Use of hearing assistance technology with students with hearing loss: identification of barriers and facilitators

Uso do sistema auxiliar de escuta com estudantes com deficiência auditiva: identificação de barreiras e facilitadores

Uso del sistema auxiliar de escucha com alunos com hipoacusia: identificación de barreras y facilitadores

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Abstract

Introduction: The signal-to-noise ratio in the classroom can be a villain in the inclusion of hearing-impaired students in regular school, users of electronic devices, that use the oral language to communicate. The technological resources are determinant for better audibility of speech sounds in noisy environments and their effectiveness depends on adherence to the use of the device. This process is determined by the partnership between health professionals, family and school. Objective: Identify the relation between the use of **remote microphone system** (RMS) in hearing impaired students and the use by teachers, which favored or hindered their adaptation and the school development of hearing-impaired students. **Method:** 175 subjects between 5 and 17 years of age who received the HAT in a hearing health service between the years 2017 and 2018 were analyzed. Parents and teachers of users were also subjects of the study. The functioning of the HAT and the classification regarding its use was verified. **Result:** Most of the individuals who 'use' HAT are in elementary school, and those who 'don't use it voluntarily' are in high

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school and middle school. Considering the type of school, most who 'don't use voluntarily' the HAT is in school or room for deaf students using sign language /or has interpreter in regular school. **Conclusion:** There was an association between the use of the HAT and the type of school. It is recommended that the type of school is a criterion for the indication of the device. The educational level was also a determinant variable in the use of the device at school.

Keywords: Hearing; Hearing aids; Wireless technology; Self-help equipment; Parents; Hearing loss

Resumo

Introdução: A relação sinal-ruído na sala de aula pode ser um vilão na inclusão na escola regular de alunos com deficiência auditiva, usuários de dispositivos eletrônicos, que utilizam a língua oral para se comunicar. Os recursos tecnológicos são determinantes para a melhor audibilidade de sons de fala em ambientes ruidosos e sua efetividade depende da adesão ao uso do dispositivo. Esse processo é determinado pela parceria entre profissionais da saúde, família e escola. **Objetivo:** Identificar a relação entre a utilização consistente do sistema de microfone remoto (SMR) em estudantes com deficiência auditiva e o uso pelos professores, que favoreceram ou dificultaram sua adaptação e o desenvolvimento escolar desses estudantes. **Método:** Foram analisados 175 sujeitos entre 5 e 17 anos que receberam o SMR num serviço de saúde auditiva entre os anos de 2017 e 2018. Pais e professores de usuários também foram sujeitos do estudo. O funcionamento do SMR e a classificação quanto ao seu uso foram verificados. **Resultado:** Os indivíduos que mais 'usam' o SMR estão no ensino fundamental I, e os que 'não usam voluntariamente' estão no ensino médio e fundamental II. Considerando-se o tipo de escola, a maioria que 'não usa voluntariamente' o SMR está em escola ou sala para surdos com uso de libras e/ou tem intérprete na sala da escola regular. **Conclusão**: Houve associação entre uso do SMR e tipo de escola. Recomenda-se que o tipo de escola seja um critério de indicação do dispositivo. O nível educacional também foi uma variável determinante no uso do dispositivo na escola.

Palavras chave: Audição; Auxiliares de audição; Tecnologia sem fio; Equipamentos de autoajuda; Pais; Perda auditiva

Resumen

Introducción: La relación señal-ruido en el aula puede ser un villano en la inclusión de estudiantes con discapacidad auditiva en la escuela normal, usuarios de dispositivos electrónicos que utilizan el lenguaje oral para comunicarse. Los recursos tecnológicos son cruciales para una mejor audibilidad de los sonidos del habla en ambientes ruidosos y su eficacia depende de la adherencia al uso del dispositivo. Este proceso está determinado por la asociación entre los profesionales de salud, familia y escuela. **Objetivo:** Identificar la relación entre el uso del sistema de micrófono remoto (SMR) en los alumnos con deficiencias auditivas y el uso por parte de los maestros, que han favorecido o dificultado su adaptación y el desarrollo escolar de los alumnos con deficiencias auditivas. **Método:** Se analizaron 175 sujetos de entre 5 y 17 años que recibieron el SMR en un servicio de salud auditiva entre los años 2017 y 2018. Los padres y maestros de los usuarios también fueron sujetos del estudio. Se ha comprobado el funcionamiento del SMR y la clasificación relativa a su uso. **Resultado:** Los individuos que "usan" más el SMR están en la escuela primaria, y los que "no usan voluntariamente" están en la secundaria. Considerando el tipo de escuela, la mayoría de los que "no usan voluntariamente" el SMR está en una escuela o sala para sordos con uso de libras y/o tiene un intérprete en la sala de la escuela regular. **Conclusión:** Hubo una asociación entre el uso del SMR y el tipo de la escuela. Se recomienda que el tipo de escuela sea un criterio para indicar el dispositivo. El nivel educativo, también fue una variable determinante en el uso del dispositivo en la escuela.

