Studia Psychologica, Vol. 65, No. 2, 2023, 120-132
https://doi.org/10.31577/sp.2023.02.870

Czech Adaptation of Test 13 Visual-Auditory Learning Included in Woodcock-Johnson IV Tests of Cognitive Abilities

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The main goal of this article is to describe the process of adaptation of Test 13: Visual-Auditory Learning, part of the Woodcock-Johnson IV Tests of Cognitive Abilities, to Czech. Specific attention is given to explaining how the authors of the adaptation dealt with the differences of the two languages between which the adaptation occurred. Test 13 is a controlled learning task and consists of Test Stories, in which symbols represent the words. Some of the differences between English and Czech did not allow simple translation of the words, deeper changes were required. The analysis of standardization data set showed an excellent reliability, however, to confirm the validity of the Czech version, further empirical studies are needed. The uniqueness of this article lies on the description of adaptation of the test to the language from the Slavic language group. It can be useful for other researchers from Slavic languages speaking countries.

Key words: Woodcock-Johnson IV, Test 13, Visual-Auditory Learning Test, Czech adaptation

Introduction

The translation and adaptation of various psychological instruments is a vital component of scientific collaboration and the dissemination of practical applications of psychological measurement. As the world has become more interconnected, the need to overcome cultural and linguistic barriers and adapt psychological instruments for cross-cultural assessment is imperative (Hambleton et al., 2005, p. 3-4). However, there are many sources of errors that may complicate the process or even invalidate translated instruments. Careful studies and comparisons of constructs in original

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Received January 22, 2022

and target languages are essential to ensure appropriate equivalence of the original and translated versions of the test.

The Woodcock-Johnson Tests of Cognitive Abilities (WJ IV COG) is a psychological instrument designed to measure cognitive functioning. Additionally, the WJ IV COG can assess an individual's general intellectual ability and predict achievement in specific curricular areas (Schrank et al., 2014).

The Woodcock-Johnson tests are based on the Cattell-Horn-Carroll theory of intelligence (CHC theory). CHC theory is an integration of two models of human cognitive abilities (Schneider & McGrew, 2012). First is the outcome of decades-worth research by Raymond Cattell, John Horn, and their associates (Cattell, 1987; Horn, 1989). Second is John Carroll's research (Carroll, 1993), in which he factor-analyzed over 460 studies spanning 60 to 70 years of research on cognitive abilities. The broad cognitive ability factors resulting from both sources are very similar. In contrast to Cattell and Horn, however, Carroll proposed using the general stratum that subsumes the broad and narrow strata factors and represents what is known as a psychometric "g" or general intelligence (Carroll, 1997; Horn & Noll, 1997). The events leading to both theories being integrated and put under the umbrella of Cattel-Horn-Carroll (CHC) are described elsewhere (McGrew, 2005). The similarities of the factors identified independently by Carroll and Cattell and Horn provided additional support for a psychometric structure that results from the use of various instruments designed to measure cognitive abilities. As the integrated structure, the CHC theory became a basis for revising the *Woodcock-Johnson Psycho-Educational Battery* (Woodcock & Johnson, 1977) and its subsequent revisions. It may be worth mentioning that the publishers of other major cognitive abilities batteries (WISC, KABC, SB) followed and provided CHC interpretation options for their products published after 2000 (Schneider & McGrew, 2012).

Tests in the fourth edition of the Woodcock-Johnson Tests of Cognitive Abilities measure abilities divided into three cognitive composites, seven CHC factors and six narrow ability and other clinical clusters (see Figure 1).

All the included tests were translated and adapted to the Czech language (Furman et al., 2019). WJ IV COG consists of 18 tests (some of them consist of two or more subtests), nine of which are primarily language based. The adaptation of the tests with verbal components was of varying difficulty. While some types of tests need little adaptation beyond a translation and standardization in the target population, others need to be carefully adapted in order to retain the constructs of the original tests. The most difficult test to adapt was the Test 13 Visual-Auditory Learning. This test consists of short stories encoded in symbols. Due to its structure and grammar/syntax differences between Czech (as a language from the Slavic language group) and English, deeper changes were required. In Czech, the words need to be flexed appropriately based on their position and function in sentence and/or grammatical gender. This makes the task somewhat more complex in Czech compared to English since the auditory representations of the used symbols remain unchanged in English (regardless of their position in the sentence). Observations of examinees' responses during pilot studies and standardization were used to examine and ensure that the nature of the task remained unchanged in the adapted version of the test. This article focuses mainly on the translation and adaptation of Test 13 Visual-Auditory Learning (included in WJ IV COG) into its Czech version. This test was chosen because it demonstrates the most significant challenges that the team had to address in order to adapt the test and preserve the original construct.

