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ASSESSMENT OF HEALTH LITERACY IN THE CHILD POPULATION

Pilar Bas Sarmiento, Universidad de Cádiz
pilar.bas@uca.es, https://orcid.org/0000-0001-6309-4997

Martina Fernández Gutiérrez, Universidad de Cádiz
martina.fernandez@uca.es, https://orcid.org/0000-0003-3961-2250

Departamento Enfermería y Fisioterapia - Universidad de Cádiz, Avda. de la Universidad, 4 (Campus de la Asunción), 11406, Jerez de la Frontera, Cádiz, Spain.

Abstract: Background: Low levels of health literacy (HL) are associated with poorer health outcomes for populations. The implementation of HL assessment strategies has the potential to change clinical practice and ensure better health outcomes.

Objectives: To determine the best way to assess health literacy in the child population and to identify the instrument with the best psychometric properties.

Methods: A comprehensive systematic review of the scientific literature in the ERIC, ProQuest, PsycINFO, PubMed, and Science Direct databases was conducted for all articles published to date in English and Spanish. A total of 304 articles were obtained and classified with Excel to remove duplicates, resulting in a total of 165 potentially relevant articles. After a full-text analysis, 11 studies were selected.

Results: Nineteen instruments were identified that measure health literacy in children: 13 general HL instruments and 6 specific HL instruments relating to food, mental health, and cancer.

Discussion/Conclusions: Instruments that are adaptations of the original tools used in adults, although they were shown to have good psychometric properties, they have the same deficiencies. The HLSAC instrument is based on a multidimensional model and has been demonstrated to have internal consistency and construct validity. There is a need for reliable and valid tools that cover all dimensions of the construct and are adapted to the developmental stage of children.

Keywords: health literacy, children, assessment, reliability, questionnaire, systematic review.

EVALUACIÓN DE LA ALFABETIZACIÓN EN SALUD EN POBLACIÓN INFANTIL

Resumen: Antecedentes: la baja alfabetización en salud (AS) se asocia a peores resultados de salud de las poblaciones. La implementación de estrategias de evaluación de AS tiene el potencial para cambiar la práctica clínica y garantizar mejores resultados de salud.

Objetivo: determinar la mejor forma de evaluar la alfabetización en salud en la población infantil y acordar cuál es el instrumento que posee las mejores propiedades psicométricas.

Metodología: se realizó una exhaustiva revisión sistemática de la literatura de todos los artículos publicados hasta la fecha en las bases de datos ERIC, PROQUEST, PSYCINFO, PUBMED y SCIENCE DIRECT en inglés y español. Un total de 304 artículos fueron obtenidos y clasificados con el programa Excel, para descartar duplicados, resultando un total de 165 artículos potencialmente relevantes. Tras un análisis a texto completo se seleccionaron 11 estudios.

Resultados: se identificaron 19 instrumentos que midieron la alfabetización en salud en niños: 13 instrumentos generales de AS y 6 específicos relacionados con la alimentación, salud mental y cáncer.

Discusión/Conclusiones: los instrumentos que son adaptaciones de los originales empleados en adultos, aunque demostraron tener buenas propiedades psicométricas, tienen las mismas deficiencias que los originales. El HLSAC se basa en un modelo multidimensional y demuestra consistencia interna y validez de constructo. Necesitamos herramientas fiables y válidas que abarquen todas las dimensiones del constructo y se adapten al nivel de desarrollo.

Palabras clave: alfabetización en salud, niños, evaluación, fiabilidad, cuestionario, revisión sistemática.

AVALIAÇÃO DA ALFABETIZAÇÃO EM SAÚDE NA POPULAÇÃO INFANTIL

Resumo: Antecedentes: a baixa alfabetização em saúde (AS) está associada a piores resultados de saúde das populações. A implementação de estratégias de avaliação de AS tem o potencial para mudar a prática clínica e garantir melhores resultados de saúde.

Objetivo: determinar a melhor forma de avaliar a alfabetização em saúde na população infantil e acordar qual é o instrumento que possui as melhores propriedades psicométricas.

