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## Question

Does musical training improve speech and music perception in children with cochlear implants?

## Rationale

Cochlear implantation has given children and adults with profound hearing loss the ability to hear through augmenting auditory sensitivity. While the cochlear implant has been extremely effective in coding speech, it has been less successful in coding music. As a result, cochlear implant users perceive speech much better than music. However, with music training, children can learn to perceive and process music more effectively. In addition, music perception has shown to have a direct correlation to speech understanding. In this poster, three studies are reviewed that have focused on the use of music training as a method to improve auditory perception in children with cochlear implants.

## Results

Kosaner, Kilinic and Deniz (2012) studied 25 unilateral cochlear implant patients age 26-72 months old who received musical training for 18 months. Music training focused specifically on rhythm, singing, and song recognition. Children were assessed on their musical improvement every 3 months using the Musical EARS Evaluation form. At the end of 18 months, the mean total scores increased significantly for all groups. One of these improvements included children not being able to discriminate between two songs to being able to recognize three or more different songs.

Kuang-Chao Chen et al. (2010), examined 27 unilateral cochlear implants with a mean age of 6.7 years old. Of these children, 13 children received musical training before and/or after implantation which focused on pitch discrimination, for a duration of 2-36 months. Training also included listening, singing, score reading and instrument playing. The remaining 14 children did not receive any formal training and were asked to perform the same tasks such as discriminating 2 pitches on a keyboard. This study found that children who attended music classes revealed significant improvements in pitch discrimination over children who did not have music training.



## Results (continued)

Lastly, Yucel, Sennaroglu and Belgin (2009), looked at 18 children with unilateral cochlear implants. This study also divided the children into two groups. The first group consisted of 9 children with a mean age of 55.2 months who received musical training, while the remaining 9 children with a mean age of 49.3 months did not receive training. Musical training focused on daily 10-minute pitch discrimination exercises for 24 months. Children were assessed at 1-3 months, 6-9 months, 12 and 24 months post activation using various speech assessments and the musical stages profile. This study found that after 24 months of music training, the music group showed greater progress in discriminating pairs of notes and pitch discrimination. Additionally, modified open set speech perception scores for the music group were significantly higher compared to the children who did not receive training.



**Figure 1:** Examples of musical pairs for melodic discrimination (left) and rhythmic discrimination (right). The correct answer for both pairs is "different." (adapted from Petersen, Mortensen, Gjedde & Vuust, 2009).



Levels	1 <sup>st</sup> Note	2 <sup>nd</sup> Note
Level 1	Blue E	Red C
Level 2	Blue E	Pink A
	Pink A	Red C
Level 3	Blue E	Pink E
	Pink E	Green C
	Green C	Green A
	Blue A#	Pink G
	Pink G	Green D#
	Green D#	Red C
	Pink C#	Pink A
	Pink A	Green F#
Pink E	Green C	
Green C	Green A	

**Figure 2:** Example of pitch discrimination task (adapted from Yucel, Sennaroglu & Belgin, 2009)

## Conclusion

The studies reviewed came to the following conclusions:

- (1.) Musical training improves pitch perception (Kuang-Chao Chen et al., 2010) (Yucel, Sennaroglu, & Belgin, 2009).
- (2.) Musical training improves performance in targeted listening and auditory tasks (Yucel, Sennaroglu, & Belgin, 2009).
- (3.) Children with cochlear implants who attended music classes revealed significant improvements in music perception and auditory tasks compared to their peers with cochlear implants who did not receive music training. ((Kuang-Chao Chen et al., 2010) (Yucel, Sennaroglu, & Belgin, 2009), (Yucel, Sennaroglu, & Belgin, 2009).
- (4.) Structured music training is recommended and beneficial when included in habilitation for children with cochlear implants (Kosaner, Kilinc & Deniz, 2012), (Kuang-Chao Chen et al., 2010) (Yucel, Sennaroglu, & Belgin, 2009).



## References

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