

Attitudes_of_children_with

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Abstract

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Introduction: This study raised the following problem: How reliable and relevant is the *Inclusion for Children and Adolescents Questionnaire* (ICAQ) to measure the attitudes of children and adolescents with cochlear implants (CIs) or hearing aids (HAs) to inclusive education (IE) in public schools in the Canary Islands (i.e. provinces of Gran Canaria and Tenerife)?

Method: The sample consisted of 297 students from the province of Gran Canaria, and 137 students from the province of Tenerife with an average of 11 years old. An exploratory factor analysis (EFA) 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*.

Conclusions: There were significant differences between the students with CIs and HAs in the following factors: *Inclusion in the centre* and *Assessment of the support technology*. The total score of students' attitudes towards IE was high. The factor *Inclusion in the centre* had the most favourable total score of students' original attitudes towards IE. *Communication with medical specialists* was the lowest total attitude score towards IE for students with CIs.

Attitudes of children with cochlear implants or hearing aids to inclusive education in the Canary Islands

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We have obtained written consent of the parents for passing tests to each child with CI and HA. Besides, the Clinical Research Ethics Committee (C.E.I.C.) of the University Hospital Insular Materno-Infantil de Canarias has approved the legal dispositions of the present study.

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Abstract Introduction: This study raised the following problem: How reliable and relevant is the *Inclusion for Children and Adolescents Questionnaire* (ICAQ) to measure the attitudes of children and adolescents with cochlear implants (CIs) or hearing aids (HAs) to inclusive education (IE) in public schools in the Canary Islands (i.e. provinces of Gran Canaria and Tenerife)? Method: The sample consisted of 297 students from the province of Gran Canaria, and 137 students from the province of Tenerife with an average of 11 years old. An exploratory factor analysis (EFA) 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*. Conclusions: There were significant differences between the students with CIs and HAs in the following factors: *Inclusion in the centre* and *Assessment of the support technology*. The total score of students' attitudes towards IE was high. The factor *Inclusion in the centre* had the most favourable total score of students' original attitudes towards IE. *Communication with medical specialists* was the lowest total attitude score towards IE for students with CIs. **Keywords:** Children and adolescents, cochlear implants, factor analysis, inclusive education

Introduction

Hearing loss caused by damage to the cochlea is the most repeated form of hearing loss. Although the threshold of sounds is extended (for example, with an acoustic device), the perception of sounds is abnormal. Children and adolescents who use hearing devices to increase the hearing threshold have difficulty understanding the spoken language of their peers and teachers. The benefits of the palliative technological devices of deafness do not always compensate for the problem of the development of intelligence and language, although they attest to attitudes towards themselves, the family and society.

Review of the literature: Organising principles of inclusive education (IE) for children and adolescents with hearing difficulties

The elements that structure the review of the literature of this study adhere to hypotheses that explore the knowledge and development about children and adolescents with hearing difficulties. We also accept principles that articulate the welfare of deaf or hard of hearing students under assumptions aimed at educational intervention (Moeller et al. 2013). Consequently, we enunciate the conceptual and empirical pillars that originated *Inclusion for Children and Adolescents Questionnaire* (ICAQ) in order to know the perceptions of children and adolescents with implanted devices towards IE in the public schools of the Canary Islands, which comprised two overseas provinces of Spain.

Family intervention and participation

One of the fundamental conjectures in the education of children and adolescents with hearing difficulties 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 implanted 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 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.' (Moeller et al. 2013, 437). Thus, students with implanted devices learn to confront them with numerous opportunities for communicative interaction that normalise their active participation in school and extracurricular situations and activities (for example, clubs or school team sports).

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 communication of children and adolescents with implanted devices, the more difficult

the school placement with ‘peer interactions and opportunities for friendship and social interaction’ (Schick et al. 2013, 48). Therefore, practical actions considered any school setting that dissipates the hesitations about the inclusive nature in educational contexts. Davenport and Alber-Morgan (2016, 44) called attention to certain constructive aspects of buildings that increased the noise in communication and decreased the attention of children with hearing difficulties: ‘Tile flooring, concrete walls, and large windows that cause sound to reverberate.’