Palabras clave: Audición; Audífonos; Tecnología inalámbrica; Equipo de autoayuda; Padres; Pérdida de la audición

ARTICLES

Introduction

Families and the hearing health service have an essential role in the rehabilitation process of children with hearing loss to reduce the negative effects of hearing loss and oral communication[1]. Adherence to treatment is understood as a multifactorial process based on a partnership between those who provide care and those who are cared for; it concerns frequency, constancy and perseverance in the relationship with care in search of health[11,14].

Current early hearing impairment detection and intervention programs have enabled and made immediate access to the hearing environment through hearing aid devices. In addition to early access to audiological diagnosis and rehabilitation, the National Plan for the Rights of Persons with Disabilities - Living Without Limit - was established in 2011 by Decree 7,612 on November 17, 2011, highlighting the importance of access to education, social inclusion, health care and accessibility for people with disabilities, promoting their citizenship and autonomy and strengthening their participation in society.

In addition, Ordinance No. 1,274/GM/MS of the Ministry of Health was published in 2013, which includes the Frequency Modulated System (FM) in the list of procedures, drugs, orthoses, prostheses and special materials (SM) of the Brazilian Unified Health System (SUS), aiming at the implementation of new initiatives and intensifying the actions already in force by the government, for the benefit of people with disabilities, improving the access of these citizens to basic rights, such as education. In this context, users of hearing aids (HA) or cochlear implants (CI), aged five to 17 years, especially those who have speech recognition skills, were able to use the SUS to have access to this device, which may facilitate their learning in the school environment.

FM technology captures the voice of the interlocutor, who can be the teacher, therapist, or parents, through a microphone connected to a transmitter and sends the signal wirelessly (through harmless radio waves) to a receiver connected to the hearing aids or to the cochlear implant, in order to mitigate problems related to distance, noise and reverberation, improving the signal/noise ratio in different environments.

Frequency modulated technology has evolved in recent years to digital transmission technology, which is being made available with the same goal of facilitating communication in noisy environments. Although using different technologies, these devices have the same function and advantages as the FM system[23]. The difference between the technologies is the transmission of the digital and adaptive signal, which results in an improvement in the quality of access to speech information, regardless of background noise, and easier use. This study chose to use the term Remote Microphone Systems (RMS) nomenclature to address all technologies involving wireless transmission.

The use of RMS favors the school performance of students with hearing loss, as it provides better access to speech sounds in noisy environments. However, its effective use necessarily involves the partnership between health and education professionals, as well as the participation of the family[3,8,9,12,15,22].

Regardless of the technological device used (HA or CI), hearing impaired children demand greater effort than their hearing peers to be able to understand the spoken message, especially in the school environment[10]. Therefore, technology can be a strong partner in the process of including hearing impaired children in regular primary education. The availability of new equipment has generated new demands on its users, which for RMS includes children, parents and teachers.

Inclusive education is a worldwide movement based on political, cultural, social and pedagogical actions that has been triggered in defense of the right of all students to share the same educational environment, and to learn and participate without any discrimination. This education is based on the premise that students need to be understood in an individualized and collaborative way, according to their skills and difficulties in group learning.

This approach was consolidated in Brazil in 2008 with the creation of the National Policy on Special Education in the Perspective of Inclusive Education, which established a new milestone in Brazilian education by defining special education as a non-substitutive modality to schooling. "The National Policy on Special Education in the Perspective of Inclusive Education[5] established that special educational care should consist of a set of educational resources and support strategies made available to students, providing them with different care alternatives, according to their individual needs, to ensure support for the specificities of

students that are not developed in the regular classroom"[2].