Metodologia: foi realizada uma revisão sistemática exaustiva da literatura de todos os artigos publicados até o momento nas bases de dados ERIC, PROQUEST, PSYCINFO, PUBMED e SCIENCE DIRECT em inglês e espanhol. Um total de 304 artigos foram obtidos e classificados com o programa Excel para descartar duplicatas, obtendo como resultado um total de 165 artigos potencialmente relevantes. Após uma análise de texto completa foram selecionados 11 estudos.

Resultados: foram identificados 19 instrumentos que mediram a alfabetização em saúde em crianças: 13 instrumentos gerais de AS e 6 específicos relacionados com a alimentação, saúde mental e o câncer.

Discussão/Conclusões: os instrumentos que são adaptações dos originais empregados em adultos, embora tenham demonstrado ter boas propriedades psicométricas, têm as mesmas deficiências que os originais. O HLSAC baseia-se em um modelo multidimensional e demonstra consistência interna e validade de constructo. Necessitamos ferramentas confiáveis e válidas que abranjam todas as dimensões do constructo e sejam adaptadas ao nível de desenvolvimento.

Palavras-chave: alfabetização em saúde, crianças, avaliação, confiabilidade, questionário, revisão sistemática.

INTRODUCTION

Health Literacy (HL) is defined as "people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course." (Sørensen, y otros, 2012) Originally, three levels are recognised: functional, interactive, and critical HL (Nutbeam, 2000).

From a health promotion perspective, improving HL at an early age is crucial to the health and development of children and adolescents. HL interventions for children and adolescents can lead to improvements in healthy behaviours and reduced use of emergency services (Diamond, Saintonge, August, & Azrack, 2011) (Guo, y otros, 2018) (Robinson, Calmes, & Bazargan, 2008).

Compared to adults, basic health knowledge in children and adolescents is influenced by four factors: (Forrest, Simpson, & Clancy, 1997) (1) Development/change: the cognitive capacity of children and adolescents is less developed than that of adults; (2) Dependence: children and adolescents are more dependent on their parents and peers than adults; (3) Differential epidemiology: children and adolescents experience a unique pattern of health, illness, and disability; (4) Demographic patterns: children and adolescents living in poverty or in a single-parent family; families are neglected and require additional care. These differences pose significant challenges for researchers when measuring HL in children.

STRUCTURED QUESTIONS

In the child population, which is the most robust diagnostic test in terms of reliability and validity, compared to the adult population, to assess health literacy?.

METHODOLOGY/EVIDENCE ASSESSMENT

According to the ATTRACT initiative: Grade I Meta-analyses and/or systematic reviews.

Search strategy

A comprehensive systematic review of the scientific literature in the ERIC, ProQuest, PsycINFO, PubMed, and Science Direct databases was conducted for all articles published to date (16th October 2018) in English or Spanish.

The search strategy was designed using the DeCS and MeSH thesauri. Boolean operators (AND/OR) were used to combine search terms. Seven categories were established to group the DeCS and MeSH

terms in order to generate all combinations possible and obtain results that are more precise. Each category corresponds to a different domain shown in Table *1*.

Table 1. *Categories established for the literature search*

Category	Domain	DECS and MESH terms included in the domain
C1	Alfabetización en salud	"health literacy"
C2	Propiedades psicométricas	"reliability", "validity", "psychometrics", "reproducibility of results", "sensitivity and specificity"
C3	Instrumentos	"tools", "instrument, "instruments"
C4	Tipos de instrumentos	"survey", "surveys", "questionniare", "questionnaires", "test", "tests"
C5	Población niños	"child".
C6	Salud del niño	"child health"
C7	Tipo de publicación	"validation studies", "review", "comparative study", "meta-analysis"

Note. Source: Compiled by the authors.

Inclusion/exclusion criteria

The inclusion/exclusion criteria followed for the selection of articles focused mainly on the search for studies developing and validating HL questionnaires in children, or in parents in relation to child health, and/or studies analysing the psychometric properties of instruments measuring HL in children.

