', with the word *maminka* 'mother' in diminutive form; see section 2) and used the female gender for the cat (*kočka* 'female cat') in the *Cat* story (cf. the Slovak adaptation, Kapalková et al., 2020).

We also suggest that the beginning of each story script should contain some simple information about the location (e.g, *in the park*), because it is an important component for model stories or for retelling; it is also a scored item in the assessment procedure. As it is not present in the English version and all adaptations of MAIN should be comparable, we have not added this component into the Czech version. We nevertheless believe that adding location to the story scripts might be a useful improvement for the next new English version of MAIN and its subsequent adaptations to individual languages, should there be any.

Using both the original and the back-translated version, we carefully checked that the number and types of answers in the scoring protocols correspond to the English version. In cases where several synonymous and relatively equally frequent answers are possible in Czech, we added more examples to the scoring protocols (e.g., frequent synonyms of 'being angry', such as *být naštvaný*, *být rozzlobený*, *být rozhněvaný*). We also added synonyms to the list of words relating to mental states – the number and types of the mental states listed remains equal to the English version, but in some cases, more synonyms are present. This is also due to the fact that verbs, including 'linguistic verbs', tend to be strongly language-specific and Slavic languages have a rich verbal prefixation. For example, in the case of the *Baby Birds* and *Baby Goats* stories, we added the verbs *zamňoukat* 'to miaow' and *zavrčet* 'to growl' to the list of 'linguistic verbs'. Because they appear in the story scripts, we believe that the administrators should also be able to find them in the scoring protocols. As there are several Czech equivalents of the English construction *in order to* + verb (such as modal verb + non-finite verb, or a compound sentence with the conjunction *aby* 'in order to', 'so that' or *že* 'that'), we added these clausal subtypes to the corresponding scoring protocols. The consequence of the above-mentioned cases is that there are more examples in the relevant sections of the scoring protocols in the new Czech version than in the revised English version (e.g., for A3, A13). We believe that such increased choice will help the test administrators during data collection but will not influence the assessment procedure.

During the data collection, we noticed in our Czech-speaking participants certain narrative features that deserve further zooming in. These features may be specific to the Czech culture (we are not aware of any existing research in Czech concerning these features) or to cultures similar to the Czech one. We noticed, for example, that Czech speakers tend to answer questions concerning the purpose of a given activity by giving not the purpose as such, but the reason. That is, most speakers, including adults, seem to prefer to answer a question such as 'Why is the boy holding the fishing rod in the water?' (*Cat*, D4) with 'Because his ball is in the water' rather than with 'Because he wants to get his ball back'. Following the MAIN core team

that has decided to evaluate this type of answers as incorrect,[4] we accept this solution and we judge them as incorrect in the Czech version as well. However, as this type of answer seems to be typical of some groups of speakers and might be related to culturally determined models of narration (this question requires further investigation) or it might be a typical interpretation among some age groups (similar type of answers has been observed in some other languages, such as Swedish, [5] as well), we believe that it would deserve a more detailed research and that the (in)correctness of the given type might be then re-evaluated. It would also be useful to clearly state whether such answers are (in)correct in the scoring protocols if MAIN is revised again.

Finally, we also observed that the Czech examiners who collected data from children repeatedly encountered difficulties with some items. We therefore decided to add explanatory footnotes to item D10 (specifying that for this question, the administrator should always ask the question 'Why?') and to the components labelled 'IST as initiation event' (specifying that the item concerns the mental state of a character, i.e., an adequate mental state, character feature, or perceptual experience that functions as the initiating impulse of the event). It also seems probable that the Czech cultural model of narratives tends to specify time (e.g., 'once upon a time') rather than place, but we have not reflected this fact in the manual (the tendency to specify time rather than place might appear in other cultures as well, and the topic would deserve further research across different languages).

4 Piloting the Czech MAIN

In this section, we give an overview of the main results from the pilot study that we carried out using the 2020 Czech version of MAIN in typically-developing children (section 4.1) and in hearing-impaired children (section 4.2).

The main aim of this paper is to present the Czech MAIN, specifics of Czech language, and to present the very first pilot data. Any results described below that may point to 'differences' between ages or telling/retelling should be seen as preliminary. At this moment, we have not verified differences statistically as we plan to do it with more data as a future step.

