International Journal of Pediatric Otorhinolaryngology 200 (2026) 112653

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

# Behavioral and socio-emotional profiles in early-school-age children with cochlear implants versus normal-hearing peers☆,☆☆

Yuşa Başoğlu [a,*], İlayda Başoğlu [b], Gül Ölçek [a]

[a] Istanbul Medipol University, Faculty of Health Sciences, Department of Audiology, Istanbul, Turkey
[b] Istanbul Medipol University, Faculty of Health Sciences, Department of Speech and Language Therapy, Istanbul, Turkey

ARTICLE INFO

*Keywords:*
Cochlear implant
Preschool
Behavior
Social anxiety
Adjustment
Rule-breaking
CBAS

ABSTRACT

*Objective:* To compare teacher-reported socio-emotional and behavioral functioning in early-school-age children with cochlear implants (CI) versus normal-hearing (NH) peers using the Child Behavior Assessment Scale (CBAS), and to test whether group differences persist after adjustment for socioeconomic factors.
*Methods:* In this cross-sectional study, 80 children aged 5–6 years were enrolled (CI = 40; NH = 40). Teachers completed CBAS subscales (Adjustment, Social Anxiety, Rule-breaking Behaviors) and total score. Between-group comparisons used Mann–Whitney U tests. ANCOVA on CBAS total adjusted for maternal education, paternal education, and household income. Exploratory correlations within the CI group examined age and clinical durations.
*Results:* Compared with NH peers, the CI group showed lower Adjustment (mean ± SD: 61.45 ± 15.46 vs 80.95 ± 6.56; $p < .001$) and higher Social Anxiety (64.20 ± 13.27 vs 34.28 ± 7.02; $p < .001$) and Rule-breaking Behaviors (113.33 ± 26.77 vs 61.08 ± 15.98; $p < .001$). CBAS total was higher in the CI group (238.98 ± 48.22) than NH (176.30 ± 17.10; $p < .001$). In ANCOVA, the CI versus NH effect on CBAS total remained significant ($F(1,75) = 33.846$, $p < .001$; partial $\eta^2 = 0.311$), while socioeconomic covariates were not significant. Within the CI group, child age correlated positively with Rule-breaking Behaviors ($r = 0.331$, $p = .037$).
*Conclusions:* At school entry children with CI showed higher levels of socio-emotional and behavioral difficulties compared to NH peers; however, these findings should be interpreted with caution given the sample size and cross-sectional design. The results support routine psychosocial surveillance and targeted supports within CI follow-up and school settings.

## 1. Introduction

Childhood hearing loss is a major public health concern with consequences that extend beyond auditory and language development into socio-emotional and behavioral domains. Current global estimates suggest that over 34 million children worldwide are affected by disabling hearing loss, and recent burden analyses indicate that more than 97 million children and adolescents under 20 years were affected in 2021 [1,2].

Behavioral difficulties are consistently reported in deaf and hard-of-hearing (DHH) children, with language and attention processes posited as key mechanisms linking auditory access to behavior. In preschoolers, impaired language and attention robustly predict externalizing and internalizing problems; parent–child communication also plays a role [3]. A study using the Child Behavior Checklist (CBCL) have shown higher rates of emotional and behavioral problems in DHH participants compared to their typically developing peers and have highlighted differences in informants and developmental stages [4].

Psychosocial outcomes are heterogeneous for children with cochlear implants (CIs). Prospective cohorts of five-year-olds with CIs or hearing aids demonstrate that psychosocial functioning is sensitive to language skills and family factors [5]. Long-term follow-ups of early-implanted users indicate broad variability, with language and executive functions explaining substantial variance in psychosocial status [6]. A systematic review concluded that the heterogeneity of study (in terms of measures, samples, designs) limits the ability to draw firm conclusions about

☆ **Previous presentation**: This study was presented at the 3rd National OTO Audiology Congress, Istanbul Medipol University, Istanbul, Turkey, 4–5 June 2022.
☆☆ Award: Second-place presentation award, 3rd National OTO Audiology Congress (4–5 June 2022).