In this sense, and based on the political and pedagogical legal frameworks of inclusive education, the Brazilian Ministry of Education (MEC) acts to ensure the right of all to regular education. The inclusion of students with hearing disabilities in schools is ensured by law, including the Law of Guidelines and Bases of National Education (LDBN) no. 9,394/96, which was enacted in 1996, as well as decree no. 5.296 on December 2, 2004, which regulates Law No. 10,048, on November 8, 2000, giving priority to assisting people with disabilities[4].

In order to favor total or assisted personal autonomy (Law No. 5,296 on December 2, 2004) of people with hearing impairment, assistive technology refers to technical aids; that is, products, instruments, equipment or technologies adapted or specially designed to improve accessibility for people with disabilities [4].

Inclusion is also associated with the concept of accessibility, which is a way of promoting equal conditions for all, providing equal treatment and allowing access to regular education. Education systems must provide conditions for access to available resources that favor learning and meet the educational needs of all students. Accessibility must be ensured by eliminating barriers in communication and information [5].

The success of school inclusion depends on multifactorial aspects, such as the family-school and health-school interface, so that the school context can be supported by networks, such as specialized educational assistance, thus favoring the changes required for the full development of the student [17].

With respect to hearing health services, especially regarding adherence to the rehabilitation process and its interaction with the community is the school, the partnership with parents and schools has been a challenge faced in everyday life. The participation of parents and the school during the process is essential for the treatment to be successful [18]. With the implementation of the remote microphone system in the child's daily life, family adherence is essential, as well as teachers' adherence, as they will use the RMS for the benefit of students with hearing impairment.

In general, teachers have received little or no guidance regarding the special needs of students who have orality as the main form of communication, and who still require educational adjustments to have conditions similar to those of their hearing peers [13,16].

Therefore, these issues and the need to evaluate new adaptation and guidance protocols for parents and teachers in the initial stages of using RMS in the classroom led this study to investigate the factors associated with family characteristics and perspectives that impact on the use of RMS in the school routine.

Thus, seven years after the grant of the remote microphone system by SUS, this study is associated with the evaluation of these processes in order to improve them since the first steps. According to the Health Service accredited by the Brazilian Unified Health System (SUS) as Specialized Rehabilitation Center II (CER) - Auditory and Intellectual, there are about 471 remote microphone systems granted in São Paulo, which allows an analysis of the reality of use in different regions of the municipality.

Adherence to the use of the device by teachers of students with hearing impairment in the classroom depends on factors related to: family, characteristics of the school and of the teacher, age and level of education of the student, which may favor or hinder use in everyday school use. Thus, the objective of this work was to identify the relationship between the consistent use of the remote microphone system (SMR) in hearing impaired students and characteristics of the family and schools of hearing impaired students.

Method

This is a qualitative and quantitative descriptive study, conducted with students with hearing impairment who received a RMS, their teachers and family members. This study was approved by the Research Ethics Committee of the Pontifícia Universidade Católica de São Paulo and Plataforma Brasil under the opinion no. 1.110.125 (CAEE – 45415514.1.0000.5482).

The study analyzed 175 subjects with mild to profound sensorineural hearing impairment who received a RMS and undergo audiological monitoring at a Health Service accredited by the Unified Health System (SUS) as a Specialized Rehabilitation Center II (CER) - Auditory and Intellectual in São Paulo. The study was selected based on data collection between January and December 2017

and 2018. Parents and teachers of RMS users were also considered subjects of this study.

Study participants are registered users of CER II according to the following criteria: having received the RMS between five to 17 years of age by SUS at Derdic/PUC-SP as established in Ordinance no. 1274/2013-MS.

Data were collected during the follow-up consultation of the user in audiological monitoring and hearing aid verification at the institution.

In addition to the application of the socioeconomic status questionnaire (Brazilian Economic Classification Criteria, 2018), semi-open interviews were conducted with parents to collect data on: educational level of parents or guardians; type of school attended by the student (regular; regular with an interpreter; special - Brazilian Sign Language (BSL)) and classified as municipal, state and private); language used in the school (BSL; BSL-interpreter and oral Portuguese); and level of education of the student (Elementary School I (ES-I), Elementary School II (ES-II), High School and High School Equivalency).