While the Anglo-Saxon culture broadened the knowledge of language and communication of students with hearing difficulties, the study by Scott and Kasun (2018) focussed 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 individualised instruction) to meet the needs of students, to promote classroom equal 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 devices, presumably offer an appropriate curriculum for their respective age groups with curricular adaptations to improve academic performance (Chute and Nevins 2006). Under these theoretical assumptions, the educational and curricular projects of a centre work with a philosophy based on the essence of the participation in class and centre, collaborations with peers and teachers, decisions on relationships, the importance of the emotional competencies of students and the development of their self-concept (Cepa, Heras, and Fernández-Hawryla 2017). This set of logical reasoning nucleated the interdisciplinary project of conditioning a school space in the study of Amiama, Ledesma, and Monzón (2017) to facilitate the inclusion of all the students of 3rd Compulsory Secondary Education.

Teacher self-efficacy refers to the personal ability of a teacher. Self-effective teachers in an inclusive environment, according to the literature synthesized by Sharma et al. (2018, 14), own ‘knowledge of content and pedagogy’, adopt a ‘managing classroom environment and behaviour’ and manifest ‘the ability to work collaboratively with parents and paraprofessionals.’ Teacher competency also maximises the outcomes of children with complex communication needs and derives benefits from augmentative and alternative communication (AAC). Thus, Radici et al. (2018, 5) applied the *Teacher Attitude Scale* (TAS) questionnaire to compare teachers’ perceptions ‘of the positive and negative issues of using AAC in class.’

The implantation of electronic devices

The results of the auditory implantation vary in children and adolescents, and consequently, they increase 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 (Moore 2008). There are differences between students who use CIs, depending on the date of implantation. Hence, evaluative studies are 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 auditory ability and on how this skill facilitates or blocks spoken communication (Noble 2013).

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 (Tomblin et al. 2005), maternal interaction (Bakar, Brown, and Remine 2010), and adequacy of language scores to age (Geers et al. 2016). It is not surprising that Holt et al. (2012) studied the relationships between the family environment (measured by the *Family Environment Scale*, 4th edition, Moos, and Moos 209) and reported that part of the variability in the development of students with cochlear implantation was related with the types of family environment.

Assistive technologies for children and adolescents with hearing difficulties

The first function of technological devices is to restore hearing through the selection of a frequency and its amplification. The visual information accompanying the identification of speech has been a recurring problem among some authors (Maidment, et al. 2015) understanding that the visual keys of speech are forms under which students who are deaf or hard of hearing can access a spoken signal.

Support of communication modes

The spoken modes of communication or using signs constitute a recurring theme in the research of implanted students. Hyde and Punch (2011) investigated both modes in Australia by probing parents, teachers, and children and found out that sign language (English or Australian) supported the personal, social and academic development of implanted schoolchildren. The communication of the students with implants was essential for the study of Gale (2011, 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.’

The study by Caldwell and Nitttrouer (2013) obtained two surprising results: the effects of noise were consistent between the groups of hearing children and students with CIs. However, the scores in other measures did not explain any group differences in recognition of voice.

Evaluation of students with hearing difficulties

It is not strange to see the proliferation of evaluation scales for teachers, families, and students with hearing difficulties to help schoolchildren in their development (Bradham and Houston, 2014). In this sense, it is convenient to have associated measures of speech/language skills, and other cognitive and educational competencies to assess different children’s auditory processes. In this sense, Bellis (2011, 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.’

Self-assessment of perceptions and attitudes

What are the attitudes (integrated by cognitive, affective and behavioural components) that children and adolescents who are deaf or hard of hearing have about their peers with or without physical or mental difficulties?

Different psychological theories have supported the study of peer attitude formation and change in the 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* (Roberts, and Lindsell 1997). (2) The ‘Contact theory’ (i.e. the intergroup contact upon students with disabilities) (Hung, and Paul 2006). (3) The ‘Gestalt therapy theory’ which envisions the self capable of making contacts with the environment. (4) The ‘Dialogical Theory of Self’ (i.e. interconnectedness of individuals with society (Grobler and Wessels 2018, 3). These tools are designed to comprehend how children with difficulties achieve an aware 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 (2002) meta-analysed revealing that children preferred classmates without physical and intellectual difficulties. Children experience rejection attitudes, lack of friendships or feelings of isolation more acutely with intellectual difficulties than those who do not have any disabilities (Beaulieu-Bergeron, and Morin 2016).

In the Israeli cultural context, Most, Wiesel, and Blitzer (2007) 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 technologies, users must have self-confidence, self-esteem, extroversion and locus of control. Rekkedal (2012) identified the factors that increased children’s use of hearing aids (for example, severe hearing loss, positive attitudes and the sound quality of devices).

