

TRANSLATION AND STANDARDIZATION OF ARABIC QUESTIONNAIRES FOR EVALUATION OF COCHLEAR IMPLANT PERFORMANCE IN TODDLERS AND CHILDREN

Iman Sadek El-Danasoury, Wafaa Shehata-Dieler, Adel Abd El-Maksoud Nassar, Mona Mohamed Sharaf Moharam

ABSTRACT:

Department of Otolaryngology
(Audiology unit), Faculty of
Medicine – Ain Shams University

Corresponding author:

Mona Mohamed Sharaf

Email:

dr_mona_sharaf2011@yahoo.com

Mobile: 01118608300

Received: 23/9/2020

Accepted: 14/10/2020

Online ISSN: 2735-3540

Background: Assessment of language perception and production in cochlear implant (CI) children at the early stages after the implantation is a challenging process especially in young children. It is not always possible to conduct a speech test battery to those children, therefore, the parent's questionnaires can be an alternative method to evaluate the state of language development in younger children with cochlear implant. Previous questionnaires were designed to assess the child's spontaneous responses to sound in his/her everyday environment, but they did not focus on how much words the child knows.

Aim of the work: The main aim of this study was to translate and standardize the German questionnaires Elternfragebogen für Risiko kinder (ELFRA questionnaires for children at risk) in order to use it to assess the benefit of the cochlear implant in the early stages after implantation in Arabic speaking young children.

Patients and Methods: The ELFRA questionnaires were translated from German to Arabic, then re-translated from the Arabic back to German language by the help of an expert panel (experts in translation from Arabic to German languages and vice versa). ELFRA-1 and ELFRA-2 questionnaires were answered by a total number of 82 parents of normal hearing infants and children; their chronological age was 12 months and 24 months respectively. ELFRA-1 and ELFRA-2 questionnaires were conducted also on 72 cochlear implant children; their hearing age was 12 months and 24 months respectively.

Results: Translation of ELFRA-1 did not necessitate changes in the structure of ELFRA-1 questionnaire. However, some items were changed during the translation of ELFRA-2 questionnaire. Comparisons of scores of ELFRA questionnaires between normal hearing group and cochlear implant group revealed statistically significant higher scores in children with CI in expressive aspect of the language while normal hearing infants had higher scores in the receptive aspect.

Conclusions: Translated and standardised Arabic versions of ELFRA questionnaires are helpful tools in assessment of the benefit of cochlear implantation at earlier stages after the implantation. Further work is needed to examine the prognostic ability of the questionnaires to detect cochlear implant children at risk for delayed language development, Arabic language.

Key words: *Translation of questionnaires, Cochlear implant children.*

INTRODUCTION:

In the past, cochlear implantation in children under 24 months of age was not performed due to concerns relating to the fact that a profound sensorineural hearing loss could not be clearly identified in this young age group. However, improvements and development in diagnostic and cochlear implant technology, surgical experience and evidence of efficacy of cochlear implantation in young children resulted in a change of the age criteria to include children younger than 24 months of age⁽¹⁾. Assessment of language perception and production in those children is a challenging process and it is not always possible to conduct the speech test battery to these children. Therefore, the parent's questionnaire can be an alternative method to evaluate the state of development in younger children with cochlear implant⁽²⁾.

The ELFRA-1 and ELFRA-2 questionnaires were constructed to identify children at risk for language disorders in the context of the routine examination of children at the age of 12 months and 24 months respectively⁽³⁾.

The main aim of the present study was to translate and standardize the German questionnaires Elternfragebogen für Risiko kinder (parental questionnaire for children at risk) to be able to use it in the routine assessment of the language development in children implanted with a cochlear implant at 12 and 24 months of hearing age. The ELFRA questionnaires were selected to be translated because, unlike the previous questionnaires which were designed to assess the child's spontaneous responses to sound in his/her everyday environment, ELFRA questionnaires focus on how much words the child knows and they consider the other aspects of development.

