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Investigation of the knowledge of teachers of regular schools of a region of the Federal District about the frequency modulation system

Investigação do conhecimento de professores de escolas regulares de uma região do Distrito Federal sobre o sistema de frequência modulada

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ABSTRACT

Purpose: To investigate the knowledge of regular schoolteachers regarding the Frequency Modulated System (FM). **Methods:** The study involved 48 teachers from five regular public schools and used a structured questionnaire with questions related to the FM system. A significance level of 5% was adopted for all inferential statistical analyzes. **Results:** We observed statistically significant proportions of teachers who were unaware of the FM system and its functions for all schools. There was no difference in basic knowledge about the device depending on the school system in which the teachers work. **Conclusion:** Teachers of early childhood and elementary education in five public schools in the region of Samambaia, in the Federal District, are unaware of the functioning, components and benefits of the Frequency Modulation System (FM System), so they may not be prepared to use this device in classroom. However, these professionals show an interest for training on the topic.

Keywords: Self-help devices; Hearing impairment; School teachers; Child; Surveys and questionnaires

RESUMO

Objetivo: investigar o conhecimento de professores de escolas regulares quanto ao Sistema de Frequência Modulada (Sistema FM). **Método:** participaram do estudo 48 professores de cinco escolas públicas regulares. Foi aplicado um questionário estruturado com questões relacionadas ao Sistema FM. Adotou-se um nível de significância de 5% para todas as análises estatísticas inferenciais. **Resultados:** observaram-se, para todas as escolas, proporções estatisticamente significativas de professores que desconheciam o Sistema FM e suas funções. Não houve diferença no conhecimento básico sobre o dispositivo em função da etapa de ensino em que os professores trabalhavam. **Conclusão:** os professores da educação infantil e ensino fundamental de cinco escolas da rede pública da região de Samambaia, no Distrito Federal, desconheciam o funcionamento, componentes e benefícios do Sistema FM, de modo que podem não estar preparados para o uso desse dispositivo em sala de aula. No entanto, esses profissionais demonstraram interesse em participar de cursos de capacitação sobre o tema.

Palavras-chave: Tecnologia assistiva; Perda auditiva; Professores escolares; Criança; Inquéritos e questionários

Study carried out at Centro Universitário Planalto do Distrito Federal – UNIPLAN – Brasília (DF), Brasil.

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Conflict of interests: No.

Authors' contribution: VLDF participated as advisor of the study, idealizing and carrying out its conception and design, data interpretation, article preparation, critical review of important intellectual content and approval of the version to be published; CAC, ISS and JMFER contributed to the collection, analysis and interpretation of data and preparation of preliminary versions of the article.

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INTRODUCTION

The Brazilian Federal Government highlights the commitment to inclusive education. The proposal of the “*Viver sem Limite*” (Living Without Limits) plan proposes the articulation of governmental policies to access education, social inclusion, health care and accessibility⁽¹⁾. It is also the duty of the State to guarantee free mandatory basic education from 4 to 17 years of age, with the division made as follows: pre-school, elementary school and high school⁽²⁾. Pre-school includes teaching children between 4 and 5 years of age; elementary education, for students aged 6 to 14, and, finally, high school deals with education for students aged 15 to 17⁽²⁾.

Although the use methods and techniques that meet the needs of students with disabilities at all educational levels⁽²⁾ is ensured by the State, there is evidence of little participation of support professionals, as well as the availability of teaching materials and resources for the educational practice of this population. Without the effective participation of the support team, teachers work without further information about the difficulties presented by the student, so that the naturalization of existing conditions becomes a possible barrier to changes⁽³⁾. In general, teachers are ideologically favorable of inclusion, but do not have enough knowledge to operationalize the proposal of inclusive education⁽⁴⁾.

Regarding hearing impairment (HI), it is known that, in addition to dealing with the student's difficulty, the teacher must also be able to use electronic devices applied to deafness and/or other accessibility devices.

Assistive technology concerns products, equipment, devices, resources, methodologies, strategies, practices and services that aim to promote functionality related to the activity and participation of people with disabilities or reduced mobility, aiming at their autonomy, independence, quality of life and social inclusion⁽⁵⁾. On June 25, 2013, with the publication of Ordinance 1,274⁽⁶⁾, the Frequency Modulation System (FM System) became part of the accessibility devices provided by the Unified Health System (UHS). Since then, hearing health services from all over the country started to organize themselves to adapt this device to individuals with hearing impairment, aged 5 to 18 years old. More recently, with the publication of Ordinance No. 3, of February 19, 2020, the use of the FM System was expanded, within the scope of UHS, to individuals with hearing impairment of any age, enrolled at any academic level⁽⁷⁾.