Self-concept and the development of the self are two interrelated aspects of self-indicative of socio-cognitive maturation and well-being. Van Gent et al. (2012) explained that deaf adolescents self-perceived low levels of social acceptance, close friendships, self-development, and more pronounced levels of physical appearance.

Besides, deaf adolescents maintained positive global self-esteem during childhood, quality of communication with parents and regularly school attendance.

Working on perceptions of self-efficacy of deaf adolescents, Michael, Cinamon, and Most (2015) compared three groups of high-school and high-school teens finding out that deaf participants reported significantly higher levels of clarity about their future than the other two groups with audiological difficulties and listeners.

Problem

We pose the following question: what is the reliability and validity of the *Inclusion for Children and Adolescents Questionnaire* (ICAQ) to measure the attitudes of children and adolescents with CIs or HAs towards IE in public schools in the provinces of Gran Canaria and Tenerife? The study tries to analyse the underlying structure of a series of items of the ICAQ to interpret the factors that explain why some items relate more to one than to others.

Method

Participants

The sample of participating children and adolescents with CIs or HAs was 297. The students attended public schools in the two provinces of 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 device, 187 (62.3%) used CIs and 110 (37%) 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 individualised 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 ($SD = 0.942$) being the majority prenatal cause ($N = 171$, 57.6%), followed by unknown cause ($N = 66$, 22.2%), perinatal ($N = 35$, 11.8%) and postnatal ($N = 25$, 8.4%). 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, according to values obtained in the *Illinois Psycholinguistic Aptitude Test* ($M = 2.45$, $SD = 0.739$).

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 authorisation of parents, we administered ICAQ with the support of the regular teachers who facilitated the school space.

Instrumentation

We planned the ICAQ for this study following the model projected by Booth and Ainscow (2002) for the *Index for Inclusion* and other sources (for example, ERIC and bibliographical references). Particularly, the 40 items of the ICAQ had concomitances with the following instruments:

Peer Attitudes Toward the Handicapped Scale (PATHS), consisting of 30 brief statements which provided scores on three subscales: ‘physical, learning and behavioural difficulties’, and *Behavioural Intention Scale*, which assessed how children ‘would behave toward a hypothetical classmate with a physical disability in a number of social situations’ (Roberts, and Lindsell 1997, 137–138).

Inclusion of Deaf or Hard-of-Hearing Students Inventory (IDHHSI), consisting of 36 statements which provided scores on 4 subscales (Inclusion, Contact, Closeness, and Class Norms) (Hung, and Paul 2006, 65).

- *Classroom Participation Questionnaire*, used to obtain information on the individual participation of a student in general class teaching (Antia, Sabers, and Stinson 2007).

- *Deaf Identity Development Scale (DIDS)*, which provided scores on 4 subscales: ‘a Deaf identity (immersion) scale, a hearing identity scale, a bicultural identity scale and a marginal identity scale’ (Most, Wiesel, and Blitzer 2007, 73).
- *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’ (Moos, and Moos 2009; Holt et al. 2012, 852), and
- *Teacher Attitude Scale (TAS)*, which measured teachers’ attitudes towards children using augmentative and alternative communication (AAC) (Radici et al. 2018).

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 in 3 dimensions. The response mode was through a 4-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, the opinion was requested on the use of support technology ‘never’ to ‘always’ (items 29–34), and the evaluation of technology with answers that fluctuated from ‘very adequate’ to ‘very inadequate’ (items 35–40).

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 (Deng et al. 2017).

Results

We carried out an analysis of the adequacy of the Kaiser-Meyer-Olkin sample. We obtained 0.806, which allowed considering the use of EFA. Bartlett’s sphericity test confirmed the previous result, which was significant [$X^2(780) = 5734,769, p < 0.001$], indicating that the sample was globally adequate item-by-item to the realisation of EFA. Cronbach’s alpha had a coefficient of 0.882, which maximised the generalizability of the factors. Cronbach’s alpha differentially was 0.863 for children with CIs, and 0.927 for children using HAs. The percentage of total variance explained by each factor was examined, obtaining four factors, which explained 55.816% of variance. Commonalities were generally high, reaching 0.843, implying that most of the items were in the factor space.

Once the EFA finished, the correlation matrix added information, in order to know the underlying structure of the items of the ICAQ. The rotated matrix, according to the orthogonal varimax method of maximum verisimilitude, allowed grouping the items with greater weight in each factor. We selected factors with a load > 0.40 , according to the cut proposed by Yong and Pearce (2013, 84–85).