Flow diagram

304 articles were extracted from the databases searched. After removing duplicates (139 publications), a total of 165 potentially relevant articles remained to be assessed for eligibility according to their titles and abstracts, while applying the inclusion criteria. After comprehensive screening of the documents, 155 were discarded, leaving a total of 10 articles selected. After consulting the bibliographical references, a new study was added. Figure 1 shows the flow diagram of the literature search, based on PRISMA (Urrútia & Bonfill, 2009) criteria.

EVIDENCE SUMMARY

A total of 11 articles were identified that met the inclusion criteria, which covered a total of 13 general HL instruments, (Okan, y otros, 2018) (Davis, y otros, 2006) (Chisolm & Buchanan, 2007) (Perry, 2014) (Chan, Hsieh, & Liu, 2012) (Wu, y otros, 2010) (Schmidt, y otros, 2010) (Yu, Yang, Wang, & Zhang, 2012) (Massey, Prelip, Calimlim, Afifi, & Quiter, 2013) (Guo, y otros, 2018) (Levin-Zamir, Lemish, & Gofin, 2011) (Norman & Skinner, 2006) (Manganello, DeVellis, & Davis, 2015) (Ghanbari, Ramezankhani, & Montanezi, 2016) (Driessnack, Chung, Perkhounkova, & Hein, 2014) (Paakari, Torppa, Kannas, & Paakari, 2016)as well as 6 specific instruments related to nutrition (HLS-TCO (Schmidt, y otros, 2010); MBL; (Williams, y otros, 2017) NLit-P; (Gibbs, y otros, 2016) FNLIT (Doustmohammadian, y otros,

2017)), mental health (QuALiSMental (De Jesus Loureiro, 2015)), and cancer (FCCHL-AYAC (McDonald, Patterson, Costa, & Shepherd, 2016)). The evidence table (Table *2*) attached at the end of the present bulletin, describes the psychometric properties of each of the general instruments that assess HL in children.

BRIEF RECOMMENDATION IN THE FORM OF AN ANSWER TO THE ORIGINAL QUESTION

There are instruments that are adaptations of the original tools used in adults (such as the REALM-teen, the c-s-TOFHLAd, and the NVS) and, although they were shown to have good psychometric properties, they have the same deficiencies, i.e. they only assess the functional dimension of HL.

The instruments that have tried to go further, for the most part, suffer from lack psychometric neatness. Of the instruments available to date, the HLSAC is based on a multidimensional model and has been demonstrated to have internal consistency and construct validity.

The skill set attained by children vary greatly by age group. Most instruments are used in the adolescent population. It would be necessary to adapt the concepts according to age groups and stages of development taking into account the cognitive and social skills of children of different ages.

There are virtually no cases in which children are taken into account in the construction of the questionnaire.

The variability of concepts and theoretical models has repercussions for the development of instruments and hinders the comparison of results.

