**AN AUTOMATIZED SYSTEM FOR THE ASSESSMENT OF NUTRITIVE SUCKING BEHAVIOR IN INFANTS: A PRELIMINARY ANALYSIS ON TERM NEONATES**

E. Tamilia\(^1\)-IEEE Student Member, J. Delafield-Butt\(^2\), S. Fiore\(^3\), F. Taffoni\(^1\)-IEEE Member

\(^1\)Lab. of Biomedical Robotics and Biomimetics, Universita Campus Bio-Medico di Roma, via A. del Portillo 21, 00128 Rome, Italy
\(^2\)Perception Movement Action Consortium, University of Edinburgh & Early Years, University of Strathclyde, G4 01T, Scotland, U.K

**INTRODUCTION**

- Nutritive Sucking (NS) is a highly organized process that can reflect infants’ maturation during the early post-natal period. It can provide predictive indicators of medical and developmental progress [1] and an early means of exploring mechanisms of fine motor control [2].
- Moreover, the evaluation of oral feeding readiness is fundamental for discharge timing [3]; however in clinical practice it is still quite subjective.
- Thus, given the need of reliable objective measures [4], recent research has focused on the assessment of early sucking behavior, using different measuring systems, and different indices for the assessment [5]. The need for a standard uniform tool and method for assessment still exists [4].

- To propose an automatic computational system for the calculation of quantitative indices of sucking behavior from Intraoral Pressure (IP) signals.
- To guide the development of a new tool to improve diagnostics and early treatment of newborns.

**OBJECTIVE**

**MATERIALS & METHODS**

**i. Measurements**

- Apparatus: pressure transducer (TranStar, Medex), connected to a catheter passing through the bottle teat and ending into the infant’s mouth.
- Subjects: 2 term healthy infants; two longitudinal recordings (2 days after birth and 6-10 weeks later).

**ii. Signal Analysis**

- Low-pass filtering with a cut-off frequency equal to 20 Hz [6].
- Characterization of the sucking pattern through an automatic identification of sucking events and bursts.

**iii. Indices**

- Sucking Amplitude (SkA)
- Inter-Suck Width (ISkW)
- Sucking Frequency (SkF; i.e. 1/ISkW)
- Suck Area (SkAr)
- IS and DS Duration (ISD and DSD)
- IS and DS Slope (ISS and DSS)

Two metrics to measure smoothness (from the IP speed profile, IPS): Peaks (\(\eta_p\), number of local maxima [7]), Spectral arc length (\(\eta_s\), negative arc length of the amp- and freq-normalized Fourier magnitude spectrum, IFPS [8]).

**RESULTS**

- ISkW, SkF and SkA significantly changed with a trend compliant with previous literature on term infants’ normal development [9,10].
- The analysis of the other indices we proposed seemed to reveal some developmental characteristics not yet investigated in typical infants:
  - SkAr increases
  - Smoothness of IS phase (\(\eta_s\)) increases (smoother musculature activation)
  - The activation/relaxation (IS/DS) pattern of suck musculature changes (see figures below)

**CONCLUSIONS**

- Proper algorithms for IP analysis have been defined and tested on a sample of pressure traces recorded from healthy term infants.
- These preliminary results represent a first step to evaluate the validity of the proposed system, but further investigation on a greater and heterogeneous sample is required.
- The novel indices proposed appear to reflect the development of sucking behavior in healthy infants. Smoothness measures as well should be further investigated, given their importance in other motor modalities.

**REFERENCES**