The simple structure principle proposed by Thurstone (1928) was applied to carry out the rotation of the factors, obtaining 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 an item weighing the most (‘My father helps with housework’), which represents 67.24% (0.820), followed by (‘My father comes to meetings at school’), which represents 61.15% (0.782). (2) Factor 2 consisted of 8 items, accounted for 13.527% of the variance and was named *Inclusion in the centre*. The item ‘I receive adequate medical attention at school’, which represents 63.36% (0.796), followed by the item ‘I have sufficiently prepared teachers’, which represents 45.02% (0.671). (3) Factor 3 consisted of 3 items, accounted for 11.43% of the variance and was named *Communication with medical specialists*, being the item of greater weight ‘I received detailed medical chart information of insertion results after implantation’,

which represents 89.49% (0.946). It follows the item ‘I received detailed medical chart information of insertion results before implantation’, which represents 89.30% (0.945). (4) Factor 4 consisted of 3 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 represents 81% (0.900), followed by the item ‘I believe the use of digital blackboards,’ which represents 76.38% (0.874).

(Insert Table 1 here)

(Insert Figure 1 here)

We obtained a general factor average that reflects the students’ attitudes towards IE, including, in the case of children and adolescents with CIs, the 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 general 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*) ($M = 2.77$, $SD = 0.725$).

Besides, 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 who used 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 with age, sex and other variables associated with the age of implant. Finally, we find no significant differences between students using CIs or HAs, in *Family involvement and use of technology*, and *Assessment of the support technology* (Table 2).

(Insert Table 2 here)

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 the 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 (magnetic loop, system roger, digital blackboard, images and representations, and visual supports). The factor average obtained reflects a general students attitude close to high rating.

It is surprising that items related to the use of technology belong to the family factor. We interpret that it is because families usually have first involvement with the correct use of technological devices. Thus, children link technological resources with family involvement. However, these items need an additional analysis in future studies.

The reality of children with hearing devices places families in situations of restlessness and discouragement (Hintermair, and Albertini 2005). Mouvet et al. (2013) 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 difficulties results complicated by the emotional elements involved in the decision-making processes between the professionals management of information and the options selected by parents (Kecman 2018). 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’ (Ching et al. 2018, 24).

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

class activities and extracurricular activities).

An interdisciplinary evaluation of children with CIs or HAs allows the identification and treatment of significant disorders of ophthalmology, neurodevelopment, genetics and speech and language (Wiley et al. 2011). We noticed that children with hearing difficulties are more likely to have problems in their meaningful knowledge development, so that early hearing assessments are useful for subsequent medical and instructional intervention (Meinzen-Derr et al. 2017).

Garberoglio, Gobble, and Cawthon (2012, 378) reported that teacher training and school settings might prioritise ‘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 (Cepa, Heras, and Fernández-Hawryla 2017; Chute, and Nevins 2006; Davenport, and Alber-Morgan 2016; Mayer, and Trezek 2018; Scott, and Kasun 2018; Woolf 2018). Also, when students with hearing difficulties 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 preparing teachers in critical competencies to be effective: ‘professional preparedness, advocacy, and role flexibility’ (Woolf 2018, 10). Classroom flexibility or instructional pacing involves two issues for children with hearing difficulties. First, who will set the pace, the regular student or the child with hearing device? Second, how rapidly will the pace be set? The merit of a teacher is the control of speed at which students with hearing difficulties increase participation in activities (Antia, Sabers, and Stinson 2007; Amiama, Ledesma, and Monzón 2017).

Factor 3 (*Communication with medical specialists*) refers to the interaction of the medical team with the students before and after the implantation, as well as the satisfaction of children with the medical team for the clear information provided. The low factor average expresses that children and adolescents with CIs do not reflect a pleasant attitude 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 (Alegre et al. 2016), Yoshinaga-Itano (2014) 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 devices regress in their development is high. Therefore, the four main challenges teachers face in today IE are as follows:

1. Professional development
2. Resource management
3. New technologies
4. Building and maintenance of an adequate physical environment (Archbold, and Mayer 2012).

Factor 4 (*Assessment of the support technology*) relates to assessment of resources: visual supports, digital board, and representations with images. This factor obtains a low-average assessment. Moreover, there are other resources, under the philosophy of *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) (Black, Weinberg, and Brodwin 2015). Furthermore, students may receive accommodation in other hearing forms (i.e. personal FM listening system, which transmits a speaker’s voice directly to the user’s ear, or speech recognition programs, audiobooks or closed-caption television). However, Maidment et al. (2015, 66) explored whether visual information improved speech identification concluding, ‘4- to 5-year-old children with normal hearing may not benefit from additional visual cues to enhance degraded speech perception’ (for example, with a speech synthesiser).