METHODOLOGY:

MATERIAL:

ELFRA-1 Questionnaire: The Elternfragebogen für Risiko kinder (ELFRA) German question-naire (Questionnaire for parents of high-risk children) was developed by Grimm and Doilin 2000⁽³⁾. The ELFRA Questionnaires are used as a screening instrument to identify children at risk of language disorders. The Arabic ELFRA-1 questionnaire was applied to children at the age of 12 months (chronological and hearing age). The translation of ELFRA-1 did not necessitate change in the content, as questions in ELFRA-1 are directed mainly to reception of sounds and words. The German and Arabic versions of ELFRA-1 are similar and they consist of:

Speech development: It consists of productive and receptive vocabulary, production of sounds and speech and reaction to speech. Productive and receptive vocabulary consists of a total number of 164 words. In front of each word there are two choices (my child can only understand and my child can understand and produce); one of them should be selected by the parents. These words are distributed in 13 groups (e.g: animals, food, transportation....). **Production of sounds and speech:** this part consists of 17 closed (Yes or No) questions, e.g: Does your child try to repeat (follow the rhythm), when he hears a song? The maximum score is 17. **Reaction to the speech:** it consists of seven closed (Yes or No) questions, e.g: When you order your child to come, does he respond? The maximum score is seven.

Gestures: This part consists of 30 closed (Yes or No) questions, e.g: Does your child respond by counting on his fingers

when you ask him “how old are you”? The maximum score is 30.

Fine motors activities: This part consists of 13 closed (Yes or No) questions, e.g: Is your child able to throw something from his hand? The maximum score is 13.

The scoring and critical values of ELFRA-1: Scoring and critical values of ELFRA-1 did not change after translation. Scores should be obtained to four aspects as illustrated in table(1). The critical value of ELFRA-1 was calculated at the scores obtained by 80% of the total tested sample⁽³⁾.

Table (1): Critical values of ELFRA-1

Item	Maximum score	Critical value
Speech perception	164+17=181	17
Speech production	164+7=171	7
Gesture	30	11
Fine motor	13	7

ELFRA-2 Questionnaire: The Arabic ELFRA-2 questionnaire was developed and standardized to be used in children at the age of 24 months (chronological age). During the translation stage of ELFRA-2, some items were modified because of the difference between both languages in the syntax and in the speech morphology (table 3). The German version of ELFRA-2 consists of:

Productive vocabulary: it consists of a total number of 260 words. In front of each word there are two choices (my child can produce - my child cannot produce); one of them should be selected by the parents. These words are distributed in 20 groups. Maximum score is 260.

Syntax:it consists of 25 questions to assess the syntax (the organization of words to build phrases and sentences). In front of 22 questions of them there are four or six choices (some choices scored as 0, some as 1, some as 2); three questions are yes or no questions which can be scored either as 1 or 0 respectively. The maximum score is 47.

Example: If the child wants to express that his father in the garden, he would say:

Papa garden (1 point)

Papa in garden (1 point)

Papa is in the garden (2 points)

He does not say anything like this (0 point)

Morphology: It consists of 11 questions to assess the speech morphology (the organization of morphemes), six questions are yes or no questions which can be scored either as 1 or 0 respectively, in front of the remaining five questions, there are three or four choices (some choices scored as 0, some as 1, some as 2). The maximum score is 16.

Example: Please cross the form that is used by your child:

Lila help Mama (2 points)

Lila helps Mama (1 points)

I help Mama (2 points)

I helps Mama (2 points)

He does not say anything like this (0 point)

Subjects:

The control group: It consists of one-year old infants and two years old children for ELFRA-1 and ELFRA-2 questionnaires respectively. All of them passed the hearing screening test and were free of hearing complaint as reported by their parents.

The study group: It consists of one-year old infants and two years old children with severe to profound hearing loss, rehabilitated with cochlear implants; their hearing age with CI was one year or two years.

