



ORIGINAL ARTICLE

# Translation and study of the measurement properties of the Early Feeding Skills Assessment tool in premature newborn<sup>☆</sup>



Milagros Matarazzo Zinoni<sup>a,\*</sup>, Laura Campos Herrero<sup>a</sup>,  
Domingo González Lamuño<sup>a</sup>, Isabel de las Cuevas Terána<sup>b</sup>

<sup>a</sup> Departamento de Ciencias Médicas y Quirúrgicas, Facultad de Medicina, Universidad de Cantabria, Santander, Cantabria, Spain

<sup>b</sup> Unidad Neonatal, Hospital Universitario Marqués de Valdecilla, Santander, Cantabria, Spain

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## Abstract

**Introduction:** With the aim of improving the care of the premature newborn during their hospital stay, and their well-being in the transition from enteral to independent feeding, it is proposed to incorporate an assessment system within a Spanish Neonatal Unit. The translation of the Early Feeding Skills Assessment (EFSA) tool is presented, along with a study of its measurement properties.

**Patients and method:** A total of 104 assessments were made on premature babies of less than 34+6 weeks of gestational age, admitted to the neonatal unit with total or partial feeding, including a normal neurological examination for their age and with physiological stability.

**Results:** The EFSA 2010 tool achieved an acceptable value (0.76) as regards its internal consistency. The EFSA 2018 tool maintained an acceptable internal consistency value (0.751). As regards the reliability between two observers, the results showed a satisfactory and excellent reliability in 57.69% of the items in the EFSA 2010 tool, a property that improved in the EFSA 2018 tool (73.68%).

**Conclusions:** The Spanish version of the EFSA tool is consistent and reliable for use as a tool for the assessment of oral abilities for feeding premature babies admitted into a Spanish Neonatal Unit.

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\* Corresponding author.

E-mail address: [matarazzomili@gmail.com](mailto:matarazzomili@gmail.com) (M. Matarazzo Zinoni).

**PALABRAS CLAVE**

Prematuro;  
Alimentación;  
Unidad neonatal de  
cuidados intensivos

## Traducción y estudio de propiedades métricas de la herramienta Early Feeding Skills Assessment en el nacido prematuro

### Resumen

**Introducción:** Con el propósito de mejorar la atención al recién nacido prematuro durante su estancia hospitalaria y su bienestar en la transición de la alimentación enteral a independiente, se propone incorporar un sistema de evaluación dentro de una unidad neonatal española. Presentamos la traducción al idioma español de la herramienta Early Feeding Skills Assessment y el estudio de sus propiedades métricas.

**Pacientes y métodos:** 104 evaluaciones sobre bebés prematuros menores de 34 + 6 semanas de edad gestacional admitidos en la unidad neonatal con alimentación oral parcial o total, con examen neurológico normal para su edad y con estabilidad fisiológica.

**Resultados:** La herramienta EFSA 2010 alcanza un valor aceptable (0,76) en cuanto a su consistencia interna. La herramienta EFSA 2018 mantiene un valor de consistencia interna aceptable (0,751). En cuanto a la fiabilidad entre dos evaluadores, los resultados muestran fiabilidad satisfactoria y excelente en un 57,69% de los ítems en la herramienta EFSA 2010, propiedad que mejora en la herramienta EFSA 2018 (73,68%).

**Conclusiones:** La herramienta EFSA-VE es consistente y fiable para su uso como herramienta de valoración de las habilidades orales para la alimentación del bebé prematuro ingresado en una unidad neonatal española.

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## Introduction

At present, the decision whether a preterm infant is ready for oral feedings, whether the infant is capable of completing an oral feeding and whether removing a nasogastric tube is appropriate depends exclusively on the subjective judgment of the clinicians on staff in the unit based on observation and clinical experience. The transition from enteral feeding to oral feeding requires the maturation and coordination of a set of reflexes that must operate simultaneously while maintaining physiological stability. Oral feeding does not merely require isolated skills but the dynamic interaction of multiple combined skills.<sup>1</sup>

Generally, the approach to the assessment of oral feeding skills in neonatal units is based on monitoring the daily volume ingested by sucking, the number of feedings completed by sucking each day, the decrease in adverse events during nutritive sucking (apnoea, oxygen desaturation, inadequate alertness with the infant falling asleep or crying) and the daily weight gain. This is a subjective approach.<sup>2–4</sup> In addition, it is not appropriate, as it measures intake and intake is an outcome rather than a direct measure of oral skills.<sup>5</sup>

