Typical or Atypical?
The Intermittent Character of Early Vocalizations in the Preserved Speech Variant

Florian B Pokorny[1,2,3], Katrin D Bartl-Pokorny[1], Dajie Zhang[1], Ralf Vollmann[3,4], Christa Einspieler[1], Peter B Marschik[1,3,5]

[1]Research Unit iDN – interdisciplinary Developmental Neuroscience, Institute of Physiology, Medical University of Graz, Austria
[2]Machine Intelligence & Signal Processing group, Technische Universität München, Germany
[3]Brain, Ears & Eyes – Pattern Recognition Initiative, BioTechMed-Graz, Austria
[4]Department of Linguistics, University of Graz
[5]Center of Neurodevelopmental Disorders, Karolinska Institutet, Stockholm, Sweden

florian.pokorny@medunigraz.at

Abstract

The speech-language domain represents one of the key domains for clinical diagnosis of Rett syndrome (RTT). Recent studies built upon the assumption that this domain is already affected in the pre-regression period (e.g., Marschik et al., 2014). For six females with the preserved speech variant (PSV) of RTT, Marschik et al. (2012) reported different vocalization characteristics appearing intermittently from the 7th month of life onwards: on the one hand, apparently normal vocalizations, and on the other hand, vocalizations with atypical characteristics, i.e. with inhalatory, pressed, or high-pitched crying-like quality.

The aim of the present study was to comprehensively document and objectify the intermittent character of early vocalizations in RTT/PSV by means of (i) listeners' vocalization assessments and (ii) vocalization analyses on signal level. Therefore, we extracted a total of 363 vocalization sequences from home video recordings of a girl from 7 to 12 months of age later diagnosed with PSV. The videos were shot by the girl's parents during typical family routines. All vocalization sequences were assessed separately by five professionals in the fields of language acquisition, developmental psychology, and/or developmental physiology. To define acoustic peculiarities, voice parameters, e.g., jitter, shimmer, zero-crossings rate, or harmonics-to-noise ratio, were extracted.

93 vocalizations were assessed as normal by all five listeners. Nine sequences were consentaneously assessed as abnormal. The relation between listeners' assessments and objective voice parameters on signal level yielded promising information for an automatic audio-based detection of atypical early vocalizations in RTT/PSV.

References

Marschik PB, Kaufmann WE, Bölte S, Sigafoos J, Einspieler C. En route to disentangle the impact and neurobiological substrates of early vocalizations: Learning from Rett syndrome. Behav Brain Sci 2014;37:562–3.

Marschik PB, Pini G, Bartl-Pokorny KD, Duckworth M, Gugatschka M, Vollmann R, Zappella M, Einspieler C. Early speech-language development in females with Rett syndrome: Focusing on the preserved speech variant. Dev Med Child Neurol 2012;54:451–6.