The operation of the RMS was verified during this audiological monitoring, and the use of the RMS was classified in the following categories:

Yes – using RMS
- For regular use at school

Not using RMS - involuntarily
- RMS being repaired
- RMS has been lost/stolen
- Teacher refused to use RMS at school

Not using RMS voluntary
- Device was returned
- Attends a Special school (BSL)
- Student refused to use RMS at school

The evaluation material and instruments of the study included the records from the subjects' medical records in the protocol, computer, and socioeconomic classification questionnaire (Brazilian Economic Classification Criteria, 2015).

At first, data analysis investigated the association between the use of the RMS and each of the variables: socioeconomic status, educational level of the guardian, type of school, language used in the school and educational level of the student.

The likelihood-ratio test was applied to assess the association between the use of the RMS and qualitative variables, while the technique of analysis of variance was used with quantitative variables. In this case, the Tukey's test was used to find the differences between the means in the three categories of use, when necessary[25].

The assumptions of normality and equality of variances were assessed by the analysis of the residuals. When gross deviations from these assumptions were observed, the analysis was complemented by the Kruskal-Wallis Test, while the Dunn's Test was used in the differences between the distributions of the response variable in the three categories of use of the RMS[24].

The variables that resulted in a p-value lower than 0.25 in the analysis reported above were selected as explanatory variables in a logistic regression model. As the use of RMS has three categories, a nominal logistic regression model could be adjusted[25]. However, the adjustment was made using two binary logistic regression models: one including the categories 'yes' and 'no voluntary use', and another including the categories 'yes' and 'no involuntary use'.

The estimates of the coefficients obtained in this way are consistent estimates of the coefficients of the nominal logistic regression model and often involve only a moderate loss of efficiency[25]. The forward stepwise variable selection procedure was used to select the explanatory variables in the final models. A significance level of 0.05 was established for hypothesis tests.

Logistic regression models were adjusted as described to assess the joint behavior of the variables analyzed above in explaining the use of the RMS. The variables whose analysis shown above obtained a p-value lower than 0.25 were initially selected as the explanatory variables in the model.

Thus, the following variables were selected at first: type of school, language used in school and educational level. Based on the results of the above analysis, the type of school was divided between BSL (special school) or others (municipal, state and private) and the language used in school was divided between oral Portuguese or BSL (BSL and BSL - Interpreter).

Result

From the launch of the ordinance no. 1274/2013-MS to 2019, 471 Remote Microphone System (RMS) have already been delivered to the Health Service accredited by the Brazilian Unified Health System (SUS) as Specialized Rehabilitation Center II - Auditory and Intellectual, according

to the criteria of the Ordinance no. 1,274/GM/MS/2013-MS.

Considering the entire sample (n= 71) of those who received the remote microphone system, 54% were male and 46% were female.

Regarding the age at which they received the RMS, the average age was 12 years (SD=3.5; median=12.21; min=5; max=17), ranging from five to 17 years of age, according to the criteria of the Ministry of Health's FM Ordinance.

A data cut was performed in 2017 and 2018, when 175 subjects returned to the institution for a follow-up visit. Of these, 81 (47%) were male and 94 (53%) were female.

Of the 175 subjects who participated in the study, 9 students were excluded (8 graduated and 1 subject who attended daycare). Therefore, 166 participants were included in the analysis.

Regarding socioeconomic status, the majority of participants (54%) were from the socioeconomic class B2+C1. In turn, in relation to the educational level of legal guardian, 62% of the legal guardians had an educational level higher than 'Complete high school'.

As for the use of the device at school, 60 (36.1%) used the RMS at school, while 47 (28.3%) did not use it involuntarily and 59 (35.6%) did not use it voluntarily.

Table 1 shows the frequency and percentage distributions of RMS use in males and females. There was no association between the use of the RMS and the gender (p=0.330).

Table 1. Frequency and percentage distributions of RMS use in males and females

Gender	Use of RMS			Total
	Yes	Not using-involuntary	Not using-voluntary	
Female	34	26	26	86
	39.5%	30.2%	30.2%	100.0%
Male	26	21	33	80
	32.5%	26.3%	41.3%	100.0%
Total	60	47	59	166
	36.1%	28.3%	35.5%	100.0%

Table 2 shows the distribution of use of the RMS and the socioeconomic level. It was possible to observe a higher percentage of children who used the RMS from the socioeconomic level A+B1. However, there was no association between the use of the RMS and the socioeconomic level (p=0.469).