4.1 Typically-developing children

In total, data from 83 Czech-speaking typically developing monolingual children aged 3;0 to 5;11 with typical language development (TD; mean age: 4;7) were analysed.[6] Two stories were administered to each child. First, the story *Baby Goats* or *Baby Birds* were given to elicit a narrative in the telling condition followed by the comprehension questions. Secondly, the *Dog* or *Cat* story was administered to elicit a retelling of the story after which the comprehension questions were asked. The whole procedure of administration followed the instruction in the

[4] Communication from the editors of the volume.

[5] Personal communication with Josefin Lindgren.

[6] Data from another 11 children aged 6;0 to 9;9 were collected, but this group is not yet sufficiently representative and will be the subject of further data collection and research.

manual (Gagarina, 2020). For purpose of the scoring, the narratives were transcribed and the story structure was calculated. The analysis and scoring of the story structure comprises the following components that can be present three times in the story: Internal state terms as initiating event, goal, attempt, outcome, and internal state terms as reaction (one point for each component). At the beginning, the indication of place and time is also scored by one or two points (the maximum score for story structure was 17). Ten comprehension questions were administered immediately after telling/retelling the story. Three questions focus on the goals, six questions on internal state terms including stating the reason. The last question monitors the understanding of the story as a whole (for a more detailed explanation see Gagarina, 2012).

In tables 1 and 2, the mean scores of narrative macrostucture (story structure) and story comprehension are reported for telling and retelling, respectively.[7]

Table 1: Descriptive statistics of narrative macrostructure and story comprehension, TD pre-school children, telling mode (*Baby Birds* and *Baby Goats*)

Age group	Average Age	N	Telling Mean (max = 17)	SD	Min-max	Comprehension Mean (max = 10)	SD	Min-max
3-year-olds	3;6	22	2.14	2.49	0-7	3.68	2.73	0-9
4-year-olds	4;6	30	3.43	2.70	0-9	4.57	3.03	0-10
5-year-olds	5;7	31	5.06	2.29	0-10	6.94	2.58	0-10
Total	4;7	83	3.70	2.73	0-10	5.22	3.08	0-10

Table 2: Descriptive statistics of narrative macrostructure (story structure) and story comprehension, TD pre-school children, retelling mode (*Cat* and *Dog*)

Age group	Average Age	N	Retelling Mean (max = 17)	SD	Min-max	Comprehension Mean (max = 10)	SD	Min-max
3-year-olds	3;6	22	4.18	3.32	0-9	5.18	2.84	0-9
4-year-olds	4;6	30	5.10	3.33	0-14	6.40	3.10	0-10
5-year-olds	5;7	31	7.29	3.01	0-13	8.16	2.42	0-10
Total	4;7	83	5.67	3.43	0-14	6.73	3.01	0-10

The results from the pilot data indicate that MAIN may differentiate well between good and poor narrative abilities in Czech pre-school children as the results show neither a floor nor a ceiling effect. The results given in the tables show differences among the age groups which suggest that the ability to tell and retell the story and comprehension of the story increases with age. In the same way, we can see from the descriptive statistics (table 1 and 2) that, in all age groups, the overall performance of the group is higher in retelling than in telling.

In addition to the overall macrostructure (story structure) and comprehension scores, we were interested in the structural complexity of each episode in the children's narratives. The approach taken here is grounded on Westby's binary decision tree (Westby, 2005 in Gagarina et al., 2012, p.11–12). The episodes within the stories are classified into one of three levels of structural complexity: (1) A sequence where no statement about the goal was generated but an attempt and outcome was included (attempt-outcome (AO) sequences); (2) incomplete episodes

[7] 3-year-olds = ages 3;0–3;11, 4-year-olds = ages 4;0 – 4;11, 5-year-olds = ages 5;0 – 5;11.

that included a goal (G) statement, but lacked a complete GAO structure because of the omission of either the attempt (A) or the outcome (O) (goal-attempt (GA) sequence/goal-outcome (GO) sequence); and (3) complete episodes that included all three components (goal-attempt-outcome = GAO). Additionally, the number of isolated goals (G) are considered (as recommended by Gagarina et al., 2012, p. 12), in order to provide a more fine-tuned differentiation between the various populations involved. In children's production, sequences that do not contain any of components (neither AO nor G) can also appear. Table 3 shows the average number of each type of sequence (where at least one of the components appeared) for all three episodes combined. The maximum for each category is 3.

