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Research Article

FAPCI Questionnaire for Russian-Speaking Children After Cochlear Implantation

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Abstract

Objective: This two-center study aims to adapt the English version of the FAPCI into Russian to measure the development of verbal communicative performance in Russian-speaking children in Kyrgyzstan with cochlear implants (CIs).

Subjects and Methods: The original FAPCI questionnaire was translated into Russian by two professional translators from Kyrgyzstan proficient in both languages. A few cultural adaptations were necessary. The 23-item FAPCI-RU instrument was distributed at the National Center of Maternity and Childhood Care in Bishkek, Kyrgyzstan. Participants included 28 healthy children of hospital employees and Russian-speaking individuals accompanying children receiving treatment in the hospital, as well as 35 prelingual bilateral deaf children implanted between 2020 and 2024. The questionnaires were distributed exclusively to parents of children raised speaking Russian, aged 22 to 108 months. The children's hearing age (duration of CI use) was calculated from the initial fitting of the speech processor, ranging from nine months to five years.

Results: Cronbach's alpha for internal consistency was 0.96 for the CI group, and 0.93 for the NH group. Spearman's correlation test revealed a significant positive correlation between test and retest scores of the children from the CI group ($r_{35} = 0.79$, $p < 0.05$).

Analyses revealed a positive correlation in the CI group between FAPCI-Rus scores and age ($r_{35} = 0.398$, $p = 0.018$) and the duration of CI use (hearing age) ($r_{35} = 0.630$, $p < 0.001$). There was no correlation between FAPCI-Rus scores and age at implantation ($r_{35} = 0.04$, $p = 0.98$).

Conclusion

The Russian version of the FAPCI questionnaire exhibits psychometric characteristics similar to the English and German versions. Its use is recommended for Russian-speaking children to assess early childhood communication skills following cochlear implantation. For children in Kyrgyzstan who do not speak Kyrgyz or Russian, it is critical to create an additional version.

Introduction

According to the World Health Organization (WHO), more than 1.5 billion people live with hearing loss. Of these, 430 million have moderate or severe hearing loss [1]. Without treatment, various health problems and socioeconomic changes can occur, including reductions in cognition, social interaction, employment status, and annual income [2]. Cochlear implantation has become a routine surgical procedure worldwide for treating profound hearing loss in individuals who do not benefit from well-fitted hearing aids [3]. Cochlear implantation was first approved for bilateral postlingually deaf adults in the 1980s [3, 4]. The indications for cochlear implants (CIs) have significantly expanded to include patients with less severe hearing loss, children, patients with single-sided deafness [4], and patients following intracochlear schwannoma resection [5].

The first cochlear implantations in children in Kyrgyzstan were performed by foreign colleagues from Russia, Ukraine, and Germany approximately ten years ago. As no CI program was available in Kyrgyzstan until recently, some parents sent their children abroad for surgery [6]. Until 2020, Kyrgyzstan operated under a quota system, with CI surgeries conducted in Turkey.

Since 2018, several initiatives and local programs have been launched to provide hearing-impaired children in Kyrgyzstan with access to CI [6].

With an estimated 140,000 to 160,000 newborns per year in Kyrgyzstan, there is a projected need for at least 50 to 150 CIs for deaf children annually [6]. Besides a nationwide newborn hearing screening program, a CI program for children has been initiated locally.

The question arose regarding how to assess speech development following CI surgery in Kyrgyzstan, as no validated measuring instruments are currently available. Various measures exist to evaluate speech perception and language skills in children, including visual-habitual procedures in the presence of speech competitors or proxy assessments [7]. The most frequently used parent-proxy instruments are the Little Ears Auditory Questionnaire [8] and the Infant-Toddler Meaningful Auditory Integration Scale [9]. Both instruments are designed to monitor the early auditory behavior of infants and toddlers aged less than 24 months.