Table 2. Distribution of frequencies and percentages of use of RMS according to the socioeconomic status

Socioeconomic status	Use of RMS			Total
	Yes	Not using-involuntary	Not using-voluntary	
A+B1	6	1	3	10
	60.0%	10.0%	30.0%	100.0%
B2+C1	30	28	31	89
	33.7%	31.5%	34.8%	100.0%
C2+D+E	24	18	25	67
	35.8%	26.9%	37.3%	100.0%
Total	60	47	59	166
	36.1%	28.3%	35.5%	100.0%

As for the educational level of legal guardian (Table 3), the highest percentage of individuals who used the RMS ('yes') also had 'complete higher education', while the highest percentage of those who answered 'no voluntary use' was recorded in the 'Complete elementary school I/ incomplete elementary school II' category. There was no association between the use of the RMS and the educational level of the guardian (p=0.882).

Table 3. Distribution of frequencies and percentages of use of RMS according to the educational level of legal guardian

Educational level of legal guardian	Use of RMS			Total
	Yes	Not using-involuntary	Not using-voluntary	
0	3	3	2	8
	37.5%	37.5%	25.0%	100.0%
1	7	5	11	23
	30.4%	21.7%	47.8%	100.0%
2	11	11	10	32
	34.4%	34.4%	31.3%	100.0%
4	27	22	28	77
	35.1%	28.6%	36.4%	100.0%
7	12	6	8	26
	46.2%	23.1%	30.8%	100.0%
Total	60	47	59	166
	36.10%	28.30%	35.50%	100.00%

Legend:
0=Illiterate/incomplete elementary school I
1=Complete elementary school I/incomplete elementary school II
2=Complete elementary school II/incomplete high school
4=Complete high school/incomplete higher education
7=complete higher education

Table 4 shows that the majority of children attending special school (BSL) did not use the RMS voluntarily. The distributions of the percentages of use observed in the other three types of schools are similar. There was an association between the use of RMS and type of school (p=0.028).

The analysis was redone excluding children from the special school (BSL) and including only state, municipal or private schools; there was no association between the use of the device and the type of school (p=0.744).

Table 4. Distribution of frequencies and percentages of use of RMS according to the type of school

Type of school	Use of RMS			Total
	Yes	Not using-involuntary	Not using-voluntary	
State School	11	13	10	34
	32.4%	38.2%	29.4%	100.0%
BSL	0	2	8	10
	0.0%	20.0%	80.0%	100.0%
Municipal School	30	20	24	74
	40.5%	27.0%	32.4%	100.0%
Private	19	12	17	48
	39.6%	25.0%	35.4%	100.0%
Total	60	47	59	166
	36.1%	28.3%	35.5%	100.0%

The results in Table 5 show that the majority of children who do not use the RSM voluntarily attend schools in which the language used is BSL and/or an interpreter, as opposed to the results when the language is oral Portuguese. In fact, there was an association between the language used and the use of the RMS (p=0.028).

The analysis was redone including only children who attend school in which the language used is BSL/interpreter and there was no association between the language used and the use of the RMS (p=0.080).

The standardized residuals in Table 5a indicate that the reported frequency of individuals who do not use the RMS voluntarily in the school in which the language is BSL/interpreter is higher than expected under the hypothesis of non-association of the two variables; when the language at school is oral Portuguese, the frequency of those who do not use the RMS voluntarily is less than expected under the hypothesis of non-association.

Table 5. Distribution of frequencies and percentages of use of RMS according to the language used in school

Language used in school	Use of RMS			Total
	Yes	Not using-involuntary	Not using-voluntary	
BSL	0	4	19	23
	0.0%	17.4%	82.6%	100.0%
BSL - Interpreter	1	0	6	7
	14.3%	0.0%	85.7%	100.0%
Oral Portuguese	59	43	34	136
	43.4%	31.6%	25.0%	100.0%
Total	60	47	59	166
	36%	28%	36%	100%

Table 5a. Standardized residuals obtained in the analysis of the association between the use of the SMR and the language used in school

Language used in school	Use of RMS		
	Yes	Not using-involuntary	Not using-voluntary
BSL	-2.9	-1	3.8
BSL - Interpreter	-1	-1.4	2.2
Oral Portuguese	1.4	0.7	-2.1

Table 6 shows that the highest percentage of individuals who used the RMS attended elementary school I, while the majority of individuals who did not use the RMS voluntarily attended high school and elementary school II. In fact, there was an association between the educational level and the use of the device (p=0.032).