Table 3: Description of structural complexity in the telling and retelling of TD children in preschool age.[8]

Age group	**N**	**AO sequence**		**Single G**		**GA / GO sequence**		**GAO sequence (complete episode)**	
		Tell	Retell	Tell	Retell	Tell	Retell	Tell	Retell
3-year-olds	22	0.32	0.27	0.09	0.05	0.14	0.41	0.00	0.23
4-year-olds	30	0.50	0.40	0.03	0.33	0.07	0.36	0.27	0.13
5-year-olds	31	0.94	0.71	0.06	0.16	0.32	0.61	0.23	0.42
Total	83	0.61	0.48	0.06	0.19	0.18	0.57	0.18	0.27

As we can see in table 3, in *telling* the story, AO sequence is overall the most frequent one, and its frequency increases with age. However, this does not apply for *retelling*, where the most frequent sequence in total is GA/GO and the AO sequence is in the second place, but as with telling the frequency of this sequence increases with age. The production of goals (G) without any other component was the least common type in both elicitation methods.

We find the results for the production of complete episodes, where all three macrostructural components are produced within the same episode (GAO sequences), especially interesting. This type of sequences was only produced by children aged 4 or above. So any of 3 years olds did not produce this type of sequence in telling the story. On the other hand, we see that the GAO sequences are produced by 3-year-olds in retelling. We can assume that the youngest children are able to produce complete episodes based on imitation during retelling, but not yet independently in telling. Therefore, to be able to claim this, we need more data. In the future research, we would like to cover all types of sequences from a developmental perspective in detail with more data from children (including children at school age). We are interested in whether we will be able to see some regularities in the production of individual types of sequences. We are particularly interested in whether the proportion of complete GAO sequences will increase with age and the proportion of incomplete sequences will decrease.

In sum, the narratives produced by the children in the pilot study suggest some interesting trends. As a future step, this will be studied in detail with more data including confirmation by statistical tests. We plan to focus on examining the development of these

[8] AO = attempt-outcome sequence, single G = isolated goal without an attempt and/or an outcome, GA/GO sequence = goal-attempt or goal-outcome sequence without an attempt, GAO sequence = complex sequence goal-attempt-outcome.

aspects and to clarify which components and/or combinations of components typically occur at which age.

4.2 Research potential and clinical usefulness of the MAIN procedure for hearing-impaired children

In this section, we want to illustrate that the MAIN procedure has also a big potential for research of language and literacy acquisition of hearing-impaired children and can be clinically very useful in assessment and planning intervention goals.

Literacy acquisition and skills in any language are based mainly on decoding and reading comprehension (National Reading Panel & National Institute of Child Health and Human Development, 2000). Phonological and language skills are described as fundamental components of decoding and comprehension in 'The Simple View of Reading' (Gough & Tunmer, 1986). Just as phonological skills are essential for learning to read words, it has become clear that narrative comprehension and storytelling are fundamental for reading comprehension. This model can also be applied to hearing-impaired children. MAIN provides a useful framework and context for eliciting semi-spontaneous oral language samples that can be analysed to gain measurements of phonological acquisition, lexical knowledge and morpho-syntactic development, together with narrative comprehension, production and retelling. Here we illustrate our approach with the results from a pilot study of three children of pre-school age who use cochlear implants: a boy aged 3;6, a girl aged 4;7, and a boy aged 7;0. All three participants are prelingually severely hearing-impaired children of parents without a hearing loss. The sessions were videotaped, and the children's narratives and answers to the comprehension questions were transcribed using the CHAT transcription format (MacWhinney, 2000).

MAIN was administered in line with standard instructions. The children's narrative production skills (telling) were measured using the *Baby Birds* story, and narrative retelling was measured by the *Cat* story. Both telling and retelling were followed by the comprehension questions. Language samples gained from telling and retelling were further used for analyses of phonological acquisition as well as lexical knowledge and morpho-syntactic development.

