

Original

Family context assessment in a public health study

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RESUMEN

Objetivo: analizar la estructura factorial de un nuevo instrumento para evaluar la calidad del contexto familiar (Escala Etxadi-Gangoiti) en la cohorte de Gipuzkoa del proyecto INMA (Infancia y Medio Ambiente)**Métodos:** se evaluaron las familias de 433 niños/as de 2 años. Se analizaron la estructura factorial y las propiedades psicométricas de los datos.**Resultados:** Se realizaron un análisis factorial exploratorio (factorización de ejes principales y rotación varimax) y un análisis factorial confirmatorio que confirmó parcialmente la estructura original del instrumento revelando la existencia de los siguientes factores: sub-escala 1 (promoción del desarrollo cognitivo y lingüístico; promoción de habilidades sociales; promoción de habilidades psicomotoras; promoción del juego simbólico y de la imitación) sub-escala 2 (promoción de la autonomía y autoestima; práctica de la frustración óptima; calidad socio-emocional de la relación; ausencia castigo físico) sub-escala 3 (implicación del padre, baja exposición al conflicto; baja frecuencia de conflicto; relaciones con la familia extensa; apoyo social; diversidad de experiencias; baja frecuencia de acontecimientos estresantes y baja percepción parental de estrés).**Discusión:** se obtiene confirmación parcial de la estructura original del instrumento, lo cual se atribuye a las características de la muestra. Se constata la relevancia de la variabilidad en la evaluación familiar y de sus indicadores adecuados de fiabilidad. Se señala la potencialidad para la salud pública de los hallazgos para la identificación de contextos familiares de calidad deficiente y para la elaboración de criterios preventivos, centrados en el desarrollo de competencias parentales.

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Evaluación del contexto familiar en un estudio de salud pública

ABSTRACT

Keywords:

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Objectives: To analyze the factorial structure of a new instrument to assess the quality of the family context (Etxadi-Gangoiti Scale) in a sample from the Gipuzkoa cohort of the Environment and Childhood (Infancia y Medio Ambiente [INMA]) study.**Methods:** Families in a sample of 433 two-year-old children were assessed in a home visit with subsequent analysis of the factorial structure and psychometric properties of the data.**Results:** An exploratory factorial analysis (principal axis factoring and varimax rotation) and a confirmatory factorial analysis were carried out; partial confirmation of the original factorial structure of the instrument was obtained, which revealed the following factorial structures. Subscale (1): promotion of cognitive and linguistic development, social skills, psychomotor skills, and pretend play and imitation; subscale (2): promotion of independence and self-esteem, provision of optimal frustration, social and emotional quality of the relationship, and absence of physical punishment; subscale (3): paternal involvement, low exposure to family conflict, low frequency of family conflict, relationship with the extended family, social support, diversity of experiences, low frequency of stressful events, and low parental perception of stress.**Discussion:** The structure of the original instrument structure was partially confirmed, which was attributed to the characteristics of the sample. We stress the importance of the variability obtained in the evaluation of the families, as well as of adequate indicators of reliability in such evaluation. The new instrument could be used in public health to identify deficient family contexts and to design preventive interventions focused on parenting skills.

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Introduction

In the framework of the Guipúzcoa INMA¹ project, aiming to conduct an assessment of environmental variables that might have a significant influence on infant development, assessment of the family context was included for the families of 2-year-old children. An assessment of family context will provide the opportunity to carry out a proper weighting of pollutants on childrens' neurobehavioral development. To this end, a new instrument was designed, the Etxadi-Gangoiti Scale, which covers the areas assessed by other instruments used in this field and adds all those variables related to the family context that have previously been identified by empirical research such as having an influence on psychological development of girls and boys at 2 years of age. This instrument was originally described in detail by Arranz et al.^{2,3} In regard to the theoretical background supporting this work, it should be highlighted that the Bronfenbrenner⁴ *ecological theory* provides a framework to include in the research design not only variables belonging to the family interactive micro system, but also variables addressing other aspects of family context such as quality of the physical environment or socio-demographic features.