* Corresponding author. Istanbul Medipol University, Faculty of Health Sciences, Department of Audiology, Kavacık Mah., Beykoz, 34810, Istanbul, Turkey.
*E-mail address:* ybasoglu@medipol.edu.tr (Y. Başoğlu).

https://doi.org/10.1016/j.ijporl.2025.112653
Received 7 October 2025; Received in revised form 16 November 2025; Accepted 22 November 2025
Available online 27 November 2025
0165-5876/© 2025 Elsevier B.V. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

socio-emotional development in CI users across preschool and school ages [7]. Parent–teacher reports often converge at the group level, but agreement is modest; poorer speech perception and receptive vocabulary are associated with more school behavior problems [8].

Clinical and contextual determinants further nuance these trajectories. Cross-sectional data from Mandarin-speaking CI users reveal increased CBCL problem scores, which are further associated with heightened family stress [9]. Even slight-to-mild hearing loss often overlooked relates to more behavioral problems and poorer school performance in large samples [10]. Importantly, bilateral versus unilateral implantation is linked to better spoken-language outcomes, and shorter inter-implant intervals predict stronger language growth—factors that may indirectly support psychosocial functioning [11,12].

Accordingly, this study (i) compares early–school-age cochlear implant users with normal-hearing peers on Rule-breaking behavior, adjustment, and social anxiety; and (ii) evaluates whether clinical parameters—age at diagnosis and implantation, duration of device/implant use, and implantation laterality (unilateral vs bilateral) and family context caregiving arrangement, parental education, and household income account for observed differences, with the goal of delineating actionable psychosocial risks and protective factors at school entry.

## 2. Materials and methods

### 2.1. Study design and ethical approval

We conducted a cross-sectional, comparative study of early–school-age children with cochlear implants (CIs) and normal-hearing (NH) peers. The protocol was approved by the Istanbul Medipol University Clinical Research Ethics Committee (27.11.2025; E-10840098-202.3.02-7551) prior to any contact with participants. Parents/legal guardians provided written informed consent; procedures complied