Methods:

Translation and standardization of ELFRA questionnaires

The ELFRA-1 was translated from German to Arabic, and then re-translated from the Arabic back to German language by the help of expert panel (experts in translation from Arabic to German languages and vice versa).

The translated version of ELFRA-1 was answered by the parents of one-year old normal hearing infants. The translated version of ELFRA-2 was answered by the parents of two-year old normal hearing children. In this stage, the ELFRA-1 and ELFRA-2 were answered in the presence of the examiner to ensure proper understating of all items. During the standardization, the questionnaires were answered by the parents. The parents were asked whether they could repeat the question in their own words, what came to their mind when they heard a particular phrase or term. These questions were repeated for each item. Parents were asked about any word and expressions they did not understand. Finally, when alternative words or expressions exist for one item or expression, the parents should be asked to choose which of the alternatives conform better to their usual language. All the alternatives suggested by the parents were added to the Arabic version.

Application of the Arabic version of ELFRA questionnaires to CI children:

Parents of CI children (with one-year hearing age) were subjected to ELFRA-1 and parents of CI children (with two years hearing age) were subjected to ELFRA-2.

Statistical analysis:

Kolmogorov-Smirnov and Shapiro-Wilk was used to test the normality. Mann Whitney test was used for comparison between normal hearing children and CI children. Pearson's correlation test was used to correlate between the age of cochlear implant children and their scores of ELFRA questionnaires. Statistical significance was set to $p < 0.05$. The statistics software IBM SPSS Statistics 25 was used for the analyses and graphs were created in Microsoft Excel 2010.

RESULTS:

ELFRA-1 questionnaire:

ELFRA-1 in the control and study groups:

The ELFRA-1 questionnaire was answered by the parents of 41 infants. All infants in this group were 12 months old (± 10 days) and had passed the hearing screening test. The ELFRA-1 was answered by the parents of 37 implanted children (12 months hearing age with CI). The chronological age of the CI group ranged from 20 to 86 months. The mean chronological age was $46.21 \text{ months} \pm 22.97$. The range mean and standard deviation (SD) were calculated for each subscale of ELFRA-1. The results of ELFRA-1 in the study group were compared to that of the control group using Mann Whitney test because the data was not normally distributed. The comparison showed that the gesture as well as speech production (word production and sound production) were statistically significant higher in the study group, while the infants of the control group had statistically higher scores in speech perception (word perception and reaction to the sounds) (Table 2).

Table (2): Comparison of the scores of ELFRA-1 questionnaires between the study and control groups using Mann Whitney test:

		Control (Normal hearing)	Cases (CI children)	P value
Word perception	Range	(16-159)	(0-126)	<0.001*
	Mean ± SD	73.5±47.1	36.9±35.7	
	Median	58	24	
Speech perception	Range	(20-162)	(2-132)	<0.001*
	Mean ± SD	78.2±47.6	43.1±36	
	Median	59	31	
Word production	Range	(0-124)	(0-150)	0.004*
	Mean ± SD	12.4±21.6	48.7±50.4	
	Median	6	28	
Speech Production	Range	(6-139)	(9-167)	0.001*
	Mean ± SD	24.2±22.7	61.9±51.9	
	Median	18	34	
Sound production	Range	(6-17)	(6-17)	0.139
	Mean ± SD	12.1±3.5	13.2±3.3	
	Median	13	14	
Reaction to sounds	Range	(3-7)	(2-7)	0.540
	Mean ± SD	6.5±1	6.2±1.4	
	Median	7	7	
Gesture	Range	(5-30)	(2-30)	0.005*
	Mean ± SD	19.4±6.2	22.6±8.4	
	Median	19	26	
Fine motor	Range	(6-13)	(3-13)	0.088
	Mean ± SD	10.4±2.1	10.8±3.2	
	Median	11	13	
Chronological age	Range	-----	(20-86)	-----
	Mean ± SD		46.21±22.97	
	Median		42.5	

Comparison of the critical values of ELFRA-1 questionnaire between the study and control groups:

The number of children who had critical scores in speech perception, production and fine motor were higher in the study group (Diagram 1).

