Laporan Penelitian

Communication ability and related factors in children with hearing aids

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ABSTRAK

Background: Hearing function is very significant in the development of speech and language. Hearing disorders in children can lead to communication skill disturbance. Hearing aids can help to support the development of hearing, talking, and communication abilities. Several factors such as age, duration of using hearing aids, and parental participation in encouraging children to communicate and undergo auditory verbal therapy, are recognized to have impacts on communication skills. **Aim:** To find out communication capabilities and related factors after using hearing aids in children. **Method:** A cross sectional study was performed at a private hearing center in Bandung. Inclusion criteria was children using hearing aids who were doing follow-up in the period January-May 2018. **Result:** From 60 research subjects, there were 35 (58.33%) who used mixed communication, and 23 (38.33%) were in special school. There were 37 (61.67%) who had more than 6 hours communication, 45 (75%) underwent routine therapy, and 23 (38.33%) underwent Auditory Verbal Therapy (AVT) and Speech Therapy. The assessment was using PEACH (Parents' Evaluation of Aural/oral performance of Children) score. A total of 66.67% subjects had a low (<60) PEACH score, 16.67% had a moderate (>60 - ≤75) PEACH score, and 16.66% had a normal (>75) PEACH score. The PEACH score in this study showed an average value of 52.63% with 16.66% had a normal (>75) PEACH score. **Conclusion:** Specific characters that had significant correlation with normal PEACH score were communication method, educational method, communication duration, frequency of therapy, and type of therapy ($p < 0.05$).

Keywords: PEACH score, hearing aid, communication, children

ABSTRACT

Latar Belakang: *Fungsi pendengaran sangat berpengaruh pada perkembangan bicara dan bahasa. Gangguan pendengaran pada anak dapat menyebabkan gangguan komunikasi. Alat bantu dengar menunjang mengembangkan kemampuan mendengar, berbicara, dan berkomunikasi. Beberapa faktor seperti usia, lamanya penggunaan alat bantu dengar, dan keaktifan orang tua dalam mendorong anak untuk berkomunikasi dan melakukan terapi verbal pendengaran diketahui memiliki dampak pada keterampilan komunikasi.* ***Tujuan:*** *Mengetahui kemampuan komunikasi dan faktor yang memengaruhi setelah menggunakan alat bantu dengar pada anak-anak.* ***Metode:*** *Telah dilakukan penelitian cross sectional di sebuah Klinik Pusat pendengaran di Bandung pada periode Januari-Mei 2018 . Kriteria inklusi untuk penelitian ini adalah anak yang menggunakan alat bantu dengar, yang melakukan kontrol pada periode Januari-Mei 2018.* ***Hasil:*** *Dari 60 subjek yang sesuai dengan kriteria penelitian, terdapat 35 anak (58,33%) yang menggunakan komunikasi campuran, dan 23 anak (38,33%) mengikuti pendidikan di sekolah khusus. Ada 37 anak (61,67%) yang memiliki durasi komunikasi lebih dari 6 jam, 45 anak (75%) rutin dalam terapi, dan 23 anak (38,33%) yang menggunakan terapi Auditory Verbal Therapy (AVT) dan terapi wicara. Penilaiannya menggunakan skor PEACH (Parents' Evaluation of Aural/oral performance of Children). Sebanyak 66,67% subjek memiliki skor PEACH rendah (<60), 16,67% memiliki skor PEACH sedang (> 60 - ≤ 75), dan 16,66% memiliki skor PEACH normal (> 75). Skor PEACH dalam penelitian ini menunjukkan nilai rata-rata 52,63% dengan 16,66% memiliki skor PEACH normal (>75).* ***Kesimpulan:*** *Karakteristik yang memiliki hubungan yang signifikan dengan skor PEACH normal adalah metode komunikasi, metode pendidikan, durasi komunikasi, frekuensi terapi, dan jenis terapi yang digunakan (p<0,05).*