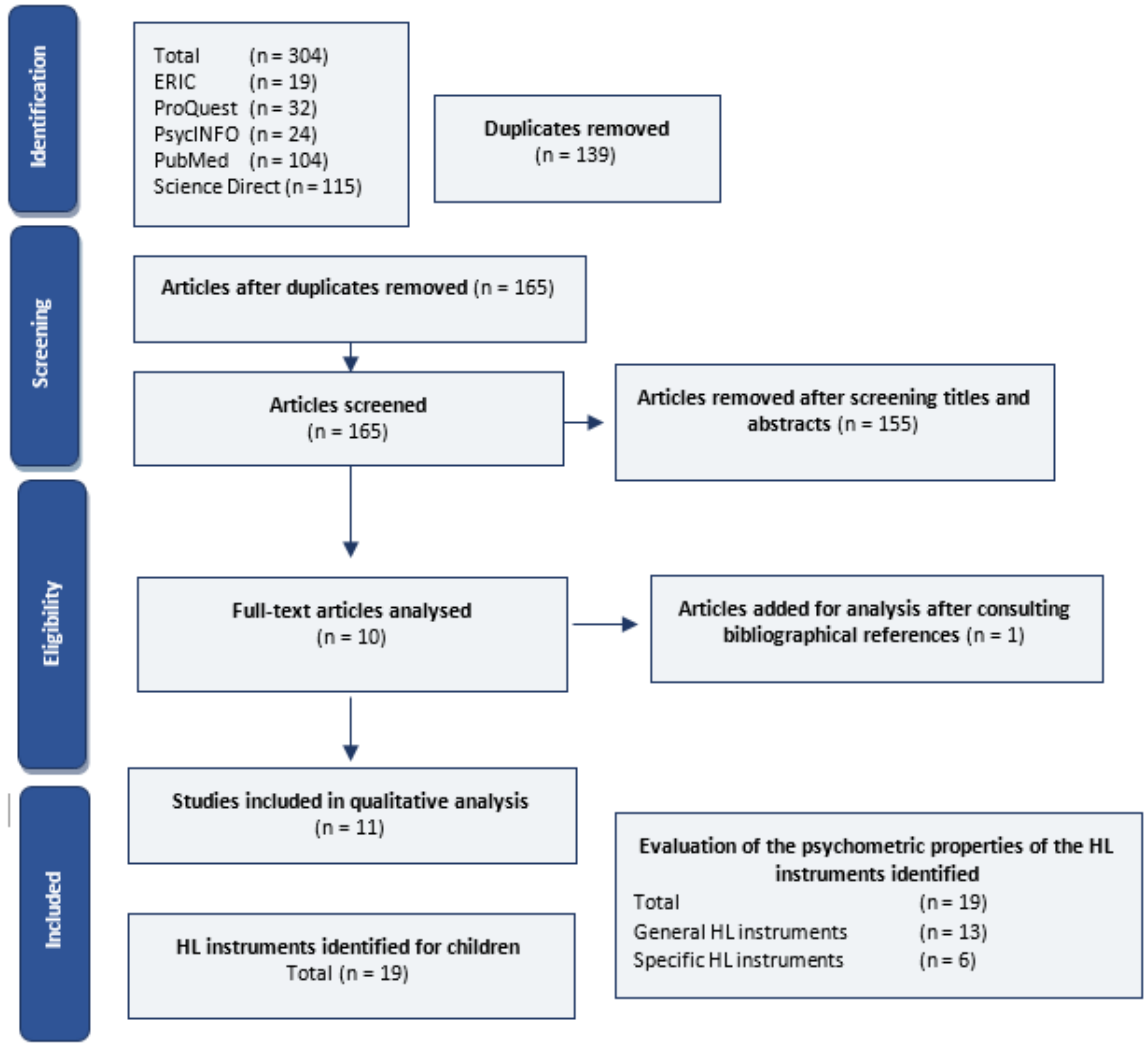

Figure 1. Flow Diagram. Compiled by the authors based on PRISMA criteria (Urrútia, G., & Bonfill, X. (2009). Declaración PRISMA: una propuesta para mejorar la publicación de revisiones sistemáticas y metaanálisis, Med Clin 135 (11), 507-511. doi: 10.1016/j.medcli.2010.01.2015).

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Table 2. *Evidence table of instruments measuring Health Literacy in children*

Instrument / Reference	Population HL components	Reliability	Face validity / Content validity	Construct validity	Criterion validity
Rapid Estimate of Adolescent Literacy in Medicine – Teen (REALM-teen) (Okan, y otros, 2018) (Davis, y otros, 2006)	1533 adolescents, aged 10-19 years. Functional Health Literacy	INTERNAL CONSISTENCY Cronbach's α * = 0.94	Content validity: GOOD Adaptation of existing instrument for adults (REALM)	Convergent validity: SORT-R (r = 0.93, P < 0.01) y WRAT (r = 0.83, P < 0.01). Curve ROC: area SORT-R under ROC (AUC) = 0.84	Not available
Test of Functional Health Literacy in Adolescents (TOFHLAd) (Okan, y otros, 2018) (Chisolm & Buchanan, 2007) Adaptation of the TOFHLA instrument for adults to the adolescent populatio.	50 adolescents, aged 13-17 years Two subscales: TOFHLA-R (50 reading comprehension items) and TOFHLA-N (17 numeracy items).	Not available	Content validity: GOOD Adaptation of existing instrument for adults (TOFHLA)	Validez convergente: - TOFHLA-R y WRAT3 (r = 0.59, p<0.001). - TOFHLA-R y REALM (r = 0.60, p<0.001). - TOFHLA-N y WRAT3 (r = 0.11, p=0.45). - TOFHLA-N y REALM (r = 0.18, p=0.22).	Not available
Chinese short-form Test of Functional Literacy in Adolescents (Perry, 2014) (Chan, Hsieh, & Liu, 2012)(c-s-TOFHLAd)	327 adolescents, aged 16-17 years Functional HL	INTERNAL CONSISTENCY Cronbach's α = 0.85 Total-item correlation**: α ranges between 0.44-0.86 Test-retest reliability (1 week): r = 0.95 (p < 0.001)	Content Validity Index (CVI)*** > 0.85 (for all items)	Convergent validity: Correlation of c-sTOFHLAd with REALM = 0.74 (p < 0.001) FACTORIAL VALIDITY CFA indicates a 1-factor model for the adolescent population, as opposed to the adult version (2-factor model)	Not available