It is also important to consider that oral feeding skills do not depend solely on the health or neurodevelopment of the preterm infant, but also on previous experience. As preterm infants develop feeding skills, they also develop compensatory strategies to facilitate this activity.<sup>1</sup> We must not forget that the different components involved in feeding mature over time at varying rates.<sup>6</sup>

With the aim of improving the care of preterm infants during their hospital stay, it was necessary to introduce an assessment method in a neonatal unit in Spain. An individualised approach to the evaluation and care of preterm

infants during the transition from enteral to oral feeding does not only yield benefits in the development of oral feeding skills during hospitalization but can also prevent future orofacial abnormalities,<sup>7</sup> achieve greater weights at discharge (with the corresponding neuroprotective effect)<sup>8</sup> and reduce the length of stay,<sup>9</sup> among others, while promoting parent-child bonding and therefore contributing to the prevention of communication and language deficits.<sup>10</sup>

We performed a literature review in search of an objective structured instrument for the assessment of oral feeding skills in breastfed or formula-fed preterm infants that took into account their condition before, during and after oral feedings in addition to the setting and caregiver actions, and we did not find any such tool validated for use in Spanish. Of the 6 instruments we identified for assessment of oral feeding skills in hospitalised preterm newborn infants (NOMAS,<sup>11</sup> LATCH,<sup>12</sup> PIBBS,<sup>13</sup> Early Feeding Skills [EFS] assessment tool,<sup>5,9</sup> POFRAS,<sup>14</sup> NeoEAT<sup>15</sup>), the EFS assessment was the best suited for our purpose.<sup>5,9</sup> It is an observational measure of oral feeding skills in term and preterm newborn infants. It can be applied from the time of initiation of oral feeding through 6 months of corrected age. The instrument was developed to identify the highest level of skill that the infant demonstrates during oral feedings.

We present the translation to Spanish of the EFS assessment tool (EFSA-VE) and the results of the analysis of the psychometric properties

## Sample and methods

We contacted the author and research team that produced the original instrument to obtain their authorization to

translate and adapt the scale to the Spanish language. The study was approved by the Ethics Committee.

### The instrument: the EFS assessment tool

The assessment profiles areas of competence and difficulty for the infant. Each item is scored based on the degree to which the infant maintains the skill throughout the feeding. The assessment must be performed by professionals specialised in the development of early feeding skills acquainted with the indicators of emergent skills. Its purpose is not to arrive to diagnosis but to allow clinicians to make an objective assessment of current oral feeding skills, monitor the development of feeding skills and nutrition in the infant and assess the effectiveness of applied interventions.

The original instrument was published in 2005.<sup>9</sup> It was revised in 2010, accompanied by a new manual. Most recently, in 2018, the latest version was published, aimed at improving its applicability in clinical practice and research by making it easier and quicker to administer.<sup>5</sup>

The EFS assessment tool (2010) comprises 28 items structured into 4 domains: ability to remain engaged in feeding (3 items), ability to organize oral-motor functioning (7 items), ability to coordinate swallowing and breathing (6 items) and ability to maintain physiological stability (12 items). Each item is scored based on whether the skill is not observed (1), emerging (2) or consistently expressed (3), except for the last 6 items that have yes/no answer choices.

The revised EFS assessment tool (2018) comprises 19 items structured into 5 domains: respiratory regulation (5 items), oral-motor function (4 items), swallowing coordination (4 items), engagement (2 items) and physiological stability (4 items). A scoring system from 1 to 3 is added at the end of the checklist, with higher ratings indicating better oral feeding skills (1 indicates absence of the skill or an identified need, 2 emergent skill or possible need and 3 consistent skill).

### Translation

To ensure and preserve the integrity of instruments, the research team of Suzanne Thoyre shared with us a protocol for the translation and cross-cultural adaptation of the instrument. The protocol was based on the PROMIS guidelines (version 2.0, revised in May 2013) and a review of various publications.<sup>16-21</sup> The first steps in this protocol were the following:

Step 1. Concurrent translation to Spanish of the English scale by 2 native Spanish speakers, yielding 2 translated scales. Each did their own translation independently from the other.

Step 2. A third native Spanish speaker analysed the 2 translated versions, reconciled discrepancies and settled on a single optimal version. This step was performed in collaboration with the 2 translators from the previous step.

