HEARING, BALANCE AND COMMUNICATION
2020, VOL. 18, NO. 3, 164–172
https://doi.org/10.1080/21695717.2019.1705059

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ORIGINAL ARTICLE

Exploring the emotional problems and mental health needs of elementary school children using cochlear implants or hearing aids in the Islas Canarias

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ABSTRACT

Purpose: The study aimed to investigate whether emotional and behavioral strengths and difficulties differ between children with cochlear implants (CIs) or hearing aids (HAs), to correlate the outcomes of children on four psychological instruments, and to identify new socio-demographic and linguistic predictors of emotional and behavioral strengths and difficulties in children. A battery of psychological instruments (SDQ, ITPA, Peabody, and Raven's) was administered to children in two provinces of the Canary Islands, Spain.

Method: The study involved 187 children with CIs, 113 children with HAs, 176 parents, and 300 schoolteachers.

Results: Rating disagreements were found between children, parents, and schoolteachers in terms of their SDQ ratings. Total SDQ score correlated weakly with other total ITPA subtests, and the final Peabody and Raven's outcomes. Six socio-demographic and linguistic factors significantly predicted children's overall strengths and difficulties.

Conclusion: Findings have consequences for implementing instructional systems for children who are in need of personal and educational support.

KEYWORDS

Cochlear implantation; hearing aid; family; schoolteacher; SDQ

Introduction

The concepts of strengths and difficulties and communication in children with hearing loss are problematic. The terms have been applied to describe cochlear-implanted children's restricted abilities to some acoustic signals, to denote students' mental health difficulties, or to ascribe intellectual dependency to children who uses cochlear implants (CIs) or hearing aids (HAs) [1]. Hearing devices contribute to distinguishing the users of hearing aids psychologically. Children with hearing loss cannot develop spoken language processes without clinical and educational knowledge of auditory stimulation. One line of research is the evaluation of psychological difficulties of children with hearing loss, related to the mental structures of their language [2]. Knowledge of sensory information perceived by children with hearing devices is essential to overcome delays in the quality of spoken language. Many diagnostic tests require additional linguistic knowledge of children who have auditory difficulties. However, the application of some psychological tests concerns researchers because of the need for young children with insufficient linguistic development to understand the test instructions. Tutors and speech-language pathologists in schools are not the only educational agents who remedy the linguistic weaknesses of children with hearing devices. Parents are *de facto* agents in the development of language. They provide fluency in the primary oral language, which sustains the basic perceptual scheme of the child's future cognitive development. Agreement or differences in perceptions of strengths and difficulties of students with auditory problems affect the intellectual adaptation and performance of children with CIs or HAs, and their quality of life [3].

Many kinds of psychological problems among students are studied and compared. It is clear that routine use of the *Strengths and Difficulties Questionnaire (SDQ)* is necessary in understanding students' interpersonal relations [4]. The SDQ was developed as an instrument for screening of positive socialisation behavior and psychopathology in children aged 3 to 16 years. Many researchers' first goal in employing this questionnaire with deaf or hard of hearing children is to validate the instrument's diagnostic sensitivity.

There is some indication that children with hearing impairments might develop speech and language

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disorders which consequently obliges parents and schoolteachers for successful intervention on language therapy and social competence to improve children's ability to communicate [5]. Therefore, communication and linguistic ability screening instruments are needed for detecting children's behavioral difficulties and resources [6]. Research findings vary in regard to the cognitive abilities of children after implantation of hearing devices. Some researchers have used the *Illinois Test of Psycholinguistic Abilities (ITPA)* to measure the performance of sequential bilingual children with and without specific language impairment on the Spanish non-word repetition task [7] or some psycholinguistic skills of children, for example, "expressive grammatical knowledge" [8, p.1037]. Furthermore, Alegre et al. [9] administered the *ITPA* and *Peabody Picture Vocabulary Test (PPVT)*, and concluded that the children's age of early cochlear implantation was a good predictor of adequate linguistic development. Although children with CIs or HAs are cognitively able to understand complex instructional issues, the PPVT has been used to assess the vocabulary of deaf and hard of hearing subjects over a wide age range and its use has helped determine that the children's age of cochlear implantation is an essential predictor of speech and language outcomes in students with CIs [10]. The PPVT reveals the results of receptive vocabulary delay, and assesses other predictors of language development in children with CIs [11,12]. Hence, other researchers have examined the extent to which children with unilateral and mild bilateral hearing loss are at risk of social skills difficulties, compared with typical hearing children and children with moderate to severe hearing loss [13].