The variables are grouped into three sub-scales: Stimulation of cognitive and linguistic development, Stimulation of social and emotional development and Organisation of the social context and physical environment. The first sub-scale includes: Materials to stimulate learning, a series of items updating the subscale of the Home Observation for Measurement of the Environment (HOME) scale.⁵ Potential for play, which describes how often the child plays with his/her parents and siblings; variables describing the use of scaffolding activities and, in particular, decontextualisation in play, as well as the presence of pretend play and participation therein together; quality of the *Stimulation of cognitive development*, in relation to the acquisition of age-appropriate skills such as the learning of colours, spatial relationships, and rhythms and imitation play and *Stimulation of linguistic development*, in terms of the frequency and quality of linguistic stimulation received by the child in interaction with his/her parents. These variables have been shown to have an impact on cognitive and linguistic development in empirical studies.^{6–8}

The second sub-scale refers to the *Stimulation of social and emotional development* and includes: *Emotional expressiveness*, which describes the quality of interactions and the emotional regulation between parents and children; the *Setting of limits and optimal frustration*, which reflects the strengthening of resilience in the family context; *Promotion of self-esteem and autonomy*, which describes factors related to the child carrying out his/her responsibilities in daily life; and *Interaction with the mother during the interview*, which assesses the quality of the relationship. Key publications on this subject include the papers by Belsky,⁹ Lamb¹⁰ and Pauli-Pott and Mertesacker.¹¹

The third sub-scale groups are those variables related to the *Organisation of the social context and physical environment* and includes variables measured throughout the *Developmental History*, authored by Pettit et al.¹², which are: *Paternal involvement*, which describes the participation of the father in the bringing up of the child, the quality of his interaction with his son/daughter and his contribution to domestic chores; this variable has been systematically identified by research as a protective factor for child development¹⁰, *Quality of substitute care*, which assesses the stability and sensitivity of non-maternal care; *Relationship with the extended family and social support network*, which assesses the frequency and quality of interaction between the nuclear family and the extended family; *Stability of the child's social relationships and parental interest therein*, which assesses whether the child has a stable network of friends; *Relationship with school*, reflecting the frequency and degree of involvement of the parents with the child's

school; and *Diversity of experiences*, in the sense that this represents a characteristic of the setting for the child's development, a variable that assesses the frequency and quality of the new and different experiences that the parents expose their child to in daily life.^{6,13,14} This third sub-scale also includes *Absence of exposure to family conflict*, which assesses the frequency of conflict situations between adults within the family and the child's exposure to them, and *Absence of parental stress*, which assesses whether the parenting process has been full of tension and worries or, on the contrary, the parents have faced it with calmness and have been able to enjoy it. Lastly, a variable which relates to the ecological environment of the child, taken from the HOME scale was included: *Quality of the physical environment*, which reflects the quality of the setting where the child carries out his/her daily living activities assessing the cleanliness and safety of the home and neighbourhood, the number of square meters per person in the household, and whether there is outdoor space for playing.^{15,16}

The influence of family context on psychological development has been studied over the past few years; for instance, Anjos Andrade et al.¹⁷ used the Bayley Scales (BSID)¹⁸ and demonstrated that a high-quality family context, assessed by the HOME scale,⁵ was associated with greater cognitive development in a sample of 350 children between 17 and 42 months of age. Motor development also seems to be sensitive to the quality of the family environment (Osorio et al.¹⁹) in a sample of 36-month-old children.

Following the theoretical background⁴ a group of variables were included in the research design as it has been shown their contribution to the creation of stimulating environments that promote child development.^{20,21} Furthermore, researchers from the INMA project found a significant impact of the level of education of mothers on child neuropsychological development in a sample of 523 children of 14 months of age.²² The inclusion of this group of variables will support a deeper weighting of the results bearing in mind sample study features.

In order to support the development and use of a new instrument in this research, it should be highlighted that the use of traditional instruments, such as HOME scale, in "not at risk" family populations was showing a ceiling effect in Spanish samples.^{7,23} Coming from this evidence, the main objectives of this study were, firstly, to analyze the factorial structure of the new instrument, in order to confirm its seminal theoretical proposal, and secondly, to disclose its psychometric properties with the aim of weighting the instruments potential as an accurate tool to assess family context.