The FM System is a device used to complement the adaptation of the individual sound amplification device (hearing aid) and/or cochlear implant (CI)⁽⁸⁾, being considered as the most advantageous approach to improve speech recognition in noise in this population⁽⁹⁾. The equipment has as components a transmitter, which consists of a wireless microphone, used by the emitter, and a receiver, part that is attached to the device used by the individual with hearing impairment.

In the case of the school environment, the teacher uses the transmitter, which captures the signal and sends it, by frequency modulation, directly to the receiver. Among the justifications for not using or partially using the FM System, users of cochlear implants complain about the excessive body noise of the teacher and the fear of taking the device to school⁽¹⁰⁾. Measures such as teacher support programs can occasionally reflect on the relationship of this professional with his students and on the

academic development of children with hearing impairment⁽⁴⁾. At the same time, before any intervention related to health promotion, it is necessary to assess the knowledge of the population for which it is intended to promote the action^(11,12).

Given the above, this study aimed to investigate the knowledge of regular schoolteachers in a given region of the Federal District about the Frequency Modulation System.

METHODS

This study started after approval by the Research Ethics Committee of “Centro Universitário UNIEURO/DF”, under protocol No. 2,873.138.

The sample was selected for convenience, and the participating teachers were those who were in the schools but outside the classroom when the researchers visited. They were willing and available to participate in this study. The representativeness is unknown, since we had no access to data on the total number of teachers in each educational institution.

Thus, the sample consisted of 48 teachers of early childhood and elementary education from five public schools, in the region of Samambaia, Distrito Federal. Participants signed the Informed Consent Form (ICF) attesting their participation in the study.

The schools where the data were collected were those authorized by “Coordenação Regional de Ensino de Samambaia”. The following inclusion criteria were adopted: teachers with a complete college degree and who had been active in education for at least one year. The following exclusion criteria were assigned: teachers who were not teaching at the time of the research; teachers with academic training in any area of health, including speech therapy. After signing the informed consent form, the participants answered a structured questionnaire (Appendix 1).

Due to the lack of specific instruments to assess the teachers' knowledge specifically about the FM System, the questionnaire used was prepared by the authors of this study. It consists of 15 simple questions with “yes” or “no” answer options, related to the teachers' knowledge about electronic devices applied to deafness, about the FM System, receiving guidance on these technologies and possible participation in training courses. This was the first time that the questionnaire was used and there was no previous validation.

The data were analyzed using descriptive and inferential statistics. The SPSS 25.0 software was used.

All variables that composed the questionnaire used to analyze basic knowledge about the FM System in teachers are nominal qualitative and were analyzed descriptively, by frequency and percentage.

For the inferential statistical analysis, the proportion of categories for each question was compared, for each learning stage, using the Two Proportions Equality Test. For questions with multiple categories, the category with the highest proportion was considered as a comparison point.

The sample was composed of subgroups with few participants, which, being a nominal qualitative variable, made it difficult to establish a direct relationship for comparison between schools. Thus, for comparative analysis, we chose to consider the large groups of classifications, which are the learning stages, using Pearson's Chi-Square test for the comparison between these stages.

A significance level of 5% was adopted for all inferential statistical analyzes.

RESULTS

Of the 48 participants, 9 were teachers of early childhood education, 25 were teaching in the initial grades of elementary school (1st to 5th grade) and 14 were teaching in the final grades of elementary school (6th to 9th grade).

In the early grades schools, there was a higher proportion of teachers who had never heard of the FM System and were unaware of its function and benefits, not being prepared to use the technology in the classroom. However, there was also a greater proportion of teachers who showed interest in participating in training (Table 1).

The same results were also observed for the stages of basic education - final grades (Table 2) and early childhood education (Table 3).

There was no difference in the basic knowledge about the FM System due to the learning stage in which the teachers worked (Table 4).