The Phonological Mean Length of Utterance (PMLU) created by Ingram (2002) enables an estimate of whole-word phonological productions in children with typical language development and in children with communication disorders including hearing impairment. The measure is comparable to MLU in language studies (Brown, 1973). PMLU indicates whole-word complexity for both child-speech and target words, e.g., the word 'zucchini' pronounced as [kini], [skini], or [dzukini]. There is a criterion of no less than 25 words in a sample for the calculation of PMLU. First, we calculated PMLU for target words used in the story scripts of *Cat* and *Baby Birds* (PMLU Script in Table 4).

Then we calculated PMLU in children's narratives to compare the children's word complexity with the complexity of words used in the scripts. This measure was calculated only for children's re/tellings, not for answers to comprehension questions. Another clinically useful indicator, derived from the PMLU and proposed by Ingram (2002), is the Proportion of Whole-Word Proximity (PWP). PWP captures how well the child approximates target words and

measures the intelligibility of his/her speech. It is calculated by dividing the child's PMLU by the PMLU of the words attempted by the child. Ingram's method was adapted to Slovak for research purposes, while accounting for differences between English and Slovak phonology (Bónová et al., 2005).[9] For example, Slovak vowels are perceptually more salient than English, so both correct consonants and correct vowels are credited in the adapted measure. As Czech and Slovak are closely related languages and neither PMLU nor PWP have been adapted into Czech, our study used the Slovak PMLU and PWP rules.

Next, lexical diversity in the children's narratives was estimated with the help of the Type/Token Ratio (TTR).[10] TTR has been broadly applied as a vocabulary acquisition index in studies examining oral narrative skills in children (e.g., Humphries et al., 2004). Here we report TTR in percentage.

Finally, for morpho-syntactic development, we analysed three different measures. The *Mean Length of Utterance* (MLU) is an index of morpho-syntactic acquisition (Brown, 1973) and is calculated as the average number of words, morphemes or syllables per utterance. Here we counted MLU in words to avoid problems with the intelligibility of children's speech. The *Grammaticality Index* (GI) is calculated as the number of grammatically correct utterances divided by the total number of utterances (see, e.g., Bedore et al., 2010). We did not include utterances in which some words could not be distinguished. The *Subordination Index* (SI) measures clausal density and indicates the average number of subordinate clauses produced per C-unit (communication unit).[11] The SI index was used, for example, in Tsimpli et al. (2016). One point can be assigned for a subordinate clause even if a whole communication unit is not grammatically correct.

The results of the three hearing-impaired children for the quantitative indicators described above are displayed in Table 4. The results are presented for each child separately. The results shown in Table 4 indicate that the three children have different developmental profiles in the domains of phonology, vocabulary, morphosyntax, narrative macrostructure, and narrative comprehension. Child 1 is the youngest (aged 3;6) but has the most intelligible speech (PWP: 0.92–0.95). He attempts words that are not much shorter than the words in the story scripts. By contrast, his vocabulary is rather limited (TTR: 15–36 %). He conveys his thoughts in relatively long utterances (MLU in words: 4.28–5.6) but his SI is close to zero (0.00–0.07), which indicates that he does not use subordinate clauses. Grammatically correct clauses prevail in narrative production. Compared with the data from the typically-developing 3-year-olds in tables 1 and 2, his comprehension of the stories is good. Narrative macrostructure in telling is age appropriate, but in retelling, it was below age level; retelling of the *Cat* story was administered first, and this could be why higher score was obtained for telling with the *Baby Birds* story due to the familiarity of the task.

[9] In Slovak (unlike English), a child is credited one point for each produced sound plus one point for the correct production of both consonants and vowels; some additional rules were also applied.

[10] We are aware of existing criticism of the TTR (e.g., Richards, 1987) and use it here only for an approximate estimation of lexical skills.

[11] The C-unit is usually described as a main clause and its subordinate clauses.

Table 4: Quantitative measures of speech and language development in telling (*Baby Birds*) and retelling (*Cat*).