The Functioning after Pediatric Cochlear Implantation (FAPCI) instrument was developed in 2007 [10] and assesses the communicative abilities of children older than 24 months. The FAPCI tool is a psychometrically validated scale designed to evaluate the communicative performance of children aged 2 to 5 years, considering the conceptual framework of the WHO's International Classification of Functioning [11]. The FAPCI instrument comprises 23 items/questions, each with a five-level response scale, yielding total scores ranging from 23 to 115 [10, 12, 13]. The instrument captures children's everyday expressive and receptive communicative behaviors as reported by parents or primary caregivers. It has been validated and demonstrates good reliability. Originally provided in American English, the FAPCI has been translated and adapted into German [14, 15], Korean [16], Portuguese [17], Hindi [18], and Kyrgyz [6]. Kyrgyz and Russian are the official national languages in Kyrgyzstan, with several minority languages also spoken, including Uzbek, Tajik, and Uyghur. This two-center study aims to adapt the English version of the FAPCI into Russian to measure the development of verbal communicative performance in Russian-speaking children with CI in Kyrgyzstan.

Materials and Methods

Ethical considerations

The Ethics Committee of the General Medical Council of Mecklenburg-West Pomerania (A 2025-0079) approved the study design. The conduct of this study strictly adhered to the revised version of the Helsinki Declaration. The Russian version of the ethics application was made available to the Kyrgyz colleagues.

Procedure

Two professional translators from Kyrgyzstan proficient in both languages performed the translation of the questionnaire from English into Russian, including linguistic and cultural adaptation, back-translation, and comparative linguistic analysis. Following the guidelines for the cross-cultural adaptation of self-reporting measures [19], a few cultural adaptations were required. However, the original essence of the questions was preserved as much as possible, similar to the Kyrgyz version [6]. Table 1 outlines all the required adaptations and changes. The Russian version maintains a consistent child-friendly style, with simple forms, short phrases, and a conversational structure (Table 2). The adaptation of the original English FAPCI questionnaire into Russian was carried out with careful attention to cultural and linguistic features, ensuring both validity and clarity for Russian-speaking parents. In some cases, questions were reformulated with simpler and more natural constructions, and proper names as well as children's songs were culturally adapted. Speech errors characteristic of children at the initial stages of language development were intentionally preserved in the examples to enhance realism and clarity. Where necessary, additional words were introduced to improve comprehension, while redundant expressions were eliminated per Russian grammar. This approach enabled the preservation of the precise meaning and intent of the original questions while making them accessible and natural in Russian.

Participants

Normal Hearing Cohort: The 23-item FAPCI-RU instrument was distributed at the National Center of Maternity and Childhood Care in Bishkek, Kyrgyzstan, in cooperation with the Department of Otorhinolaryngology, Head and Neck Surgery at the KMG Klinikum in Güstrow, Germany (Table 2). Participants were healthy children of Russian-speaking hospital employees and individuals accompanying children receiving treatment in the hospital.