DISCUSSION

In the present study, we observed that more than half of the interviewees never taught students with hearing impairment. Of these, only 22.3% said they had already received guidance on hearing impairment, and only 14.8% said they had already received guidance on hearing aids and/or CI. It is known that the objective of the current educational policy is the inclusion of children with disabilities in regular education⁽²⁾. However, for this to happen properly, there must be an adaptation of the school environment and the training of civil servants⁽¹¹⁾.

A study carried out with teachers of hearing-impaired children, users of hearing aids and/or CI, who were in the

Table 1. Analysis of the proportion of answers to questions about the basic knowledge of the Frequency Modulation System in teachers of the initial grades of elementary school

Variable	Categories	Attendance	Percentage	p-value
At some point in your professional career, has your classroom ever been attended by a student with HI?	No	10	40.0	0.168
	Yes	15	60.0	
Have you received any guidance on HI, its causes and main developmental consequences?	No	16	64.0	0.095
	Yes	9	36.0	
Have you ever had students using hearing aids?	No	14	56.0	0.279
	Yes	11	44.0	
Have you ever had students using CI?	No	19	76.0	Ref.
	NA	1	4.0	0.025*
	Yes	5	20.0	0.015*
Have you received any guidance on hearing aid or IC devices?	No	22	88.0	0.003*
	Yes	3	12.0	
Have you heard about the FM System?	No	22	88.0	0.003*
	Yes	3	12.0	
Do you know what the function of the FM System is?	No	24	96.0	<0.001*
	Yes	1	4.0	
Do you know what the benefits of the FM System are for the hearing-impaired child in a school environment?	No	22	88.0	0.003*
	Yes	3	12.0	
Do you know what are the components of the FM System?	No	24	96.0	<0.001*
	Yes	1	4.0	
Did you know that one of the components of the FM System should be used by the teacher?	No	19	76.0	Ref.
	NA	3	12.0	0.020*
	Yes	3	12.0	0.020*
If today you received a hearing-impaired student, user of the FM System, in your classroom, would you know how to handle and deal with this technology?	No	23	92.0	0.002*
	Yes	2	8.0	
Have you received any guidance on the FM System?	No	24	96.0	<0.001*
	Yes	1	4.0	
In your opinion, would a training course aimed at teachers on the issues investigated in this questionnaire help with regard to the treatment of children with hearing impairment in the school environment?	No	3	12.0	0.003*
	Yes	22	88.0	
Would you participate in a training course like this?	No	1	4.0	0.001*
	NA	1	4.0	0.001*
	Yes	23	92.0	Ref.

*p<0.05 – Two Proportions Equality Test

Subtitle: HI = hearing impairment; CI = cochlear implant; FM System = Frequency Modulation System; NA = no answer; Ref. = Highest proportion category used as a basis for comparison

Table 2. Analysis of the proportion of answers to questions about basic knowledge about the Frequency Modulation System in teachers of the final grades of elementary school

Variable	Categories	Attendance	Percentage	p-value
At some point in your professional career, has your classroom ever been attended by a student with HI?	No	10	71.4	0.087
	Yes	4	28.6	
Have you received any guidance on HI, its causes and main developmental consequences?	No	5	35.7	0.167
	Yes	9	64.3	
Have you ever had students using hearing aids?	No	11	78.6	0.042*
	Yes	3	21.4	
Have you ever had students using CI?	No	11	78.6	0.042*
	Yes	3	21.4	
Have you received any guidance on hearing aid or CI devices?	No	9	64.3	0.167
	Yes	5	35.7	
Have you heard about the FM System?	No	13	92.9	0.006*
	Yes	1	7.1	
Do you know what the function of the FM System is?	No	13	92.9	0.006*
	Yes	1	7.1	
Do you know what the benefits of the FM System are for the hearing-impaired child in a school environment?	No	13	92.9	0.006*
	Yes	1	7.1	
Do you know what are the components of the FM System?	No	13	92.9	0.006*
	Yes	1	7.1	
Did you know that one of the components of the FM System should be used by the teacher?	No	13	92.9	0.006*
	Yes	1	7.1	
If today you received a hearing-impaired student, user of the FM System, in your classroom, would you know how to handle and deal with this technology?	No	13	92.9	0.006*
	NA	1	7.1	
Have you received any guidance on the FM System?	No	13	92.9	0.006*
	Yes	1	7.1	
In your opinion, would a training course aimed at teachers on the issues investigated in this questionnaire help with regard to the treatment of children with hearing impairment in the school environment?	Yes	14	100.0	
Would you participate in a training course like this?	Yes	14	100.0	

