# Module III.3 and 4

## Pathologies at an early age:

## Prematurity and Maturational Delay

Dra. María Consuelo Sáiz Manzanares

Universidad de Burgos

Co-funded by the European Union

e-EarlyCare-T

"This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein. "

# Pathologies in early ages: Prematurity and maturational delay.

## Introduction

In the first years of life, specifically in the period 0-3 years of age, a series of developmental delays can be detected that may be due to a known vs. unknown aetiology. This chapter will specifically address two cases, prematurity and mild developmental delays. Both can lead to permanent developmental problems. Therefore, early detection and intervention are essential for the prevention of significant impairments in the future.

# Pathologies in early ages: Premature babies and maturational delay.

## Prematurity.

A term birth is defined as a birth at 40 weeks' gestation. Prematurity includes babies born at less than 37 weeks gestation, or with a birth weight of less than 2,500 grams. The causes of these circumstances are diverse and complex, and may be related to problems during gestation (socio-economic, multiple pregnancies, emotional and affective situations of the mother, hospitalisations or chronic illnesses of the mother, among others).

## Pathologies in early ages: Prematurity and maturational delay.

### Prematurity.

Low **birth weight** (LBW) has long been an important topic in neonatological and paediatric studies, as it is directly related to **infant mortality and short and long term morbidity**. However, the analysis of low birth weight has an associated prognostic scaling. Babies born weighing between **1,500-2,500 grams** would be understood as **low birth weight**, those between **1,000 and 1,499 grams** as **very low birth weight**, and those weighing **less than 1,000 grams** would fall into the category of **extremely low birth weight**. However, it is important to consider the causes of underweight, as the aetiology is related to the **type of intervention and the prognosis**.

## Pathologies in early ages: Prematurity and maturational delay.

### Prematurity.

Birth weight is determined by the growth of the foetus during gestation and the duration of gestation. **LBW** may be due to **preterm birth** but with normal growth until delivery, or because the **newborn is small for gestational age**, i.e. **intrauterine growth restriction (IUGR)** has occurred. The aetiology will have differences for the development of the baby. For example, preterm birth leads to high mortality rates, as well as medical, neurocognitive and behavioural problems, and IUGR in its most severe form leads to metabolic disorders and, in less extreme cases, long-term growth deficits, learning disabilities and even chronic diseases in adulthood, such as hypertension, type 2 diabetes and coronary heart disease (Minde and Zelkowitz, 2020).

## Pathologies in early ages: Prematurity and maturational delay.

### 3.1.1. Babies with low birth weight due to premature birth.

Children who are born prematurely and have a low birth weight have a higher probability of mortality, neurodevelopmental disabilities, behavioural problems and economic costs for the affected families. In addition, the families of these children are often exposed to long periods of hospitalisation of their baby in the neonatal and/or paediatric intensive care unit (ICU). **This situation can lead to stress and anxiety in parenting figures. However, advances in medicine combined with technological advances are currently producing a better prognosis for this type of affliction**.

### 3.1.1. Babies with low birth weight due to premature birth.

**Common characteristics of underweight babies** are:

**1. Problems in psychomotor development.**

**2. Joint attention problems.**

**3. Problems in language development (morphosyntactic and semantic).**

**4. Problems in cognitive development.**

However, the **degree of impairment** will depend on **weight** and **other circumstances of embryonic development and/or birth**. Early intervention is recommended to alleviate these difficulties. This intervention will focus on **working with the child and his or her family, guided by an interdisciplinary intervention developed by multiprofessional teams**.

### 3.1.2. Very low birth weight babies due to premature birth.

Babies with a very low birth weight have a higher **risk** of suffering cognitive and behavioural problems. **The interventions that have been developed from early stimulation are related to sensory stimulation, medical follow-up, support to parenting figures and early schooling in a nursery school with specialised professionals in special educational needs**.

Premature babies move from the maternal environment to a **Neonatal Intensive Care Unit (NICU)** environment where there are strong stimuli such as bright lights, noises, etc., which are difficult for them to process.

## 3.1.3. Proposals for intervention in prematurity.

- **Sensory stimulation** programmes to enhance relationships between children and their parents in NICU settings.
- **Pre- and post-discharge parenting** programmes based on work on cognitive, motor and behavioural self-regulation, such as **the Infant Health and Development Program (IHDP)** (Ramey et al., 1992).

### 3.1.3. Proposals for intervention in prematurity.

- **Apply the "Neonatal Behavioral Assessment Scale" (NBAS) (**Aydlett, 2011; Barlow et al., 2018; Brazelton, 1973; Buckner, 1983) which facilitates parental observation of the infant's sensory skills and responsiveness to self-regulatory processes. In addition, it offers a proposed intervention **"Neonatal Induvidualized Developmental Care and Assessment Program" (NIDCAP)**, the implementation of which facilitates **a decrease in the incidence of intra-ventricular haemorrhage, reduces days of mechanical ventilation, enables weight gain and decreases days of admission to the NICU** (Als, 2009; Als and B McAnulty, 2011; McAnulty et al., 2010; Westrup, 2007).