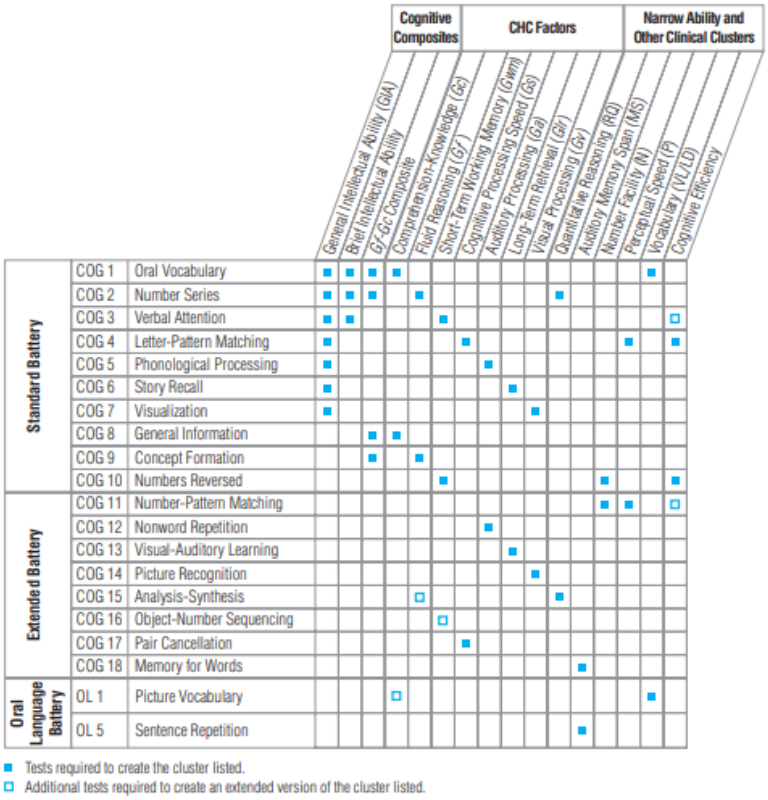

Figure 1 Tests and interpretative clusters for the WJ IV COG (McGrew et al., 2014, p. 9).

About Test 13 Visual-Auditory Learning

Test 13 Visual-Auditory Learning is a test included in the Extended Test Book of the WJ IV COG. It is a controlled learning task. The examinees are asked to learn and recall a series of pictographic representation of words that are combined into phrases and sentences of increasing length and complexity. Each symbol represents one word or one grammatical instrument in the more complex items. The narrow cognitive ability measured by this test is associative memory (MA), which is part of Long-Term Storage and Retrieval (*Glr*), one of the broad cognitive factors identified in CHC theory (Schrank et al., 2016). The examinees need to remember the association between the symbol (visual input) and its name (auditory input) in order to recall the names when the symbols are presented to them after one exposure. As the number of presented symbols grows, the task of "reading" the symbols becomes more difficult. In the original version, the test consists of seven introductions, where each symbol and corresponding name is presented. Each of introductions is followed by a test story, presented through a series of

pictograms, which measures the recall of visual-auditory information.