***Kata Kunci** : PEACH score , Alat Bantu Dengar, komunikasi, anak*

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INTRODUCTION

Communication can be performed through auditory and visual pathways. The auditory pathway is characterized by speech and acoustic signs, while the visual path is carried out through lip reading and pragmatic signs, such as expression on the other person.[1,2]

The function of auditory perception includes awareness of sound and the ability to integrate with stimuli from other sensory organs as well as the ability to compare or distinguish sounds such as between mother's voice and father's voice.[1,2,3] Role of hearing function in the speech process includes: 1. the ability to hear the voice of conversation, causing someone to learn the language and to use it in their daily environment; 2. the existence of a voice feedback channel (auditory feedback), that is the sound of the voice spoken by the speaker to his own ear. It can be beneficial for monitoring the sound pattern or words spoken, then it can be used to correct the state of the muscles of speech when the speaker is talking (motoric feedback).[1,4]

Talk is the ability to communicate in oral language which requires a harmonious combination of the neuromuscular system to produce phonation and sound articulation. The process of talking involves several systems and functions of the body, involving the respiratory system, cerebral cortex which is the central regulator of speech, the respiratory center in the brainstem, and the structure of articulation, oral resonance and nasal cavity.[3]

There are two processes of speaking, namely sensory and motoric processes. Sensory aspects include the senses of hearing, sight and touch which function to understand what is heard, seen and felt. The motoric aspect is to regulate the larynx, articulation organs and resonance to produce sound.[3]

In the dominant hemisphere of the brain or central nervous system, Broadmann area 39 is a visuo-lexic perception center that controls the recognition and understanding of everything related to visual aspect of language. There are 2 centers that regulate the mechanism of language namely Wernicke area located in Broadmann areas 41 and 42, which is the center of auditory-lexic perception that function in the recognition and understanding of everything related to verbal language, and the Broca area which is the expressive language center. The language centers then relate to one another which is called the association process.[5,6]

When we hear a conversation, the sound waves turn into electrical waves to the Wernicke area of the brain, and response to the conversation by conveying it to the motoric area in the brain that controls speech movements. Subsequently, the speech process which is produced by the vibration of the vocal cords transmitted to the oral and nasal cavities as sound resonance. Resonance is then formed into language articulation by the movement of the lips, tongue and palate. So the process of speech requires coordination of the sensory and motoric nervous systems, where it emphasizes that auditory organs are very important.[4,6]

Ability to speak is very important for every person, and had to be learned in the early days of life. As time passes, a child's ability to speak increases from one word (the

average of six words in a day), becomes one sentence and then becomes a conversation. The language ability is a tool for social interaction and opens the opportunity for a child to learn, seek experience, fulfill needs, and grow normally and productively.[7,8]

Some of the factors that influence speech development: good form auditory pathways, auditory stimuli, surrounding environment, adults' participation in encouraging a child to speak, and the language used daily. According to Young and Kirk,[7] there are 5 dominant factors in shaping the ability to speak i.e. social, perceptual, cognitive, conceptual, and linguistic factors.

The goal of amplification was different for young children and adult. For young children the hearing aids will facilitate the development of language, speech perception, and speech production, whereas for adults the goal of amplification is in adjusting with the surrounding environment (contextual and redundancy cues).[9]

Early identification of hearing problems and prompt effective treatment will provide the children a chance to develop language as good as their normal-hearing peers. For spoken language development, children need access to the full range of speech sounds during all waking hours, and daily hearing aid management. Parents should understand how hearing loss affects the development of their child, and they also need to know and apply the skill of hearing aid management (e.g., consistent use, listening checks, and troubleshooting problems).[10]

METHODS

A descriptive study had been conducted with inclusion criteria of children who used hearing aids and had been followed up in the period of January-May 2018. The researcher used PEACH (Parents' Evaluation of Aural/oral performance of Children) score based on 13 questionnaire questions. The researcher conducted a face-to-face meeting with each subject's parents to explain about the meaning, purpose, and results to be achieved in each question item in order to obtain a correct understanding. Subject's parents then took home the questionnaire, observed the child's communication behavior for one week, and then the questionnaire was returned to the researcher. A final assessment test and a statistical analysis of the characteristics of communication skills were performed upon the collected questionnaires.