The technologies mentioned above constitute the basis of a web-based ‘eHealth system’, which provided information about pain management among students and their parents. The eHealth interventions are not often distributed to teachers. However, King, Boutilier, and Chorne (2018, 103) reported that ‘usability goals’ of eHealth were met.

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. Nor we analysed the links between special needs types and classroom practices or the students’ academic results.

Recommendations

The findings of this study have practical implications for implementing attitudes of students with CIs or HAs towards inclusive-based schools. In brief, we recommend the following:

(1) Emphasis on family environment (i.e. school policies cultivate sense of community and participatory culture). (2) School-based inclusion efficiency (i.e. plan and develop individualisation of instruction and adapt learning standards for students with hearing difficulties). (3) Openness of communication (i.e. audiological experts, teachers and parents ought to rethink models of communication with implanted students). (4) Flow of resources for performance (i.e. students with hearing devices need to cope with any kind of classroom tasks).

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. This study has the feature of ‘emergent’ attitude knowledge-based of children and adolescents with hearing difficulties measured directly by their own students. The final average of the attitude of schoolchildren towards inclusion is the highest. The factor *Inclusion in the centre* has the highest average. The average of 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*.

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Table 1. Factors obtained in ICAQ

Items	Factors 1	Factors 2	Factors 3	Factors 4
10. My father helps with housework	.820			

9. My father comes to meetings at school	,782	
1. My father and/or mother reviews homework	,683	
29. I believe the use of magnetic loop antennas	,642	
5. My father and/or mother attends and participates at school activities (i.e. shows, sports)	,639	
30. I believe the use of the Roger system	,632	
4. My father and/or mother requests meetings with tutors to have information related with logopedic treatment, implant, adaptations	,559	
32. I believe the use of digital blackboards	,549	
33. I believe the use of image presentations	,541	
8. My mother helps with homework	,539	
19. I receive adequate medical attention at school		,796
17. I have sufficiently prepared teachers		,671
21. I have support from specialists who improve communication at school		,656

11. I feel welcome at school	,637	
14. The school makes efforts to avoid discrimination practices	,601	
20. I have technological aids that help communication	,599	
12. The school sets high expectations for students	,566	
13. Schoolteachers think that all students are equally important	,500	
24. (If you use implanted devices) I received detailed medical chart information of insertion results after implantation		,946
23. (If you use implanted devices) I received detailed medical chart information of insertion results before implantation		,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		,643
40. I assess the use of visual aids		,900

38. I assess the use of the Roger system	,874
39. I assess the use of the FM listening systems	,863

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

Factors	<i>t</i> <i>t</i> -Student, <i>p</i> <	CI (n= 184) M	CI (n= 184) SD	HA (n= 113) M	HA (n= 113) SD
1. Family involvement and use of technology	-.905 n.s.	2.77	.725	2.85	.752
2. Inclusion in the Centre	15.38***	3.31	.543	2.29	.575
3. Communication with medical specialists	32.13***	1.96	.830		
4. Assessment of the support technology	21.437***	3.30	.965	1.23	.430

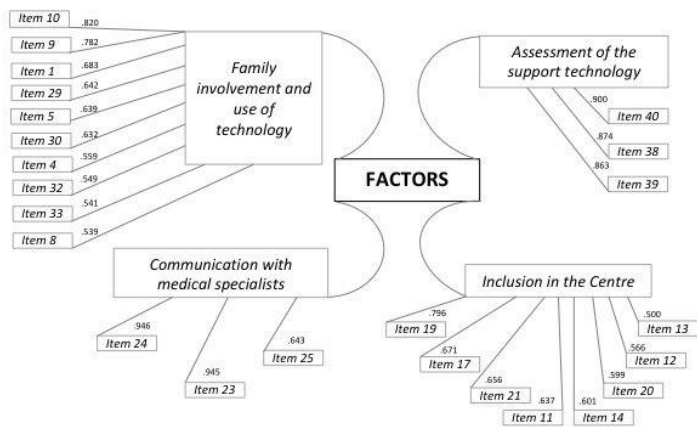


Figure 1. Four-factor solution of ICAQ derived from EFA. The boxes represent the 4 factors. Item numbers and loadings are also indicated.