The identification of students with hearing loss who are talented is a research topic of great concern in educational theory and research. *Raven's Progressive Matrices Test (SPM)* is used to estimate the abstract reasoning fluency of children with CIs or HAs. Even though the original test has a large number of items, researchers have reduced its size [14] without losing its predictive validity, demonstrating "that items are largely measurement invariant" [15, p.9]. Other scholars have reflected on the limitations of linguistic and cognitive processing of children with CIs compared to their peers who hear complex semantic tasks, after RPM administration and scoring [16].

Aims of the study

First, the study aimed to investigate multiple inter-rater concordance correlation coefficients. Authors calculated agreement reports between children, parents, and schoolteachers on strengths and difficulties of children with CIs or HAs in an effort to give homogeneity and consistency to scores [17]. Second, the study aimed to determine the functional relationships of strengths and difficulties of children with hearing devices and their total scores in tests of psycholinguistic abilities, picture vocabulary, and abstract reasoning [18]. Last, the study aimed to determine the predictors of children's total SDQ scores.

Method

Participants

All eligible children in the Canary Islands were recruited to the study. The study cohort consisted of children with CIs ($n = 187$) and HAs ($n = 113$). They had access to the same hearing service provider (Canaria Health Service) before three years of age. One hundred and thirty-seven children were recruited from the island of Tenerife and 163 from the island of Gran Canaria. The chronological ages of the children were between 6-9 years ($n = 104$), 10-12 years ($n = 88$), and 13-16 years ($n = 108$). They attended ordinary educational centres. One hundred and nineteen children attended Individualised Curriculum Adaptation (ICA) plans, while 181 were enrolled in the regular curriculum of their typical peers. Aetiological causes were not considered in the study because of lack of information.

All parents provided informed written consent for administering questionnaires and tests to each child with CIs or HAs. Additionally, ethical and legal dispositions approval for the present study was obtained from the Clinical Research Ethics Committee of the Canarias Insular Maternal and Child University Hospital. The role of the family-centre care was essential for children's communication [19]. Therefore, the authors included parental education and family employment status as latent variables that might predict children's strengths and psycho-educational problems [20]. Thus, fathers ($n = 87$) and mothers ($n = 89$) had primary education degrees and were working (parents $n = 230$, mothers $n = 213$). Fathers' age was categorised into groups of 41-50 years old ($n = 143$), between 31-40 years old ($n = 95$), more than 50 years ($n = 55$), and between 20-30 years ($n = 7$). Mothers' age was categorised into groups of 41-50 years old ($n = 143$), 31-40 years old ($n = 95$), more than 50 years old ($n = 55$), and 20-30 years old ($n = 15$).

The authors substantiated the fathers' active role in oral communication with their children, noting parents who utilised verbal communication ($n = 215$), compared to those who employed signs only ($n = 28$), or were bilingual ($n = 57$). Previous research provides contradictory data about the role played by school professionals who had been in contact with children with CIs or HAs.

There were more female teachers: speech-language pathologists ($n = 249$) and tutors ($n = 227$), than male teachers: speech-language pathologists ($n = 51$) and tutors ($n = 73$). The average age of speech-language pathologists was between 50 and 59 ($n = 171$), and the average age of the tutors was 60 or more ($n = 150$). On average, both types of school educators had ten years or more of professional experience: speech-language pathologists ($n = 193$) and tutors ($n = 185$).