Elicitation mode	Phonological measures				Lexical diversity	Morpho-syntactic measures			Narrative measures	
	PMLU Script	PMLU Child	PMLU target	PWP	TTR	MLU	GI	SI	SS	Comp
Child 1 (boy, aged 3;6)										
Telling	9.95	8.18	8.62	0.95	36%	5.60	0.73	0.07	2	3
Retelling	8.63	7.44	8.70	0.92	15%	4.28	0.47	0.00	1	4
Child 2 (girl, aged 4;7)										
Telling	9.95	7.30	7.68	0.91	30%	3.72	0.42	0.06	0	0
Retelling	8.63	Not calculated			31%	3.78	0.56	0.00	0	0
Child 3 (boy, aged 7;0)										
Telling	9.95	7.90	8.77	0.81	57%	4.89	0.56	0.11	5	8
Retelling	8.63	7.37	8.89	0.83	77%	4.38	0.63	0.13	6	9

Note: PMLU child = Phonological MLU of words produced by the child; PMLU target = Phonological MLU of words attempted by the child; PWP = Proportion of Whole-Word Proximity; TTR = Type/Token Ratio; MLU = MLU in words; GI = Grammaticality Index ; SI = Subordination Index; SS = story structure score/narrative macrostructure (maximum score: 17); Comp = narrative comprehension (maximum score: 10).

Child 2 (aged 4;7) has intelligible speech (PWP: 0.91) but produces shorter word forms than those used in the story scripts (PMLU script: 9.95, PMLU child: 7.30). Her vocabulary is also rather limited, like that of Child 1. Her utterances are on average 3–4 words long (MLU: 3.72–3.78). About half of the utterances are grammatically incorrect (GI: 0.42–0.56), but a higher score was obtained for retelling. At the beginning of the assessment, she was not sufficiently interested in following the Cat story and her retelling was very limited (less than the 25 words needed for calculation of the PMLU). Later, with the Baby Birds story, her attention improved, but the production of macrostructure and narrative comprehension were both scored at zero points.

Child 3 (aged 7;0) has less intelligible speech (PWP: 0.81–0.83) but his vocabulary is much richer (TTR: 57–77 %) than that of the other two children. His utterances are 4–5 words long (MLU: 4.38–4.85), only slightly more than half are grammatically correct (GI: 0.56–0.63) and although the boy already has subordinate clauses in his repertoire (SI: 0.11–0.13), his morphosyntactic development can be classified as delayed according to his age. In the story telling and retelling, he demonstrates quite a good understanding of narrative macrostructure (story structure score: 5–6 points) and gives correct answers to nearly all comprehension questions (8–9 points).

Our first experience with using the Czech MAIN for the elicitation of language samples in hearing-impaired children demonstrates that MAIN can be fruitfully used in speech and language assessment of these children. MAIN thus provides material not only for the analysis of narrative skills, but also for phonological acquisition, vocabulary, and grammar. When we combine the quantitative indicators described above, it enables us to see a more complex

"language picture" of individual children. MAIN therefore is a valuable tool both for research purposes and for clinical use in evidence-based interventions.

5 Conclusion and future steps

MAIN is a crucial tool for the assessment of narratives that has already been adapted into many languages (at this moment, more than 80 language adaptations are found on the webside https://main.leibniz-zas.de/). In 2022, its revised adaptation to Czech, a highly inflectional West Slavic language, was created.

In this paper, we have described the process of adaptation of MAIN into Czech in detail and we have reported preliminary results from 83 typically-developing Czech-speaking children aged 3;0–5;11 (the pre-school age in the Czech Republic) and three children with hearing impairment. These preliminary analyses have successfully tested the MAIN assessment tool in the Czech context as well as its clinical potential for hearing-impaired children.

In addition to collecting data from TD and hearing impaired children, we piloted the Czech MAIN with 36 children with various types of communication disorders (developmental language disorder and speech sound disorder). These data were collected by speech therapists. They were useful for acquiring a basic idea of how these children react to the assessment, and it was possible to consider their answers when reviewing the Czech MAIN. However, this group is so heterogeneous that it has not yet been possible to perform a more detailed analysis of the data, but we would like to carry out a more systematic examination in the future. We would like to find the best way to communicate and cooperate with speech therapists in order to make the best use of MAIN, not only for research, but also for diagnostic purposes for this group of children.