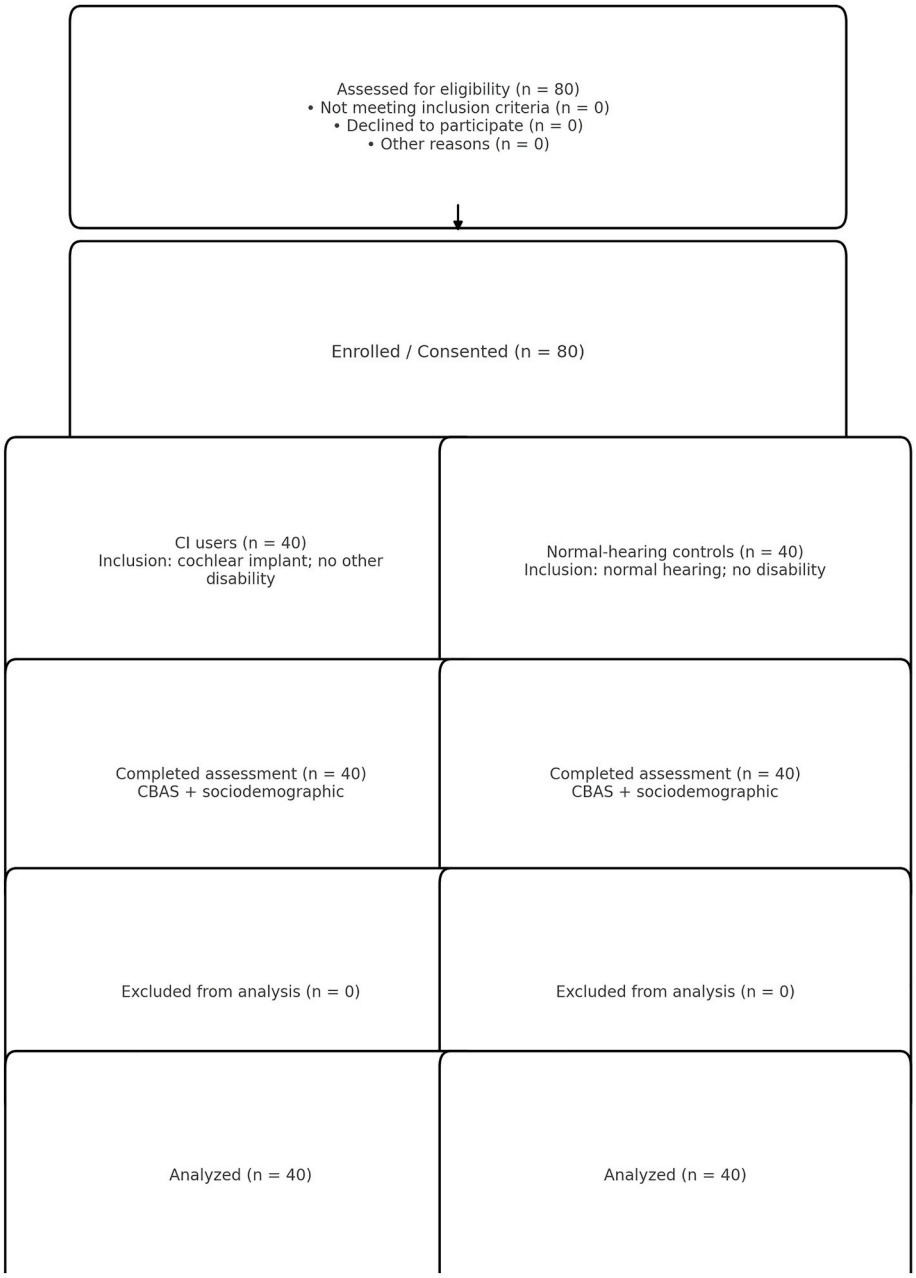



**Fig. 1.** CONSORT flow diagram.

with national data-protection legislation. Participation was voluntary with the right to withdraw at any time.

### 2.2. Setting

Participants were recruited from rehabilitation and cochlear-implant centers in İzmir, İstanbul, and Mardin.

### 2.3. Participants and eligibility

We enrolled N = 80 children aged 5–6 years: CI users (n = 40) and NH controls (n = 40). As depicted in Fig. 1, there were no exclusions or withdrawals; all enrolled participants completed assessments and were included in analyses.

Inclusion—CI group: age 5–6 years; unilateral or bilateral CI; no additional disability beyond hearing loss; routine follow-up at the participating center.

### 2.4. Inclusion—NH group: age 5–6 years; normal hearing and no other disability

Exclusion (both groups): documented neurological disease; intellectual disability, autism spectrum or other major psychiatric disorder under active treatment, current psychotropic medication likely to influence behavior ratings, uncorrected visual impairment, acute intercurrent illness on assessment day; for CI users: a history of device failure (e.g., coil or cable malfunction, weakened magnet retention, skin or soft-tissue complications requiring magnet strength adjustment, internal device dysfunction, or other manufacturer-verified technical issues) or revision surgery within the 3 months preceding the assessment.

### 2.5. Informants

Behavioral questionnaires were completed by the children's preschool/kindergarten teachers in both groups (CI and NH). Teachers were chosen as informants because they observe children in naturalistic peer and classroom settings, allowing reliable assessment of socio-emotional and behavioral functioning. The demographic information form was completed by the parents.

### 2.6. Measures

#### 2.6.1. Socio-demographic and clinical form

Parents reported child age and sex; caregiving arrangement; parental education (mother/father); household income; and CI-specific variables (age at diagnosis, age at implantation, duration of device/implant use, duration of special-education, implantation laterality [unilateral vs bilateral]).

#### 2.6.2. Child Behavior Assessment Scale (CBAS) and scoring

We assessed socio-emotional/behavioral functioning with the Child Behavior Assessment Scale (CBAS), a 73-item measure comprising three domains Rule-breaking Behavior, Adaptation, and Social Anxiety originally developed and validated in Turkish preschool samples with excellent internal consistency (Cronbach's α = .96, 0.93, 0.88; total 0.95) [13]. Items are rated on a 5-point Likert scale (1 = Never to 5 = Always); 21 positively keyed items are reverse-scored prior to aggregation. Subscale scores are computed as the sum of their respective items, and the total score is the sum across all 73 items (range 73–365), with higher scores indicating greater behavioral difficulties.

#### 2.6.3. Procedures

After obtaining ethics committee approval, suitable families were contacted through center staff during routine visits. Parents who gave consent completed a socio-demographic/clinical form; designated informants completed the CBAS. Data were de-identified using study identification numbers and stored in password-protected files accessible only to the research team.