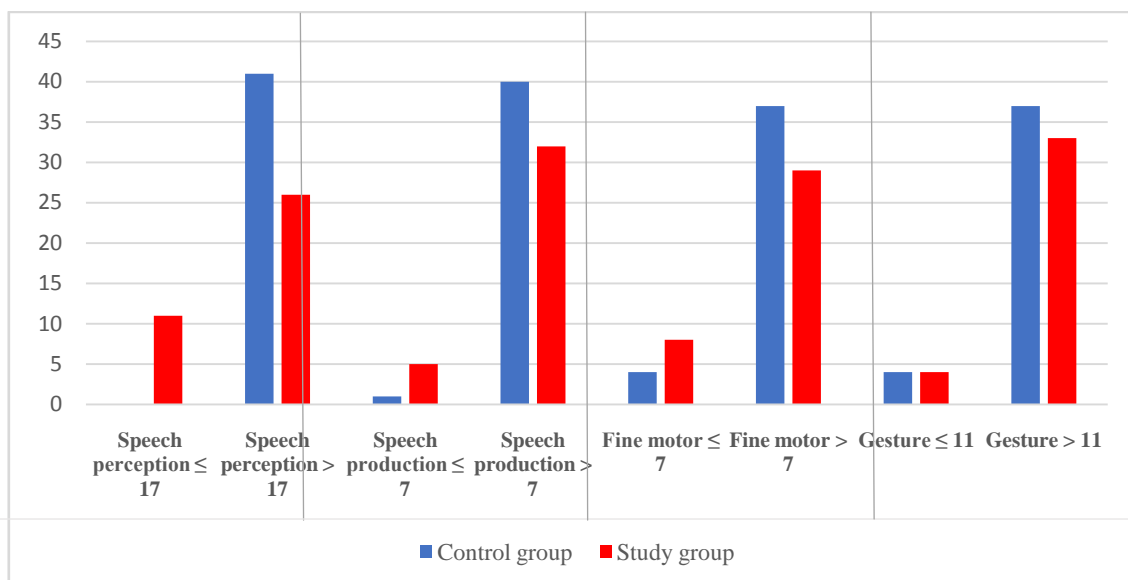
