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Attitudes of Children with Hearing Loss towards Public Inclusive Education

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Abstract: Background: This study raised the following problem: How reliable is the *Inclusion for Children and Adolescents Questionnaire* (ICAQ) when measuring the attitudes of students with hearing loss towards inclusive education (IE) in public schools in the Canary Islands? Methods: The sample consisted of 297 students from the province of Gran Canaria, and 137 students from the province of Tenerife, with an average age of 11 years old. An exploratory factor analysis determined the reliability and relevance of ICAQ. Results: The authors found four factors of students' attitudes towards IE: *Family involvement and use of technology, inclusion in the centre, communication with medical specialists*, and *assessment of the support technology*. Conclusion: There were significant differences between the students with hearing loss in terms of the following factors: *Inclusion in the centre* and *assessment of the support technology*. The total score of students' attitudes towards IE was high. This piece of research is very important for the governing body of any school administration, especially in relation to schools' educational planning and IE.

Keywords: children and adolescents; cochlear implants; factor analysis; inclusive education

1. Introduction

Spain approved the *Law of Social Integration of Disabled People* [1] in order to promote the integration of students with difficulties in all kinds of life settings (e.g., social interactions, school system, and labor market). Since then, several educational reforms have been implemented to transform the inclusive education (IE).

The education of deaf and hard-of-hearing students is unclear, as special education teachers have clashed in a debate on whether students' self-perceptions or professionals' reports should be used as the primary framework of integration, communication, educational options, and academic performance [2] Primary and Secondary Education children and adolescents with hearing loss are key informants for providing inclusive practices of school learning, social and family processes, and professional configurations of help services. Surveys toward IE are tools which give opportunities to develop students' attitudes with a focus on inclusion change.

The design of the Inclusion for Children and Adolescents Questionnaire (ICAQ) has the following methodological considerations: one, to substantiate the method, followed by similar questionnaires about children's attitude towards IE, and, two, to illuminate studies that have underlined concepts incorporated as elements in the ICAQ.

1.1. Organising Principles of IE for Children and Adolescents with Hearing Loss

The elements that structure the review of the literature of this study adhere to hypotheses that explore the knowledge and development of children and adolescents with hearing loss. We also accept principles that articulate the welfare of students with hearing loss under assumptions aimed at educational intervention [3]. Consequently, we enunciate the conceptual and empirical pillars that originated from the *Inclusion for Children and Adolescents Questionnaire* (ICAQ) in order to know the perceptions of children and adolescents with hearing assistive devices towards IE in the public schools of the Canary Islands, which comprised two overseas provinces of Spain.

1.2. Family Intervention and Participation

One of the fundamental conjectures in the education of children and adolescents with hearing loss is that families, teachers, and related professionals provoke an optimal environment that facilitates language proficiency for the intellectual development and academic performance of students with hearing assistive devices. In the post-implantation processes of acoustic technology, parents assume the double role of apprentices or teachers or the dominance of one of these roles in terms of the perceived insecurity or attributed responsibility. Bearing in mind that the school is an institution that provides services to society, any educational project must "interact in a manner that is respectful of families' culture, beliefs, and attitudes." [3] (p. 437). Therefore, students with hearing assistive devices need to cope with learning strategies and manage peer interactions in their daily lives (e.g., in clubs or school team sports).

1.3. Collaborative Teamwork in a School Centre

An educational centre project that ensures IE as a principle must support families in hearing detection and the implementation of spoken expression schemes in newly implanted children and adolescents. The more evident the need for the communication of children and adolescents with hearing assistive devices, the more difficult the school placement with "peer interactions and opportunities for friendship and social interaction" [4] (p. 48). Placement stability is associated with individual (child and foster parent) factors, placement factors, and school organizations. Therefore, the focus of placement stability is a key concern for the field of psychological and physical child welfare. Davenport and Alber-Morgan [5] (p. 44) called attention to certain constructive aspects of buildings that increased the noise in communication and decreased the attention of children with hearing loss: "Tile flooring, concrete walls, and large windows that cause sound to reverberate."

While the Anglo-Saxon culture broadened the knowledge on the language and communication of students with hearing loss, the study by Scott and Kasun [6] focused on the analysis of sign language as the first line of communication for deaf children to interact with the world. They urged teachers to use resources and practices (explicit instruction, scaffolding, prior knowledge creation, and individualized instruction) to meet the needs of students, to promote equal classroom opportunities, and to manage social justice (for example, providing a context in which values can be safely expressed and examined).