Table 6. Distribution of frequencies and percentages of use of RMS according to the **educational level**

Educational level	Use of RMS			Total
	Yes	Not using-involuntary	Not using-voluntary	
Elementary school I	37	22	21	80
	46.3%	27.5%	26.3%	100.0%
Elementary school II	15	21	29	65
	23.1%	32.3%	44.6%	100.0%
High school	8	4	9	21
	38.1%	19.0%	42.9%	100.0%
Total	60	47	59	166
	36.1%	28.3%	35.5%	100.0%

RMS usage categories: Not using RMS - involuntarily and use of RMS.

The logarithm of the probability of using/not using the RMS involuntarily was modeled in this part of the analysis; that is, the logarithm of the chance of using the RMS.

The chance of using in relation to not using the RMS involuntarily was not associated with the type of school, the language used in the school and the educational level.

RMS usage categories: Not using RMS voluntary and use of RMS.

The logarithm of the probability of using/not using the RMS voluntarily was modeled in this part of the analysis; that is, the logarithm of the chance of using the RMS.

The language used in the school (p<0.001) and the educational level (p=0.028) were selected as part of the model. None of the other variables contributed to explain the logarithm of the chance

to use the RMS in relation to not voluntarily using the RMS. Table 7 shows the values of the coefficients of the variables in the model and the respective standard errors.

The relation to language used at school and educational level is qualitative; each of them has a reference category. For the language used at school, the BSL was the reference category and the coefficient of 3.8 corresponds to the increase in the logarithm related to the chance to use a RMS in relation to not voluntarily using the RMS, when the language spoken at school was oral Portuguese and not BSL, for the same educational level.

In turn, the reference category for the educational level was elementary school I. The coefficient of primary education II of -1.24 corresponds to the decrease in the logarithm of the chance of using the RMS in relation to not voluntarily using it, when the educational level was the elementary school II and not the elementary school I, for the same language spoken in the school.

Table 7. Estimates of coefficients and standard errors obtained when adjusting the logistic regression model when considering 'no voluntary use' and 'yes' categories

Term	Coefficient	Standard error
Constant	-2.66	1.04
Language at School		
Oral Portuguese	3.80	1.05
Educational level		
High school	-0.87	0.63
Elementary school II	-1.24	0.48

The interpretation of the coefficients is usually presented in terms of odds ratios, as follows:

- the chance of using the RMS in relation to not using it voluntarily when the language spoken at school is oral Portuguese is 44.5 times the chance of using the RMS in relation to not using it voluntarily, when the language spoken is BSL (note that the confidence interval does not include the value 1);
- the chance of using the RMS in relation to not using it voluntarily when the educational level is elementary school II is 0.3 times the chance of using the RMS in relation to not using it voluntarily when the educational level is elementary school I (note that the confidence interval does not include the value 1);

The chances of using the SMR in relation to not using it voluntarily are equal in the two categories of educational level compared, with no statistically significant difference.

Discussion

This study aimed to identify barriers and facilitators in the use and adherence of RMS in students with hearing impairment, correlating the variables that facilitate or hinder this process. To this end, the 471 RMS that were delivered to patients were investigated to analyze the cases and verify the variables included in this process.

A data cut was carried out in 2017 and 2019 to select a sample of 166 subjects who received a RMS by Derdic and have follow-up visits at the institution.

The distribution of RMS was balanced between genders in this study, which varies from study to study according to the sample used.

Regarding the age at which the students received the RMS, the average age was 12 years (SD=3.5; median=12.21; min=5; max=17), ranging from five to 17 years of age. It was possible to notice that the distribution was homogeneous in all the age groups included, which is in line with the criteria established in the FM Ordinance of the Ministry of Health[19]. Other national studies have evaluated subjects in the same age group, since the RMS use at school age is decisive for the academic performance of students with oral hearing impairment[3,21].

Since there are no data describing a significant difference in the consistency of use and the genders,

the findings regarding the use of the device and gender are consistent with the literature [7,20].