As a next step in the future, we plan to collect more data and to provide a more detailed analysis of the data collected so far. Our first goal is to obtain a larger set of high-quality data from typically developing preschool and school children that could be published in the international CHILDES database (https://childes.talkbank.org/). More data obtained from various clinical groups of children is needed to verify the functioning of MAIN in diagnostic contexts as well. We are especially interested in children with developmental language disorders, hearing disorders, and Down syndrome. We have also identified several questions for further research, such as whether Czech and/or other cultures tend to prefer specification of time over specification of location in narratives or what is the typical answer to questions starting with "why" (e.g., "why did somebody do something?") in a specific culture. We also suggest that it might be fruitful to consider certain changes to the future new versions of the MAIN manual (should there be any), such as adding the specification of location (place) to the story scripts.

Acknowledgements

This work was partly supported by Charles University, Faculty of Humanities in the Cooperatio Program, research area Psychological Sciences, and partly supported by the grant awarded to Marína Mikulajová by Grantová agentura Academia aurea GAA 11-5/2020 "Analysis of

language profile in children with hearing impairment – development of a diagnostic scheme for clinical practice."

References

Bedore, L. M., Peña, E. D., Gillam, R. B., & Ho, T. H. (2010). Language sample measures and language ability in Spanish-English bilingual kindergarteners. *Journal of Communication Disorders*, *43*(6), 498–510. https://doi.org/10.1016/j.jcomdis.2010.05.002

Bónová, I., Slančová, D., & Mikulajová, M. (2005). The measurement of phonological acquisition in Slovak in crosslinguistic view. Poster presentation at the Tenth International Congress for the Study of Child Language, Freie Universität, Berlin. Program & abstracts (p. 344). *International Association for the Study of Child Language.*

Botting, N. (2002). Narrative as a tool for the assessment of linguistic and pragmatic impairments. *Child Language Teaching and Therapy*, *18*(1), 1–21. https://doi.org/10.1191/0265659002ct224oa

Brown, R. (1973). *A first language: The early stages*. Harvard University Press.

Klenková, J., Bočková, B., Bytešníková, I., Horáková, R., Hricová, L., Kopečný, P., Ošlejšková, H., Pavelková, J., Řehulka, E., Šlapák, I. (2014). Aktuální otázky z oblasti lexika u dětí před zahájením školní docházky. [Current questions from the field of vocabulary in children prior to starting school attendance.] In: *Inkluze žáků s narušenou komunikační schopností a žáků se sluchovým postižením: psychologické, medicínské a speciálněpedagogické souvislosti* [Inclusion of pupils with disordered communication ability and with hearing impairment: Psychological, medical, and special educational context] (pp. 59–70). Masarykova univerzita.

Chejnová, P. (2016). *Acquisition of morphological categories and vocabulary in early ontogenesis of a Czech child.* Karolinum.

Gagarina, N., Klop, D., Kunnari, S., Tantele, K., Välimaa, T., Balčiūnienė, I., Bohacker, U., & Walters, J. (2012). MAIN: Multilingual Assessment Instrument for Narratives. *ZAS Papers in Linguistics*, *56*, 1–140. https://doi.org/10.21248/zaspil.56.2019.414

Gagarina, N., Klop, D., Kunnari, S., Tantele, K., Välimaa, T., Bohnacker, U., & Walters, J. (2019). MAIN: Multilingual Assessment Instrument for Narratives – Revised. *ZAS Papers in Linguistics*, *63*, 1–36. https://doi.org/10.21248/zaspil.63.2019.516

Gagarina, N., & Lindgren, J. (Eds.) (2020). New language versions of MAIN: Multilingual Assessment Instrument for Narratives – Revised*. ZAS Papers in Linguistics*, *64.* https://doi.org/10.21248/zaspil.64.2020.543

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education*, *7*, 6–10.

Homolková, K. (2020). Bilingvismus u dítěte s Downovým syndromem [Bilingualism in a child with Down syndrome]. *Studies in Applied Linguistics*, *8*(2), 7–15.