#### 2.6.4. Statistical analysis

All tests were two-tailed (α = .05). Distributional assumptions were screened with the Kolmogorov–Smirnov test. Because at least one CBAS domain violated normality in groupwise checks, between-group comparisons (CI vs. NH) for CBAS subscales and total used the Mann–Whitney *U* test; we report test statistics and exact p-values (nonparametric effect sizes were not reported). For the CBAS total score, an ANCOVA adjusted for socioeconomic covariates (maternal education, paternal education, household income); we report F, p, and partial $\eta^2$. Within the CI group, exploratory associations with family/SES indicators and selected clinical variables were examined using Spearman's ρ where justified by preliminary correlations. A priori power calculations in GPower 3.1 targeted a small-to-moderate effect (Cohen's d = 0.45) for two-tailed independent-means comparisons (α = .05, power = 0.80, 1:1 allocation), indicating a required total N = 80 (n = 40 per group); this sample size was planned and achieved. The *t*-test family in GPower was used as a conservative approximation for the subsequent nonparametric analyses.

## 3. Results

A total of 80 children participated in the study, including 40 in the cochlear implant (CI) group and 40 in the normal-hearing (NH) group. As shown in Fig. 1, the participant flow involved no exclusions and complete case analysis. The mean age was 5.45 ± 0.50 years in the CI group and 5.38 ± 0.50 years in the NH group, with no significant difference between groups (p = .498). In the CI group, 65.0 % of participants were male and 35.0 % female, whereas in the NH group, 37.5 % were male and 62.5 % female. Bilateral implantation was present in 82.5 % of the CI group, while 17.5 % had unilateral implantation. Regarding caregiving, 72.5 % of CI children were primarily cared for by their mothers, 20.0 % by both parents, 5.0 % by their fathers, and 2.5 % by a guardian, whereas 87.5 % of NH children were cared for by both parents and 12.5 % by their mothers. Educational attainment of mothers and fathers was generally lower in the CI group compared with the NH group (Table 1).

Within the CI group, the mean age at diagnosis of hearing loss was 5.75 ± 8.57 months (range 0–30), and the mean age at implantation was 24.60 ± 11.13 months (range 12–48). The mean duration of CI use was 39.73 ± 13.90 months (range 8–60), the mean duration of special education was 43.35 ± 19.51 months (range 0–78), and the mean duration of hearing-aid use was 18.25 ± 16.34 months (range 0–72) (Table 2).

Comparisons of CBAS subscale scores indicated significant group differences across all domains (Table 3, Fig. 2). The CI group demonstrated lower Adjustment scores (61.45 ± 15.46) than the NH group (80.95 ± 6.56; Z = −6.014, p < .001), while Social Anxiety scores were markedly higher among CI users (64.20 ± 13.27) relative to the NH group (34.28 ± 7.02; Z = −7.188, p < .001). Similarly, Rule-breaking Behaviors cores were greater in the CI group (113.33 ± 26.77) compared with the NH group (61.08 ± 15.98; Z = −6.954, p < .001), and Total CBAS scores were higher in the CI group (238.98 ± 48.22) than in the NH group (176.30 ± 17.10; Z = −5.814, p < .001).

Correlation analyses performed within the CI group revealed a significant positive association between age and Rule-breaking Behaviors (r = 0.331, p = .037). No significant correlations were observed between CBAS scores and age at diagnosis of hearing loss, age at implantation, duration of CI use, duration of special education, or duration of hearing-aid use (Table 4).

Controlling for socioeconomic covariates (maternal/paternal education, household income), the group effect on CBAS Total scores remained significant, F(1, 75) = 33.846, $p < .001$, partial $\eta^2 = 0.311$ (CI > NH). None of the covariates were significant—maternal education: F = 0.104, $p = .748$, partial $\eta^2 = 0.001$; paternal education: F = 1.022, $p =$