Schools that support IE for children who use hearing assistive devices presumably offer an appropriate curriculum for their respective age groups, with curricular adaptations to improve the academic performance [7]. The school curriculum uses a philosophy based on essential IE concepts for giving extra *support* for children with hearing loss (e.g., collaboration with all human beings, the development of students' self-concept, or the cognitive and emotional competencies of students) [8]. This set of logical reasoning involved identifying core interdisciplinary concepts that facilitated the inclusion of all the students of 3rd Compulsory Secondary Education [9].

Perceived teacher self-efficacy refers to the teachers' beliefs about their capabilities to produce selected levels of performance that exercise an influence on students that affects their lives [10] (p. 2). Self-effective teachers in an inclusive environment, according to the literature synthesized by Sharma, Jitoko, Macanawai and Forlin [11] (p. 14), own "knowledge of content and pedagogy", adopt a

"managing classroom environment and behavior", and manifest "the ability to work collaboratively with parents and paraprofessionals." Teacher competency also maximizes the outcomes of children with complex communication needs and derives benefits from augmentative and alternative communication (AAC). Therefore, Radici, Heboyan, Mantovani, and De Leo [12] (p. 5) applied the *Teacher Attitude Scale* (TAS) questionnaire to compare teachers' perceptions "of the positive and negative issues of using AAC in class."

1.4. The Implantation of Hearing Assistive Devices

The results of auditory implantation vary in children and adolescents and, consequently, this increases the variability between them. The perceptions of these students reveal the degree of satisfaction with those institutional factors that most influence intelligibility in spoken communication [13]. There are differences between students who use cochlear implants (CIs), depending on the date of implantation. Hence, evaluative studies have been conducted on the quality of life in pre-surgical stages and during post-surgical rehabilitation, as well as the inclusion of students in schools that show an auditory ability and on how this skill facilitates or blocks spoken communication [14].

1.4.1. Age of Implementation and Timely Access to Educational Services

The problem of the age of auditory implantation in students is associated with other variables, such as expressive language [15], maternal interaction [16], and the adequacy of language scores to age [17]. It is not surprising that Holt, Beer, Kronenberger, Pisoni, and Lalonde [18] studied the relationships between the family environment (measured by the *Family Environment Scale, 4th edition,* Moos and Moos [19]) and reported that part of the variability in the development of students with cochlear implantation was related to the types of family environment.

1.4.2. Hearing Assistive Devices and Communication Technology for Children and Adolescents with Hearing Loss

Visual information (e.g., visual speech cues) provides one of the main ways in which children with CIs or hearing aids (HAs) can access a spoken signal [20].

1.5. Support of Communication Modes

IE involves changes in the content, approaches, the structure, and communication strategies to respond to heterogeneous learners with special needs. Instruction in an inclusive classroom needs to use a multisensory communication approach, as well as multiple teaching strategies.

Spoken modes of communication or using signs constitute a recurring theme in the research on implanted students. Hyde and Punch [21] investigated both modes in Australia by probing parents, teachers, and children, and found that sign language (English or Australian) supported the personal, social, and academic development of implanted schoolchildren. The communication of the students with hearing assistive devices was essential for the study of Gale [22] (p. 136), who analysed the sign language and speech using narrated texts subscribing that "cochlear implant users can be bilingual using both the oral language (spoken English) and a visual sign language."

Caldwell and Nittrouer [23] examined the phonological, language, and cognitive skills that might help explain speech-in-noise abilities for children with CIs. However, the scores in other measures did not explain any group differences in the recognition of voice.

1.6. Evaluation of Students with Hearing Loss

It is not strange to see the proliferation of evaluation scales for teachers, families, and students with hearing loss to help schoolchildren in their development [24]. In this sense, Bellis [25] (p. 229) suggested implementing additional assessment measures: "A comprehensive central auditory processing evaluation should include tests from more than one category...in a test battery approach." Furthermore,

it is convenient to have associate measures of speech/language skills, and other cognitive and educational competencies, to assess different auditory programs, because these services, in addition to traditional occupation therapy, can speed up progress in students with hearing loss.