*p<0.05 – Two Proportions Equality Test

Subtitle: HI = hearing impairment; CI = cochlear implant; FM System = Frequency Modulation System; NA = no answer; Ref. = Highest proportion category used as a basis for comparison**Table 3.** Analysis of the proportion of answers to questions about basic knowledge about the Frequency Modulation System in teachers of early childhood education

Variable	Categories	Attendance	Percentage	p-value
At some point in your professional career, has your classroom ever been attended by a student with HI?	No	7	77.8	0.092
	Yes	2	22.2	
Have you received any guidance on HI, its causes and main developmental consequences?	No	5	55.6	0.365
	Yes	4	44.4	
Have you ever had students using hearing aids?	No	8	88.9	0.028*
	Yes	1	11.1	
Have you ever had students using CI?	No	8	88.9	0.029*
	Yes	1	11.1	
Have you received any guidance on hearing aid or CI devices?	No	6	66.7	Ref.
	NA	1	11.1	
	Yes	2	22.2	
Have you heard about the FM System?	No	7	77.8	0.092
	Yes	2	22.2	
Do you know what the function of the FM System is?	No	8	88.9	0.028*
	Yes	1	11.1	
Do you know what the benefits of the FM System are for the hearing-impaired child in a school environment?	No	8	88.9	0.029*
	Yes	1	11.1	
Do you know what are the components of the FM System?	No	8	88.9	0.028*
	Yes	1	11.1	
Did you know that one of the components of the FM System should be used by the teacher?	No	8	88.9	0.029*
	Yes	1	11.1	
If today you received a hearing-impaired student, user of the FM System, in your classroom, would you know how to handle and deal with this technology?	No	8	88.9	0.028*
	Yes	1	11.1	
Have you received any guidance on the FM System?	No	8	88.9	0.028*
	Yes	1	11.1	
In your opinion, would a training course aimed at teachers on the issues investigated in this questionnaire help with regard to the treatment of children with hearing impairment in the school environment?	Yes	9	100.0	

*p<0.05 – Two Proportions Equality Test

Subtitle: HI = hearing impairment; CI = cochlear implant; FM System = Frequency Modulation System; NA = no answer; Ref. = Highest proportion category used as a basis for comparison

Table 4. Association between basic knowledge on the Modulated System Frequency and learning stage

Question	Category		Type school			p-value
			EFSF	EFSI	EI	
At some point in your professional career, has your classroom ever been attended by a student with HI?	No	n	10	10	7	0.058
		%	40.0%	71.4%	77.8%	
	Yes	n	15	4	2	
		%	60.0%	28.6%	22.2%	
Have you received any guidance on HI, its causes and main developmental consequences?	No	n	16	5	5	0.234
		%	64.0%	35.7%	55.6%	
	Yes	n	9	9	4	
		%	36.0%	64.3%	44.4%	
Have you ever had students using hearing aids?	No	n	14	11	8	0.121
		%	56.0%	78.6%	88.9%	
	Yes	n	11	3	1	
		%	44.0%	21.4%	11.1%	
Have you ever had students using CI?	No	n	19	11	8	0.842
		%	76.0%	78.6%	88.9%	
	NA	n	1	0	0	
		%	4.0%	0.0%	0.0%	
	Yes	n	5	3	1	
		%	20.0%	21.4%	11.1%	
Have you received any guidance on hearing aid or CI devices?	No	n	22	9	6	0.108
		%	88.0%	64.3%	66.7%	
	NA	n	0	0	1	
		%	0.0%	0.0%	11.1%	
	Yes	n	3	5	2	
		%	12.0%	35.7%	22.2%	
Have you heard about the FM System?	No	n	22	13	7	0.562
		%	88.0%	92.9%	77.8%	
	Yes	n	3	1	2	
		%	12.0%	7.1%	22.2%	
Do you know what the function of the FM System is?	No	n	24	13	8	0.742
		%	96.0%	92.9%	88.9%	
	Yes	n	1	1	1	
		%	4.0%	7.1%	11.1%	
Do you know what the benefits of the FM System are for the hearing-impaired child in a school environment?	No	n	22	13	8	0.890
		%	88.0%	92.9%	88.9%	
	Yes	n	3	1	1	
		%	12.0%	7.1%	11.1%	
Do you know what are the components of the FM System?	No	n	24	13	8	0.742
		%	96.0%	92.9%	88.9%	
	Yes	n	1	1	1	
		%	4.0%	7.1%	11.1%	
Did you know that one of the components of the FM System should be used by the teacher?	No	n	19	13	8	0.506
		%	76.0%	92.9%	88.9%	
	NA	n	3	0	0	
		%	12.0%	0.0%	0.0%	
	Yes	n	3	1	1	
		%	12.0%	7.1%	11.1%	
If today you received a hearing-impaired student, user of the FM System, in your classroom, would you know how to handle and deal with this technology?	No	n	23	13	8	0.437
		%	92.0%	92.9%	88.9%	
	NA	n	0	1	0	
		%	0.0%	7.1%	0.0%	
	Yes	n	2	0	1	
		%	8.0%	0.0%	11.1%	
Have you received any guidance on the FM System?	No	n	24	13	8	0.742
		%	96.0%	92.9%	88.9%	
	Yes	n	1	1	1	
		%	4.0%	7.1%	11.1%	
In your opinion, would a training course aimed at teachers on the issues investigated in this questionnaire help about the treatment of children with hearing impairment in the school environment?	No	n	3	0	0	0.229
		%	12.0%	0.0%	0.0%	
	Yes	n	22	14	9	
		%	88.0%	100.0%	100.0%	
Would you participate in a training course like this?	No	n	1	0	0	0.750
		%	4.0%	0.0%	0.0%	
	NA	n	1	0	0	
		%	4.0%	0.0%	0.0%	
	Yes	n	23	14	9	
		%	92.0%	100.0%	100.0%	