**Table 1**
Demographic characteristics of participants.

| Variable | CI Group (n = 40) | NH peers (n = 40) | Total (N = 80) | *p* value |
|---|---|---|---|---|
| **Age (years)**, mean ± SD (min–max) | 5.45 ± 0.50 (5–6) | 5.38 ± 0.50 (5–6) | 5.41 ± 0.50 (5–6) | 0.498[a] |
| **Sex**, n (%) | Male: 26 (65.0) Female: 14 (35.0) | Male: 15 (37.5) Female: 25 (62.5) | Male: 41 (51.3) Female: 39 (48.7) | – |
| **Cochlear implant laterality**, n (%) | Bilateral: 33 (82.5) Unilateral: 7 (17.5) | – | – | – |
| **Primary caregiver**, n (%) | Mother: 29 (72.5) Father: 2 (5.0) Both parents: 8 (20.0) Guardian: 1 (2.5) | Mother: 5 (12.5) Both parents: 35 (87.5) | – | – |
| **Mother's education**, n (%) | Elementary: 9 (22.5) Middle school: 13 (32.5) High school: 14 (35.0) Associate: 3 (7.5) Bachelor's: 1 (2.5) | Middle school: 4 (10.0) High school: 11 (27.5) Associate: 6 (15.0) Bachelor's: 19 (47.5) | – | – |
| **Father's education**, n (%) | Elementary: 10 (25.0) Middle school: 9 (22.5) High school: 14 (35.0) Associate: 3 (7.5) Bachelor's: 4 (10.0) | Elementary: 1 (2.5) Middle school: 2 (5.0) High school: 7 (17.5) Associate: 10 (25.0) Bachelor's: 20 (50.0) | – | – |

CI, cochlear implant; NH, normal-hearing; SD, standard deviation; n, number; min–max, minimum–maximum; p, p-value.
[a] Mann–Whitney *U* test.

**Table 2**
Clinical descriptive characteristics of the cochlear implant group (n = 40).

| Variable (months) | n | Mean ± SD | Range (Min–Max) |
|---|---|---|---|
| Age at diagnosis of hearing loss | 40 | 5.75 ± 8.57 | 0–30 |
| Age at cochlear implantation | 40 | 24.60 ± 11.13 | 12–48 |
| Duration of cochlear implant use | 40 | 39.73 ± 13.90 | 8–60 |
| Duration of special education | 40 | 43.35 ± 19.51 | 0–78 |
| Duration of hearing-aid use | 40 | 18.25 ± 16.34 | 0–72 |

All values are reported in months.
CI, cochlear implant; SD, standard deviation; n, number; min–max, minimum–maximum.

.315, partial $\eta^2 = 0.013$; income: $F = 0.429$, $p = .514$, partial $\eta^2 = 0.006$. These findings indicate that the unadjusted group difference persists after accounting for socioeconomic status (see Table 5).

## 4. Discussion

This study compared the socio-emotional and behavioral profiles of early–school-age children with CI and NH peers. Within this sample, CI users displayed significantly greater social anxiety and rule-breaking behaviors, along with lower adjustment, resulting in higher CBAS total scores compared with NH peers. Importantly, this CI–NH difference persisted after adjusting for socioeconomic covariates (ANCOVA; partial $\eta^2 \approx 0.31$), and the SES terms themselves were non-significant. These findings indicate that, even with auditory access provided through cochlear implantation, children with CI remain at increased risk for behavioral and emotional difficulties at the transition to formal schooling.

**Table 3**
CBAS Subscale Scores: Between-Group Comparisons (Cochlear Implant vs. Normal-hearing peers).

| Subscale | CI group (n = 40) Mean ± SD (Min–Max) | NH peers (n = 40) Mean ± SD (Min–Max) | Z | *p* value |
|---|---|---|---|---|
| Adjustment | 61.45 ± 15.46 (28–93) | 80.95 ± 6.56 (65–91) | −6.014 | <0.001 |
| Social Anxiety | 64.20 ± 13.27 (30–90) | 34.28 ± 7.02 (24–57) | −7.188 | <0.001 |
| Rule-breaking Behaviors | 113.33 ± 26.77 (55–162) | 61.08 ± 15.98 (43–127) | −6.954 | <0.001 |
| Total Score | 238.98 ± 48.22 (140–327) | 176.30 ± 17.10 (152–239) | −5.814 | <0 0.001 |

Between-group comparisons by Mann–Whitney *U* test. CBAS, Child Behavior Assessment Scale; CI, cochlear implant; NH, normal-hearing; SD, standard deviation; min–max, minimum–maximum; Z, standardized test statistic; p, p-value.

The findings are consistent with literature documenting heightened psychosocial risk among children with hearing loss. The study by Predicting Behavior Problems in Deaf and Hearing Children (2009) demonstrated that language delays and attention deficits mediate the relationship between hearing status and behavioral problems in young children [3]. Similarly, a systematic review on socio-emotional development in CI children reported mixed but often unfavorable results compared to typical peers, especially in domains such as emotion regulation and identifying emotional cues [14]. Psychosocial outcomes in long-term CI users have also been tied to executive functioning and language competence, as shown in studies of prelingually deaf, early-implanted cohorts [8]. In some investigations, social-emotional profiles among early-implanted children were similar to hearing peers, with exceptions in specific domains like prosocial behavior and emotional adjustment; bilateral implantation emerged as a predictor of better socio-emotional outcomes in those studies [15].