1.7. Self-Assessment of Perceptions and Attitudes

Different psychological theories have supported the study of peer attitude formation and change in regular schools. Some of them are as follows:

(1) The theory of "reasoned action" that investigates the determinants of children's attitudes and behavioural intentions towards classmates with physical disabilities, measured by the *Peer Attitudes Toward the Handicapped Scale* (PATHS) and *Behavioural Intention Scale* [26];
(2) The "Contact theory" (i.e., the intergroup contact with students with disabilities) [27];
(3) The "Gestalt therapy theory" which envisions the self-capability of making contact with the environment (e.g., symbolic numerical comparisons, [28]);
(4) The "Dialogical Theory of Self" (i.e., interconnectedness of individuals with society [29] (p. 3). These tools are designed to comprehend how children with difficulties achieve an awareness of their sense of self.

Measuring the attitudes of children with physical and intellectual difficulties has been the subject of multiple studies, which Nowicki and Sandieson [30] meta-analysed, revealing that children preferred classmates without physical and intellectual difficulties. Children with intellectual difficulties experience rejection attitudes, a lack of friendships, or feelings of isolation more acutely than those who do not have any disabilities [31].

In the Israeli cultural context, Most, Wiesel, and Blitzer [32] investigated the orientations of deaf and hard-of-hearing adolescents to the cochlear implant and found that participants expressed positive attitudes towards cochlear implant technology. To be successful with hearing assistive devices, users must have self-confidence, self-esteem, extroversion, and a locus of control. Rekkedal [33] identified the factors that increased children's use of hearing assistive devices (e.g., severe hearing loss, positive attitudes, and the sound quality of devices).

The self-concept and the development of the self are two interrelated aspects that are self-indicative of socio-cognitive maturation and well-being. Van Gent et al. [34] (p. 333) found that deaf adolescents "showed lower levels of self-perceived social acceptance, close friendships and ego development and higher physical appearance." Additionally, deaf adolescents maintained a positive global self-esteem during childhood, through the quality of communication with parents, and through regular school attendance.

Michael, Cinamon, and Most [35] compared future perceptions of three groups of students who were deaf, hard-of-hearing, and hearing. They found that deaf participants reported significantly higher levels of clarity about their future than the other two groups, which had audiological difficulties and listeners.

1.8. Problem

We pose the following question: How reliable and relevant is the *Inclusion for Children and Adolescents Questionnaire* (ICAQ) when measuring the attitudes of children and adolescents with cochlear implants (CIs) or hearing aids (HAs) towards inclusive education (IE) in public schools in the Canary Islands (i.e., provinces of Gran Canaria and Tenerife)? The study tries to analyse the underlying structure of a series of items of the ICAQ in order to interpret the factors that explain why some items relate more to one than to others.

2. Method

2.1. Participants

The sample of participating children and adolescents with CIs or HAs was 297 individuals. The students attended public schools in the two provinces of the Canary Islands. Considering gender, 161 (54.2%) were boys and 136 (45.8%) girls. The mean age was 11.07 years (SD = 3.61). Depending on the hearing assistive device, 187 (62.3%) used CIs and 110 (37%) used HAs. They were in Early Childhood Education (n = 30, 10.1%), Primary Education (n = 152, 51.2%), Compulsory Secondary Education (n = 104, 35%), and Baccalaureate or Vocational Training (n = 11, 3.7%). They had individualized curricular adaptations (ICAs) (n = 118, 39.7%) compared to those without ICAs (n = 179, 60.3%). The communication system with their families was oral (n = 212, 71.4%), bilingual (n = 57, 19.2%), or by sign language (n = 28, 9.4%). The mean age of diagnosis of deafness was before one year (SD = 0.942), with the majority having a prenatal cause (n = 171, 57.6%), followed by unknown (n = 66, 22.2%), perinatal (n = 35, 11.8%), and postnatal (n = 25, 8.4%) causes. They were students with average values (M = 3.86, DS = 0.903) measured by the *Raven Test—Progressive Matrices* (between 26–75 'Intelligence Quotient' (IQ) test score); mean values (M = 2.80, SD = 1.25) assessed by the *Peabody. Vocabulary Test in Images*; and moderately low values, according to values obtained in the *Illinois Psycholinguistic Aptitude Test* (M = 2.45, SD = 0.739).

2.2. Process

The hearing care specialist team of the Government of the Canary Islands was asked to identify those children and adolescents who met the requirements of the study in terms of age, use of hearing devices, and not having other deficits associated with deafness. Once we had the written authorization of parents, we administered ICAQ with the support of regular teachers who emphasized facilitating student understanding of the questionnaire items.