Subtitle: n = number; % = percentage; HI = hearing impairment; CI = cochlear implant; FM System = Frequency Modulation System; NA = no answer; EFSI = Elementary School final grades; EFSF = Elementary School initial grades; EI = Early Childhood Education

process of hearing rehabilitation based on the aural approach, showed that, despite knowing the national legislation on the inclusion of students with special educational needs. These professionals were unanimous in admitting that they have not been sufficiently prepared to receive hearing impaired children in their classrooms⁽¹³⁾. Of the teachers who confirmed previous contact with students with hearing impairment, 66.7% reported never having received guidance on hearing aids and/or CI. It is noted, therefore, the teachers' lack of preparation regarding the amplification devices used by the hearing-impaired students before their insertion in the regular classroom. Still on this part of the aforementioned sample ($n = 27$), 33.3% said they had not received guidance on hearing impairment, confirming the results of another study, carried out in 2011, which evaluated the knowledge of ten elementary school teachers and observed that 60% had already taught students with hearing impairment; however, of these, only 30% reported having received previous guidance on the subject⁽¹⁴⁾. Other studies have also shown that more than half of regular schoolteachers are unaware of the resources used by hearing-impaired students to access sound^(4,15).

We observed that, proportionally, teachers who have already taught students with hearing impairment, in general, received more guidance than those who had never taught this population. However, there is evidence that the experience with students with hearing impairment does not favor greater teacher knowledge regarding electronic devices applied to deafness⁽³⁾. The teachers' lack of knowledge about the functioning mechanisms of the hearing aid and the CI influences negatively, concerning the inclusion of differentiated strategies that favor the learning of students with hearing impairment⁽¹⁵⁾. In the present study, more than 90% of teachers stated that they were unaware of the FM System, its components, and benefits. A total of 87.5% of teachers said they had never even heard of this device. These data confirm those of other studies described in the literature, which affirmed the almost complete ignorance of teachers in regular schools, about the FM System^(4,15).

A study carried out with teachers of special schools for deaf children in the United States, observed that, even with existing experience with this population, almost half of the participants reported the desire to obtain additional information about the FM System, before using the device in the classroom. In addition, 80% of participants reported that they would like to receive training on how to solve some specific device problems in the classroom⁽¹⁶⁾.