Materials

Strengths and Difficulties Questionnaire. Goodman [21] designed the SDQ consisting of 25 items grouped into five scales: Emotional problems, Behavioral problems, Problems with peers, Hyperactivity, and Prosocial behavior. The SDQ is an instrument used to screen both the positive behavior of socialisation and the psychopathology of children and adolescents aged from 3 to 16 years old. The results of factor analysis replicated by researchers in Spain have validated its structure [22]. Cronbach's alpha values in this research differed according to the groups studied: children with CIs or HAs (0.789), speech-language pathologists (0.725), tutors (0.616), and parents (fathers and mothers) (0.759), which represented adequate reliability values [23].

Illinois Psycholinguistic Aptitude Test. Prior to the ITPA being translated into Spanish, 68 studies had adopted this instrument between 1968 and 1974 to investigate children's abilities [24,25]. We administered *ITPA* with norms from Spain, as other researchers have previously used [7]. It is composed of the following functions: listening comprehension, visual comprehension, visual-motor sequential memory, auditory association, auditory sequential memory, visual association, visual integration, verbal expression, and grammatical integration. It allows the detection, prediction, and diagnosis of possible errors or difficulties in the child's communication process. Some researchers have applied the whole instrument to children with CIs [26] or specific subtests for predicting individual differences in peer acceptance and friendship formation among children with specific language impairments [18]. Cronbach's alpha for this study was 0.852, which represents a reasonable reliability coefficient [23].

Peabody Picture Vocabulary Test. This interactive test [27] offers two alternative forms (A and B) of a receptive vocabulary assessment. Each form contains 228 elements, grouped in 19 sets of 12 and increasing in difficulty. The administration time is kept to a 10 to 15-minute limit by applying the sets according to the child's age or skill level. Children point to one of four images that best represents the meaning of a verbally presented stimulus word. The average reliability coefficient for this test, based on the normative sample, was 0.89 [12]. However, Cronbach's alpha for this study was 0.641, which is considered a questionable coefficient [23].

Raven's Progressive Matrices. This instrument [28,29] has been delivered to deaf or hard of hearing children for the last 50 years [2]. It comprises 60 items that measure abstract reasoning, in which children are required to select the missing fragment from an incomplete pattern. Alpha for this study was 0.713, which seems an acceptable value coefficient [23].

Procedure

The authors obtained written consent from each child's father, mother, or both for their child's participation in the study. Parents and teachers (tutors and speech-language pathologists) and children with CIs or HAs completed the SDQ and a socio-demographic background questionnaire either at home or school. The socio-demographic questionnaire for parents and schoolteachers sought information about gender, hearing loss of children, communication mode, location, and educational experience. In addition, the family's economic situation was measured using parental employment status. Parents and Gran Canaria Hospital provided data on the age of children in the first auditory adjustment, the degree of hearing loss, type of hearing device, and age at the time of the installation of the acoustic devices. Members of the research team (psychologists or pedagogues) administered the ITPA, PPVT, and RPM tests in a quiet schoolroom or the child's clinical setting. Each testing session lasted a morning with appropriate pauses. The participating schoolteachers were all classroom tutors or speech-language pathologists.

Data analysis

First, descriptive statistics were calculated. All statistical analyses used an alpha level of .05. Second, the concordance rates between children and tutors and

speech-language pathologists, and schoolteachers and families on SDQ subscales were computed using Cohen's kappa coefficient. Third, Pearson correlation coefficients examined the strength and direction of the linear relationship between the responses of children with hearing devices on the SDQ subscales and total ITPA scores, and final PPVT and RPM scores. Next, separate Pearson correlations were performed for the schoolteachers and children with hearing devices on the total SDQ and ITPA scores, and the final PPVT and RPM scores. Last, a multiple regression analysis was carried out to examine the predictive power of the independent variables (e.g. the sociodemographic data, the total ITPA score, final PPVT and RPM scores, and a combination of SDQ subscale scores (parents and schoolteachers) in the SDQ total score. All analyses were performed with version 21 of SPSS.