				1-Factor model χ2 = 2335.90; df = 573; p < 0.001; RMSEA = 0.06 90% CI = 0.11-0.15; GFI = 0.92; AGFI = 0.90; SRMR = 0.068; CFI = 0.89Modelo 1 factor X2 = 2335.90; df=573; p<0.001; RMSEA = 0.06 90% CI = 0.11-0.15; GFI = 0.92; AGFI = 0.90; SRMR = 0.068; CFI = 0.89	
Health Literacy Assessment Booklet (HLAB) (Okan, y otros, 2018) (Perry, 2014) (Wu, y otros, 2010)	275 students in 8th-12th grade 2 dimensions of HL: understand and evaluate	Inter-rater reliability = 95% concordance of scores INTERNAL CONSISTENCY Cronbach's α (total) = 0.92 α (understand) = 0.88 α (evaluate) = 0.82	Not available	FACTORIAL VALIDITY Principal Component Analysis (PCA). 2 factors were identified: understand and evaluate	Multiple linear regression model. Sex (male): r= -0.27; p = 0.004 Non-English speaker: r = -0.27; p = 0.008 Advanced age upon arrival in Canada: r = -0.30; p = 0.014 Low education level: r = 0.53; p = 0.001 Absent from school in the previous 4 weeks: r = -0.35; p = 0.016
GeKoKids Questionnaire (Okan, y otros, 2018) (Perry, 2014) (Schmidt, y otros, 2010)	852 children, aged 9-13 years	INTERNAL CONSISTENCY Cronbach's α (communication)= 0.73 α (attitudes) = 0.57 Reliability using the Rasch model with the knowledge subscale (χ2 = 6.45, p = 0.17) and the behaviour subscale (χ2 = 15.48, p = 0.12)	Not available	Not available	Not available

Health Literacy Questionnaire (Okan, y otros, 2018) (Yu, Yang, Wang, & Zhang, 2012)	8,008 students in primary and secondary education.	INTERNAL CONSISTENCY Cronbach's α = 0.73 Spearman-Brown coefficient = 0.75	Not available	Not available	Not available
Multidimensional health literacy instrument (Okan, y otros, 2018) (Massey, Prelip, Calimlim, Afifi, & Quiter, 2013)	1,208 adolescents, aged 13-17 years 6 dimensions: A = patient-provider encounter; B = interacting with the healthcare system; C = rights and responsibilities; D = health information seeking; E = confidence in health information from personal source; F = confidence in health information from media source	INTERNAL CONSISTENCY Cronbach's α = 0.834 Dimensions: A (α = 0.815) B (α = 0.803) C (α = 0.827) D (α = 0.638) E (α = 0.834) F (α = 0.709)	Not available	Not available	Not available
Media Health Literacy (MHL) (Guo, y otros, 2018) (Levin-Zamir, Lemish, & Gofin, 2011)	Adolescents, aged 13-17 years Four dimensions: identification of health content; critical evaluation; perceived influence; and intended action	INTERNAL CONSISTENCY Cronbach's α = 0.74	Not available	Not available	Multiple linear regression model. MHL is associated with females (β = 1.25, p < 0.001) and whose mothers had received > 15 years of education (β = 0.16, p = 0.04). MHL was positively associated with health empowerment (β = 0.36, p = 0.0005) and health behaviour (β = 0.03, p = 0.05).