RESULTS

In the period of January - May 2018 a descriptive study had been conducted in a private hearing and speech center in Bandung. There were 65 children using hearing aids doing follow up during this period and the researcher obtained 60 subjects who were willing to take part in the study. The subjects' parents were provided with explanation of the procedures for filling in the PEACH questionnaire. The PEACH score in this study showed an average value of 52.63% with 16.66% had a normal PEACH score (>75).

A total of 51.6% of the subjects were boys. Our finding was similar with a meta-analysis study conducted by Umek[12] that girls expressed higher language ability than boys. Subjects resided outside of Bandung city were 39 (51.6%). Total subjects fitted with hearing aids at the age between two to five years old were 61.7%, and 48.3% of subjects had used hearing aids as long as one to three years. Prenatal risk factors were found in 89.8% subjects. Most subjects (88.3%) had a hearing threshold of >80 dB before wearing hearing aids, and 33.3% of subjects used unilateral hearing aid.

Mixed communication between verbal and non-verbal was used as means of daily communication by 58.33% of subjects, with 61.67% communicating with parents and

Table 1.Subject distribution based on characteristics

No	Characteristics	Frequency (n=60)	Percent (%)
1	**Gender**		
	Boy	31	51.6
	Girl	29	48.4
2	**Origin of the patient**		
	Bandung	29	48.4
	Beyond Bandung	31	51.6
3	**Length use of hearing aid**		
	< 1 year	9	15
	1 - < 3 years	29	48.3
	≥ 3 years	22	36.7
4	**Age of use hearing aid**		
	≤ 2 years	3	0.5
	2 - < 5 years	37	61.7
	≥ 5 years	20	33.3
5	**Risk factor**		
	Prenatal	53	89.8
	Perinatal	4	6.8
	Postnatal	3	3.4
6	**Right hearing threshold**		
	40-60 dB	4	6.67
	60 - 80 dB	3	5.00
	> 80 dB	53	88.33
	Left hearing threshold		
	40-60 dB	4	6.67
	60 - 80 dB	3	5.00
	> 80 dB	53	88.33
7	**Ear side of hearing aid**		
	Unilateral	20	33.3
	Bilateral	40	66.7
8	**Hearing aid system**		
	Analog Programmable	19	31.67
	Digital Programmable	41	68.33
9	**Communication method**		
	Verbal	25	41.67
	Non-Verbal	0	
	Mix	35	58.33
10	**Education method**		
	Not yet attended School	22	36.67
	Public School	15	25.00
	Special School	23	38.33
11	**Communication duration**		
	≤ 6 hours	23	38.33
	> 6 hours	37	61.67
12	**Frequency of therapy**		
	Routine	45	75
	Not Routine	15	25
13	**Education period of parents**		
	≤ 16 years	58	96.67
	> 16 years	2	3.33
14	**Parents income**		
	< 6 Million	35	58.33
	6 - 15 Million	25	41.67
15	**Type of hearing aids**		
	swift 120 +	21	35
	SAF 300 SP	3	5
	3000 DM	13	21.67
	RIA P	1	1.67
	Dinamo Sp 4	2	3.33
	Dinamo Sp 6	3	5
	BTE P	2	3.33
	Sumo DM	13	21.67
	Get P	2	3.33
16	**Therapy**		
	Speech Therapy	20	33.33
	AVT &Speech Therapy	23	38.33
	AVT	14	23.33
	Not doing Therapy	3	5.00

