
Eleonora Tamilia*, Fabrizio Taffoni*, Eugenio Guglielmelli*

*Laboratory of Biomedical Robotics and Biomicrosystems, Università Campus Bio-Medico di Roma

Introduction

• The prevalence and survival of high-risk newborns is increasing worldwide1.

→ There is a rising concern about the potential problems that this population may encounter, which must be carefully considered and monitored.

→ As a result, there is a strong need for new and more reliable tools to support healthcare professionals in assessing newborns’ neuro-motor status and readiness for discharge, and in planning for subsequent care2.

• A major developmental milestone for newborns is the attainment of proper Nutritive Sucking (NS) skills for feeding, which is a complex task requiring good coordination skills.

→ The assessment of Oral-Motor Behavior (OMB) during feeding is a very early way to evaluate a newborn’s well-being and neuromotor behavior3.

GOAL

The goal of this work was to develop a new low-cost, easy-to-use and noninvasive system for a technology-aided assessment of newborns’ OMB during bottle feeding.

About the Nutritive Sucking (NS) Process...

NS is characterized by the rhythmic alternation of Suction (S) and Expression (E)

IP and EP pattern is made of events, grouped in bursts that are separated by pauses

The rhythmic alternation of S and E requires a good motor control of all the different structures and muscles involved.

Feeding OMB can be considered as a complex dynamical system

The Feeding Assessment and Monitor (FAM) System

We developed a low cost, portable device for a noninvasive recording of OMB during bottle feeding, enabling the measurement of IP and EPL.

We developed a fully automated quantitative system for a proper analysis of OMB.

Methodology

I. Signal Segmentation

1) Event Detection

• Threshold-based detection of event related peaks

2) Burst/Pause Segmentation

A burst is a series of at least 3 events whose interval between peaks is lower than 2 s

II. Feature Extraction

We introduced indices of:

- Pattern Instability ——
- Motor Performance (IP ——)
- Motor Coordination (IP ——)

Key Design Points

LOW-COST
SAFETY
PORTABILITY/EASE OF USE
NON-INVASIVENESS

Data Collection & Analysis – Main RESULTS

Healthy versus At Risk Oral-Motor Behavior

IP/EP ANALYSIS

• More variable S/E coordination pattern in R infants

Principal Component Analysis

H group defines a clear cluster

• PCA showed the system suitability to automatically identify typical OMBs and deviations from the norm.

References

4. E. Tamilia et al., IEEE EMBC, 2015
6. E. Tamilia et al., IEEE EMBC, 2014