Table 1: Item changes in the adaptation of the FAPCI to the Russian language.		
Русский	Кыргызский	English
Смысловая точность в целом сохранена, но часто наблюдается расширение значения: добавлены идеи «оценки» и «развития», которых нет в оригинале. Пример: «Functioning» → «functional development / функциональное развитие» — добавлен компонент оценки.	Негизги мааниси сакталып калган, бирок көп учурда маанинин кеңейиши бар: «баалоо» жана «өнүгүү» деген түшүнүктөр кошулган.	Semantic accuracy is generally preserved, but often expanded: notions of "assessment" and "development" are added beyond the original.
Терминология: различие между «caregiver» и «guardian». Кыргызский перевод («камкорчу») удачно охватывает оба значения, тогда как ретроперевод сужает смысл. Пример: caregiver → guardian (сужение смысла). Кыргызский: «камкорчу» — охватывает оба значения.	Терминология: «caregiver» менен «guardian» айырмасы. Кыргызча «камкорчу» эки маанини тең камтыйт, ретроперевод болсо тар мааниге өтөт.	Terminology: distinction between "caregiver" and "guardian." Kyrgyz term «камкорчу» successfully covers both, while the retro-translation narrows the scope.
Собственные имена, научные степени и профессиональные термины переведены корректно. Кыргызский вариант звучит академично и остаётся понятным. Пример: «Certified auditory-verbal therapist» → «угуу жана сүйлөө боюнча сертификатталган адис».	Аттар, илимий даражалар жана адистик терминдер туура берилген. Кыргызча котормосу академиялык да, түшүнүктүү да.	Proper names, academic degrees, and professional terms are translated correctly. The Kyrgyz version remains both academic and accessible.
Важное различие: акцент всегда на устной речи (spoken language), а не на письменной. Кыргызский перевод это точно передаёт («оозеки»). Пример: «spoken language» → «оозеки».	Маанилүү жагы: басым ар дайым оозеки сөзгө (spoken language), жазуу сөзгө эмес. Кыргызча котормо так берет («оозеки»).	Key point: the focus is always on spoken language, not written. Kyrgyz translation conveys this accurately («оозеки»).
Стилистика: в ретропереводах часто формализованный стиль, тогда как кыргызский вариант ближе к живому и естественному языку родителей. Пример: «overhears» → «heard unintentionally» (ретроперевод формальнее). Кыргызский: «тыңшап уккан» — естественно.	Стиль: ретропереводдор расмий угулат, кыргызча вариант болсо жандуу, ата-энелерге түшүнүктүү тилде жазылган.	Style: retro-translations tend to sound more formal, while the Kyrgyz version is more natural and parent-friendly.
Примеры детской речи сохраняют ошибки (пропуски артиклей, вспомогательных глаголов, неправильный порядок слов). Кыргызский перевод тоже отражает «детские» формы, не исправляя их. Пример: «Can I more milk?» → «Мен дагы сүт» (сохранена детская ошибка).	Балдардын сөздөрүндөгү каталар сакталып калган (артикль жок, жардамчы этиш жок, сөздөрдүн ирети туура эмес). Кыргызча котормо да ушул «балдарча» формаларды оңдобой берет.	Examples of child speech preserve errors (missing articles, auxiliaries, word order). The Kyrgyz version also retains these "childlike" forms without correcting them.
Грамматические категории (время, отрицание, местоимения, прошедшее время) переданы точно. Кыргызский перевод адаптирован культурно и грамматически. Пример: «She took it» → «Ал аны алды» — сохранено два местоимения.	Грамматикалык категориялар (чак, терс форма, ат атоочтор, өткөн чак) так берилген. Кыргызча котормо маданий жана грамматикалык жактан ылайыкташтырылган.	Grammatical categories (tense, negation, pronouns, past tense) are accurately conveyed. The Kyrgyz version is both culturally and grammatically adapted.

Table 2: Russian version of the FAPCI (CI group, N = 35)/ (NH group, N = 28).		
Item	Question Как часто Ваш ребёнок...? *(Грамматика в примерах значения не имеет)*	Factor loading (Corrected Item-Total Correlation)
Q1	...реагирует на фразы, случайно услышанные из разговора поблизости? (Например, Ваш ребёнок случайно услышал, что Вы говорите «мороженое», и он возбужденно реагирует, говорит «я хочу» или показывает соответствующий жест «мороженное»)	0.623 / 0.470
Q2	...правильно отвечает на простые вопросы, заданные УСТНО БЕЗ зрительных подсказок? (Например, Ваш ребёнок кивает/выражает жестовым языком/говорит, когда его спрашивают: «Ты хочешь сок или молоко?», «Ты хочешь посмотреть мультик?»)	0.684 / 0.210
Q3	...рассказывает о событиях дня или о произошедшем ранее, используя простые УСТНЫЕ предложения? (Например, «я съел бутерброд», «я и мама играем в футбол»)	0.617 / 0.827
Q4	...задаёт простые вопросы, используя УСТНУЮ речь? (Например, «Могу я больше молока?», «Можешь читать мне сказку?»)	0.726 / 0.647
Q5	...использует прошедшее время в УСТНОЙ речи? (Например, «Я разговаривал с бабушкой», «Я ел картошку фри»)	0.792 / 0.573