Tabel 2.Relationship between characteristics and PEACH score

No	Characteristics	Communication Ability (PEACH Score)			p
		Low (n=40)	Medium (n=10)	Normal (n=10)	
1	**Gender**				
	Boy	21 (67.7%)	4 (12.9%)	6 (19.4%)	0.659
	Girl	19 (65.5%)	6 (20.7%)	4 (13.8%)	
2	**Age of using hearing aid**				
	≤ 2 years	2 (100.0%)	0 (0.0%)	0 (0.0%)	0.604
	2 - < 5 years	11 (78.6%)	2 (14.3%)	1 (7.1%)	
	≥ 5 years	27 (61.4%)	8 (18.2%)	9 (20.5%)	
3	**Length use of hearing aids**				
	< 1 year	11 (78.6%)	2 (14.3%)	1 (7.1%)	0.733
	1 - < 3 years	14 (58.3%)	5 (20.8%)	5 (20.8%)	
	≥ 3 years	15 (68.2%)	3 (13.6%)	4 (18.2%)	
4	**Risk factor**				
	Prenatal	34 (64.2%)	9 (17.0%)	10 (18.9%)	0.524
	Perinatal	4 (100.0%)	0 (0.0%)	0 (0.0%)	
	Postnatal	2 (66.7%)	1 (33.3%)	0 (0.0%)	
5	**Right hearing threshold**				
	Medium	1 (25.0%)	1 (25.0%)	2 (50.0%)	0.133
	Heavy	1 (33.3%)	0 (0.0%)	2 (66.7%)	
	Very Heavy	38 (71.7%	9 (17.0%	6 (11.3%)	
6	**Left hearing threshold**				
	Medium	1 (25.0%)	1 (25.0%)	2 (50.0%)	0.276
	Heavy	8 (61.5%)	2 (15.4%)	3 (23.1%)	
	Very Heavy	31 (72.1%)	7 (16.3%)	5 (11.6%)	
7	**Ear side implants**				
	Unilateral	13 (65.0%)	5 (25.0%)	2 (10.0%)	0.357
	Bilateral	27 (67.5%)	5 (12.5%)	8 (20.0%)	
8	**Hearing aid system**				
	Analog	14 (73.7%)	4 (21.1%)	1 (5.3%)	0.260
	Digital	26 (63.4%)	6 (14.6%)	9 (22.0%)	
9	**Communication method**				
	Verbal	8 (32.0%)	7 (28.0%)	10 (40.0%)	0.000
	Non-Verbal	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	Mix	32 (91.4%)	3 (8.6%)	0 (0.0%)	
10	**Education method**				
	Not yet in School	18 (81.8%)	2 (9.1%)	2 (9.1%)	0.000
	Public School	3 (20.0%)	4 (26.7%)	8 (53.3%)	
	Special School	19 (82.6%)	4 (17.4%)	0 (0.0%)	
11	**Communication duration**				
	≤ 6 Hours	23 (100.0%)	0 (0.0%)	0 (0.0%)	0.000
	> 6 Hours	17 (45.9%)	10 (27.0%)	10 (27.0%)	
12	**Frequency of therapy**				
	Routine	26 (57.8%)	9 (20.0%)	10 (22.2%)	0.036
	Not Routine	14 (93.3%)	1 (6.7%)	0 (0.0%)	
13	**Education period of parents**				
	≤ 16 years	8 (80.0%)	0 (0.0%)	2 (20.0%)	0.301
	> 16 years	32 (64.0%)	10 (20.0%)	8 (16.0%)	
14	**Parents income**				
	< 6 Million	24 (68.6%)	5 (14.3%)	6 (17.1%)	0.842
	6 - 15 Million	16 (64.0%	5 (20.0%)	4 (16.0%)	
15	**Therapy**				
	Speech Therapy	18 (90.0%)	2 (10.0%)	0 (0.0%)	0.020
	AVT & Speech Therapy	15 (62.5%)	4 (16.7%)	5 (20.8%)	
	AVT	4 (30.8%)	4 (30.8%)	5 (38.5%)	
	Not doing Therapy	3 (100.0%)	0 (0.0%)	0 (0.0%)	

Description : * Chi-square test, significant if p <0.05.

the surrounding environment for more than six hours per day, and 75% were having routine auditory verbal therapy, while 35% of subjects used swift 120+ type of hearing aids, which 68.33% of users utilised digital programmable. Most subjects (59.3%) attended special schools, and 38.33% parents had undergone education ≤ 16 years. As much as 58.33% of subjects' parents had an income between six to fifteen million per month. As the form of therapy, AVT and Speech Therapy was as much as 38.33%.