There was no association between the use of RMS and the socioeconomic level and educational level of legal guardian in this study. Similarly, another study carried out by Spósito analyzed 310 medical records of adolescents through the collection of demographic, socioeconomic data and the consistency of use of the SMR, and also found no relationship between these variables[20]. As reported in another study[26], there was also no significant difference in the relationship between these variables in the analysis of the relationship between the use of PSAP and the socioeconomic status.

Although the majority of users report the use of the device at school, some of the subjects reported that they did not use it unintentionally due to the device being repaired, having been lost/stolen or because the teacher refused to use the RMS in the school environment.

Regarding the third group, the majority of children who attended a special school (BSL) and used BSL as a means of communication do not use the RMS voluntarily. Some situations may explain these results, such as students not wanting to use it, not seeing benefit from the use of the device, or being ashamed of using it, both in the sense of feeling different from the others, as well as having to approach the teachers and/or studying at a school that uses BSL as a form of communication. These data are in line with the reasons explained in another study described in the scientific literature[20].

The family has an essential role in the effective use of the RMS, as they will be responsible for articulating the communication between health and school, favoring a more effective use in school daily life. Adherence to treatment is understood as a multifactorial process based on a partnership between those who provide care and those who are cared for; it concerns frequency, constancy and perseverance in the relationship with care in search of health[11,14,21].

When comparing the use of RMS with the type of school (special and regular), the first analysis shows that there is a significant association between the use of RMS and the type of school. On the other hand, when the analysis was redone excluding children from the special school and including only state, municipal or private schools, there was no association between the use of the device and the type of school. This result is in line with the

National Policy on Special Education in the Perspective of Inclusive Education, in which the use of BSL is performed by an interpreter or in a special school (Municipal School of Bilingual Education for the Deaf - EMEBS), while orality is the main means of communication in regular school, recommending the use of assistive technology (RMS) so that children achieve greater school performance[5].

The RMS is not expected to be used in the special school, as the BSL is the main means of communication in this environment. In contrast to oral Portuguese, BSL is a space-visual language, since the use of RMS aims to mitigate the effect of the distance between the interlocutor and the hearing impaired child. The majority of children who do not use the RSM voluntarily attend schools in which the language used is BSL and/or an interpreter, as opposed to the results when the language is oral Portuguese. In fact, there was an association between the language used and the use of the RMS. This is also in line with ordinance no. 1,274 that regulates the RMS, which defines that they must "Master the oral language or it must be in the development phase and must demonstrate speech recognition skills in silence in performance evaluation", in addition to studying in a school where orality is not the main means of communication, as the device loses its meaning as assistive technology[4,19]. Given the above, the type of school should be included as a criterion for indicating the device. Considering the factors mentioned, the language used at school is a factor to be considered when indicating the device.

The student's educational level also had an impact on adherence to the use of the RMS, since most of the individuals who used the RMS attended elementary school I. It may be explained by the fact that there is only one teacher responsible for the class, favoring the use of the device in the classroom. As well as students who did not use the RMS voluntarily attended high school and elementary school II, which have a greater number of teachers per classroom. In fact, there was a significant association between the educational level and the use of the device. These data are consistent with international and national studies, which report that the RMS is most used by children attending elementary school I[7,8,20].

Seven years after the implementation of the RMS ordinance, providing the device to children who meet the criteria is clearly not enough for them to use the device at school. The use of RMS depends on a number of factors that have been mentioned above for the proper use of the device. However, some aspects reported in the study could be included in the Ordinance as new criteria for indicating the RMS, such as the language used at school (oral/BSL) and the type of school attended by the child (regular or special).

Conclusion

The study allowed concluding that the use of the RMS was not associated with the socioeconomic status, the educational level of the guardian or the child's gender.

However, a statistically significant association was found between the use of RMS and type of school. In this sense, children who attend special schools that use BSL on a daily basis, tend not to use the SMR by their own choice. Therefore, the type of school should be included as a criterion for indicating the device. The language used at school is a factor to be considered when indicating the device.

Although the comparison between state schools that use oral Portuguese, municipal or private, showed no association between the use of the RMS and this type of school, the educational level was a determining variable for the use of the device at school.

The educational level was presented as a determining variable in the use of the device at school, when analyzed in isolation. Children who attended Elementary School I used the device more often. However, in the multifactorial analysis, other factors seem to interfere in this result.

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