Results

In accordance with the first aim of the study, mild agreement was found between speech-language pathologists and tutors on the SDQ subscales, when they scored the emotional and behavioral aspects of children with CIs or HAs. Results also revealed a moderate agreement between both kinds of schoolteachers on the Behavioral problems subscale ($k = -.405$, $p < .001$). Furthermore, mild agreement was observed between schoolteachers and children on the total SDQ and subscales outcomes. Likewise, moderate agreement appeared between children and their speech-language pathologists, although this applied exclusively to the Behavioral problems subscale of children with HAs ($k = .415$, $p < .001$). Similarly, moderate agreement was revealed on the Emotional problems subscale of children with CIs and their tutors ($k = .410$, $p < .001$).

Table 1 shows small relationships between children's self-report SDQ subscale scores, for example, Emotional problems mildly correlated with Behavioral problems ($r = .325$, $p < .001$) and was negatively correlated with Problems with peers ($r = -.122$, $p < .05$), meaning that when Emotional problems increased, Problems with peers proportionally decreased. Behavioral problems revealed significant correlations with Problems with peers ($r = .391$, $p < .001$), and Hyperactivity ($r = .260$, $p < .001$), and were negatively correlated with Prosocial behavior ($r = -.298$, $p < .001$), meaning that when Behavioral problems increased, Prosocial behavior proportionally decreased. Moreover, Hyperactivity had a significant positive relationship with Problems with peers ($r = .445$, $p < .001$), and a negative correlation with Prosocial behavior ($r = -.291$, $p < .001$), meaning that when Hyperactivity increased, Prosocial behavior proportionally decreased. Finally, Problems with peers was negatively correlated with Prosocial behavior ($r = -.432$, $p < .001$), meaning that when Problems with peers increased, Prosocial behavior proportionally decreased.

Furthermore, small positive correlations were found between children's SDQ subscale scores and total ITPA score ($r = .115$, $p < .05$) and final RPM score ($r = .115$, $p < .05$). Similarly, children's total ITPA score had small correlations with final RPM score ($r = .115$, $p < .05$), and with some SDQ subscale scores, such as, Behavioral problems ($r = .163$, $p < .001$), and Hyperactivity ($r = .177$, $p < .001$). Additionally, there were significant small correlations between children's final PPVT score and some SDQ subscale scores, such as, Behavioral problems

Table 1. Correlations between the five SDQ subscales and ITPA, PPVT (Peabody) and RPM (Raven) for children with hearing devices.

	ITPA	PPVT	RPM	Emotional problems	Behavioral problems	Hyperactivity	Problems with peers	Prosocial behavior
ITPA	1.000	−.073	.115*	−.049	−.163**	−.177**	−.200**	.094
		.206	.046	.394	.005	.002	.001	.103
PPVT	−.073	1.000	.077	−.053	.118*	.091	.108	−.141*
	.206		.186	.358	.041	.116	.061	.015
RPM	.115*	.077	1.000	.016	−.061	−.011	.001	.017
	.046	.186		.781	.292	.843	.985	.772
Emotional problems	−.049	−.053	.016	1.000	.325**	−.108	−.122*	.098
	.394	.358	.781		.000	.062	.034	.090
Behavioral problems	−.163**	.118*	−.061	.325**	1.000	.260**	.391**	−.298**
	.005	.041	.292	.000		.000	.000	.000
Hyperactivity	−.177**	.091	−.011	−.108	.260**	1.000	.445**	−.291**
	.002	.116	.843	.062	.000		.000	.000
Problems with peers	−.200**	.108	.001	−.122*	.391**	.445**	1.000	−.432**
	.001	.061	.985	.034	.000	.000		.000
Prosocial behavior	.094	−.141*	.017	.098	−.298**	−.291**	−.432**	1.000
	.103	.015	.772	.090	.000	.000	.000	

*Correlation coefficients significant at the .05 level (bilateral).
**Correlation coefficients significant at the .001 level (bilateral).