### 3.1.3. Proposals for intervention in prematurity.

- Another intervention that is proving to be very effective is the application of the **Kanguro** method**.** This method was originally developed to care for premature newborns in unreliable incubator environments. This method can be applied by either the mother or the father **and is considered to be effective in preventing hypothermia, sleep rhythm and quality, physiological stabilisation of behaviour and in the growth and neurodevelopment of the newborn. It also improves parental stress and attachment between the baby and parenting figures. It also reduces hospitalisation and antibiotic use in low birth weight infants** (Birhanu and Mathibe-Neke, 2022; Jamehdar, el al., 2022; Letzkus et al., 2022; Mehrpisheh et al., 2022; Pradhan et al., 2022; Kiputa et al., 2022; Taha and Wikkeling-Scott, 2022).

## 3. 2. Maturational delay

In this section we understand **maturational delay** as **that which occurs without a detected aetiology, whether physical, psychological or sensory, and which presents with a slower development according to the parameters included in the development scales** (paediatric, Brunet-Lézine, Battelle, etc.) and which does not exceed one year with respect to the age level of the subject assessed, or which presents with a Global Developmental Delay CDG not less than 70. **The delay may affect one, two, three or all areas of development (motor, cognitive, language, social, emotional, and/or personal autonomy).**

## 3. 2. Maturational delay

We must start from the premise that **development**, especially in the 0-3 years stage, **is global and interrelated**, for example, fine or gross motor skills will condition cognitive development and this is directly related to the development of communication and language and socialisation. Likewise, psychomotor development will affect the development of personal autonomy.

**Early detection is essential to implement stimulation programmes in the required areas of development and such detection is directly linked to a better prognosis.**

## 3.2.1. Proposals for intervention in Maturational Delay.

### Portage Guide


### eEarlyCare web application

### 3.2.1. Proposals for intervention in Maturational Delay.


**Portage Guide**

The Portage Guide to Preschool Education (revised edition) is the result of a project, Project Portage, developed by the Cooperative Educational Service Agency 12 in Wisconsin (USA). It has an English and a Spanish version (Bluma et al., 1978).

## 3.2.1. Proposals for intervention in Maturational Delay.


### Portage Guide

The Guide has a list of Objectives (behaviours) ordered by developmental age (from 0-1, 1-2, up to 5-6 years) that helps users to make an accurate observation of the user's development. Each objective has a number that corresponds to a card. It offers different activities or tasks that can help to implement the development of the specific behaviour specified in the objective. The Portage Guide covers the following areas of development: How to stimulate the baby, Socialisation, Language, Self-help, Cognition and Motor Development. It also provides a series of guidelines for the design of the stimulation programme.

### 3.2.1. Proposals for intervention in Maturational Delay.


### Portage Guide

It also includes a section on reinforcement and work on the basic pre-requisites for learning (attention, imitation and following instructions), which are fundamental elements for good development of early intervention programmes. It is important to highlight the importance of the area "How to stimulate the baby" for intervention with premature babies or babies with developmental delay. This includes both objectives for observation behaviours in the 0-1 year stage and cards to guide intervention in this period. Similarly, the Portage Guide includes guidelines for intervention by the early childhood professional that describe the type of support that can be given (physical, through language, or both, including the behavioural techniques of modelling, shaping and social reinforcement). In Table 1, the number of targets and sheets per developmental area are included.

## 3.2.1. Proposals for intervention in Maturational Delay.

## Portage Guide

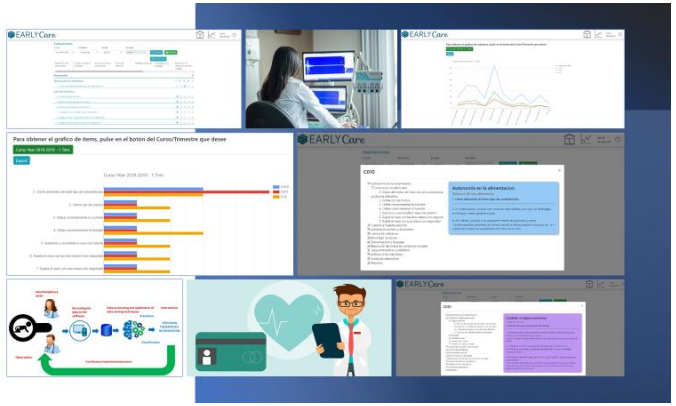

Table 1. *Objectives and cards by area of development in the Portage Guide*.