Methods

Sample

The sample for this study was from the cohort of the Gipuzkoa INMA project, which was recruited in the health areas of Goierri and Alto/Medio Urola (Gipuzkoa). Recruitment was performed through the Zumarraga hospital (Department of Obstetrics and Gynaecology), part of the Basque Health Public Service (Osakidetza), which is the reference hospital for the whole study area. More than 90% of women use public health services during pregnancy. Detailed information of the characteristics and methodology of the project is described elsewhere.¹ To summarize, pregnant women were recruited at their first routine antenatal care visit (10–13 weeks of gestation) in the hospital. The inclusion criteria were: to be over 16 years old, to live in the study area, to have a singleton pregnancy, to not follow an assisted reproduction programme, to have the intention of delivering at the reference hospital, and to not present communication problems in Spanish or Basque. From April 2006 to January 2008, 993 pregnant women were contacted and asked to participate in the study. Women participating signed an

Table 1
Etxadi-Gangoiti Scale (original instrument and confirmation after CFA).

<i>Subscale Stimulation of cognitive and linguistic development (33 items)</i>	
F1	Materials to stimulate learning (CFA Promotion of Psychomotor skills)
F2	Potential for play (CFA Promotion of pretend play and imitation)
F3	Stimulation of cognitive development (CFA Promotion of cognitive and linguistic development)
F4	Stimulation of linguistic development (CFA Promotion of cognitive and linguistic development)
<i>Subscale Stimulation of social and emotional development (31 items)</i>	
F1	Emotional expressiveness (CFA Social and emotional quality of the interaction)
F2	Setting of limits and optimal frustration (CFA Optimal frustration practice)
F3	Promotion of self-esteem and autonomy (CFA Promotion of independence and self-esteem)
F4	Interaction with the mother during the interview (CFA Social and emotional quality of the interaction)
<i>Subscale Organisation of the social context and physical environment (63 items)</i>	
F1	Paternal involvement (CFA Paternal involvement)
F2	Quality of substitute care (Not confirmed by CFA)
F3	Relations with the extended family and social support network (CFA Relationships with the extended family and Social support)
F4	Stability of the child's social relationships and parental interest therein (Not confirmed by CFA)
F5	Relationship with the school (Not confirmed by CFA)
F6	Diversity of experiences (CFA Diversity of experiences)
F7	Absence of exposure to family conflict (CFA Low exposure to family conflict and Low frequency of family conflict)
F8	Absence of parental stress (CFA Low frequency of stressful events and Low parental perception of stress)
F9	Quality of the physical context (Not confirmed by CFA)

informed consent form and the Ethical Committee of the Donostia Hospital approved the research protocol.

Instruments

Etxadi-Gangoiti scale:^{2,3} This scale assesses the quality of the family environment of 2-year-old boys and girls, the original instrument considering three dimensions, assessed with three sub-scales: *Stimulation of the cognitive and linguistic development* (33 items), *Stimulation of the social and emotional development* (31 items) and *Organisation of the social context and physical environment* (63 items). The original factorial structure of the scale, based on the above exposed theoretical background, is summarized in [Table 1](#).

Data was obtained in three different ways: First, directly collected by interviewers visiting the family, including details of the stimulating materials and the physical environment; second, from direct observation by interviewers of the interaction between the child and the mother or father or both during the interview; and third, via a questionnaire completed by the mother or both parents during the interview. Overall, the interview has 127 items, of which 33 cover the factors assessed by the interviewers in accordance with pre-established criteria, and 66 are questions to be answered by the mother or the parents, based on a 6-point Likert scale, information for the other 28 items comes from direct observation. An updated version of the scales handbook will be sent to any researcher or practitioner upon request for the research team.

Sociodemographic questionnaire: a protocol and questionnaire created *ad hoc* for the INMA project¹ were used; this questionnaire collected information related to the social and demographic characteristics of participants such as age, level of education, occupational social class,²⁴ size of family, country of origin, etc.