2.3. Instrumentation

Currently, there are no CI or HA-specific ICAQ measures for children and adolescents in Islas Canarias. Therefore, the major purpose of this study was to develop the first CI or HA-specific ICAQ measure for school-age children and adolescents (4 to 18 years). The questionnaire targeted students' attitudes and perceptions. The questionnaire incorporated questions designed to obtain information from children and adolescents by either having the students complete the questionnaire or by conducting the screening in an interview format with the teachers in a school setting.

We performed a detailed search of the ERIC and AERA databases. Articles and papers were initially identified based on combinations of research words and a thesaurus. The search produced a high number of articles from ERIC (n = 9851) for the term "inclusive education". Meanwhile, the AERA produced the following number of paper results: "inclusive education" (n = 4516), "inclusive schools" (n = 1913), "inclusive measures" (n = 791), and "inclusive questionnaires" (n = 340) (the last search date was March 31, 2019). Specifically, the 40 items of the ICAQ were consistent with some of the items of the following measurement instruments: The *Peer Attitudes Toward the Handicapped Scale* (PATHS), consisting of 30 brief statements which provided scores on three subscales: "physical, learning and behavioural difficulties", and the *Behavioural Intention Scale*, which assessed how children "would behave toward a hypothetical classmate with a physical disability in a number of social situations" [26] (pp. 137–138); the *Inclusion of Deaf or Hard-of-Hearing Students Inventory* (IDHHSI), consisting of 36 statements which provided scores on four subscales (Inclusion, Contact, Closeness, and Class Norms) [27] (p. 65); the *Classroom Participation Questionnaire*, used to obtain information on the individual participation of a student in general class teaching [36]; the *Deaf Identity Development Scale* (DIDS), which provided scores on four subscales: "a Deaf identity (immersion) scale, a hearing identity scale, a bicultural identity scale and a marginal identity scale" [32] (p. 73); the *Family Environment Scale, 4th edition*, which evaluated three dimensions of family dimensions: "(a) family relationships,

(b) personal growth and goals within the family, and (c) the family's focus on system maintenance using 10 subscales" [18] (p. 852); and the *Teacher Attitude Scale* (TAS), which measured teachers' attitudes towards children using augmentative and alternative communication (AAC) [12]. We also took into consideration the model projected by Booth and Ainscow [37].

The first ICAQ was designed and sent to experts in hearing, language, and inclusion, who acted as judges, clarifying expressions and concepts. Afterwards, we administered ICAQ to a group of 10 deaf children from three private educational centres (not participants in the study) in order to improve the quality and adequacy of the items.

The ICAQ consists of 40 items grouped into three dimensions. The responses were obtained through a four-point Likert scale that ranged from "never" to "always" in the first dimension, linked to the frequency of the statements presented and related to family involvement (items 1–10). The second dimension was related to the degree of agreement and ranged from "totally disagree" to "totally agree", with statements related to inclusion in the centre, support, and communication with professionals (items 11–28). Finally, participants' opinion on the use of support technology was measured from "never" to "always" (items 29–34), and an evaluation of technology was conducted with answers that fluctuated from "very adequate" to "very inadequate" (items 35–40).

2.4. Analysis of Data

The data were analysed through exploratory factor analysis (EFA), using the *Statistical Package for Social Sciences* (SPSS) version 16.0, to determine groups of significant latent variables existing between items of the ICAQ. EFA allowed for the reduction of the size of a bank of items in order to identify the underlying dimensions of ICAQ [38].

3. Results

3.1. Factor Structure

To identify the factor structure of the children's concept of IE, a Principal Component Analysis (PCA) was conducted for 40 items with orthogonal rotation (varimax). The value of 0.806 for the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the analysis indicated that the proportion of variance in the variables was caused by underlying factors. According to Kaiser (cited in Field [39] (p. 647), this value was above the acceptable limit of 0.5. Furthermore, Hutcheson and Sofroniou [40] considered values between 0.7 and 0.8 as good. Therefore, it allowed for the application of factor analysis. This was also supported by the Bartlett's test of sphericity ($X^2 \times (780) = 5{,}734{,}769$, $p < 0.001$), indicating that correlations between items were sufficiently large for PCA. Four factors were specified to be extracted, and, in combination, they explained 55.816% of the variance. Commonalities were generally high, reaching 0.843, implying that most of the items were in the factor space. We selected factors with a load >0.40, according to the cut proposed by Yong and Pearce [41] (pp. 84–85).