($r = .118$, $p < .05$), and Prosocial behavior ($r = -.141$, $p < .05$).

In accordance with the second goal of the study, children's total SDQ scores had small significant correlations with those of speech-language pathologists ($r = .250$, $p < .001$) and tutors ($r = .247$, $p < .001$) Links between children's problems and receptive vocabulary were found. Speech-language pathologists' total SDQ score was negatively correlated with children's final PPVT score ($r = -.113$, $p < .05$). Additionally, speech-language pathologists' ratings of the total SDQ score were significantly correlated with those of tutors ($r = .258$, $p < .001$).

As indicated in Table 2, ITPA subtests significantly correlated among themselves, for example, Auditory Reception with Verbal Expression ($r = .616$, $p < .001$), Auditory Reception with Auditory Sequential Memory ($r = .632$, $p < .001$), and Auditory Reception with Grammatic Closure ($r = .581$, $p < .001$). These correlations showed an association between two levels of organisation of increasing complexity.

The third aim of this study was to explain the relationship between the predictor and target variables. For the purpose of determining the predictive value of the different subscales and dimensions of the ITPA, PPVT, and SPM test, as well as to identify the socio-demographic independent variables predicting the final construct linked to the total SDQ score, the authors employed the *introduce* method of multiple linear regression analysis, and confirmed the assumptions of linearity, independence, normality, homoscedasticity, and non-collinearity to guarantee the validity of the model.

The method of least squares was chosen (Table 3). The Pearson correlation coefficient was .751, while the goodness of fit was calculated following the coefficient of determination R-square, which predicted 55.1% of the variance (corrected effect of the sample and independent variables). The typical estimation error (square root of the unexplained variance) was 0.468. An ANOVA was performed, and the model was significant ($F = 42.431$, $p < .001$) in predicting the children's total SDQ score.

Finally, the regression model, that included hearing device, geographical location, ACI, mothers' age, and children's chronological age as predictors, was significant, with hearing device (CI/HA) having the highest coefficient ($t = 10{,}511$, $p < .000$).

The regression analysis results for the ITPA subscales, PPVT, and RPM dimensions are shown in Table 4. Some ITPA subscales explained 42.6% of the variance in the children's total SDQ score. The Automatic Level Auditory-Vocal had considerable weight in the scores of strengths and weaknesses in the children's total SDQ score; specifically, these were the scales of Visual Sequential Memory, Auditory Sequential Memory, and Grammatic Closure. The Representative Level Visuo-Motor in the Verbal

Table 2. Correlations between the SDQ and ITPA, PPVT (Peabody), and RPM (Raven) for teachers and children with hearing devices.

	SDQ total speech-language pathologist	SDQ total tutor	SDQ total children with hearing devices	ITPA total score children with hearing devices	PPVT final score children with hearing devices	RPM final score children with hearing devices
SDQ total Speech-language pathologist	1.000	.258**	.250**	.053	−.113*	.032
SDQ total Tutor	.258**	1.000	.247**	.037	.050	.053
SDQ total Children with hearing devices	.250**	.247**	1.000	.115*	−.062	.053
ITPA total score Children with hearing devices	.053	.037	.115*	1.000	−.073	.115*
PPVT final score Children with hearing devices	−.113*	.050	−.062	−.073	1.000	.077
RPM final score Children with hearing devices	.032	.053	.053	.115*	.077	1.000

*Correlation coefficients significant at the .05 level (bilateral).
**Correlation coefficients significant at the .001 level (bilateral).

Table 3. Regression analysis of the socio-demographic variables as predictors of children's total SDQ score.