Based on the correlation shown in table 2, out of 40 children who used mixed communication, there were 91.4% who had low PEACH score and 8.6% had medium PEACH score. Out of 23 children who went to special schools 82.6% had low PEACH score and 17.4% had medium PEACH score. Out of 37 children who had communication duration more than 6 hours per day, 45.9% had low PEACH score, 27% had medium PEACH score, and 27% had normal PEACH score. Out of 45 children who had routine therapy 57.8% had low PEACH score, 20% had medium PEACH score, and 22.2% had normal PEACH score. Out of 23 children who underwent AVT and Speech Therapy, 62.5% had low PEACH score, 16.7% medium PEACH score and 20.8% normal PEACH score.

DISCUSSION

A total of 51.6% of the subjects were male. Our study finding was in accordance with a meta-analysis study conducted by Umek,[12] that girls expressed higher language ability than boys. Most subjects (89.8%) had prenatal risk factors. It has been estimated that bilateral sensorineural hearing loss (SNHL) occurs in approximately 1.86 of 1000 newborns. The prevalence of bilateral severe SNHL was previously reported to be 9.7% in neonates who survived with a very low birth weight (1500 g) and 16.7% in neonates who survived after neonatal seizure. Although the prevalence of severe SNHL in very low birth weight or preterm neonates has decreased in the past decade, it still remains significant, ranging from 0% to 4%.[13] The majority of subjects were fitted with hearing aids between the age of two to five years (61.7%), and 48.3% subjects had used hearing aid for between one to three years. As much as 38.33% parents had undergone education for ≤ 16 years. Earlier fitting of hearing aids was not significantly associated with better outcomes, however, children with hearing loss should get early intervention prior to 6 months old. It is unreasonable to delay amplification until the child is capable of providing a comprehensive behavioral audiogram.[9,10] Four predictors associated with better developmental outcomes for children using hearing aids, were 1) no additional disabilities, 2) female gender, 3) lesser degree of hearing loss, and 4) higher maternal education. Further research was necessary to better understand hearing aid use and the influence of consistent use towards developmental outcomes.[10] Mixed communication between verbal and non-verbal was used as a mean of daily communication by 58.33% of subjects, this is not in accordance with the research conducted by Dunn[14] which stated that children who used oral communication methods in daily activities had better articulation and word recognition compared to children with mixed communication. Most subjects (59.3%) attended special schools. As much as 58.33% of subjects parents had an income between six to fifteen million per month and 38.33% had AVT and Speech Therapy. Subjects communicating with parents and the surrounding environment for more than six hours a day was as much as 61.67%, and 75% of subjects were doing routine auditory verbal therapy. Subjects who routinely underwent auditory verbal therapy had better and statistically significant PEACH scores compared with subjects who did not routinely

got auditory verbal therapy (p = 0.0036). In this study, routine in undergoing auditory verbal therapy meant once a week therapy. Compliance with auditory verbal therapy was influenced by the economic ability and location of the parent's residence. Subjects who had parents with sufficient economic ability and living in large cities tended to be more routine in carrying out verbal auditory therapy.[15] Dorman,[16] in his research stated that routine auditory verbal therapy could improve receptive language skills and good language articulation. However, the intensity of therapy is not the dominant factor in influencing the auditory and speaking development in post-cochlear implantation children, because verbal auditory therapy without intensive interaction with the surrounding environment will produce unsatisfactory results.

Boucher-Jones,[17] in his research stated that auditory verbal therapy has a role in the development of communication through the interaction of several factors i.e. family and the surrounding environment, therapist factors, and individual factors. When family factors, the surrounding environment and individuals are good, the role of verbal auditory therapy will be effective.

The PEACH score in this study showed an average value of 52.63%, with 16.66% had a normal PEACH score (>75). The factors that had significant correlation with normal PEACH score were communication method, educational method, communication duration, frequency of therapy, and type of therapy applied.

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