Mechanistically, although we did not assess language or executive functioning (EF) in the present study, prior work indicates that language acquisition and attentional control are plausible mediators linking auditory input to behavioral outcomes. In particular, children with greater language delays and attentional difficulties exhibit more behavioral problems [3,14], and longitudinal studies report that stronger language and EF are associated with better psychosocial adjustment in CI users [4,15]. Consistent with this account, our null SES effects suggest that distal socioeconomic proxies may explain less variance in behavior than proximal language-cognitive pathways; future analyses should include direct language/EF measures to test mediation explicitly.

Evidence on device configuration is mixed: some cohorts report that bilateral implantation and shorter inter-implant intervals relate to better socio-emotional adjustment, but others do not [16]. We observed no such associations, likely reflecting limited variability (predominance of bilateral users) or the constrained age range of our sample—conditions that can mute between-configuration contrasts.

Finally, the broader family context warrants attention. Quantitative and qualitative studies show that parental stress is elevated in families of children with hearing loss and can shape child behavioral/emotional outcomes; social support appears to buffer these effects [17]. Given that SES covariates were null in our models, targeted family-focused supports (stress management, coaching on communication strategies, linkage to school-based resources) may be more actionable levers than distal socioeconomic indicators.

In sum, early–school-age CI users showed heightened socio-emotional and behavioral difficulties relative to NH peers, and the group effect remained after SES adjustment. These data argue that rehabilitation should extend beyond audiological targets to routine

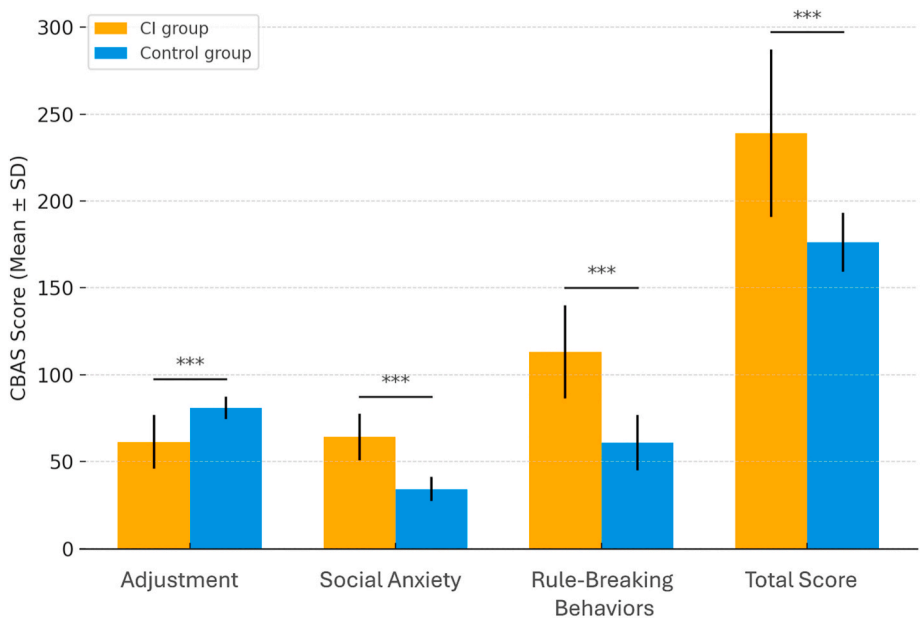



**Fig. 2.** Comparison of CBAS subscale and total scores between cochlear implant (CI) users and normal-hearing (NH) peers.