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Q6	...использует отрицание в УСТНОЙ фразе из 2-3 слов? (Например, «Мне не хочу», «Не делай так»)	0.627 / 0.532
Q7	...правильно использует местоимения в УСТНОЙ речи? (Например, «Мы идём в садик/школу», «Она взяла это»)	0.741 / 0.657
Q8	...правильно использует предлоги в УСТНОЙ речи? (Например, «Моя игрушка под кроватью», «Моя кружка на столе»)	0.714 / 0.642
Q9	...сам инициирует разговор с другим ребёнком? (Например, Ваш ребёнок рассказывает однокласснику/другому ребёнку в садике о своей новой игрушке)	0.801 / 0.683
Q10	Сколько предметов, соответствующих возрасту, Ваш ребёнок может ОПОЗНАТЬ с помощью УСТНОЙ РЕЧИ, когда Вы укажете на них? (Например, Вы указываете на помидор/стул/телефон и спрашиваете: «Что это?»)	0.803 / 0.771
Q11	Насколько много из речи Вашего ребенка сможет понять взрослый, не знакомый с ним (любые произносимые ребёнком звуки или слова)?	0.751 / 0.194
Q12	Как обычно реагирует Ваш ребёнок, когда его/её приветствует знакомый человек? (Например, когда Ваш ребёнок навещает бабушку или встречает близкого друга семьи)	0.828 / 0.702
Q13	Сколько имён людей Ваш ребёнок использует в УСТНОЙ речи? (Например, Ваш ребёнок говорит «мама», «баба» / «бабушка», «дядя Ваня»)	0.626 / 0.440
Q14	Какой из следующих утверждений лучше всего описывает пение Вашего ребенка? (Например, «жили у бабуси два весёлых гуся», «ладушки, ладушки»)	0.711 / 0.672
Q15	Каким ОСНОВНЫМ способом Ваш ребенок сообщает о своих желаниях, когда ему НЕ подсказывает взрослый? (Например, Ваш ребенок хочет молока, ему нужно в туалет или ему слишком жарко в куртке)	0.823 / 0.801
	Для вопросов 16 - 17: Сколько из следующих типов слов/фраз используют Ваш ребёнок в УСТНОЙ речи? *(Грамматика в примерах значения не имеет)*	
Q16	- Что (например, «Что!?», «Что это?») - Где (например, «Где это?», «Где моя игрушка?») - Почему (например, «Почему нам надо?») - Какой/Который (например, «Какой мой?»)	0.858 / 0.775
Q17	- Слова, описывающие цвет или размер (например, «красный мяч», «большая машина») - Числительные (например, «три собаки», «две машины») - Слова для описания количества (например, «много машин», «всё пропало», «много») - Множественные формы слов (например, «машины» вместо «машина», «книги», «куклы») - Притяжательные формы (например, «игрушка Коли», «мамина сумка», «папина машина»)	0.815 / 0.848
	Для вопросов 18 - 21: Какое утверждение лучше всего описывает, как Ваш ребёнок понимает УСТНУЮ речь БЕЗ визуальных подсказок в следующих ситуациях?	
Q18	Когда Ваш ребёнок едет в машине, он(она) способен(на) понять ...	0.786 / 0.688
Q19	Когда Ваш ребёнок слушает из другой комнаты, он(она) способен(на) понять ...	0.749 / 0.666
Q20	Когда Ваш ребёнок в шумной обстановке (например, при разговоре лицом к лицу на дне рождения), он(она) способен(на) понять ...	0.686 / 0.374

Q21	Когда Ваш ребёнок разговаривает по телефону с кем-то знакомым (Например, с родителем или бабушкой/дедушкой), он(она) способен(на) понять …	0.758 / 0.750
Q22	Если вариантов может быть НЕОГРАНИЧЕННОЕ КОЛИЧЕСТВО, на сколько предметов, соответствующих возрасту, Ваш ребёнок смог бы УКАЗАТЬ, когда они представлены в РАЗГОВОРНОЙ речи БЕЗ визуальных подсказок? (Например, когда на кухне Вы спрашиваете ребёнка «Где духовка? Твой рюкзак? Собака?»)	0.759 / 0.773
Q23	Сколько соответствующих возрасту двухэтапных УСТНЫХ команд, представленных БЕЗ визуальных подсказок, понимает Ваш ребёнок? (Например, «Надень обувь и куртку», «Убери игрушки и вымой руки»)	0.628 / 0.429

Internal consistency 0.96 for the CI group, and 0.93 for the NH group.

All parents and children older than six, if appropriate, were informed about the study's aims and provided their written consent. Parents were asked to complete the survey. The mean age of the NH group was 60.4 months ± 24.3 months, with an age range of 13–102 months.

The 23-item FAPCI-RU instrument was also distributed at the National Center of Maternity and Childhood Care in Bishkek, Kyrgyzstan, exclusively to Russian-speaking parents of prelingual bilateral deaf children implanted between 2020 and 2024. The mean age of the CI group was 64.8 months ± 26.7 months, with an age range of 24–126 months (Table 3). To ascertain test-retest reliability, the questionnaire was distributed to the 17 parents of CI children a second time within two to three weeks. Exclusion criteria included malformations of the inner ear and cognitive disorders.

Table 3: Demographic data of children.