### Study universe and sample size calculation

We achieved a sample size of at least 5 assessments per item<sup>22</sup> following observation of preterm infants feeding orally from a bottle. The infants had been born before 27 weeks' gestation and were 33 weeks of postmenstrual age or older at the time of the first assessment. They engaged in partial or full oral feedings, had a normal neurologic examination for age and were physiologically stable (did not require haemodynamic support or mechanical ventilation, although oxygen therapy did not preclude inclusion in the study). The exclusion criteria were presence of congenital malformations, neurologic disease (congenital anomaly of the nervous system, intracranial haemorrhage grade III or IV, hydrocephalus, periventricular leukomalacia), meningitis and chromosomal anomalies.

### Data collection

We carried out the field work between September 2017 and November 2018. We identified potential participants once preterm infants met the inclusion criteria. We considered infants eligible when they were stable and did not meet any exclusion criteria. We included participants once we obtained signed informed consent from the parents or legal guardians. We assessed infants within 5 days from inclusion. The evaluators were 2 speech therapists with specific training on the development of early feeding skills that observed together the feedings of each infant at 9 AM, 12 PM and 3 PM. Each infant could be re-evaluated as long as evaluations were at least 6 days apart, and each evaluation was considered a separate observation. The sequence of evaluations ended at the time of hospital discharge.

It is important to note that as we were conducting the fieldwork with the EFS assessment tool of 2010, the author published the most recent update (October 2018). The update involved the elimination of 9 items and restructuring of the domains. We decided to transfer the results obtained with the former tool to the new tool, eliminating items that were no longer used and rearranging them according to the new domains.

### Objectives and data analysis

#### Objective 1

To assess the content validity of the new tool, EFS-VE. To this end, we provided a copy of the tool to 5 providers in the neonatal unit to ensure that it was comprehensible in the new language and setting. We assessed content validity through cognitive interviewing.<sup>17,18</sup> The interview consisted in gathering participants and reviewing each item as a group, assessing comprehension and the ability to respond in each participant.<sup>20,21</sup> Items that all participants agreed with remained as they were. Those that elicited questions or were interpreted differently by participants were reviewed again.<sup>22</sup>

**Table 1** Distribution of assessments by week of hospitalization.

Week of hospitalization	1	2	3	4	5	6	7	8
Assessed preterm infants, <i>n</i>	21	12	7	3	3	2	2	2
Hospital discharge, <i>n</i>	9	5	4	1	1	0	0	2
Assessments performed, <i>n</i>	42	24	14	6	6	4	4	4
Mean gestational age <sup>a</sup>	31 <sup>+1</sup>	–	–	–	–	–	–	–
Mean postmenstrual age at the time of assessment <sup>a</sup>	35 <sup>+3</sup>	35 <sup>+5</sup>	35 <sup>+5</sup>	34 <sup>+5</sup>	35 <sup>+5</sup>	36 <sup>+4</sup>	37 <sup>+4</sup>	38 <sup>+4</sup>

<sup>a</sup> Expressed as completed weeks + completed days.

## Objective 2

To assess the internal consistency of the instrument. We used the Cronbach alpha. We calculated this statistic for each subscale and for the entire instrument. We considered values of 0.70 or greater indicative of an acceptable consistency.

## Objective 3

To assess the interobserver test-retest reliability when 2 observers applied the tool to the same subject at the same time point. We used the Cohen kappa index, considering values of 0.75 or greater indicative of excellent reliability, 0.40 to 0.75 of satisfactory reliability and less than 0.40 unsatisfactory.

## Results

We evaluated a total of 21 preterm infants admitted to the neonatal unit from the time they were included in the study through hospital discharge. We performed simultaneous evaluations, adding up to a total of 104 observations. [Table 1](#) presents the distribution of the evaluations grouping observations of preterm infants by week of hospitalization.

## Objective 1

The cognitive interviewing step involved 1 physician, 2 medical residents and 2 speech therapists. They read every item and discussed their comprehension and ability to answer each of them. The items in the third domain, which refer to breathing-swallowing coordination, were reviewed using real-life examples in video format. The group considered these items difficult to rate and requiring training before using the tool. They also considered items in the fourth domain regarding alertness and engagement during feeding complex. The group considered that items 1 and 4 in the first domain (respiratory regulation) and item 16 in the fifth domain (physiological stability) required training of health professionals on the behavioural and physiological signs of stress in the infant and their detection.

## Objective 2

The 2010 EFS assessment tool had an acceptable internal consistency (0.76). The 2018 version, despite the

modifications, maintained an acceptable level of internal consistency (0.751).

## Objective 3

The assessment in 2 evaluators of the interrater reliability for each item showed a satisfactory or excellent reliability in 57.69% of the items of the 2010 EFS assessment tool. This parameter improved in the 2018 EFS assessment tool, in which test-retest reliability was satisfactory or excellent in 73.68% of the items.