Target	R	R^2	F	Explained variance	Sociodemographic predictors	β	t
Children's total SDQ score	.751	.564	42.431***	55.1%	Hearing device	1.155	10.511***
					Geographical location	–.268	–3.278***
					ICA	.230	3.019**
					Mothers' age	–.1504	–2.789**
					Children's chronological age	.078	2.006*

*$p < .05$; **$p < .010$; ***$p < .001$.

Table 4. Regression analysis of ITPA, Peabody, and Raven variables as predictors of children's total SDQ score.

Target	R	R^2	F	Explained variance	ITPA subscalepredictors	β	t
Children's total SDQ score	.426	.181	8.594***	42.6%	ALAV-VSM:	.022	4.502***
					ALAV-ASM	−.014	−2.934**
					ALAV-GC	.015	3.781***
					RLAV-VE	−.014	−2.846**
					RLAV-RV	−.014	−2.683**

**$p < .010$; ***$p < .001$.

Expression scale and the Representative Level Visuo-Motor in the Auditory Reception scale also had significant weights. The model was significant ($F = 8.594$, $p < .001$) in predicting the children's total SDQ score.

Therefore, the results showed that the total SDQ score was clearly influenced by integrated habits, such as memory and remote learning, which produce an automatic chain of responses, as well as in the visual or auditory modalities that constitute the input of the communication channel, highlighting the highest influence of the Automatic Level Auditory-Vocal in the Visual Sequential Memory ($t = 4.502$, $p < .001$).

Discussion

The different informants (parents, children, schoolteachers) rated the strengths and difficulties of children with CIs or HAs in a discrepant manner (e.g. *r*s were often discordant among informants' ratings, being .00–.20) [30]. However, pairs of informants were compared, and showed different correspondence agreements in the Cohen's Kappa coefficients (e.g. mother–father, father–son with CIs, father–schoolteacher, tutor–child with CIs). The categorical covariates (e.g. child's age, pairs of schoolteachers who observe children over different periods of time) accounted for some of the variability among the effects. Child evaluations tended to produce low to moderate levels of correspondence among informants. However, the authors noticed mild levels of correspondence occurred when informants had relatively more significant opportunities to observe (e.g. speech-language pathologists perceived conduct problems in children with HAs) within the same school class context (e.g. tutors observed emotional symptoms of children with CIs). The poor agreements that can be observed in the other SDQ subscales have led researchers to consider that schoolteachers have limited awareness of the emotional and behavioral aspects of children with hearing loss. On the other hand, mothers are in a unique position to observe children in a wide variety of situations and for long periods of time compared to other informants, such as teachers and peers. Little or no agreement between children and parents in this study may have been found because of the inability of the children or their refusal to report their problems. Although parents' speech encourages children's vocabulary progress, families have limited knowledge about children's interpersonal relations with other peers [31].

Regarding our second research question, the authors assumed a correlation between children's problems, psycholinguistic abilities, and cognitive aptitudes. In hearing loss education, diagnostic-prescriptive teaching refers to the launch of an individualised educational programme for students with learning difficulties. As a rule, learning problems involve many uncovered factors. The authors found that scores on the Problems with peers subscale were significantly negatively associated with Prosocial behavior, meaning that friendship quality improves as Problems with peers decrease [18]. Besides, participants who rated themselves higher on Prosocial behavior rated themselves lower on Behavioral problems, Hyperactivity, and Problems with peers. The authors assume that this result was to be expected because of the subsample of adolescents, whose Prosocial behavior, especially towards friends, is a feature that characterises early adolescence. Correlations in children with hearing loss between SDQ subscales appear low and incoherent. These correlation outcomes also indicate differences between the SDQ subscales depending on *distal* factors, for example, administering the same questionnaire to students in different school grades from different provinces by different parents and schoolteachers. Furthermore, the results hint at similarities between children with CIs and those with HAs before device implantation. This is due to the lack of baseline data and this limitation is outlined in other studies [26]. In this study, the correlations between ITPA and SDQ scores showed a low relationship. In any case, it has previously been observed that the ITPA has low correlations with other tests [24]. The Auditory Reception and Verbal Expression subtests are used in the selection of children for placements in ICA plans. In this study, ratings by speech-language pathologists and tutors of