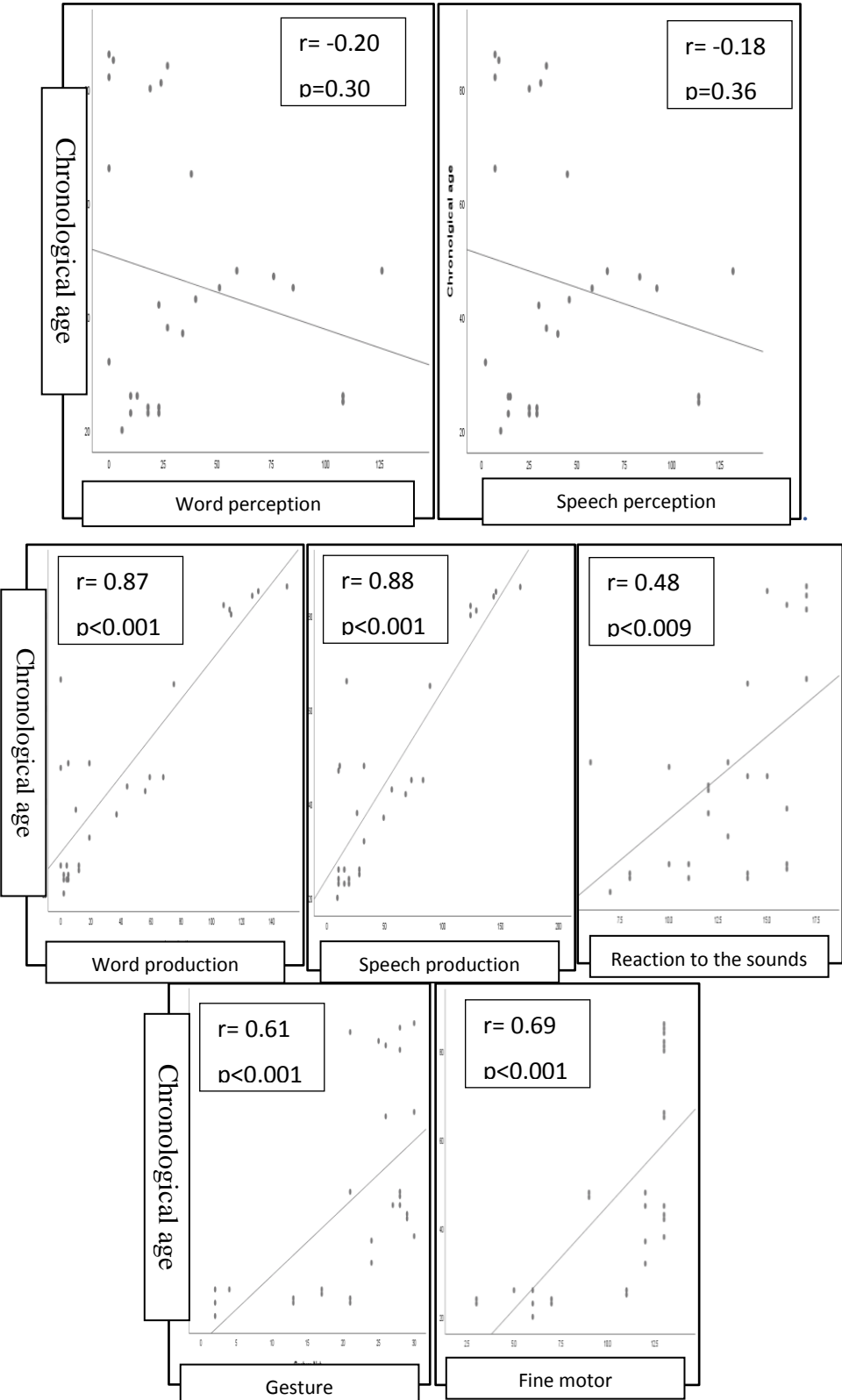