Characteristics	Normal hearing N = 28 (Percentage)	Cochlear implant N = 35 (Percentage)
Age of child[a]		
0-12	0 (0)	0 (0)
13-24	3 (10.7)	1 (2.9)
25-36	2 (7.1)	5 (14.3)
37-48	4 (14.3)	7 (20.0)
49-60	3 (10.7)	3 (8.6)
61-72	8 (28.6)	3 (8.6)
> 72	8 (28.6)	16 (45.7)
Gender Female	18 (51.4)	12 (34.3)
Age at implantation		
< 24 months		12 (34.3)
≥ 24 months		23 (65.7)
Age at survey[a]		64.8 ± 26.7
age at implantation < 24 months		45.2 ± 19.3
age at implantation ≥ 24 months		75.1 ± 24.4
Duration of use of CI (hearing age)[a]		29.5 ± 19.4
age at implantation < 24 months		24.6 ± 18.1
age at implantation ≥ 24 months		32.0 ± 19.9

[a] in months.

The children's hearing age (duration of CI use) was calculated from the initial fitting of the speech processor, ranging from nine to 60 months. The initial fitting of the speech processor was performed four weeks after CI surgery. Therefore, the date of the initial fitting was used as the basis for calculating hearing age. The proportion of children receiving bilateral CIs was 6% (N = 2).

Standardized audiologic rehabilitation for implanted children was performed every three months during the first year and every five to six months in the second year. From the third year onward, adjustments to the speech processor are carried out annually at the clinic. Since there is no state program for the rehabilitation of children with CIs, speech therapy rehabilitation has been conducted at private centers, educational institutions, and private audiologists' practices in the children's places of residence, usually financed by the parents, Qatari projects, and the Rotary Club Kühlungsborn-Bad Doberan (Germany) [6].

Statistical Analyses

FAPCI questionnaire data were entered into an electronic database in Güstrow, Germany, and verified by double-data entry. FAPCI scores ranged from 23 to 115, with higher scores indicating better communicative performance. FAPCI scores were calculated by summing the scores of all items and assigning a score of 0 to items with no response. Missing data on several items were found in one survey, and one child with residual hearing in the contralateral ear resulted in only 35 surveys being used for evaluation. Exploratory analyses were conducted using graphical displays and frequency distributions to identify potential outliers for further data validation.

SPSS Version 30.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. Data were evaluated using descriptive statistical methods and comparative tests. Numerical tests were expressed as mean ± standard deviation, and categorical variables as percentages. Statistical tests (Kolmogorov test and Shapiro-Wilk test) indicated a non-normal distribution for all parameters (all p-values < 0.05). Nonparametric tests were performed for group comparisons whenever appropriate. Spearman statistics were used for correlational analyses. A p-value of < 0.05 was accepted as statistically significant in all analyses. To verify the internal consistency of the 23 items of the FAPCI-RU instrument, Cronbach's alpha was calculated. There are different reports about the acceptable values of alpha, ranging from 0.70 to 0.95 [20], with a recommended maximum alpha value of 0.90 [21]. Curve fitting was performed using polynomial terms in linear regression.

Results

FAPCI-RU score results were collected from a cross-sectional cohort of 35 CI children and from 28 parents of children with NH. (Table 3). The results of two children had to be excluded. Questions 1 to 9 were not answered in one questionnaire, and the other child did not have bilateral deafness; the opposite ear had residual hearing, which could still be treated with a hearing aid. Cronbach's alpha for internal consistency was 0.96 for the CI group and 0.93 for the NH group. As deleting individual questions did not change internal consistency, all questions were retained (Table 2). Pearson's correlation test revealed a significant positive correlation between test and retest scores of the children in the CI group ($r_{17} = 0.94$, $p < 0.001$). Analyses indicated a positive correlation in the NH group between FAPCI-RU scores and age ($r_{28} = 0.691$, $p < 0.001$).

Figure 1 displays the group medians and distributions. Comparison analyses revealed significantly better FAPCI-RU scores in children with normal hearing (96.8 ± 13.5) than in children with CI (64.6 ± 22.6) ($p < 0.001$).

