

# The Impact of Family Environment on Language Development of Children With Cochlear Implants: A Systematic Review and Meta-Analysis

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**OBJECTIVES:** The authors conducted a systematic review of the literature and meta-analyses to assess the influence of family environment on language development in children with cochlear implants. **DESIGN:** The Pubmed, excerpta medica dataBASE (EMBASE), Education Research Information Center, cumulative index to nursing and allied health literature (CINAHL), Healthcare Literature Information Network, PubPsych, and Social SciSearch databases were searched. The search strategy included terms describing family environment, child characteristics, and language development. Studies were included that (a) assessed distal family variables (such as parental income level, parental education, family size, and parental stress) with child language outcomes, and/or more proximal correlates that directly affect the child (such as family engagement and participation in intervention, parenting style, and more specifically, the quantity and quality of parental linguistic input) on child language; (b) included children implanted before the age of 5 years; (c) measured child language before the age of 21 years with standardized instruments; (d) were published between 1995 and February 2018; and (e) were published as peer-reviewed articles. The methodological quality was assessed with an adaptation of a previously validated checklist. Meta-analyses were conducted assuming a random-effects model. **RESULTS:** A total of 22 study populations reported in 27 publications were included. Methodological quality was highly variable. Ten studies had a longitudinal design. Three meta-analyses on the correlations between family variables and child language development could be performed. A strong effect of the quality and

quantity of parental linguistic input in the first 4½ years postimplantation on the child's language was found,  $r = 0.564$ ,  $p < 0.001$ , 95% confidence interval (CI) = 0.449 to 0.660, accounting for 31.7% of the variance in child language outcomes. Results demonstrated high homogeneity,  $Q(3) = 1.823$ ,  $p = 0.61$ ,  $I = 0$ . Higher-level facilitative language techniques, such as parental expansions of the child's utterances or the use of open-ended questions, predicted child language skills. Risk of publication bias was not detected. The results on the impact of family involvement/participation in intervention on child language development were more heterogeneous. The meta-analysis included mainly cross-sectional studies and identified low to moderate benefits,  $r = 0.380$ ,  $p < 0.052$ , 95% CI = -0.004 to 0.667, that almost attained significance level. Socioeconomic status, mainly operationalized by parental level of education, showed a positive correlation with child language development in most studies. The meta-analysis confirmed an overall low and nonsignificant average correlation coefficient,  $r = 0.117$ ,  $p = 0.262$ , 95% CI = -0.087 to 0.312. A limitation of the study was the lack of some potentially relevant variables, such as multilingualism or family screen time. **CONCLUSIONS:** These data support the hypothesis that parental linguistic input during the first years after cochlear implantation strongly predicts later child language outcomes. Effects of parental involvement in intervention and parental education are comparatively weaker and more heterogeneous. These findings underscore the need for early-intervention programs for children with cochlear implants focusing on providing support to parents for them to increase their children's exposure to high-quality conversation.