Diagram (1): Comparison between the control and the study groups regarding the critical values of ELFRA-1 questionnaire (depending on the German ELFRA-1).

Correlation between the chronological age of the study group and the scores of ELFRA-1:

Pearson’s correlation test was used to examine the correlation between the chronological age of the study group and the scores of ELFRA-1. No correlation was found between the chronological age of the

study group and word perception and speech perception (Figure 2- a). A positive correlation was found between the chronological age of the study group and word production, sound production, reaction to sounds, gesture and fine motor (Diagram 2- b).



Diagram(2): a: Correlation between the age of the study group and word perception or speech perception. b: Correlation between the age of study group and word production, sound production, reaction to sounds, gesture and fine motor.

ELFRA-2 questionnaire:

Modification of ELFRA-2:

The following modifications were done during the translation of ELFRA-2 (Table 3).

Table (3): Modification of the Arabic version of ELFRA-2

The item	The modification	The cause of modification
The productive vocabulary: The pronouns	The number of pronouns was reduced from 26 to 22 pronouns.	The number of pronouns in German language is 26. In Arabic language there are 22 pronouns.
The words which refer to amounts and articles	The number of words which refer to amounts and articles in the German questionnaire is 12, however, in the translated version; only 11 words could be translated.	In German language, there are two sets of articles named: Definite and Indefinite. In the Arabic language, there is only one article.
The auxiliary verbs	The number of the auxiliary verbs was reduced from 14 to 13.	One verb is expressed by two different words (or forms) in German. In Arabic they are expressed only by one word.
The syntax	The number of questions was reduced from 25 to 21.	Four questions were removed because they targeted the ability of the child to use the verbs, which have the ability to be separated. The Arabic language does not include such verbs
The morphology	The number of questions was reduced from 11 to 8.	Three questions were removed because they targeted the ability of the child to correctly build different forms of the past. In Arabic, there is one form of the past.
The maximum score	The maximum score of the production vocabulary were reduced from 260 to 254, the maximum score of the syntax were reduced from 47 to 39 and the maximum score of the morphology were reduced from 16 to 13.	The maximum score of the translated form of ELFRA-2 were reduced because of the removed items.

ELFRA-2 in the control and study groups:

The ELFRA-2 questionnaire was answered by the parents of 41 infants. The mean age of the infants was 24 months \pm 10 days. The ELFRA-2 was answered by the parents of 35 implanted children (24 months hearing age). The chronological age ranged from 40 to 82 months. The mean age of the

children was 63.7 months \pm 13. The results of ELFRA-2 in the study group were compared to that of the control group using Mann Whitney test because the data were not normally distributed. The comparison showed statistically significant difference between the control and the study groups in all components of ELFRA-2 (Table4).

Table (4): Comparison of the scores of ELFRA-1 questionnaire between the study and control groups:

		Control (Normal hearing)	Cases (CI children)	P value
Words	Range	(0-134)	(0-130)	0.006*
	Mean ± SD	45±33.8	68.8±38.6	
	Median	42	68	
Syntax	Range	(0-36)	(0-38)	0.017*
	Mean ± SD	15.6±11.2	21.8±12.7	
	Median	16	28	
Morphology	Range	(0-13)	(0-13)	0.011*
	Mean ± SD	6.4±4.6	8.5±4.7	
	Median	7	11	
Chronological age	Range	-----	(40-82)	-----
	Mean ± SD	-----	63.7±13.5	
	Median	-----	71	

Correlation between the chronological age of the study group and the scores of ELFRA-2 questionnaire:

Pearson’s correlation test was used to examine the correlation between the chronological age of the study group and the scores of ELFRA-2. A positive correlation was found between the chronological age of the study group and all subscales of ELFRA-2 (Diagram 3).

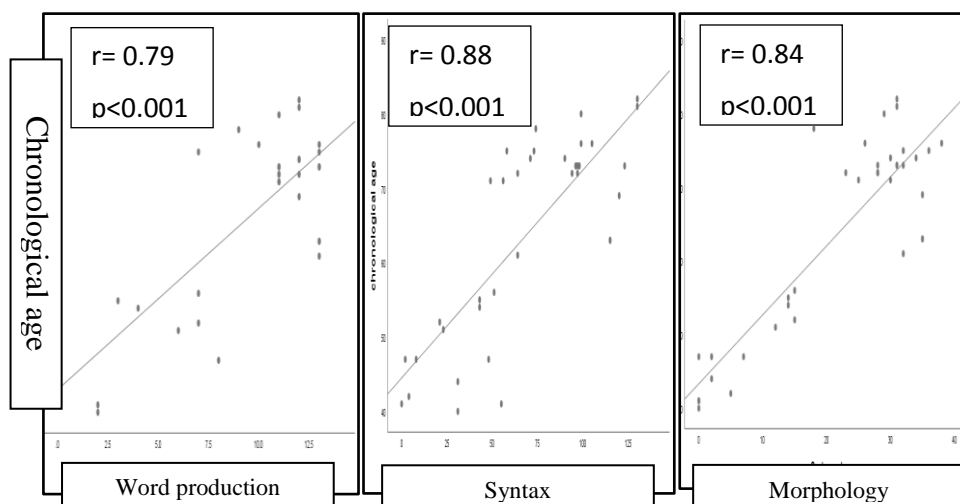


Diagram (3): Correlation between the age of the study group of ELFERA 2 and word, syntax and morphology.