Humphries, T., Cardy, J. O., Worling, D. E., & Peets, K. (2004). Narrative comprehension and retelling abilities of children with nonverbal learning disabilities. *Brain and Cognition*, *56*(1), 77–88. https://doi.org/10.1016/j.bandc.2004.06.001

İlknur, M., Müge Tunçer, A. & Selvi Balo, S. (2020). The adaptation of MAIN to Turkish. *ZAS Papers in Linguistics*, *64*, 246–256. https://doi.org/10.21248/zaspil.64.2020.579

Ingram, D. (2002). The measurement of whole-word productions. *Journal of Child Language*, *29*(4), 713–733. https://doi.org/10.1017/S0305000902005275

Kapalková, S., & Nemcová, M. (2020). MAIN: The Slovak version and pilot data. *ZAS Papers in Linguistics*, *64*, 199–205. https://doi.org/10.21248/zaspil.64.2020.574

Lewis, M. P. (Ed.) (2009). *Ethnologue: Languages of the World* (16th ed.). SIL International. http://www.ethnologue.com/16

MacWhinney, B. (2000). *The CHILDES Project: Tools for Analyzing Talk* (3rd ed.). Lawrence Erlbaum Associates.

Mieszkowska, K., Otwinowska, A., Białecka-Pikul, M., Kiebzak-Mandera, D., Opacki, M., & Haman, E. (2020). Polish MAIN: how was it developed and how has it been used so far? *ZAS Papers in Linguistics*, *64*, 169–181. https://doi.org/10.21248/zaspil.64.2020.571

National Reading Panel (U.S.), & National Institute of Child Health and Human Development (U.S.). (2000). *Report of the National Reading Panel: Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Reports of the subgroups. National Institute of Child Health and Human Development, National Institutes of Health.

Norbury, C. F., & Bishop, D. V. M. (2002). Inferential processing and story recall in children with communication problems: A comparison of specific language impairment, pragmatic language impairment and high-functioning autism. *International Journal of Language & Communication Disorders*, *37*(3), 227–251. https://doi.org/10.1080/13682820210136269

Nováková, I., Nováková Schöffelová, M., & Mikulajová, M. (2020). *Když dítě vidí, co má slyšet: trénink jazykových schopností dle D. B. Elkonina u dětí se sluchovým postižením* [When a child sees what he/she should hear: The training of language skills according to D. B. Elkonin in children with hearing impairment]. Pedagogická fakulta Univerzity Karlovy.

Richards, B. (1987). Type/Token Ratios: what do they really tell us? *Journal of Child Language*, *14*, 201–209. https://doi.org/10.1017/S0305000900012885

Saicová Římalová, L. (2013). *Když začínáme mluvit…: lingvistický pohled na rané projevy česky hovořícího dítěte* [When we start talking...: linguistic analysis of early production of a Czech speaking child]. Filozofická fakulta Univerzity Karlovy.

Saicová Římalová, L. (2016). *Osvojování jazyka dítětem* [Child Language Acquisition]. Karolinum.

Saicová Římalová, L. (2018). *„Já rozumím všem – a mně nerozumí nikdo": Komunikace dítěte s vývojovou dysfázií* ["I understand everyone – and nobody understands me": Communication of a child with developmental language disorder]. In P. Odaloš (Ed.), *Synchrónne a diachrónne kontexty jazykovej* [Synchronous and diachronous contexts of language communication] (pp. 291–297). UMB.

Seidlová Málková, G., & Smolík, F. (2014). *Diagnostika jazykového vývoje: diagnostická baterie pro posouzení vývoje jazykových znalostí a dovedností dětí předškolního věku: Testová příručka* [Diagnostics of language development: diagnostic battery for assessing the development of language skills and competences in pre-school children: Test guide]. Grada.

Stothard, S. E., Snowling, M. J., Bishop, D. V. M., Chipchase, B. B., & Kaplan, C. A. (1998). Language-impaired preschoolers. *Journal of Speech, Language, and Hearing Research*, *41*(2), 407–418. https://doi.org/10.1044/jslhr.4102.407

Sussex, R., & Cubberley, P. (2006). *The Slavic Languages*. Cambridge University Press.

Trinh, T., Pham, G., Phạm, B., Hoang, H. & Pham, L. (2020). The adaptation of MAIN to Vietnamese**.** *ZAS Papers in Linguistics*, *64*, 263–269. https://doi.org/10.21248/zaspil.64.2020.581

Tsimpli, I. M., Peristeri, E., & Andreou, M. (2016). Narrative production in monolingual and bilingual children with specific language impairment. *Applied Psycholinguistics*, *37*(1), 195–216. https://doi.org/10.1017/S0142716415000478