**Table 4**
Spearman correlations between CBAS scores and clinical/demographic variables in the study group (n = 40).

| CBAS Subscale/ Total | Age | Age at diagnosis of HL (months) | Age at implantation (months) | Duration of CI use (months) | Duration of special education (months) | Duration of HA use (months) |
|---|---|---|---|---|---|---|
| Adjustment | 0.052 (0.749) | 0.089 (0.587) | −0.004 (0.980) | 0.042 (0.797) | −0.008 (0.962) | 0.069 (0.674) |
| Social Anxiety | 0.057 (0.729) | −0.089 (0.585) | −0.096 (0.554) | 0.093 (0.569) | 0.168 (0.299) | 0.040 (0.804) |
| Rule-breaking Behaviors | 0.331* (0.037) | −0.027 (0.870) | −0.001 (0.995) | 0.229 (0.156) | 0.250 (0.120) | −0.219 (0.175) |
| Total Score | 0.196 (0.226) | −0.018 (0.913) | −0.025 (0.880) | 0.170 (0.296) | 0.138 (0.396) | −0.102 (0.531) |

Values are Spearman's rho (r) with p-values in parentheses; *p < .05.
HL, hearing loss; CI, cochlear implant; HA, hearing aid; r, Spearman's rho; p, p-value; n, number.

**Table 5**
ANCOVA results for CBAS Total scores after controlling for socioeconomic covariates.

| Predictor | df_effect | df_error | SS (Type III) | F | p | Partial $\eta^2$ |
|---|---|---|---|---|---|---|
| **Group (CI vs. NH)** | 1 | 75 | 45,060.940 | **33.846** | **< .001** | **.311** |
| Maternal education | 1 | 75 | 138.756 | 0.104 | 0.748 | 0.001 |
| Paternal education | 1 | 75 | 1360.840 | 1.022 | 0.315 | 0.013 |
| Household income | 1 | 75 | 571.763 | 0.429 | 0.514 | 0.006 |

CI = Cochlear implant; NH = Normal-hearing peers; CBAS = Child Behavior Assessment Scale; df = degrees of freedom; SS = sum of squares; $\eta^2$ = eta squared.

psychosocial surveillance and brief, evidence-based supports, ideally integrated within CI follow-up and school settings. Longitudinal, multi-informant designs that incorporate direct measures of language, EF, and family processes are needed to delineate causal pathways and to determine whether the CI–NH gap narrows when proximal abilities improve.

## 5. Limitations

This study has some limitations. First, its cross-sectional design prevents conclusions about developmental trajectories or causality; longitudinal data would clarify whether the behavioral differences observed persist over time. Second, although the overall sample size was sufficient for detecting group differences, the distribution within the cochlear implant group was uneven, with a predominance of bilateral users; a more balanced sample including unilateral and bilateral users would have allowed stronger comparisons. Finally, as the study was conducted in a single national context, generalizability may be limited.

Moreover, the present study did not include several audiological indicators that more fully describe CI-related hearing outcomes, such as detailed programming (mapping) parameters, aided hearing thresholds, speech perception test results, or formal speech–language assessments. These measures are routinely used to evaluate how effectively children detect and understand speech with their devices, and they may help explain individual variability in socio-emotional functioning. Because these data were not available for all participants, they could not be incorporated into group comparisons or correlation analyses. Future studies that integrate complete and standardized audiological datasets will be better positioned to clarify how hearing performance with CI relates to socio-emotional and behavioral outcomes.

## CRediT authorship contribution statement

**Yuşa Başoğlu:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Formal analysis, Conceptualization. **İlayda Başoğlu:** Writing – review & editing, Supervision, Formal analysis, Conceptualization. **Gül Ölçek:** Visualization, Validation, Supervision.

## Ethics approval and consent to participate

The study protocol was approved by the Istanbul Medipol University Clinical Research Ethics Committee (27.11.2025 E-10840098-202.3.02-7551). Written informed consent was obtained from all parents/legal guardians prior to participation.

## Consent for publication

Not applicable, as no identifying information about participants is included in this article.

## Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

The authors thank the children, families, and clinical staff at the participating rehabilitation and cochlear implant centers for their valuable cooperation and support throughout the study.

## References

[1] World Health Organization, Deafness and hearing loss—Fact sheet. https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss, 2025. (Accessed 28 September 2025).

[2] Z. Guo, L. Song, et al., Global, regional, and national burden of hearing loss in children and adolescents under 20 years, 1990–2021: a systematic analysis from the GBD 2021 study, BMC Public Health 24 (2024) 2521, https://doi.org/10.1186/s12889-024-20010-0.

[3] D.H. Barker, A.L. Quittner, N.E. Fink, L.S. Eisenberg, E.A. Tobey, J.K. Niparko, Predicting behavior problems in deaf and hearing children: the influences of language, attention, and parent–child communication, J. Deaf Stud. Deaf Educ. 14 (2009) 417–436, https://doi.org/10.1093/deafed/enp030.