DISCUSSION:

The main purpose of this study was to translate and adapt the ELFRA questionnaires which can be used as screening tools for detection of language development disorders as early as possible. Translation and standardization of ELFRA questionnaires was an important preliminary step towards achieving a tailored tool to evaluate speech development in CI children.

After translation of ELFRA-1 and ELFRA-2 questionnaires, they were answered by the parents of 60 infants and 52 children respectively. All infants in this group were 12 months old (± 10 days) and all children were 24 months (± 10 days) Unfortunately, only the answers of the parents of 82 infants and children were included in the study because these 82 infants and children were confirmed passing the

hearing screening test. The translation of ELFRA-1 questionnaire did not necessitate modifications because the questions in ELFRA-1 are directed to reception of sounds and words, however, translation of ELFRA-2 did require some modifications in the Arabic version because of the difference between both languages. Comparison of the mean scores of ELFRA-1 and ELFRA-2 questionnaires between normal hearing infants and cochlear implant children showed statistically significant higher scores in CI children regarding the expressive aspect of the speech. This finding was not surprising and can be explained by the fact that cognitive processing abilities in children develop over time because of experience-dependent learning. (4&5) However, the CI children scored less than normal hearing infants in perception aspects of the speech. This result is in contrast to a large body of studies stating that speech perception skills improve earlier and faster than in speech production skills. (6) This could be attributed to the type of training received by the CI children and the goals set by the parents after cochlear implantation. The training and rehabilitation concentrate essentially on enhancing the CI children ability to produce speech. Most of the cochlear implanted children had a chronological age exceeding 48 months. This made them very close to the entry age of the schools in Egypt. The main concern of their parents is the expressive language as it contributes to the official acceptance in the schools. Hence the importance to educate all those who are responsible for accepting the enrollment of CI children in regular schools about the temporary delay in speech production. Moreover, it is recommended to set different standards than normal for CI children in the entry evaluation. These findings were consistent with the results of correlations done between the scores of the ELFRA subscales and the chronological age of CI children; positive correlations were found between speech production, gesture and fine

motor in ELFRA-1 and between age and speech production, syntax and morphology in ELFRA-2, while no correlations were found between the chronological age of CI children and speech perception. Comparison of the critical values of ELFRA-1 questionnaire between the study and control groups revealed a higher number of CI children at high risk to be delayed regarding speech production and fine motor. This finding is crucial and proves that ELFRA-1 questionnaire can be helpful in early detection of CI children at risk of delayed language development. Early detection of delayed language development in CI children is a preliminary step to condense and modify the rehabilitation program provided to these children. Nevertheless, the question remained to be answered, whether ELFRA-1 questionnaires has a high prognostic value in detecting delayed language development in CI children or it overlooks these children. The critical values of ELFRA-2 questionnaires could not be applied in this study because those values were calculated based on the German version which was modified in the Arabic one during the translation. One of the advantages of this study is that the questionnaires take into account the use of receptive and expressive language together with other developmental aspects (gesture and fine motor). We believe that conditions for evaluating the linguistic behaviour and language-related aspects are improved by considering the observation of children at play as these observations can help to define the progression achieved after cochlear implantation in greater detail. Although ELFRA questionnaire is a parental questionnaire, which might be considered as an alternative for formal testing in infants and toddlers, the parents' observational results could be biased. Therefore, it is recommended to perform the questionnaire by an expert therapist especially in CI children who are at risk for delayed language development or when a bad

prognosis is expected. To facilitate applying the ELFRA questionnaire by an expert therapy, a difficulty index of ELFRA questionnaires should be created to develop a shorter version (omit the difficult item from the long version). Moreover, development of a short version of the questionnaires will help us to refine the Arabic translated version as it contains some words which are not frequently used in the Egyptian environment.

