

SUMMARY

This study provides a comprehensive, comparative investigation of preverbal vocalizations of normally hearing (NH) and profoundly hearing-impaired (HI) infants. I had two major goals: First, to investigate whether different emotional states are encoded in infant vocalizations; and second, to examine the influence of hearing deficiency on vocal production, vocal development, and on the encoding of emotions in infant vocalizations. Apart from learning more about preverbal vocal communication, I additionally wanted to prove whether acoustical analysis could be useful to improve the early diagnosis of hearing impairment.

In the first part of the study, I examined the vocalizations of NH infants. I first characterized the vocal repertoire in the first year of life based on acoustic parameters. A total of twelve call types were described, all of which were uttered in positive as well as in negative emotional states. Next, I examined at which age the different call types emerged and whether the acoustic structure of certain call types, that were uttered from the start of recordings on, show age-related changes. Only minor age-related changes in call structure were found, all of which may be presumed to reflect growth and maturation processes. Furthermore, I analyzed whether call structure correlates with the estimated emotional state of the vocalizing infant. The results showed that positive and negative emotions could be differentiated from each other very well. Vocalizations uttered in negative emotional states had a longer duration and showed a shift of energy from lower to higher frequencies in the spectrum. Single positive (joy, contentment and interest) or single negative emotions (unease and anger), in contrast, could not be separated by call structure. Finally, I examined the composition of coherent sequences of vocalizations, asking if there are certain call types whose relative frequency is related to the infants' emotional states. Indeed, sequence composition was different when comparing sequences uttered in positive and negative emotions, and also when comparing various positive emotions with each other.

In the second and third parts of the study, I investigated the vocalizations of HI infants in the same way and compared them with the vocal production of the NH group. The results revealed that the preverbal vocal production of NH and HI infants is, in many respects, very similar. Both infant groups shared the same vocal repertoire. Except for the call type babbling, which was produced later, all call types emerged at the same age in the HI group. In addition, only one of three call types tested (cry) showed significant differences in acoustic

structure related to hearing ability. Furthermore, HI and NH infants equally encoded positive and negative emotions in call structure. Differences between NH and HI infants were mainly found in call-sequence composition. First, independent of the emotional context, HI infants uttered certain call types more or less often than their NH peers. Second, the emotion-related changes found in NH sequences were virtually lacking in HI sequences.

To sum up, the results of this study indicate that the emergence and the acoustic structure of preverbal vocalizations is to a great extent independent of the auditory input and, hence, seems to be essentially predetermined. The basic information of whether an infant feels good or bad is encoded in the acoustic structure of its vocalizations. This kind of emotional expression is apparently inherent. Sequence composition, in contrast, seems to be influenced by auditory learning. However, due to the given similarities and the high variability of NH and HI vocal production, acoustic analyses of preverbal utterances are, in my view, too labor-intensive to represent a practicable method for improving the early diagnosis of hearing impairment. The only exception is the observation of the emergence of babbling which can easily be checked by physicians and parents.