## Discussion

In this article, we present the Spanish translation of a tool used to assess oral feeding skills in preterm infants translated to Spanish and the results of assessing its psychometric properties in a sample of preterm infants admitted to a neonatal intensive care unit in Spain.

One of the objectives of our study was to provide neonatal units a structured tool for the assessment of healthy preterm infants (see the inclusion and exclusion criteria). There is a need in the neonatal care setting for a tool allowing assessment of oral feeding skills in preterm infants to be able to establish the needs of preterm infants and deliver individualised support accordingly. The aim of supportive care is to promote the maturation of reflexes and their coordination until the infant can feed orally independently, safely and effectively.<sup>3,5,10,23,24</sup>

The use of a structured and objective instrument, such as the EFSA-VE, allows intervention aimed at the prevention of sequelae that could affect subsequent development of oral feeding skills and speech.<sup>3,5,23–28</sup> The EFS assessment tool has exhibited predictive power in other settings,<sup>29</sup> and therefore performing assessments during the hospital stay, especially before discharge, can help identify preterm infants at higher risk of feeding problems, in terms of both safety (choking, aspiration) and effectiveness (decreased weight gain). It is important to remember that families are part of the care team in the neonatal unit and must be trained on how to identify and address the needs of the infant.<sup>15</sup> After the preterm infant is discharged from hospital, it is the family that is responsible for the administration of 8 or more feedings a day.

To date, other assessment tools similar to the EFS, such as the Neonatal Oral Motor Assessment scale (NOMAS)<sup>11</sup> and the Cuestionario Observacional de las Conductas de Alimentación en Neonatos Prematuros (COCANP, developed in Spain)<sup>30</sup> have helped differentiate between healthy preterm

infants and preterm infants with needs associated with anatomical, physiological or neurologic deficits. However, when it comes to the ongoing evidence-based evaluation of the oral feeding skills of preterm infants during the neonatal stay in hospital with the aim of providing specific support based on individual needs, we believe that the EFSA-VE is the appropriate tool.

One of the strengths of the EFSA-VE is that it is the only published instrument that, in addition to assessing oral skills at the time of feeding, also takes into account the condition of the infant before and after the feeding, the specific setting and the actions of the individual feeding the infant. While the EFS assessment tool published in 2018 has fewer items, one possible limitation when it comes to the management of the care team management is that the assessment requires the provider to focus exclusively on the feeding of a single preterm infant in each evaluation.

Another strength is that the evaluation can be conducted in breastfed as well as bottle-fed infants of up to 6 months of corrected age. Until a few years ago, preterm infants developed oral feeding skills with the exclusive use of the bottle as a tool. With increasing frequency, neonatal unit protocols aim to establish breastfeeding in preterm infants, and therefore availing units of the EFSA-VE would allow assessment of all hospitalised preterm infants independently of the feeding modality.

This instrument can be used for non-diagnostic purposes. The score indicates the maturation level of feeding skills in the 5 established domains: regulation of breathing, organization of oral-motor functioning, coordination of swallowing and breathing, sustained engagement in feeding and physiological stability. In the field of speech therapy, there was always an interest in orofacial stimulation techniques for management of newborn infants with feeding deficits. The evidence published to date has yet to prove that direct interventions used in speech therapy (orofacial stimulation) can reduce the number of days it takes for infants to develop independent feeding skills or be discharged from hospital,<sup>24</sup> although there are authors that consider this approach beneficial.<sup>10,25–28</sup> In consonance with current concerns regarding the level of stress in hospitalised preterm infants, the importance given to the outcomes of nutrition as opposed to the method employed to deliver it<sup>8</sup> and the shift to clustering care procedures and minimising infant handling and disruptions,<sup>29</sup> the EFSA-EV proposes a method to identify the needs of the infant and provide specific support during oral feedings, without adding interventions requiring handling to the routine care provided in the neonatal unit. Once supportive care is implemented, monitoring the progress of the infant is necessary to verify the positive impact of the intervention.<sup>5</sup>

One of the limitations of the EFSA-EV is that it must be applied by providers knowledgeable of the early development of feeding skills and behavioural and physiological indicators in infants to assess the maturity of these skills.<sup>9</sup> In the guideline published in 2005, the American Speech-Language-Hearing Association indicated that speech therapists should be the professionals in charge of the evaluation and management of oral feeding skills in infants in neonatal intensive care units.<sup>31</sup> In Spain, speech therapists are also the professionals trained in the evaluation of dys-

phagia, but they are not routinely included in neonatal care teams.

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## Conflicts of interest

The authors have no conflicts of interest to declare.

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