The FM System is an assistive technology device, which was made official by the Technical Assistance "Comitê de Ajudas Técnicas da Subsecretaria Nacional de Promoção dos Direitos da Pessoa com Deficiência" (Technical Assistance Committee of the National Secretariat for the Promotion of the Rights of Persons with Disabilities) and is considered an interdisciplinary area of knowledge, which encompasses products, resources, methodologies, strategies, practices and services to promote functionality related to the activity and participation of people with disabilities, disabilities or reduced mobility, to provide them with autonomy, independence, quality of life and social inclusion⁽¹⁷⁾. It is known that the FM System can become a strong ally in helping to insert and include children with hearing impairment in the school environment, however, its effect occurs only in the face of a partnership between therapeutic intervention, family and school^(17,18).

We found that 91.6% of teachers would not know how to operate the FM System, if they received a student in their

classroom who used this device. This data seems to be directly related to the lack of training of these professionals, given the statistically significant proportion, for all learning stages, of teachers who said they had never received information about the FM System.

In order for the school to be involved in the work with the hearing impaired student, to provide the effective benefit of the FM System in the school environment, it is essential that teachers become familiar with the technology and know how to handle the equipment, since they will be the ones using the transmitter (microphone) during classes. Given the results obtained in this study, it is believed that these professionals would not be prepared to receive a student using this device, without prior guidance. In this way, it is essential that teachers from regular Brazilian schools are adequately guided, by a speech therapist specialized in the area, regarding the use, benefits and handling of the FM System. In addition, there is also scientific evidence that the excessive body noise of the teacher and the fear of taking the device to school are some of the justifications of children and adolescents using cochlear implants for the partial or non-use of the FM System⁽¹⁰⁾. Study published in 2018 concluded that teachers' lack of knowledge about the FM System can be a barrier to using the device in the classroom⁽¹⁹⁾.

The same number of teachers who said they were not prepared to deal with the FM System responded that they believed that participation in a training course on the topic would help the inclusion of students with hearing impairment in regular schools. In addition, 95.84% of teachers stated that they would accept to participate in a training course that dealt with this theme. Only three teachers answered that they did not believe that the course could help them. However, of these, two stated that, even so, they would participate in a training course. Only one teacher replied that he would not participate in a training course; however, he did not specify the reason. On the other hand, these teachers stated that they would not know how to deal with the FM System, if they received a student who used the device. Despite the existence of oral approaches and the inclusion of oralized hearing impaired students in a regular class, there is still a predominance of the mistaken idea that the hearing-impaired student is "dumb"⁽¹⁴⁾. In this context, in general, teachers receive little or no guidance regarding the special needs of their hearing-impaired students, oralized^(20,21). Thus, teachers need to be guided on basic issues related to hearing impairment, the amplification devices that can be used and the needs of students with hearing impairment, oralized. In 2012, an investigation was carried out, with the objective of evaluating a website (Frequency Modulated System Course for Teachers) as a training tool for teachers of children with hearing impairment, users of the FM System. It was found, at first, that there was low adherence of these professionals, requiring the use of several facilitating strategies, such as traveling to the school for meetings, so that there was adherence to the training course⁽²²⁾. Another study used a speech therapy follow-up program, through guidance to teachers in monthly meetings, during an academic year, using audiovisual support, seeking to raise awareness regarding the communicative needs of children using hearing aids and/or CI and found that, at the end of the program, the participants reported feeling supported for the development of work with students with hearing impairment⁽²⁰⁾. More didactic guidelines with the support of visual content materials with easy to understand language are necessary in

order to disseminate information to teachers in a quick and self-explanatory way about the FM System⁽¹⁰⁾.

Decree No 5296/2004⁽²³⁾ guarantees students with hearing impairments the right to accessibility, through the provision of assistive technology resources. Thus, in 2012, the Ministry of Education (*Ministério da Educação* - MEC) developed a project in partnership with several public universities in Brazil, which involved 106 public schools in the state, municipal and Federal District, covering the five regions of the country; 202 children with hearing impairment and 99 teachers from the “Atendimento Educacional Especializado” (Specialized Educational Service) - AEE proved the effectiveness of the FM System in the school context, in addition to suggesting the continuing education of AEE teachers to enable the use of this assistive technology⁽²⁴⁾. The pilot project developed culminated in the ordinance for the concession of the FM System⁽⁶⁾. The “Universidade Federal do Rio Grande do Norte” (UFRN), one of the partners in the development of this project, launched itself as a pioneer in offering a training course aimed at the needs of hearing-impaired students, oralized. The material culminated in the publication of an e-book for teachers’ continuing education, launched in 2019⁽²⁵⁾.