Conclusions:

Translation and standardisation of ELFRA questionnaires is a helpful tool in assessment of the benefit of cochlear implantation at earlier stages after the implantation. Further work is needed to examine the prognostic ability of the questionnaires to detect cochlear implant children at risk for delayed language development.

REFERENCES:

1. Waltzman SB, Cohen NL. Cochlear implantation in children younger than 2

years old. *Am J Otol.* 1998 Mar;19(2):158-62. PMID: 9520051.

2. May- Mederake B. Early intervention and assessment of speech and language development in young children with cochlear implants. *Int J Pediatr Otorhinolaryngol.* 2012;76:939–946.
3. Grimm H, Doil H. ELFRA - Elternfragebögen für die Früherkennung von Risikokindern, Hogrefe Verlag für Psychologie, Göttingen, 2000.
4. Jusczyk PW, Luce PA. Speech perception and spoken word recognition: Past and present. *Ear and Hearing.* 2002;23:2–40.
5. Locke JL. *The Child's Path to Spoken Language.* Cambridge, MA: Harvard University Press; 1993.
6. Tait M, De Raeve L, Nikolopoulos TP. Deaf children with cochlear implants before the age of 1 year: comparison of preverbal communication with normally hearing children. *Int J Pediatr Otorhinolaryngol.* 2007 Oct;71(10):1605-11. doi: 10.1016/j.ijporl.2007.07.003. Epub 2007 Aug 10. PMID: 17692931.

تطوير بطارية اختبارات كلام بالغة العربية لتقييم أداء الأطفال مستخدمي القوقعة
ايمان صادق الدناصوري؛ وفاء شحاته ديلير؛ عادل عبد المقصود نصار؛ منى محمد شرف

قسم الأنف و الأذن و الحنجرة (وحدة السمعيات) – جامعة عين شمس

المقدمة: تقييم التطور اللغوي عند الأطفال مستخدمي القوقعة عملية صعبة خصوصا في المراحل الأولى بعد الزراعة. كما أن الاستبيانات السابقة ركزت فقط على تقييم التفاعل مع الأصوات البيئية و لم تركز على التطور اللغوي.

الهدف الرئيسي: ترجمة و تطبيق استبيانات جديدة لاستخدامها في تقييم الأطفال مستخدمي قوقعة الأذن. تم ترجمة الاستبيانات من اللغة الألمانية إلى العربية ثم أعيدت ترجمتها من اللغة العربية إلى اللغة الألمانية بمساعدة فريق من الخبراء.

المرضى و الأساليب: قام آباء و أمهات 82 رضيعا و طفلا (من الذين ثبت اجتيازهم اختبارات الكشف المبكر عن ضعف السمع) بالاجابة على الاستبيانات المترجمة للعربية. كان عمر الرضع في هذه المجموعة 12 شهرا بينما كان عمر الأطفال 24 شهرا. علاوة على ذلك، أجاب آباء و أمهات 72 طفلاً من مستخدمي القوقعة على نفس الاستبيانات. تراوح عمر الأطفال مستخدمي القوقعة الذين تم تطبيق الاستبيانات عليهم 20-80 شهرا.

النتيجة: لم تتطلب عملية الترجمة أي تغيير في هيكل الاستبيان الأول بينما تم تغيير بعض بنود الاستبيان الثاني. كما كشفت المقارنة بين المجموعتين أن مجموعة الأطفال مستخدمي القوقعة حصلوا على معدلات أعلى في الجانب التعبيري من الكلام مقارنة بذويهم ممن يتمتعون بسمع طبيعي بينما تفوق الأطفال ذوي السمع الطبيعي على ذويهم من مستخدمي القوقعة في استقبال الكلام.

الخلاصة: استخدام الاستبيان هذه الاستبيانات مفيد في الكشف المبكر عن التأخر اللغوي في الأطفال مستخدمي القوقعة.