Procedure

The assessment of the family context based on the Etxadi-Gangoiti scale for 2-year-old children was carried out in the home

of each family by two family psychologists. The interview was initially aimed at both parents but, due to schedule problems, it was accepted that there was just one of them. 55.8% of the interviews were conducted in the presence of both parents, 42.2% in the presence of the mother and 2% in the presence of the father. Inter-observer differences index were controlled at the beginning of this data collection (Kappa= 0.98, $p < 0.05$ for total scale score and 0.93, $p < 0.05$ for direct observation variables). Data was collected between January 2009 and December 2010. The mean duration of visits to the families was 91 minutes including recording of the data.

Statistical analysis

A previous descriptive analysis of sociodemographic characteristics of the sample was performed. As a first stage of analysis, dimensions presented in the original factor solution for the Etxadi-Gangoiti instrument were tested removing items with levels of saturation under 0.30; Also eliminated were those that, exceeding 0.30, showed saturation levels in two or more factors, which occasionally improves the reliability of some of the subscales in which these items featured. Then, and prior to the second stage, exploratory factorial analysis (principal axis factoring and varimax rotation), the Bartlett's test of sphericity was performed for each of the three subscales of the instrument: *Stimulation of cognitive and linguistic development* (SCLD), *Stimulation of social and emotional development* (SSED) and *Organisation of the social context and physical environment* (OSPE).

In order to confirm these exploratory factorial solutions, a confirmatory factorial analysis (CFA) was carried out to assess the goodness-of-fit of the general model of the Etxadi-Gangoiti instrument presented for the three main dimensions (three subscales). Some authors have established 200 as the critical sample size regardless of the original size of the sample.²⁵ For the CFA, we randomly selected 218 cases out of the 433 collected, that is, about 50% of the overall sample in order to prevent data overfitting.

For fitting the model to the data, it was considered that the fit was excellent for root mean square error of approximation (RMSEA) values under 0.05, acceptable for values of 0.05 to 0.08, and poor for values over 0.09. The fit obtained can be considered acceptable in terms of goodness-of-fit statistics provided that the strictest criteria are not applied.²⁶ In order to test the factorial structure of the Etxadi-Gangoiti, the sample was divided into two subsamples taking into account that there was a balance of the sex in the sample. CFA was conducted using these two sub-samples.

In order to analyse the results as a function of sex, an ANOVA controlling for sex of the children was performed to assess whether there were differences in the scores obtained in the three subscales of Etxadi-Gangoiti. The analysis of data was carried out using the IBM SPSS Statistics 20 software. CFA analyses were performed with IBM SPSS Amos 20 software.

Results

The final sample comprised 433 children aged 2 years of whom 225 (51.9%) were girls. Most of the families were from Spanish origin. 237 (58%) children were primiparous. [Table 1](#) shows the sociodemographic characteristics of family participants. ([Table 2](#))

Exploratory factorial analysis

Results were statistically significant for all three subscales: SCLD ($\chi^2 = 6563.62$, $df = 171$, $p < .001$), SSED ($\chi^2 = 1301.88$, $df = 406$, $p < .001$) and OSPE ($\chi^2 = 2890.91$, $df = 300$, $p < .001$). These data enabled the research team to proceed to factorial analysis. In addition, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was calculated, yielding values of 0.74, 0.69 and 0.65 respectively.

Table 2
Sociodemographic characteristics of the mothers and fathers of the Gipuzkoa INMA cohort.

Age (years)	Mother %	Father %	Social class ^a	Mother %	Father %
<25	3.1	0	High (I-II)	32.4	28.3
[25-29]	30.5	18.8	Middle (III)	27.5	12.2
[30-34]	53.1	42.2	Low (IV-V)	40	59.5
≥35	13.3	39.1	Type of employment		
Country of origin			Manual	40.1	59.5
Spain	94.5	98.4	Non-manual	59.9	40.5
Latin America	3.9	1.6	Parity		
Europe	1.6		Primiparous	54.8	
Level of education			1 child	39.9	
Primary education	12.6	24.2	≥2 children	5.3	
Secondary education	35.4	51.6	Dominant language		
University qualifications	52.0	24.2	Niño/a %		
			Basque	70,5	
			Spanish	28,6	
			Living status with the biological father		
			Live with the child' father 97.4%		

Classified according CNO94²⁴

Table 3
Descriptive statistics, reliability coefficient and explained variance of the stimulation of cognitive and linguistic development (SCLD) subscale.