SDQ total score were correlated, although the size of the effect was small. Moreover, ratings by both kinds of school professionals were correlated with those of children with hearing devices, although the size of the effect was equally small. In children with hearing implants, the need for continuous observation of children with hearing loss and the complexity of identifying children's communication and social problems makes speech-language pathologist and tutor-based diagnosis difficult [2]. Data show that children with CIs or HAs misunderstand words from content areas of the PPPVT, with evidence of particular difficulty when the speech-language pathologist augments the total SDQ score.

This study confirmed that children with CIs or HAs disagreed in SDQ subscale ratings. The first factor entered in the regression model that predicted total SDQ outcome was the presence of children with bilateral CIs or a hearing aid [12]. The regression model highlighted some socio-demographic predictors of total SDQ scores that need additional comments. This study revealed that the province was a predictor of children's psychosocial problems and difficulties, as was found in another study [32]. The Gran Canaria model of service delivery is unique, for example, the Hearing Loss Unit, where children are fitted with implants, is enriched by closer technical and personnel resources in comparison to Tenerife. Therefore, it would be of interest to replicate the study in other Spanish provinces where similar or different models may be employed. ICA plans as a strategy of compensatory instructional design predicted the total SDQ outcome in a school environment. The route of ICA plans taken by each school learner depends on an initial diagnosis of ITPA abilities in each available ICA plan, for example, memory and remote learning or those integrated abilities, which link the visual or auditory modalities that constitute the input of the communication channel. This study emphasised mothers' age as an important resource for solving problems of children with hearing devices. Future studies would be able to illustrate the benefits of maternal education or mother-to-mother support for implanted children's social and emotional health-related quality of life [33]. Children's chronological age of implantation influences psychosocial problems and difficulties [16]. Future research should centre on the functional hearing children have from birth until they receive their implants, when oral communication, vocabulary, and grammar develop [34]. The regression analysis of this study showed that the factor ITPA Automatic Level Auditory-Vocal was crucial in predicting implanted children's total SDQ score. In other words, children's ability to obtain meaning from orally presented material, and their semantic knowledge discloses children's strengths and difficulties. Therefore, auditory-verbal therapy demands a high level of interaction between speech-language pathologists, parents, and school children [32].

Speech-language pathologist and tutor training programmes, for diagnosing children's psychosocial difficulties and designing school aptitude-treatment instructional systems, ought to be implemented at universities [2]. This study also suggests the need for mentoring of parents with children diagnosed with hearing loss, because of the low or no agreement between children with CIs or HAs and their parents in ratings of children's psychological difficulties [35]. The authors particularly highlight the conclusion of Isarin et al. [36] on the importance of child and family-centered case management topics (e.g. care, facilities, and services).

In summary, the results from this study show divergence in the assessment of children's psychological problem outcomes, among the following groups: children with CIs or HAs, fathers and mothers, and speech-language pathologists and tutors. Although the study found evidence that the SQD and ITPA did not correlate, from the data collected, the authors revealed significant correlations among some ITPA subscales. The study identified new predictive factors of outcomes in this population (hearing device, geographical location, ICA plan, mothers' age, children's chronological age, and ITPA subtests). The results of this study have significantly expanded the body of knowledge (personal, environmental, curricular, and familiar) regarding SDQ outcomes in children with hearing loss.

Acknowledgements

The authors thank the children, families, participating schoolteachers, the Canaria Health Service researchers and the Canarias Insular Maternal and Child University Hospital personnel.

Disclosure statement

The authors report no conflicts of interest. The authors are entirely responsible for the content and writing of this article. The authors contributed equally to this work.

Funding

This work was supported by the CajaCanarias Foundation [competitive call project n° CSOCSEDO3 for four years, completed in 2018].

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