[4] van Eldik, P.D.A. Treffers, J.W. Veerman, F.C. Verhulst, Mental health problems of deaf Dutch children as indicated by parents' responses to the child behavior checklist, Am. Ann. Deaf 148 (2004) 390–395, https://doi.org/10.1353/aad.2004.0020.

[5] C.L. Wong, T.Y.C. Ching, L. Cupples, et al., Psychosocial development in 5-year-old children with cochlear implants or hearing aids, Ear Hear. 38 (2017) e224–e232, https://doi.org/10.1097/AUD.0000000000000433.

[6] I. Castellanos, D. Levine, P.J. Blamey, J.Z. Sarant, P.A. Busby, et al., Psychosocial outcomes in long-term cochlear implant users implanted in early childhood, Otol. Neurotol. 39 (2018) e1004–e1012, https://doi.org/10.1097/MAO.0000000000001966.

[7] G.C. Long, et al., Socio-emotional development of children with cochlear implant: a systematic review (2010–2020), Int. J. Pediatr. Otorhinolaryngol. 151 (2021) 110915, https://doi.org/10.1016/j.ijporl.2021.110915.

[8] M. Boerrigter, A. Vermeulen, H. Marres, E. Mylanus, M. Langereis, Frequencies of behavioral problems reported by parents and teachers of hearing-impaired children with cochlear implants, Front. Psychol. 10 (2019) 1591, https://doi.org/10.3389/fpsyg.2019.01591.

[9] W.C. Chao, Y.H. Lin, C.Y. Ou, J.C. Chen, C.Y. Chien, Behavior problems in children with cochlear implants: a mandarin-speaking sample, Int. J. Pediatr. Otorhinolaryngol. 79 (2015) 648–653, https://doi.org/10.1016/j.ijporl.2015.02.006.

[10] C.M.P. le Clercq, G. van Ingen, L. Ramma, et al., Association of slight to mild hearing loss with behavioral problems and school performance in children, JAMA Otolaryngol. Head Neck Surg. 146 (2020) 113–120, https://doi.org/10.1001/jamaoto.2019.3451.

[11] J.Z. Sarant, D.C. Harris, L.A. Bennet, Bilateral versus unilateral cochlear implants in children: language outcomes, Ear Hear. 35 (2014) 396–409, https://doi.org/10.1097/01.aud.0000444641.07478.63.

[12] J.P. Brokx Boons, J.H.M. Frijns, et al., Effect of pediatric bilateral cochlear implantation on language development, JAMA Pediatr. 166 (2012) 28–34, https://doi.org/10.1001/archpediatrics.2011.180.

[13] G. Sübaşı, N. Şehirli, Development of the child behavior assessment scale: validity and reliability study, Kastamonu Educ. J. 18 (2010) 789–804. URL: https://dergipark.org.tr/tr/pub/kefdergi/issue/49056/625864. (Accessed 7 October 2025).

[14] C.H. Wiefferink, C. Rieffe, L. Ketelaar, J.H.M. Frijns, Predicting social functioning in children with a cochlear implant and in normal-hearing children: the role of emotion regulation, Int. J. Pediatr. Otorhinolaryngol. 76 (2012) 883–889, https://doi.org/10.1016/j.ijporl.2012.02.065.

[15] J.Z. Sarant, D.C. Harris, K.L. Galvin, L.A. Bennet, M. Canagasabey, P.A. Busby, Social development in children with early cochlear implants: Normative comparisons and predictive factors, including bilateral Implantation, Ear Hear. 39 (4) (2018) 770–782, https://doi.org/10.1097/AUD.0000000000000533.

[16] Y. Chen, Y. Li, H. Jia, G. Gu, Z. Wang, Z. Zhang, et al., Simultaneous bilateral cochlear implantation in very young children improves adaptability and social skills: a prospective cohort study, Ear Hear. 44 (2023) 254–263, https://doi.org/10.1097/AUD.0000000000001277.

[17] D.R. Gunjawate, R. Ravi, C. Driscoll, Stress among parents of children with hearing loss and how they deal with it: a systematic review, Int. Arch. Otorhinolaryngol. 27 (2023) e166–e177, https://doi.org/10.1055/s-0042-1743273.