	SCLD Subscale (total alpha= .73)			
	F1	F2	F3	F4
Mean	62.76	82.84	45.23	50.62
SD	24.68	37.59	35.99	25.68
Explained variance in % 14.76	7.20	5.90	5.20	
Reliability	.73	.95	.63	.37

F1= Promotion of cognitive and linguistic development; F2= Promotion of social skills; F3= Promotion of psychomotor skills; F4= Promotion of pretend play and imitation

Table 4
Descriptive statistics, reliability coefficient and explained variance of the stimulation of social and emotional development (SSED) subscale.

	SSED Subscale (total alpha= .65)			
	F1	F2	F3	F4
Mean	50.11	88.55	80.63	88.93
SD	22.57	17.63	19.00	16.75
Explained variance in %	11.27	6.58	5.51	5.38
Reliability	.65	.58	.46	.39

F1= Promotion of Independence and self-esteem; F2= Optimal frustration practice; F3= Social and emotional quality of the interaction; F4= Absence of physical punishment

The subsequent analysis found four-factor solutions that explained 33.18% of the observed variance on the SCLD scale (see Table 3) and 28.75% of the variance on the SSED scale (see Table 4), while there was an eight-factor solution that explained 55.64% of the variance of scores on the OSCPE scale (see Table 5).

Confirmatory factorial analysis

The multidimensional model obtained for the three subscales had the following goodness-of-fit indices: $\chi^2 = 232.43$, $df = 101$,

$p < .001$: CMIN/DF= 2.32; CFI= 0.76; NFI= 0.66; PCFI= 0.64; and RMSEA= 0.055. (Fig. 1)

The model displayed good fit by sex of children. Similar fit statistics were obtained studying boys ($\chi^2 = 152.62$, $gl = 101$, $p < .001$: CMIN/DF= 1.51; CFI= 0.79; NFI= 0.58; PCFI= 0.66; and RMSEA= 0.049) or girls ($\chi^2 = 180.56$, $gl = 101$, $p < .001$: CMIN/DF= 1.78; CFI= 0.74; NFI= 0.58; PCFI= 0.63; and RMSEA= 0,059). See the items of the 3-factor model of the Etxadi-Gangoiti scale in Appendix I.

In the multidimensional model with the three constructs initially analysed, it was observed that the OSCPE subscale had the poorest reliability coefficients. Given this, it was decided to compare the first solution with an alternative model with two dimensions including SCLD y SSED subscales and removing the aforementioned subscale. The goodness-of-fit statistics were significantly better ($\chi^2 = 42.249$, $gl = 19$, $p < .002$: CMIN/DF= 2.22; CFI= 0.92; NFI= 0.87; PCFI= 0.62; and RMSEA= 0.053).

The correspondence between the original scale and the new scale, obtained through CFA can be observed in Table 1.

Differences in Etxadi-Gangoiti by sex

It was found that girls scored higher than boys ($x = 64.2$ vs $x = 56.35$) in the SCLD subscale, this being the statistically significant difference ($F(432,1) = 19.142$ $p < .001$). No other statistically significant differences by sex were detected in SSED and OSCPE subscales.

Discussion

These results partially confirm the original factorial structure of the scale, indicating that this tool is sensitive to variability in family context in various different areas, with acceptable reliability indicators. Factorial analysis did not exclude any of the variables describing the family environment that were included in this study but have not been assessed in traditional family assessment instru-

Table 5
Descriptive Statistics, reliability coefficients, and explained variance of the organisation of the social context and physical environment (OSCPE) subscale.

