A longitudinal study of vocabulary development in children with cochlear implants: the role of music exposure and maternal musicality

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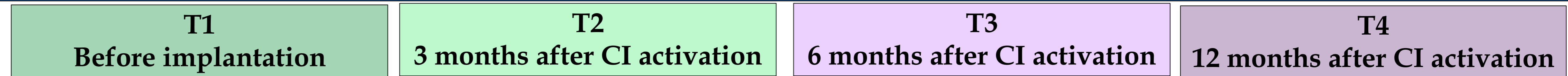
BACKGROUND

- Children with cochlear implants (CIs) report great variability in language outcomes after implantation (Majorano et al., 2018), despite a younger age at implantation favors better language development (Boons et al., 2013).
- Music abilities and exposure support language acquisition by facilitating word segmentation and acquisition and hierarchical processing (Bernard & Gervain, 2018; Chern et al., 2018; Jusczyk, 1999).
- Engagement in musical activities could have beneficial effects for the development of speech and language skills in children with hearing impairment (Torppa & Huotilainen, 2019).
- Parents' predisposition for music affects children's musicality (Ullén et al., 2014).

AIM: Exploring the role of music exposure and maternal musicality in supporting vocabulary development in children with CIs.

METHODS

Participants
- 16 children with CIs
- Mean age at T1: 16 mos. (±7.7; range: 9-32)

Inclusion and exclusion criteria
- Diagnosis: severe to profound hearing loss
- CI surgery by 36 mos. of age
- No diagnosis of sensorimotor or developmental disorders or of cognitive disabilities
- Normal hearing parents
- Italian monolinguals, no exposure to other languages including sign language
- Participation in the same rehabilitation program once a week.

T1 Before implantation	T2 3 months after CI activation	T3 6 months after CI activation	T4 12 months after CI activation

Measures:
- MB-CDI (Caselli et al., 2015) **at each session** → receptive and expressive vocabulary
- Data loggings of children's devices → mean daily music exposure between each session and in total
- Goldsmiths Musical Sophistication Index-Italian (Gold-MSI-IT) questionnaire (Müllensiefen et al., 2014; Santangelo, Persici et al., in prep) at **T1** and **T4** → maternal musicality
- Music@Home questionnaire (Politimou et al., 2018) at **T1** and **T4** → music engagement at home
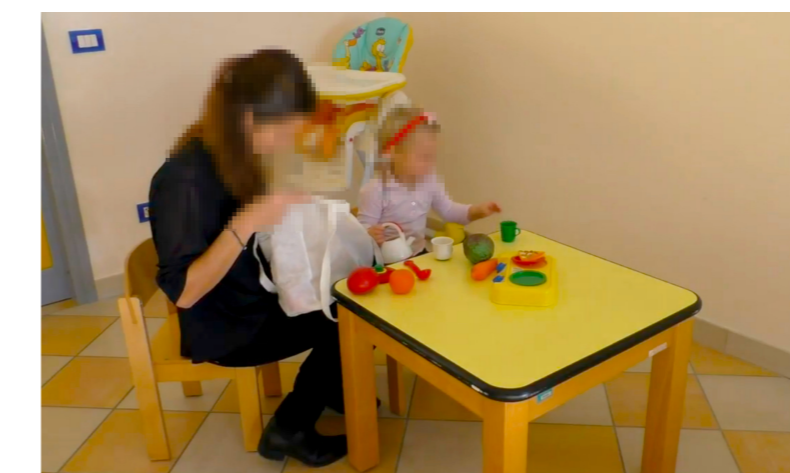
DATA ANALYSIS AND RESULTS

Vocabulary outcomes and maternal education – Spearman's correlations
- Correlations between maternal education and receptive MB-CDI scores at T1 ($r_{(s)} = 0.65$**) and T2 ($r_{(s)} = 0.61$*);
- Correlations between maternal education and expressive MB-CDI scores at T1 ($r_{(s)} = 0.5$*), T2 ($r_{(s)} = 0.85$***), and T3 ($r_{(s)} = 0.53$*).

Note. P-values are corrected for multiple comparisons with the Benjamini-Hochberg correction. $*p <.05$, $**p <.01$, $***p <.001$.