Language Differences between English and Czech

Both Czech and English are Indo-European languages. While English is from the Germanic branch (e.g., German, Dutch, etc.), Czech is derived from the Slavic branch (e.g., Slovak, Russian, Polish, etc.); thus, notable differences in morphology and syntax exist between the two (Comrie & Corbett, 2002; Sussex & Cubberley, 2006, p. 2). Czech is an inflected language, which means that the grammatical meaning is included in affixes (especially endings), which change according to a paradigm. These changes are apparent both phonetically and orthographically and in order to create a grammatically correct sentence they are obligatory. Their forms allow to express grammatical attributes including tense, number, case, person, and gender (Naughton & von Kunes, 2020, p. 26; Sussex & Cubberley, 2006, p. 222). In comparison, English words retain the same form (with some exceptions, for example, plural of nouns or third person of verbs with the ending *-s*) and prepositions are used to distinguish different cases (for example, *go on foot with friends through the park*) (Eppler & Ozón, 2013, p. 64, 91). In Czech, the process of inflection is used for verbs (called conjugation) and for nouns, adjectives, pronouns, and numerals (called declension). The Czech language has seven cases, three genders (masculine, feminine, neutral), two numbers (singular and plural), three persons and three tenses (future, present, past) for verbs (Naughton & von Kunes, 2020, p. 22, 158). Depending on the part of speech and phonological or semantic category of a word, a variety of suffixes (endings) are used in the Czech morphology resulting in significant changes to the word's orthography (Sussex & Cubberley, 2006, p. 217). From a syntactic point of view, the order of words in the sentence is not fixed and some constituents (for example, the subject) need not be expressed (Comrie & Corbett, 2002, p. 7; Sussex & Cubberley, 2006, p. 325). These differences made the adaptation of Test 13 to Czech significantly more difficult, since merely translating individual words and ordering items by difficulty was insufficient.

The words used in Test 13 are nouns, adjectives, verbs, conjugations, prepositions, and pronouns. In the Czech version, some items only needed to change the order of the symbols due to the different word order in the Czech sentences; some symbols were removed, some were added, and, in some cases, names were changed. For the pilot study and standardization, three additional symbols and their corresponding names were created and included in the test. The simplest included the modification of proper nouns. Other, more difficult changes that were needed to adapt Test 13 to the Czech language are elaborated in more detail in this article. We also discuss their relevance to the original English version based on psychometric properties of the Czech version and evidence of validity.

Methods

Czech Adaptation of WJ IV COG

Between the years 2014 to 2019, a team of five psychologists (focusing on test development, educational and clinical psychologists, linguistics, psychometric and statistics) and additional colleagues adapted all tests from the WJ IV COG to the Czech language and created norms for the Czech population. The process of adapting the WJ IV COG was divided into three steps: two individual pilot studies and the standardization process. Test instructions and items from the original tests

were translated and/or adjusted, so that they were in accordance with the rules of the Czech language. New test items of varying estimated difficulty, recorded audio recordings, and pictures were created. Our co-workers (mainly educational psychologists and some graduate students of psychology) administered the modified version of the tests to the Czech participants (half of the tests in the first pilot study and the second half of the tests in the second pilot study). These collected data were analyzed using the Rasch ability scale (W scores). The first and second pilot studies assisted in the selection of the test items with the best fit. The final version of the Czech WJ IV COG includes selected items sorted by difficulty. The Czech normative data are based on the sample population that was administered the final version of the adapted tests.

Participants

Participants were recruited from the general population. Items were administered to participants individually in a face-to-face setting in accordance with ethical rules by psychologists trained in WJ IV COG administration. The psychologists could read and edit a Google document with the table in which the general criteria with the gender, age and education requirements were listed. Based on this table they selected the suitable participants. Completed record sheets were collected with a colleague who transcribed the data to an Excel table and coded it so no other person could identify the examinees.

The first pilot study included 123 participants (59 men, 63 women, 1 not specified) with the mean age of 25.16 years (*SD* = 23.01). The second pilot study included 112 participants (57 men, 55 women), mean age of 25.63 years (*SD* = 23.56). The final standardization sample consisted of 936 participants (51.2% men, 48.8% women), aged between 2 and 80 years (*M* = 25.3; *SD* = 18.95).

Procedure

For statistical analyses, the Rasch model with one item parameter was used. The Rasch model expresses the relationship between the dichotomous item difficulty (correct/incorrect) and the respondent's abilities (latent trait) in one scale (see Bond et al., 2020). The advantage of the model is that the estimates of item difficulties are independent of the estimates of the latent ability (i.e., intellect) of the examinees and vice versa. For all tests overall scores were calculated and then W scores and standard errors were calculated based on the final calibration of items in Winsteps (Linacre, 2012). The W scores were used as the input data for norm development. The standardization process is described in more detail in the *Technical manual of the Czech version of Woodcock-Johnson IV*[1] (Urbánek, 2019).

Czech Adaptation of Test 13

The adaptation of tests that include more than single-word items brings special challenges. In this case they are related to grammatical rules that impact the auditory representation of the word in its basic form. While the auditory form of the symbols remains unchanged in English regardless of their position in a sentence, the words in Czech are flexed following its grammar and syntax rules. One author from a team of five psychologists (graduated in Psychology and Czech language and literature) created the Czech version of the items in Test 13, including drawing new symbols.