In addition to the aforementioned e-book, the ReMic website⁽²⁶⁾ - initially known as the FM System Portal⁽²⁷⁾ - is currently available online, developed in the Graduate Course of the Faculdade de Odontologia de Bauru da Universidade de São Paulo. It was created with the purpose of providing a source of continuing education for speech therapists and informing parents and teachers of children with hearing impairment, users of the FM System.

In several other countries, access to the FM System by students with hearing impairments was already a consolidated reality, well before the publication of the Ordinances that govern the dispensation of the device via UHS, in Brazil. In the United States of America (USA), for example, the government has a program, through which it is possible to provide the FM system to students in public and private schools (American With Disabilities Act)⁽²⁸⁾. The spread of the use of this assistive technology by other countries, including, helped in the creation of Brazilian public policies.

In the USA, the speech therapist participates in the child’s Individualized Education Program (IEP), sharing information in meetings with teachers about the FM System, about changes in the child’s classroom arrangement and about communication strategies that favor their hearing. In addition, the speech therapist works with the team of teachers at the beginning of each new school year, creating an “FM Plan” for each school, which includes the school calendar, guidelines for facilitating the device configuration by teachers, e-mail addresses, mail of people working with the FM System, class lists and schedules of students who use this assistive technology, among other information⁽²⁹⁾. In addition, the FM System is often provided by the school itself, so it is used by the student in the classroom and, after class, the device remains in the educational institution⁽³⁰⁾, in a reality totally different from the one experienced in Brazil.

Regarding the measures adopted in Brazil, it appears that, despite the efforts of the MEC for the continuing education of public school teachers and materials from scientific research made available free of charge by different public universities, the information needs to be more widely shared and disseminated to better inform teachers and help in the inclusion of hearing-impaired students, and promote the benefit of the hearing aids use to improve learning.

The present study had some limitations, such as, for example, that the sample’s representativeness in the total population of teachers in the schools visited is unknown, and that the questionnaire used was not previously validated. Therefore, additional studies need to be carried out, with the creation of standardized and previously validated questionnaires with a greater number of participants, in different regions of the country, for better investigation of the theme and future development of strategies for teacher guidance, in an attempt to reduce the insecurity of these professionals when operating the FM System and other issues related to the presence of students with hearing impairment in the regular classroom.

CONCLUSION

The study participants, teachers of early childhood and elementary education at five public schools in the region of Samambaia, Distrito Federal, said they were unaware of the functioning, components and benefits of the FM System. At the same time, these professionals showed interest in participating in training on the topic, and reported believing that this would help them in working with students with hearing impairments in the school environment.

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Appendix 1. Questionnaire used for data collection**Identification:**

Name: _____ Gender: () F () M DB: ____/____/____

Age: _____

Education: _____

How long have you been a teacher? _____

Works at: () public school () private school

Have you ever worked with special education? () Yes () No

Date of application of the questionnaire: ____/____/____

Basic Knowledge of Teachers on the Frequency Modulation System - FM

1. At some point in his professional career, his classroom has already been attended by a student with hearing impairment?
() yes () no
2. Have you received any guidance on hearing impairment, its causes and main developmental consequences?
() yes. Which professional did the orientation? _____ () no
3. Have you ever had students using Hearing Aids?
() yes () no
4. Have you ever had students using cochlear implants?
() yes () no
5. Have you received any guidance on the devices mentioned in questions 3 and 4?
() yes. Which professional did the orientation? _____ () no
6. Have you heard about the Frequency Modulated System (FM)?
() yes () no
7. Do you know what the function of the FM System is?
() yes () no
8. Do you know what the benefits of the FM System are for the hearing-impaired child in a school environment?
() yes () no
9. Do you know what are the components of the FM System?
() yes () no
10. Did you know that one of the components of the FM System should be used by the teacher?
() yes () no
11. If you were to receive a hearing-impaired student using the FM System in your classroom today, would you know how to handle and deal with this technology?
() yes () no.
12. If you answered no to question 11, what do you think might be your greatest difficulty in this regard?

13. Have you received any guidance on the FM System?
() yes. Which professional did the orientation? _____ () no
14. In your opinion, would a Training Course aimed at teachers on the issues investigated in this questionnaire help about the treatment of children with hearing impairment in the school environment?
() yes () no
15. Regarding question 14, would you participate in a course like this?
() yes () no. Why? _____