| Development area | Objectives | Intervention sheets |
|---|---|---|
| How to stimulate the baby | 45 | 45 |
| Socialisation | 83 | 83 |
| Language | 99 | 99 |
| Self-help | 105 | 105 |
| Cognition | 108 | 108 |
| Motor Development | 140 | 140 |
| TOTAL | 580 | 580 |

### 3.2.1. Proposals for intervention in Maturational Delay.

### eEarlyCare web application


Another important tool for recording, developmental analysis and intervention is the eEarlyCare web application (Sáiz-Manzanares, Marticorena-Sánchez and Arnaiz-González, 2020a; 2022; Sáiz-Manzanares et al., 2020b). eEarlyCare includes a module for recording and analysing behavioural observation indicators and a module for therapeutic intervention, the "eEarlyCare intervention Program". A more detailed review of the tool is presented in Module VII. 3.



## Bibliographical references

Als, H. (2009). Newborn Individualized Developmental Care and Assessment Program (NIDCAP): New frontier for neonatal and perinatal medicine. Journal of Neonatal-Perinatal Medicine, 2, 135-147 135. https://doi.org/10.3233/NPM-2009-0061

Als, H., and B McAnulty, G. (2011). The newborn individualized developmental care and assessment program (NIDCAP) with kangaroo mother care (KMC): comprehensive care for preterm infants. Current women's health reviews, 7(3), 288-301. https://doi.org/10.2174/157340411796355216

Aydlett, L. (2011). Neonatal Behavioral Assessment Scale (NBAS). In S. Goldstein and J.A. (Eds.), Encyclopedia of Child Behavior and Development. Boston, MA: Springer. https://doi.org/10.1007/978-0-387-79061-9_425

Barlow, J., Herath, N.I., Bartram Torrance, C., Bennett, C., & Wei, Y. (2018). The Neonatal Behavioral Assessment Scale (NBAS) and Newborn Behavioral Observations (NBO) system for supporting caregivers and improving outcomes in caregivers and their infants. Cochrane Database Syst Rev, 14, 3(3), CD011754. https://doi.org/10.1002/14651858.CD011754.pub2

Birhanu, B.G., and Mathibe-Neke, J.M. (2022). Interventions to enhance newborn care in north-West Ethiopia: the experiences of health care professionals. BMC Pregnancy Childbirth, 22, 328. https://doi.org/10.1186/s12884-022-04669-0

Bluma, M.S., Shearer, M.S., Frohman, A.H., and Hilliard, J.M. (1978). Portage Guide to Early Education, 2nd ed. Cooperative Educational Service Agency: Pewaukee, WI, USA.

Brazelton, T. B. (1973). Neonatal Behavioral Assessment Scale. Clinics in Developmental Medicine, 50. London: Spastics Intemational Medical Publications.

Buckner, Ellen B. (1983). Use of Brazelton Neonatal Behavioral Assessment in Planning Care for Parents and Newborns. JOGN nursing, 12(1), 26 - 30.

## Bibliographical references

Cristóbal Cañadas, D., Parrón Carreño, T., Sánchez Borja, C., and Bonillo Perales, A. (2022). Benefits of Kangaroo Mother Care on the Physiological Stress Parameters of Preterm Infants and Mothers in Neonatal Intensive Care. *Int. J. Environ. Res. Public Health*, *19*, 7183. https://doi.org/10.3390/ijerph19127183

Jamehdar, M., Nourizadeh, R., Divband, A. et al. (2022). KMC by surrogate can have an effect equal to KMC by mother in improving the nutritional behavior and arterial oxygen saturation of the preterm infant: results of a controlled randomized clinical trial. *BMC Pediatr*, *22*, 242. https://doi.org/10.1186/s12887-022-03316-z

Josse, D. (1997). *Escala de desarrollo psicomotor de la primera infancia Brunet-Lézine Revisado [Scale of psychomotor development of early childhood* (Brunet-Lézine-Revised)]. Psymtéc: Madrid, Spain.