[1] Technical manual can be downloaded for free from https://shop.propsyco.cz/images/uploaded/WJ%20IV%20Technick%C3%BD%20manu%C3%A1l%202021%20(3).pdf.

The other four authors discussed and agreed upon her suggestion of a solution. We present it in detail in this chapter.

Declension and Conjugation

The main issue during the adaptation of Test 13 to Czech was the declension of nouns and conjugation of verbs which is required in Czech syntax. In Czech, when the symbols in Test 13 are presented to the examinees one at a time and examinees repeat them exactly the way the examiner presents them, the words are used in their basic form (without inflection). When examinees are presented the pictographic symbols in a series, they need to make the appropriate changes – inflections – in order to adhere to the correct syntax and grammar and form a sentence. This means that the examinees are expected to use their knowledge of Czech grammar to appropriately inflect the words based on their position in a given "sentence", which they need to "read" once the pictographic series representing the words are presented.

To assist with the declension and conjugation issue, the Spanish version of this assessment was used as a guide (Muñoz-Sandoval, 2005). Spanish conjugates many words – but the form of nouns does not change. We decided to use the words representing the symbols as lemmas that represent the basic form of the word (especially nominative and singular). It was expected that examinees would make the changes reflecting the correct Czech grammar and use the appropriate declension or conjugation paradigms, which brings more complexity to the task (examinees need to flex the words in addition to recalling their basic form learned at the introductory part of the task). The request to flex the words slightly changes the instruction, but the fundamental nature of the task remains the same. The flexing is automatic as it is typically mastered by the age of five or six by the majority of native speakers (without language development delays). This proved to be not entirely true as the pilot studies showed that some younger participants did not flex the words and often used them in the basic form presented to them during introductory (learning) phase of the task. While penalties for these "less appropriate" responses were considered, the authors decided to score both grammatically correct and incorrect forms as correct responses in order to make sure that only retrieval of visual-auditory association was assessed by the test. The identified difficulties with applying flexing to the recalled names of symbols in Czech offers opportunities for studying additional phenomena that may be related to this cognitive factor and reading.

For a similar reason, we could not use the grammatical instrument of plural in the Czech version. While a single suffix (*-s*) is used in English, a wide range of endings following a paradigm is used in Czech (Naughton & von Kunes, 2020, p. 25). It was not possible to preserve the meaning of one of the symbols used in the original, so we decided to replace it with the past tense which is created by adding the suffix *-l* in Czech. Although this is only one of the variants of past tense in Czech, it is one that is created following a very stable pattern.

Considering the need to change verb tense during conjugation, we could not use the symbol for the past tense in a comparable way to the original version. When a verb is a derivate in the past tense in Czech, affixation is used as well (Naughton & von Kunes, 2020, p. 168). While in English the change of person is not reflected in the expression (*he wrote* versus *she wrote*), in Czech there is a difference (*on psal* versus *ona psala*) and therefore it was necessary to find a word that does not change its auditory (and, in this case, orthographic) characteristics. We used sentences formulat-

ed in the present tense since the form representing 3rd person singular and plural in Czech – *on kresl-í* (*he is drawing*), *oni kresl-í* (*they are drawing*) are phonetically and orthographically identical. As a result, one form of this symbol remains without change throughout the Czech version.

The Negation is Created by Prefixation

Another phenomenon which had to be adapted to Czech is related to negation. In the Czech language, negation of verbs is created by adding the prefix *ne-* (or less often *ni-*) to the derived base (Naughton & von Kunes, 2020, p. 254; Sussex & Cubberley, 2006, p. 431), while in English a negated verb consists of two words (with a graphic gap between them), which correspond to two separate symbols in Test 13. In Czech, there is only one word and so it should be represented by one symbol, such as the phrase "They *are* <u>*not*</u> old. – Oni <u>*nejsou*</u> staří." In addition, in Czech, a verb is derived directly from the stem (or derived word with prefix) without the use of an auxiliary verb – for example, "Oni <u>*nejedí*</u>. – They *are* <u>*not*</u> *eating*." Because of this, we made the following modifications in Test 13: the symbol used for negation was retained but the order of the symbols was changed and spacing between symbols was removed when the symbols represented one word in Czech. Thus, the number of symbols, and the meaning remained the same as in the original version. In the final scoring they were counted as two symbols.