	OSCPE Subscale (total alpha= .67)							
	F1	F2	F3	F4	F5	F6	F7	F8
Mean	77.04	97.10	63.84	88.10	65.22	87.32	71.62	74.71
SD	22.02	13.61	35.62	32.24	27.47	21.46	35.62	34.47
Explained variance in %	13.78	8.72	7.69	5.97	5.44	5.19	4.69	4.46
Reliability	.61	.74	.68	.98	.34	.33	.40	.42

F1= Paternal involvement; F2= Low exposure to family conflict; F3= Low frequency of family conflict; F4= Relationship with the extended family; F5= Social support; F6= Diversity of experiences; F7= Low frequency of stressful events; F8= Low parental perception of stress

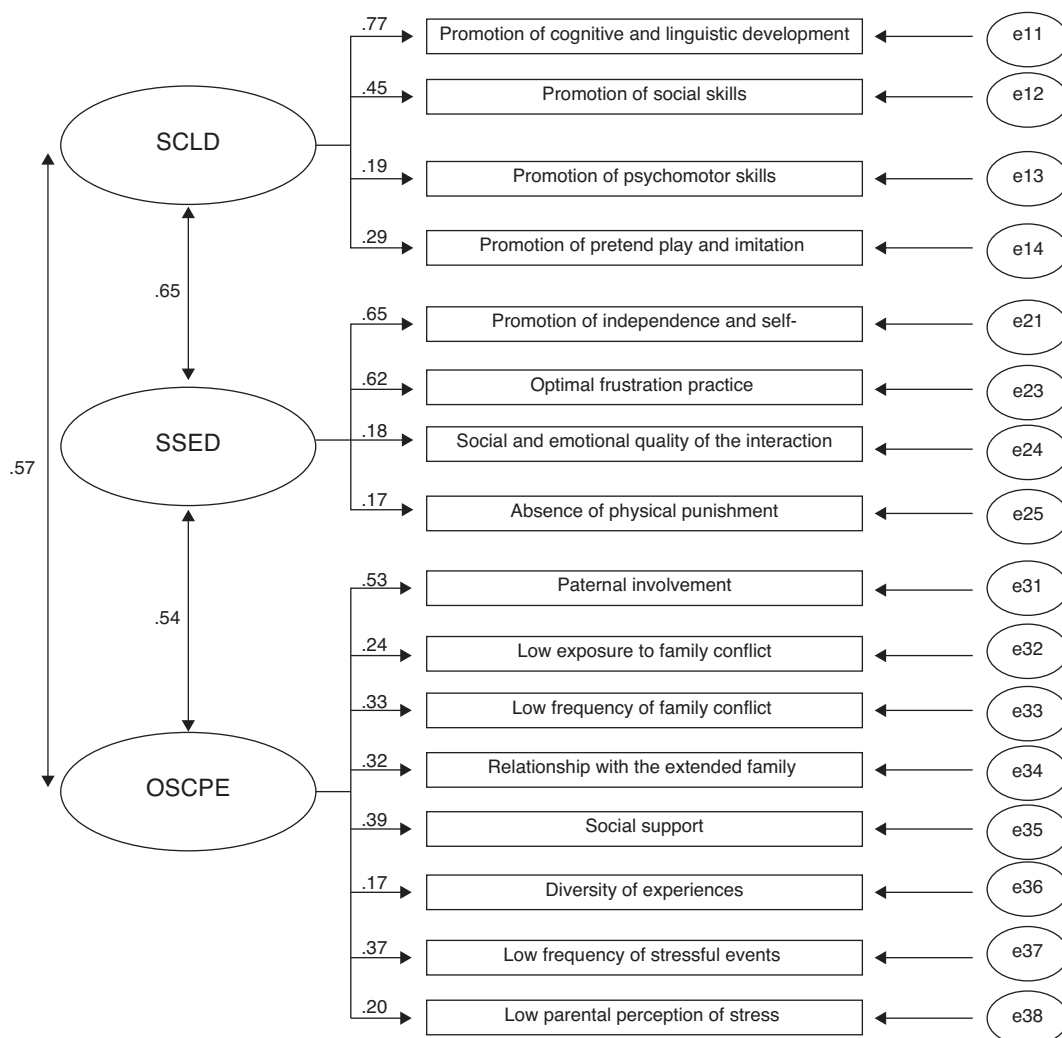


Figure 1. Confirmatory factor analysis of the ETXADI-GANGOITI scale: model for the three subscales showing covariance between the three subscales, loading factors and error variance.

ments, such as the assessment of micro-interactions within families which have been grouped into factors in subscales: *Promotion of cognitive and linguistic development*, *Promotion of pretend play and imitation*, *Promotion of self-esteem and independence*, and *Optimal frustration practice*.