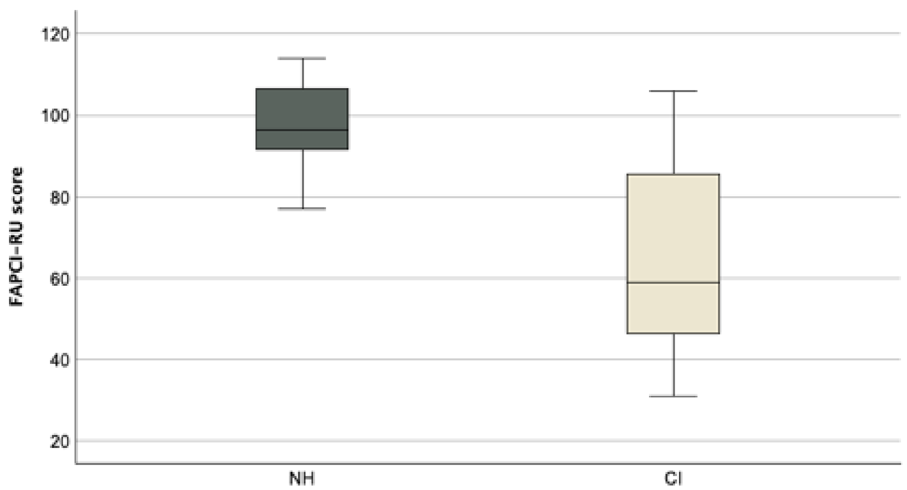

Figure 1: Box plot presenting group medians and distribution of FAPCI-RU scores among NH (normal hearing, N = 28) and CI (cochlear implant, N = 35) children (first measurement date).

Analyses revealed a positive correlation in the CI group between FAPCI-RU scores and age (r_{35}= 0.398, p = 0.018) as well as the duration of CI use (hearing age) (r_{35}= 0.630, p < 0.001). There was no correlation between FAPCI-RU scores, and age at implantation was not significant (r_{35}= 0.04, p = 0.98).

Cross-sectional FAPCI-RU scores from 28 NH children show that the scores consistently increase with age (Figure 2). Communicative performance in healthy children, as measured by FAPCI-RU, rapidly increases until three years, after which a stable plateau is reached.

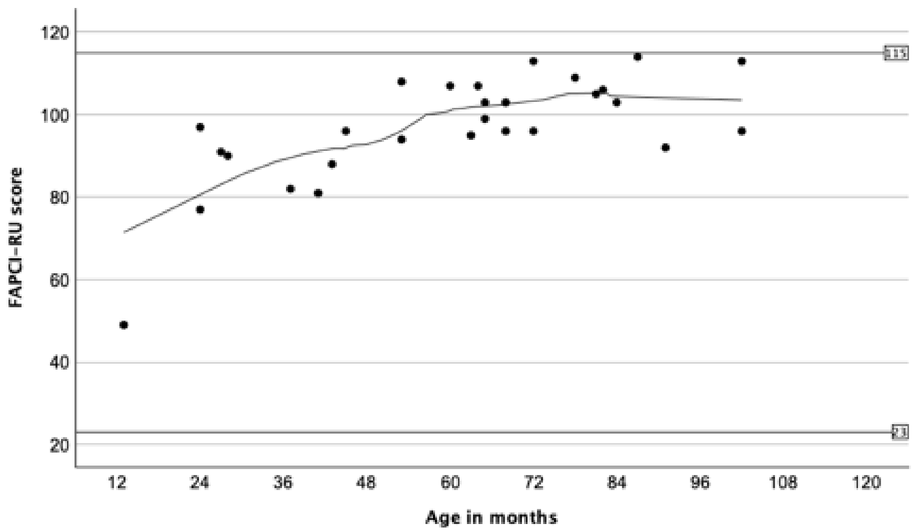

Figure 2: FAPCI-RU score in 28 NH children depending on life age. The minimum and maximum scores of 23 and 115 are specified.

Figure 3 portrays the results of the survey depending on age in children with CI. According to the original publication, the data on the age at implantation were considered. The FAPCI-RU score tends to increase in both groups with increasing age. Considering the regression lines of Figure 3, children who received implants early showed a faster increase in FAPCI-RU scores than those who received implants later. However, there are significant individual variations.