No Present Tense Continuous

In English, there is a distinction between present tense simple and progressive (continuous). When an English speaker creates a sentence with present tense continuous, he or she must add the auxiliary verb *be* and the suffix *-ing*. The gerund is not added in the present simple tense (Depraetere & Tsangalidis, 2019, p. 400). In Czech, the difference between these tenses is not so salient. The main way to express in Czech the duration and repetition of action, or whether the action has ended or not, is by a grammatical aspect of the perfective and imperfective opposition (Comrie & Corbett, 2002, p. 10; Sussex & Cubberley, 2006, p. 244). The problem is that the aspect distinction is expressed by a prefix or very often by an infix, which is inserted between the stem and the suffix. It is not possible to emulate this process pictographically as it would require inserting a new symbol inside another symbol. Therefore, a different solution was sought. Fortunately, the Czech language has another grammatical instrument called a reflexive pronoun (or simply a reflexive). Reflexive represents the accusative position of verbs – the close example of a reflexive word in English is the affix -self (for instance, myself, herself). In Czech we have only two reflexive pronouns, where the first one is much more frequent than the second one. For this reason, we decided to replace the past tense in the original English version with reflexive pronouns in the Czech version. This means that we did not change a word, but the form, and thus followed the principle of the task in the original version.

Optional Grammatical Articles

Grammatical articles in Czech are facultative, and it is not common to use them in a sentence (Sussex & Cubberley, 2006, p. 235). Demonstrative pronouns (like *this*, *that* or *those* in English) or numeral (the most common *one*) are the alternatives which Czech speakers can use but they are more typical in colloquial speech. We have decided to use them even though the sentences including them may sound slightly cumbersome.

Results

Psychometric Relevance

The results presented in this manuscript are only the ones from the final standardization sample. Two types of estimating reliability (internal consistency) of the adapted WJ IV COG tests were used: 1) a split-half reliability was calculated for tests with dichotomous scoring and/or without time limit, 2) the reliability derived from the Rasch model was used or the test with multiple-point scoring and/or time limit (for the formula see bullet 4.9 in McGrew et al., 2014, p. 91,). The original version of Test 13 Visual-Auditory Learning has a reported median reliability of 0.96 in the 5 to 19 age range and 0.98 in the adult age range (Mather & Wendling, 2014, p. 17). The median reliability of the Czech version was 0.98 for both the 7 to 19 age and the adult age range. The reliability for the whole group was 0.99.

The validity of the Czech version of the WJ IV COG battery was explored by IRT models and factor models.

First, IRT models were fit to data from each WJ test separately, using the *mirt* package for *R*. For subtests containing items with only dichotomous responses (T1, T2, T3, T5, T7, T8, T9, T10, T12, T14, T15, T16, and T18), Rasch and 2-PL models were used; for tests with at least one polytomous response (T4, T6, T11, T13, and T17), Partial Credit (PCM) or Generalized Partial Credit (GPCM) models were used. Table 1 shows model fit statistics for each model and test, as well as their marginal reliability (Cheng, Yuan, & Liu, 2012) estimates.

The GPCM model for Test 13 showed an acceptable degree of fit. However, polytomous models for subtests with a relatively small number of items (such as T4, T11, or T17) did not have enough degrees of freedom to calculate the M2 fit statistic, as such, the model fit information for these models is not reported.

Next, the latent score for each subject was estimated using the models fitted. More complex models (2-PL or GPCM) were used for all subtests where necessary model fit information was available. For subtests where this was not the case, less complex models (Rasch model or PCM) were used instead. In every case, empirical a posteriori (EAP) method was used to estimate the latent scores. WJ IV COG consists of seven CHC factors, therefore a 7-factor model was used.

After obtaining the latent score estimates for every person and subtest, we utilized the *lavaan* package in *R* to fit a series of factor models with the latent score estimates as observed (manifest) variables. The specified factor models were as follows: 1) a one-factor model, 2) a multidimensional factor model with seven correlated factors, and 3) a multidimensional hierarchical factor model with uncorrelated factors but instead a single, general second-order factor. See Table 2 for an overview of model fit statistics and indices for every fitted model. The multidimensional model with correlated factors exhibited the best fit, with satisfying values of the TLI and SRMR fit indices. The RMSEA fit index, however, is showing borderline values, as was the case for all models fitted. We considered the local indicators of the model fit.