3.2. Reliability

Cronbach's alpha had a coefficient of 0.882, which maximized the generalizability of the factors. Cronbach's alpha differential was 0.863 for children with CIs and 0.927 for children using HAs.

The simple structure principle proposed by Thurstone [42] was applied to carry out rotation of the factors, resulting in the following four factors (Table 1):

(1) Factor 1 consisted of 10 items, accounted for 14.038% of the variance, and was named *Family involvement and use of technology*, with one item weighing the most ("My father helps with housework"), representing 67.24% (0.820), followed by "My father comes to meetings at school", which represented 61.15% (0.782);

(2) Factor 2 consisted of eight items, accounted for 13.527% of the variance, and was named *Inclusion in the centre*. The item "I receive adequate medical attention at school", represented 63.36% (0.796), followed by the item "I have sufficiently prepared teachers", which represented 45.02% (0.671);

(3) Factor 3 consisted of three items, accounted for 11.43% of the variance, and was named *Communication with medical specialists*. The item of the greatest weight was "I received detailed medical chart information of insertion results after implantation", which represented 89.49% (0.946). This was followed by the item "I received detailed medical chart information of insertion results before implantation", which represented 89.30% (0.945);

(4) Factor 4 consisted of three items, accounted for 8.057% of the variance, and was named *Assessment of the support technology*. The item with the greatest weight was "I assess the use of visual aids," which represented 81% (0.900), followed by the item "I believe the use of digital blackboards," which represented 76.38% (0.874). (See Figure 1).

Table 1. Factor loadings after rotation and eigenvalues obtained from the *Inclusion for Children and Adolescents Questionnaire* (ICAQ).

ICAQ Items	Factors			
	1	2	3	4
10. My father helps with housework	0.820			
9. My father comes to meetings at school	0.782			
1. My father and/or mother reviews homework	0.683			
29. I believe the use of magnetic loop antennas	0.642			
5. My father and/or mother attends and participates at school activities (i.e., shows, sports)	0.639			
30. I believe the use of the Roger system	0.632			
4. My father and/or mother requests meetings with tutors to have information related with logopaedic treatment, implant, adaptations	0.559			
32. I believe the use of digital blackboards	0.549			
33. I believe the use of image presentations	0.541			
8. My mother helps with homework	0.539			
19. I receive adequate medical attention at school		0.796		
17. I have sufficiently prepared teachers		0.671		
21. I have support from specialists who improve communication at school		0.656		
11. I feel welcome at school		0.637		
14. The school makes efforts to avoid discrimination practices		0.601		
20. I have technological aids that help communication		0.599		
12. The school sets high expectations for students		0.566		
13. Schoolteachers think that all students are equally important		0.500		
24. (If you use implanted devices) I received detailed medical chart information of insertion results after implantation			0.946	
23. (If you use implanted devices) I received detailed medical chart information of insertion results before implantation			0.945	
25. (If you use implanted devices) I have satisfactory communication with the medical team because they speak in a clear, direct and understandable way			0.643	
40. I assess the use of visual aids				0.900
38. I assess the use of the Roger system				0.874
39. I assess the use of the FM listening systems				0.863

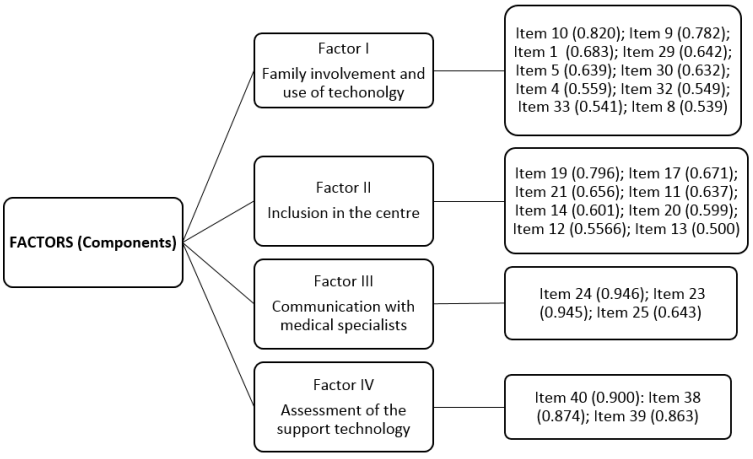

Figure 1. Four-factor solution of ICAQ derived from exploratory factor analysis (EFA). The boxes represent the four factors. Item numbers and loadings are also indicated.