Kiputa, M., Salim, N., Kunambi, P.P., and Massawe, A (2022) Referral challenges and outcomes of neonates received at Muhimbili National Hospital, Dar es Salaam, Tanzania. *PLOS ONE*, *17*(6), e0269479. https://doi.org/10.1371/journal.pone.0269479

Letzkus, L., Conaway, M., Miller-Davis, C. et al. (2022). A feasibility randomized controlled trial of a NICU rehabilitation program for very low birth weight infants. *Sci Rep*, *12*, 1729. https://doi.org/10.1038/s41598-022-05849-w

McAnulty, G.B., Butler, S.C., Bernstein, J.H., Als, H., Duffy, F.H., and Zurakowski, D. (2010). Effects of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) at Age 8 Years: Preliminary Data. *Clinical Pediatrics*, *49*(3), 258-270. https://doi.org/10.1177/0009922809335668

Mehrpisheh, S., Doorandish, Z., Farhadi, R., Mozhgan, A., Moafi, M., and Elyasi, F. (2022). The Effectiveness of Kangaroo Mother Care (KMC) on attachment of mothers with premature infants. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 15*, 100149 https://doi.org/10.1016/j.eurox.2022.100149

## Bibliographical references


Minde, K., and Zelkowitz, P. (2020). Premature Babies. In J.B. Benson (Ed.), *Encyclopedia of Infant and Early Childhood Development* (Second Edition) (pp. 578-587). https://doi.org/10.1016/B978-0-12-809324-5.22834-4

Newborg, J. (2005). *Battelle Developmental Inventory*, 2nd Edition: Examiner's manual. Itasca, IL: Riverside, USA

Pradhan, N.A., Ali, S.A., Roujani, S. et al. (2022). Quality of care assessment for small and sick newborns and young infants in Pakistan: findings from a cross-sectional study. *BMC Pediatr*, *22*, 68. https://doi.org/10.1186/s12887-022-03108-5

Ramey, C.T., Bryant, D.M., Wasik, B.H., Sparling, J.J., Fendt, K.H., and LaVange, L.M. (1992). Infant Health and Development Program for low birth weight, premature infants: program elements, family participation, and child intelligence. *Pediatrics*, *89*(3), 454-65.

Sáiz-Manzanares, M.C., Marticorena, R., and Arnaiz-Gonzalez, Á. (2022). Improvements for therapeutic intervention from the use of web applications and machine learning techniques in different affectations in children aged 0-6 years. *Int. J. Environ. Res. Public Health*,*19*, 6558. https://doi.org/10.3390/ijerph19116558

Sáiz-Manzanares, M.C., Marticorena, R., & Arnaiz, Á. (2020a). Evaluation of Functional Abilities in 0-6 Year Olds: An Analysis with the eEarlyCare Computer Application (2020). *Int. J. Environ. Res. Public Health*, *17*(9), 3315, 1-17 https://doi.org/10.3390/ijerph17093315

Sáiz-Manzanares, M.C., Marticorena, R., Arnaiz, Á., Díez-Pastor, J.F., and García-Osorio, C.I. (2020b). Measuring the functional abilities of children aged 3-6 years old with observational methods and computer tools. *Journal of Visualized Experiments*, *e60247*, 1-17. https://doi.org/10.3791/60247

Westrup, B. (2007). Newborn Individualized Developmental Care and Assessment Program (NIDCAP) - Family-centered developmentally supportive care. *Early Human Development*, *83*, 443-449. https://doi.org/10.1016/j.earlhumdev.2007.03.006

Taha, Z., and Wikkeling-Scott, L. (2022). Review of Kangaroo Mother Care in the Middle East. *Nutrients*, *14*, 2266. https://doi.org/10.3390/nu14112266

## Web

**Brazelton Institute NBAS**
https://www.childrenshospital.org/research/centers/brazelton-institute-research/nbas

**Mentoring Caregivers. Changing Hospitals.** Improving the Futures for Newborns and Their Families. https://nidcap.org/

**NIDCAP Cincinnati. NIDCAP Training Center: A National Leader in Developmental Care.**
https://www.cincinnatichildrens.org/service/n/nicu/hcp/nidcap

## Images

Image 1 Image by PublicDomainPictures on Pixabay
Image 2 Photo by Tim Bish on Unsplash
Image 3 Photo by Christian Bowen on Unsplash
Image 4 Photo by Christian Bowen on Unsplash
Image 5 Photo by Gabriel Tovar on Unsplash
Image 6 Image by Tawny Nina Botha on Pixabay
Image 7 Photo by Sharon McCutcheon on Unsplash
Image 8 Photo by Dragos Gontariu on Unsplash
Image 9 Photo by Yuri Shirota on Unsplash


# THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!

Co-funded by the European Union

e-EarlyCare-T

# Pathologies in early ages: Premature babies and maturational delay.

## Licence

Author: Dr. María Consuelo Sáiz Manzanares
Developmental and Educational Psychology Area
Faculty of Health Sciences
University of Burgos

"This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein. "




Co-funded by the European Union

e-EarlyCare-T

Licence available at:

https://creativecommons.org/licenses/by-nc-sa/4.0/

UNIVERSIDAD DE BURGOS

Kveloce I+D+i Tus ideas son nuestros proyectos

gestionet Play Think Learn

ROMA TRE UNIVERSITÀ DEGLI STUDI

UNIRI MEDRI