The results of several exploratory analyses (PCAs and linear regressions) performed for several age subgroups with a goal to identify which tests are most closely related to Test 13 Visual-Auditory Learning were, however, ambiguous. While in the youngest group (from 2 to 8 years) the T13 score was predicted by T1, T2, T5, T6 and T7 (adj. R^2 = 0.763), in the group from 9 to 13 years it was predicted only by the T6 score (adj. R^2 = 0.361), in the group from 14 to 18 years by the T6 and T7 scores (adj. R^2 = 0.378), in the group from 19 to 30

Table 1 *Model fit and marginal reliability estimates, IRT models*

Subtest	Model	M2	*df*	RMSEA	95% CI RMSEA	TLI	Reliability
T1	Rasch	3361.8	1711	0.04	(0.04, 0.04)	0.96	0.87
T1	2-PL	3249.9	1652	0.04	(0.04, 0.04)	0.96	0.97
T2	Rasch	1394.5	861	0.04	(0.03, 0.04)	0.99	0.76
T2	2-PL	1557.9	819	0.04	(0.04, 0.05)	0.98	0.96
T3	Rasch	809.1	595	0.03	(0.02, 0.03)	0.98	0.76
T3	2-PL	815.5	560	0.03	(0.03, 0.04)	0.97	0.93
T4	PCM	40.1	3	0.12	(0.09. 0.15)	0.97	0.51
T5	Rasch	2020	903	0.05	(0.04, 0.05)	0.95	0.82
T5	2-PL	1829.8	860	0.05	(0.04, 0.05)	0.96	0.96
T6	PCM	165.6	35	0.06	(0.05, 0.07)	0.99	0.96
T7	Rasch	1137.8	1035	0.01	(0.01, 0.02)	0.99	0.85
T7	2-PL	1041.6	989	0.01	(0.00, 0.01)	1.00	0.93
T8	Rasch	3018.6	903	0.06	(0.05, 0.06)	0.92	0.83
T8	2-PL	2494.0	860	0.05	(0.05, 0.05)	0.93	0.95
T9	Rasch	3012.5	780	0.06	(0.06, 0.06)	0.96	0.83
T9	2-PL	2210.9	740	0.05	(0.05, 0.05)	0.97	0.93
T10	Rasch	1279.5	561	0.06	(0.06, 0.07)	0.95	0.71
T10	2-PL	1608.5	527	0.08	(0.07, 0.08)	0.93	0.94
T11	PCM	60.6	3	0.15	(0.12, 0.18)	0.95	0.55
T12	Rasch	2953.9	990	0.06	(0.06, 0.06)	0.87	0.77
T12	2-PL	2524.4	945	0.05	(0.05, 0.06)	0.89	0.94
T13	PCM	4146.4	276	0.13	(0.12, 0.13)	0.96	0.96
T13	GPCM	2369.4	252	0.10	(0.09, 0.1)	0.98	0.97
T14	Rasch	324.6	276	0.01	(0.01, 0.02)	0.98	0.74
T14	2-PL	287.2	252	0.01	(0.00, 0.02)	0.99	0.83
T15	Rasch	2616.9	595	0.07	(0.06, 0.07)	0.93	0.75
T15	2-PL	1954.2	560	0.06	(0.05, 0.06)	0.95	0.93
T16	Rasch	913.0	435	0.06	(0.05, 0.06)	0.94	0.67
T16	2-PL	850.5	405	0.06	(0.05, 0.06)	0.94	0.94
T17	PCM	57.2	3	0.14	(0.11, 0.17)	0.97	0.64
T18	Rasch	465.7	325	0.03	(0.02, 0.04)	0.98	0.62
T18	2-PL	457.0	299	0.03	(0.03, 0.04)	0.97	0.91

Table 2 *Model fit indices, factor models*

Model	X^2	*df*	RMSEA	95% CI RMSEA	TLI	SRMR
1-factor	2904.9	135	0.15	(0.15, 0.16)	0.83	0.05
7-factor	758.1	83	0.10	(0.09, 0.10)	0.94	0.03
Hierarchical	927.5	97	0.10	(0.09, 0.11)	0.94	0.03

years by the T4, T5 and T7 scores (adj. R^2 = 0.527), and in the group from 31 to 80 years by the T1, T2, T6 and T7 (adj. R^2 = 0.479). The best interpretation seems to have emerged from a regression analysis, in which the T13 score served as a dependent variable and seven scores (Test 1 through Test 7) representing seven broad CHC factors served as predictors; the regression was performed for five age subgroups.