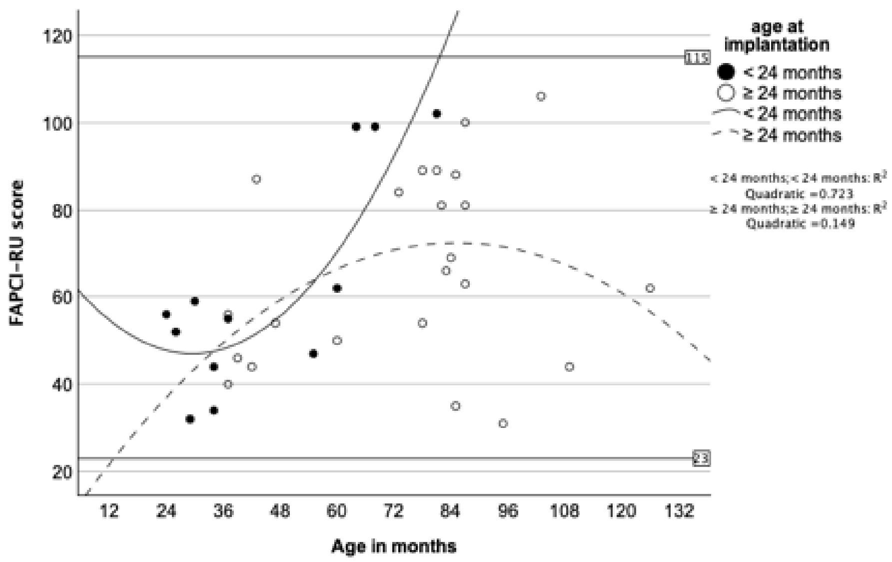

Figure 3: FAPCI-RU score in 35 CI children depending on life age and age at implantation. The minimum and maximum scores of 23 and 115 are specified.

Considering the hearing age (duration of CI use), the regression lines indicate that children who received implants early and wore them for a shorter period achieved lower FAPCI-RU scores than those who received implants later (Figure 4). However, as the hearing age increased, the values rose more quickly than in children who received implants later.

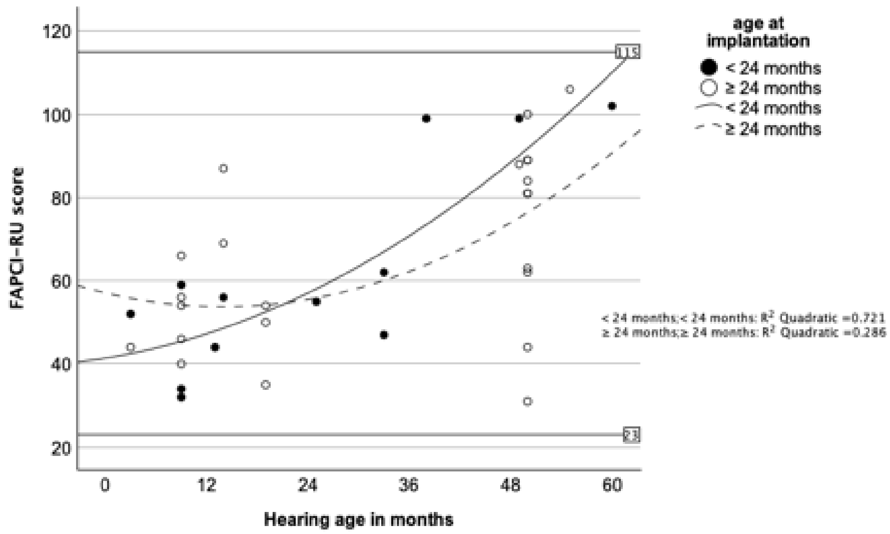

Figure 4: FAPCI-RU score in 35 CI children depending on hearing age and age at implantation. The minimum and maximum scores of 23 and 115 are specified.

Discussion

To establish a CI program in Kyrgyzstan, standardized postoperative care should be implemented, including audiological and speech therapy rehabilitation, besides neonatal hearing screening, standardized preoperative diagnostics, and the training of CI surgeons as recommended [6]. In a previous study, we implemented a Kyrgyz version of the FAPCI instrument for Kyrgyz-speaking children with CI in Kyrgyzstan between the ages of 2 and 6 [6]. As some children grow up speaking Russian as their native language in Kyrgyzstan, the implementation of a Russian version of the FAPCI instrument was recommended. This study aimed to adapt the established English-language FAPCI questionnaire and create a Russian version. A comparison of the demographic data of the children included in the study indicated a similar age distribution and comparable duration of CI use, but a slightly higher proportion of female CI users in the current study (FAPCI-RU) compared to the Kyrgyz study (FAPCI-Kyrg). Regardless, the Russian version of the FAPCI questionnaire exhibits psychometric characteristics similar to the Kyrgyz version.