We obtained a general factor average that reflects the students' attitudes towards IE, including, in the case of children and adolescents with CIs, factor 3 (*Communication with medical specialists*). The final average of the students' attitudes towards IE (factors 1, 2, and 4) was 2.74, which, in a scale range from 1 ("very low") to 4 ("very high"), reflects an attitude close to 3 (i.e., a positive and high attitude towards inclusion). If factor 3 (*Communication with medical specialists*) includes its weight, a generally low attitude was obtained ($M = 1.80$). Factor 3 reached the lowest mean ($M = 1.96$, $SD = 0.830$), followed by factor 4 (*Assessment of the support technology*) ($M = 2.51$, $SD = 1.285$). Contrarily, factor 2 (*Inclusion in the centre*) had the highest mean (close to the high rating) ($M = 2.92$, $SD = 0.745$), followed by factor 1 (*Family involvement and use of technology*) ($M = 2.77$, $SD = 0.725$).

Additionally, we applied an analysis of variance (ANOVA) for each of the four factors, obtaining differences between students using CIs or HAs. Significant differences were found between both groups of students for factors 2 and 4, with higher means in the case of students using CIs than those using HAs (factor two $M_{CI} = 3.31$, $M_{HA} = 2.29$; factor 4 $M_{CI} = 3.30$, $M_{HA} = 1.23$). Students who used CIs in factor 3 had significant intragroup differences ($t = 32.13$, $p < 0.001$) related to age, sex, and other variables associated with the age of implantation. Finally, we found no significant differences between students using CIs or HAs in terms of *Family involvement and use of technology* and *Assessment of the support technology* (Table 2).

Table 2. Student's *t*-values for each of the four factors obtained from the ICAQ.

Factors	*t*	CI (*n* = 184)		HA (*n* = 113)	
	***t*-Student**	**M**	**SD**	**M**	**SD**
1. Family involvement and use of technology	−0.905 n.s.	2.77	0.725	2.85	0.752
2. Inclusion in the Centre	15.38 ***	3.31	0.543	2.29	0.575
3. Communication with medical specialists	32.13 ***	1.96	0.830		
4. Assessment of the support technology	21.437 ***	3.30	0.965	1.23	0.430

Note: ***$p < 0.001$; n.s. non significant differences

4. Discussion

The findings of this study indicate that ICAQ is a reliable and valid tool that measures the attitudes of children and adolescents with CIs or HAs towards IE in public schools of the Canary Islands.

Factor 1 (*Family involvement and use of technology*) relates to family involvement (assistance and request for meetings, help with tasks, and performance assessment) and the use of technology (a magnetic loop, system roger, digital blackboard, images and representations, and visual supports). The factor average obtained reflects a general student attitude close to a high rating.

It is surprising that items related to the use of technology belong to the family factor. We interpret that this is because families usually have initial involvement with children's correct use of hearing assistive devices for auditory stimulation. Therefore, children connect technological and media use with family involvement in children's lives. However, these issues need an additional analysis in future studies.

The reality of children with hearing assistive devices places families in situations of restlessness and discouragement [43]. Mouvet, Matthijs, Loots, Taverniers, and Van Herreweghe [44] suggest that a child benefits from the bilingual approach until nine months of age. After implantation, tendencies towards a monolingual approach appear. The provision of information about early intervention to students with hearing loss is complicated by the emotional elements involved in the decision-making processes between the professionals' management of information and the options selected by parents [45]. Because of family stress caused by deafness, specialists provide families with "information on all available options and technology as well as evidence on the benefits (advantages) and harms (disadvantages) of each option to support informed choices" [46] (p. 24).

Factor 2 (*Inclusion in the centre*) refers to staff (doctors, tutors, and specialists), the centre (reception, expectations, and technological support), values (equality and social justice), and socialization (participation in class activities and extracurricular activities).

Of key importance to ensuring inclusive education at the school centre is the need for available services and professional staff. Wiley, Arjmand, Jareenmeinzen–Derr, and Dixon [47] provided an understanding of the importance of considering thorough medical (e.g., causes of hearing loss) and neurodevelopmental evaluations among children who were deaf or hard-of-hearing. Furthermore, early hearing assessments are useful for subsequent medical and instructional intervention [48].