IRT models fit to scores from the individual subtests showed a relatively good model fit, especially when more complex models (2PL vs. Rasch, GPCM vs. PCM) were considered. Taken together in a structural model, the WJ IV COGs test score structure seems to conform to a 7-factor correlated structure.

The 18 tests were used as the manifest variables of the CHC theory underlying the WJ IV COG battery expected to represent seven broad cognitive abilities intercorrelated factors. Due to underidentification of the model (some factors include only two variables as indicators), some problems emerged (the Heywood case). But the local fit, regression coefficients, seem to correspond with the expectations based on the CHC theory.

Discussion

This article described the process of adaptation of the Woodcock-Johnson IV Tests of Cognitive Abilities, specifically Test 13 Visual-Auditory Learning, to Czech. As in many other non-English speaking countries (Wechsler et al., 2010), the importance of specific adaptation is obvious. The differences between English and Czech morphological, lexical, and syntactic rules brought special challenges to the adaptation of the Test 13 to Czech. The changes included the use of declension and conjugation reflecting Czech grammar and syntax, absence of the special form (gerund) used to express the present tense continuous, formation of negation by prefix instead of a separate word, an irregular plural formation, and more freedom in using grammatical articles. The most significant changes included altering the sequences of the used symbols, creating new language expressions and sentences, changing the grammatical components of symbols, and using the Czech variants of proper nouns.

The statistical analyses of the standardization data demonstrated excellent reliability of the adapted version of Test 13. The evidence of validity of the Czech adaptation of Test 13, however, is not unequivocal at this time. Local fit and regression coefficients seem to correspond with the expectations based on the CHC theory. The generalized partial credit model for Test 13 showed an acceptable degree of fit. The modifications qualitatively followed the original version (we substituted English proper names by Czech proper names, English verbs by Czech verbs, grammatical instruments used in English for Czech grammatical instruments).

Due to a smaller Czech sample size, the results of the factor analyses may be expected to differ from the studies using the original US standardization sample. To confirm the va-

lidity of the Czech version, further empirical studies are needed.

The results presented in this article highlight difficulties associated with adaptation of tests to different languages and cultures in general. As Kush and Canivez (2019), authors of the article focused on construct validity of the Wechsler Intelligence Scale for Children–Fourth Edition (WISC-IV) Italian adaptation, emphasized: "The WISC-IV Italian measures *g* quite well, but unique measurement of group factors is poor" (p. 24). Many other studies focused on construct validity of adapted batteries used for measuring cognitive abilities recommend interpreting group factor scores carefully (see, for example, Fenollar-Cortés & Watkins, 2019; Kush & Canivez, 2019; McGill & Canivez, 2018; Watkins et al., 2013; Watkins et al., 2018). Our adaptation followed the guidelines for adaptation of psychological instruments (Cook et al., 2005; Gudmundsson, 2012), so that WJ IV COG would be a useful instrument for Czech psychologists. The uniqueness of this article lies on the description of test adaptation from English to a Slavic language. As Gudmundsson (2012) points out, translated tests developed in English speaking countries are widely used but often lack information about how they were translated or what psychometric properties they have. While more validation studies will be useful to further solidify evidence of equivalency of the original and Czech versions of WJ IV COG, the Czech adaptation has brought more psychometrically sound and defensible version of the original test to be used in a culture and language significantly different from the original.

Conclusion

In this article, the process of adaptation of Test 13 Visual-Auditory Learning and the changes that were necessary due to differences between English and the Czech language are described. The Test 13 is a controlled learning task, and it is supposed to measure Long-Term Retrieval CHC Factor (*Glr*). Even though the modifications made qualitatively correspond to the principles underlying the original version (the nature of the controlled learning task was retained), and the reliability of the adapted test is excellent, further studies are needed to confirm if the test measures the same CHC factor as the original version does.

Declaration of Interest Statement

Three authors of this article are the authors of the Czech adaptation of WJ IV. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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