The results of the reliability analysis, with Cronbach's alpha of 0.96, correspond to those of the original English version by Lin et al., who reported it as 0.86 [12]. As deleting individual questions did not change internal consistency, all questions were retained. The FAPCI versions now available in other languages achieve similarly high internal consistency scores (German between 0.795 and 0.987 [15], Hindi 0.90 [18], Brazilian 0.948 [17], and Kyrgyz 0.96) [6]. The validity analysis suggests that the FAPCI score increases with the children's age. However, this is a cross-sectional study and not a longitudinal one. The regression curves shown in Grugel et al. [15] approximate the regression lines of actual temporal hearing-speech development. It would be useful to have the FAPCI questionnaire completed to assess the communication skills of healthy children aged 2–6 to map the actual progression. The few children in this study who received early implants were also younger than those who received late implants. Therefore, some children had understandably lower scores. Older children can compensate cognitively [6]. With increasing duration of CI use (hearing age), the FAPCI score improved more rapidly in children who received early implants than in those who received them late. However, the quantity and quality of speech therapy post-CI surgery, besides the duration of use, are key factors not adequately reflected in this study.

After 6 years and 6 months, a so-called ceiling effect sets in, meaning that, the greater the age, the more children achieve the possible maximum score of 115 [15]. Therefore, the use of the FAPCI questionnaire for assessing the language development of older children appears less useful. However, our data also indicate that a few older children with NH did not achieve the maximum score of 115. Therefore, it is important to include 7- to 9-year-old children in a follow-up study.

The comparison of FAPCI scores of children with NH and CI children demonstrated deficits in communication among children with CI. Several factors determine speech development with CI. Besides biological factors (e.g., intact auditory nerve, normal brain development), underlying pathologies, the presence of other disabilities, correct electrode insertion and proper adjustment of the speech processor, the timing of implantation in cases of congenital deafness, and audiological and speech therapy rehabilitation after CI surgery are decisive factors in the success of CI surgery [22].

The timing of CI surgery has a stronger influence on the speech development of the child than the duration of implant use [23]. Children implanted between 16 and 24 months reached a preschool language scale comparable to hearing age-mates by 4.5 years. Children implanted after 24 months did not keep pace with hearing peers. To minimize the time of deafness and the lack of sensory input to the brain, CI surgery should be performed before the age of 2 [24-27].

In this study, only about one-third of the bilaterally prelingually deaf children examined (N = 12) received implants before the age of 2. Sixty-six percent of the children received their implants between the ages of 3 and 4. The present study's CI group was quite heterogeneous concerning the age of CI surgery, pathology, and hearing rehabilitation. All implanted children were born deaf in both ears. Genetic testing was not performed, and previous infections that could have contributed to deafness were not reported. Despite the varied rehabilitation programs, the children received in their hometowns, the results of the study show a significant improvement in the communication skills of the implanted children in Kyrgyzstan. This improvement is also attributed to the high level of commitment shown by the parents, who take every opportunity to provide their children with hearing therapy. However, in Kyrgyzstan, rehabilitation facilities need to be established in the medium and long term inside and outside the clinics that perform the implantations (family-centered intervention) [28].

On the one hand, the study results demonstrate the applicability of the questionnaire developed to assess the communication skills of Russian-speaking healthy children and children with CI aged 2 to 6. On the other hand, the study highlights the need for early CI in prelingually deaf children. Based on the limited data of the study, the results confirm that the earlier the implantation, the faster the improvement in the communication skills of CI children.

The limitation of the study is the limited data on children with NH and those with CI implants. Therefore, the aim is to conduct a follow-up study to better validate the results statistically. According to the original study [4], the study design was to include only Russian-speaking children to prevent data distortion due to multilingual influence. The inclusion of bilingual children cannot be ruled out with certainty. It would also be interesting to explore the extent to which the communication skills of bilingual or multilingual Kyrgyz children can be assessed using the FAPCI-RU questionnaire.

Conclusion

The Russian version of the FAPCI questionnaire exhibits psychometric characteristics similar to the English and Kyrgyz versions. Its use is recommended for Russian-speaking children to assess early childhood communication skills following cochlear implantation. For children in Kyrgyzstan who do not speak Kyrgyz or Russian, it is particularly important to create a separate version.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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