Garberoglio, Gobble, and Cawthon [49] (p. 378) reported that teacher training and school settings might prioritize "instructional strategies and classroom management over student engagement." However, scholars argue that the most important learning (i.e., most likely to convey flexible understanding) occurs when learners engage in solving tasks that pose challenges [2–8,50]. Furthermore, significant learning also occurs when students with hearing loss listen to the ideas of their peers as a way of improving their own thinking about a task.

The critical issue is staffing for good teaching (i.e., a "challenge approach", which assumes that teachers gain intrinsic motivation from working in school settings implementing IE). The challenge model requires long-term planning for providing teachers with critical competencies to be effective: "professional preparedness, advocacy, and role flexibility" [2] (p. 10). Classroom flexibility or instructional pacing involves two issues for children with hearing loss. First, who will set the pace, the regular student or the child with the hearing assistive device? Second, how rapidly will the pace be set? The merit of a teacher is the control of speed at which students with hearing loss increase their participation in activities [9,36].

Factor 3 (*Communication with medical specialists*) refers to the interaction between the medical team and the students before and after the implantation, as well as the satisfaction of children with the medical team in terms of whether clear information has been provided. The low factor average expresses that children and adolescents with CIs do not exhibit a pleasant attitude towards or satisfaction with the communication they have had with medical professionals before and after the cochlear implant.

Although much research highlights the value of early cochlear implantation in spoken language and educational performance [51], Yoshinaga-Itano [52] argues that reliable audiological systems can also be beneficial given certain conditions for diagnosis and early intervention (i.e., when the professionals are competent and the materials provide feedback). For example, without the condition of teacher competency, the possibility that the children with hearing assistive devices regress in their development is high. Therefore, the four main challenges teachers face in today's IE are as follows: (1) Professional development; (2) resource management; (3) new technologies; and (4) building and maintenance of an adequate physical environment [53].

Factor 4 (*Assessment of the support technology*) relates to the assessment of resources: visual supports, digital boards, and representations with images. This factor obtains a low-average assessment. Moreover, there are other resources, under the philosophy of the *Universal Design of Learning*, which aim to be inclusive of different learning experiences and learners and to reduce barriers to learning (i.e., existing facilities which are readily accessible to and usable by students with difficulties) [54]. Furthermore, students with hearing loss may need to be seated close to the blackboard. Other students may need other hearing forms (e.g., a personal frequency-modulated listening system, which transmits a speaker's voice directly to the user's ear, or speech recognition programs, audiobooks, or closed-caption television).

4.1. Limitations

This study avoided systematic observations and interviews with the children and adolescents of the sample and privileged the cultural cohesion of the public schools that support IE. Moreover, we did not analyse the links between children's special needs types and classroom curriculum practices or the students' academic results.

4.2. Recommendations

The findings of this study have practical implications for improving the attitudes of students with CIs or HAs towards inclusive-based schools. In brief, we recommend the following: (1) Emphasis on the family environment (i.e., school policies cultivate a sense of community and participatory culture); (2) school-based inclusion efficiency (i.e., plan and develop individualization of instruction and adapt learning standards for students with hearing loss); (3) openness of communication (i.e., audiological experts, teachers, and parents ought to rethink models of communication with implanted students); and (4) flow of resources for performance (i.e., students with hearing assistive devices need to cope with all kinds of classroom tasks). Other databases should be searched in the future to provide information on how the science of IE measurement has developed over time (AMED, ASSIA, BNI, CINHAL, Embase, IBSS, ISI Web of Science, MEDLINE, PsycInfo, PubMed, Social Science Citation Index, and Web of Knowledge (Web of Science)).

5. Conclusions

The factors "Family involvement and use of technology", "Inclusion in the centre", "Communication with medical specialists" and "Assessment of the support technology" derived from the ICAQ have been developed and validated in this investigation. This study has the feature of the "emergent" knowledge-based attitude of children and adolescents with hearing loss measured directly by their own students. The final average of the attitude of schoolchildren towards IE is the highest. The factor "Inclusion in the centre" has the highest average. The average of the attitudes of students with CIs in the factor "Communication with medical specialists" is the lowest. There were significant differences between students with CIs and HAs in the factors "Inclusion in the centre" and "Assessment of the support technology".

A school board includes teachers, parents, community representatives, and students. This piece of research is very important for the governing body of any school administration, especially in relation to schools' educational planning and IE.

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