It should be highlighted that some sub-factors belonging to the three sub-scales included in the originally proposed assessment *Quality of substitute care*, *Relationship with the school*, *Stability of the child's social relationships and parental interest therein* and *Quality of the physical environment* have not been confirmed in the analysis, these items being removed due to their small contribution to the model. This finding may, however, be explained by the fact that most children in the sample were not of school age and were cared for by their mother at the time when the scale was administered. Furthermore, the low variability observed in the quality of the physical environment may be attributable to the relatively high socioeconomic status of the families in the sample. Given these results, it should be noted that the potential utility of using the original scale in populations with a different socio-demographic background or in clinical case assessment should be carefully adapted to the specific family characteristics.

The data show a good reliability of the *Promotion of cognitive and linguistic development* subscale, being the Factor 1, which shows

a good reliability level, the one that explains the higher percentage of variability. This factor reflects scaffolding activities such as decontextualisation, learning of new words, and repetition of words by syllable to promote the acquisition and contingent correction of the child's pronunciation.^{7,27} It also assesses parental stimulation of new learning, such as colours, songs, and simple spatial relationships, also covered by the HOME scale, and other elements related to the stimulation of narrative skills at receptive and expressive levels and to the promotion of pretend play and imitation.

In regard to the sub-scale quality of socio-emotional stimulation, it is worth noting the good reliability and factor variance explained by the *Promotion of independence and self-esteem* factor, a parental practice involving the delegation of responsibilities in everyday life and the promotion of the ability to cope autonomously in different tasks. Closely linked to this, it turns out that the *Optimal frustration practice* factor, is able to explain significant variance and is strongly connected to the promotion of resilience as essential parenting practice.²⁸

The sub-scale assessing the quality of the organization of the social and physical context, namely factor 1, shows results consistent with the empirical literature highlighting the contribution of parental involvement in the creation of an optimal parenting context.²⁹ Likewise with factors 2 and 3, referring to the positive

impact it has on the family environment and a low frequency of childhood exposure to parental conflict.³⁰

The finding of a significant trend of a higher quality of family environment for girls, specifically in terms of stimulation of linguistic development, provides an explanation to a previously reported pattern³¹ showing girls with a better performance on the Bayley Mental Scale; this relationship should be deeply analyzed in future studies.

The results suggest that to assess the quality of the family context it would be pertinent to include the measurement of the micro-interactions assessed by this scale, as far as they are supported by empirical research showing its strong influence on childrens' psychological development; furthermore, an assessment of family context will allow practitioners, working with families, to design preventive intervention strategies based upon positive parenting principles.³²

Editor in charge of the article

Carlos Álvarez-Dardet.

What is known about the topic?

An abundant empirical literature shows the influence of the quality of family context on children psychological development. Traditional scales assessing family contexts not include recent research results and were creating a ceiling effect in standard populations.

What does this study add to the literature?

A new instrument for assessing the quality of family contexts of 2 year old children. The new instrument is useful to assess and identify deficient family contexts and to design preventive interventions aimed to promote public health issues in the families.

Authors' contributions

David Velasco: data collection and processing, statistical analysis, co-drafting of the conclusions.

Manuel Sánchez de Miguél: methodology supervision, statistical analyses, co-drafting of the conclusions.

Maitane Egurza: data collection and processing, co-drafting of the introduction, critical review of the manuscript with substantial contributions.

Enrique Arranz: design of the original instrument, design of the structure of the manuscript, co-drafting of the introduction and conclusions, review of the scientific literature.

Aritz Aranbarri: review of the scientific literature, critical review of the manuscript with substantial contributions, co-drafting of the introduction.

Eduardo Fano: review of the scientific literature, critical review of the manuscript with substantial contributions, co-drafting of the conclusions.

Jesús Ibarluzea: design of the structure of the article, co-drafting of the methods section, critical review of the manuscript with substantial contributions, main investigator and author of the project in which the research was based.

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Conflicts of interests

The authors declare that they have no conflicts of interests.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.gaceta.2014.03.015>.

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