VOCABULARY OUTOMES AND MATERNAL MUSICAL VARIABLES – MATERNAL EDUCATION AS COVARIATE

$\beta = 0.524$, SE = 0.221, $p = .042$*

$\beta = 0.506$, SE = 0.197, $p = .030$*

$\beta = 0.556$, SE = 0.159, $p = .007$**
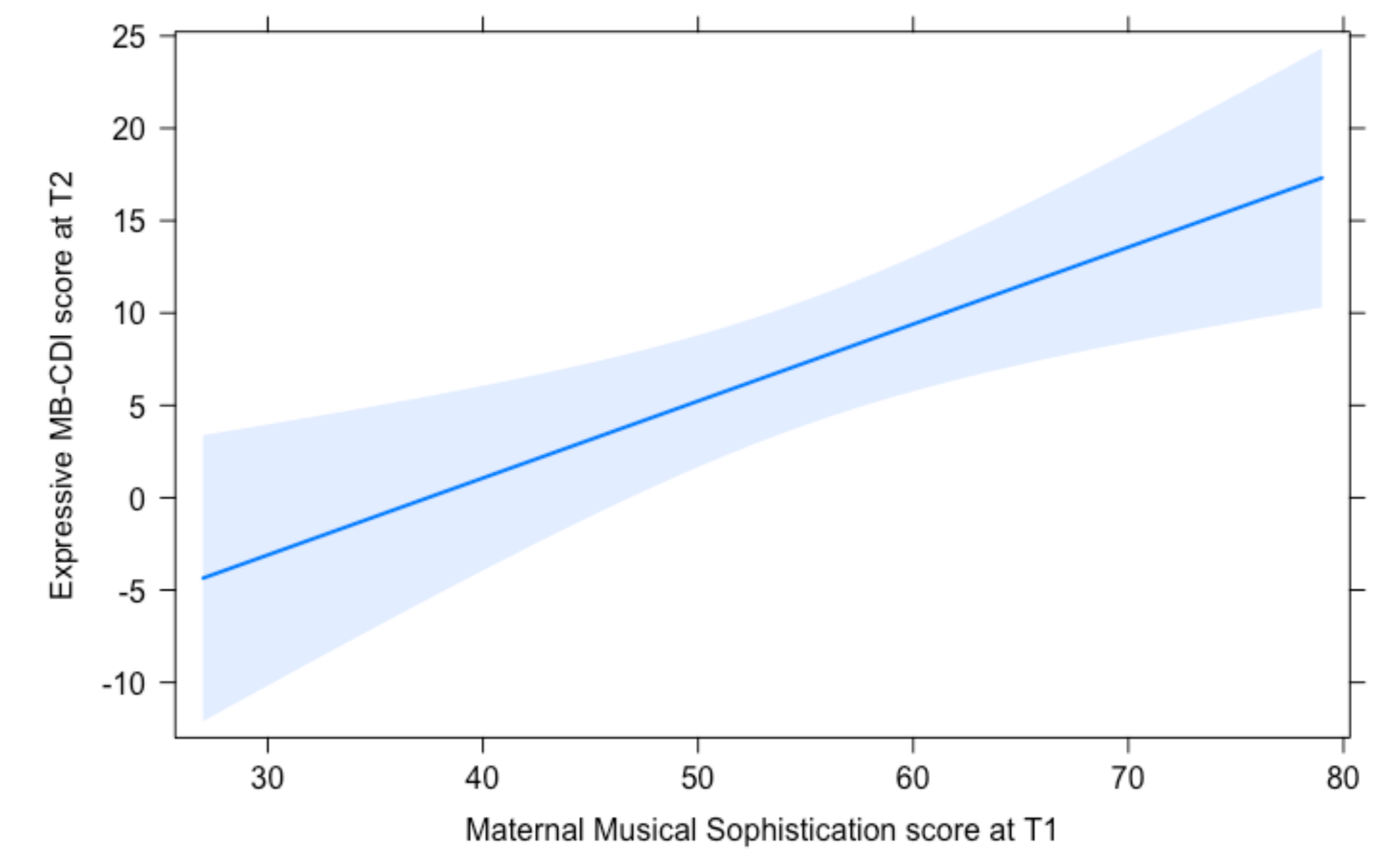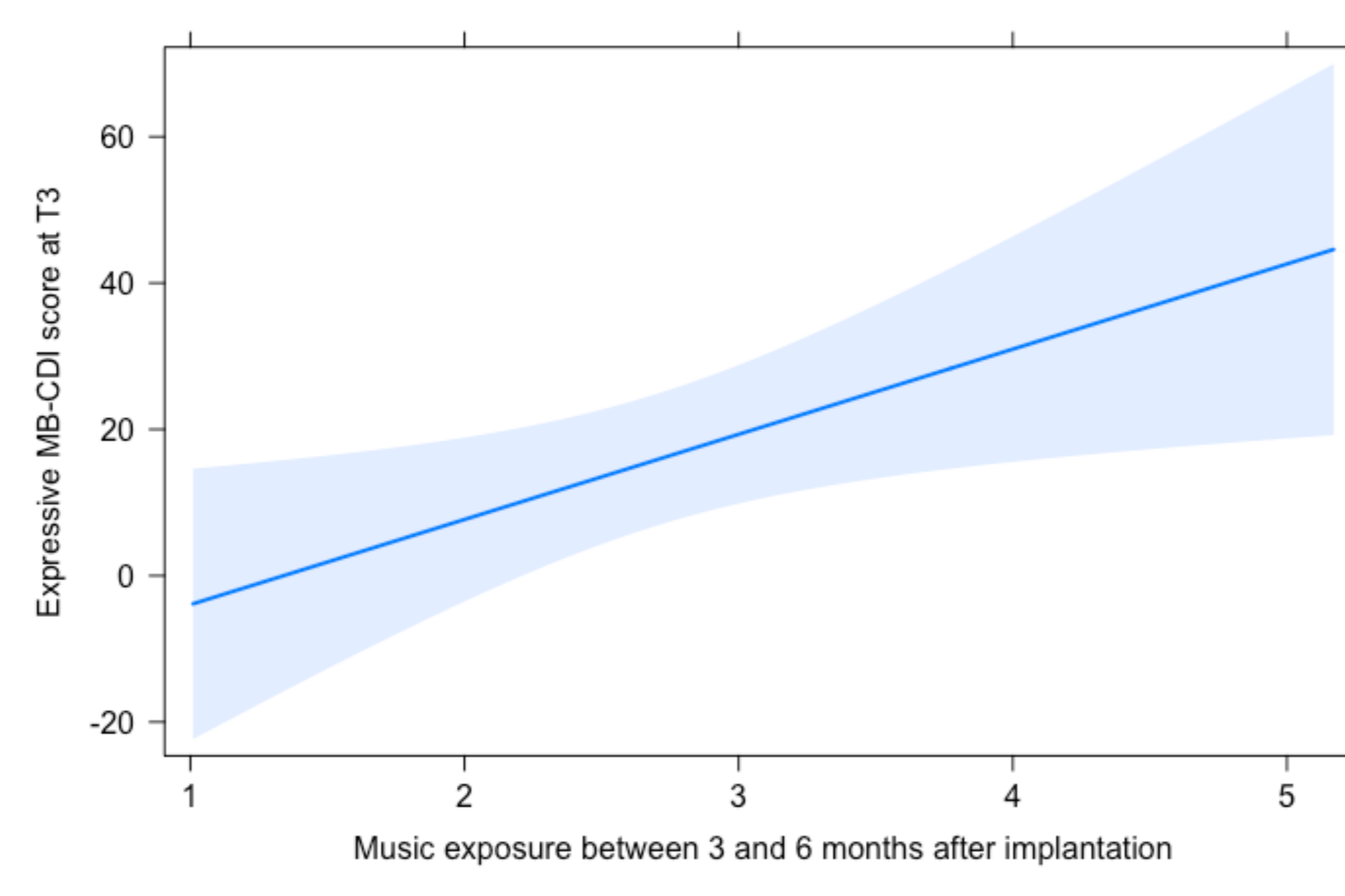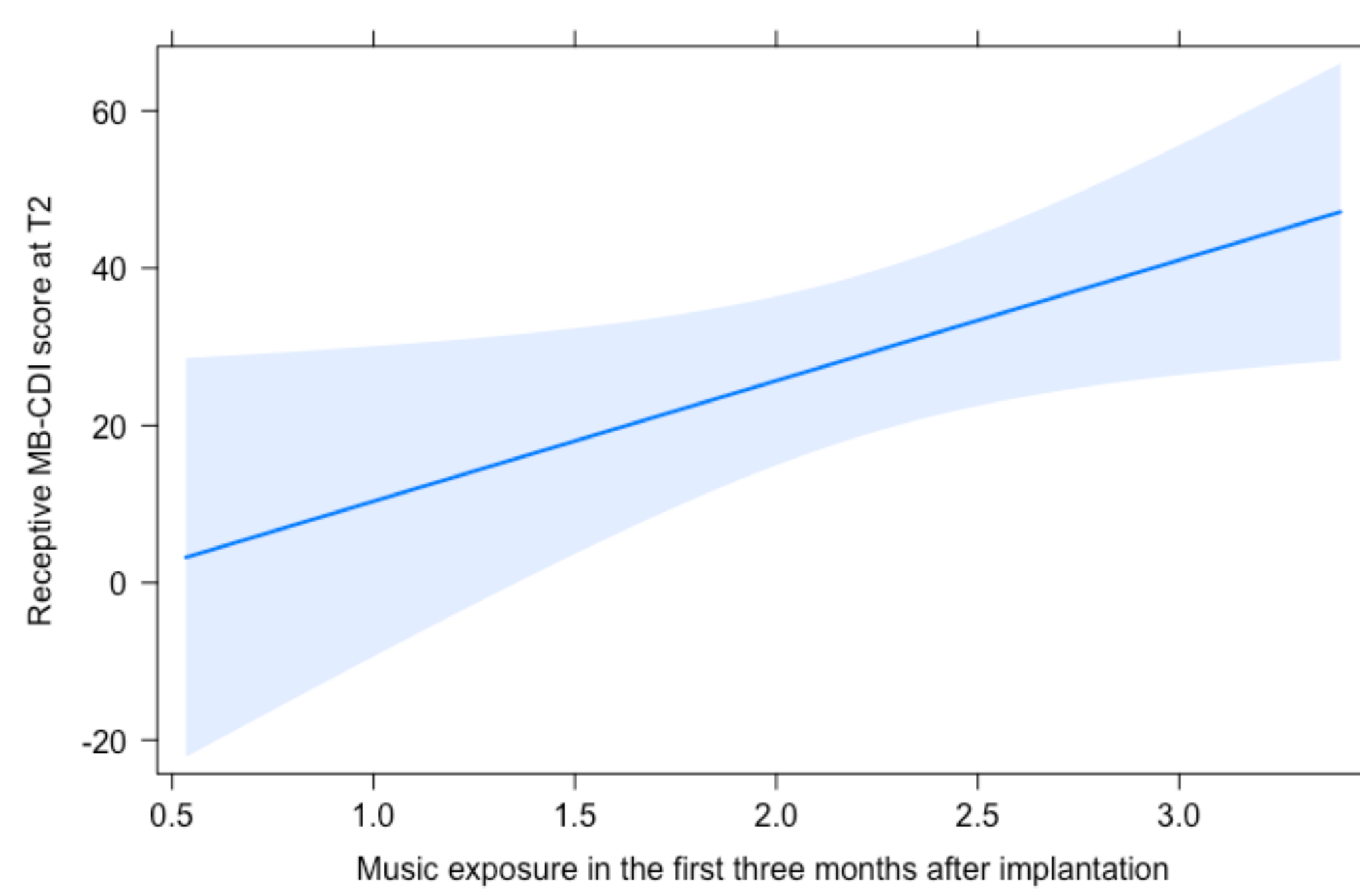
MUSIC EXPOSURE

MATERNAL MUSICALITY

DISCUSSION AND CONCLUSIONS

- Musical sophistication predicts expressive vocabulary at **three months after CI activation** and daily music exposure predicts children's expressive vocabulary **between three and six months after CI activation**
- Music exposure predicts children's receptive vocabulary **at three months after CI activation**
- Parental predisposition for music and music exposure are able to support only the first stages of children with CIs' vocabulary development, but not the later stages. Could this be ascribable to the **type of musical activity** proposed in the home environment? May **more targeted and actively engaging musical stimuli** support children with CIs' vocabulary acquisition for a longer period?

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