eHealth Literacy Scale (Eheals) (Guo, y otros, 2018) (Norman & Skinner, 2006)	664 adolescents and young adults, aged 13-21 years Level of eHealth literacy	INTERNAL CONSISTENCY Cronbach's α = 0.88 Item-total correlation = 0.51-0.76 Test-retest reliability (4 measurements): r = ranges between 0.49-0.68 Intra-class correlation coefficient (for all measurements). r = 0.49 Modest stability over time	Theoretical model and experts. CVI not available	FACTORIAL VALIDITY Principal Component Analysis. Only one factor was identified (Eigenvalue = 4.479, accounting for 56% of the variance). The factor loading of the 8 items ranged from 0.60 to 0.84.	At baseline, eHEALS scores were statistically significant in males (t 726 = 2.236, p = 0.026). No differences were found for the other variables.
Health Literacy Assessment Scale for Adolescents (HAS-A) (Guo, y otros, 2018) (Manganello, DeVellis, & Davis, 2015)	272 adolescents (aged 12-19 years) Scale 1. Communicating health information (5 items) Scale 2. Confusion about health information (4 items) Scale 3. Understanding health information (6 items)	INTERNAL CONSISTENCY Cronbach's α (total) = 0.88 α (scale 1) = 0.77 α (scale 2) = 0.73 α (scale 3) = 0.76	Not available	FACTORIAL VALIDITY Exploratory factor analysis: Three main factors were identified accounting for 41% of the variance: Scale 1. Eigenvalue = 7.3; Scale 2. Eigenvalue = 3.0; Scale 3. Eigenvalue = 1.8 CONVERGENT VALIDITY AURA Questionnaire: Scale 1: (r = 0.69, p < 0.0001); Scale 2: r = −0.50; Scale 3: r = −0.42 (p value not available). Not available: values for the correlation of the questionnaire with REALM-teen and NVS gold standards.	Hispanic teens. Non-English speakers scored > on the REALM-Teen (p = 0.001). The REALM-Teen and NVS scores were higher with father/mother education (p < 0.00101; p < 0.0001). Teens receiving free or reduced lunch scored < on the REALM-Teen and NVS (p < 0.0001) and Scale 2 (p = 0.003). Teens receiving special education services scored < on the REALM-Teen and NVS (p < 0.0001). Teens with lower grades scored < on the REALM-Teen and NVS (p < 0.0001),

					however, not on Scale 1 (p = 0.161), but on Scales 2 (p = 0.003) and 3 (p = 0.005).
Health Literacy Measure for Adolescents (HELMA) (Guo, y otros, 2018) (Ghanbari, Ramezankhani, & Montanezi, 2016)	582 adolescents, aged 15-18 years 8 factors of HL: Access (5 items); Reading (5 items); Understanding (10 items); Appraisal (5 items); Use (4 items); Communication (8 items); Self-efficacy (4 items); Numeracy (4 items).	INTERNAL CONSISTENCY Cronbach's α (total) = 0.93; Cronbach's α (factor 1) = 0.61; Cronbach's α (factor 2) = 0.71; Cronbach's α (factor 3) = 0.86; Cronbach's α (factor 4) = 0.89; Cronbach's α (factor 5) = 0.81; Cronbach's α (factor 6) = 0.65; Cronbach's α (factor 7) = 0.83; Cronbach's α (factor 8) = 0.65 Intra-class Correlation Coefficient = 0.93	CONTENT VALIDITY Face validity, by 10 experts. CVI value not available.	FACTORIAL VALIDITY Exploratory Factor Analysis: A total of 8 factors were identified accounting for 53.37% of the variance.	No disponible
Newest Vital Sign used in children (NVS) (Driessnack, Chung, Perkhounkova, & Hein, 2014)	47 dyads (N = 94) made up of parents and children aged 7-12 years.	INTERNAL CONSISTENCY Cronbach's α (children) = 0.71 Cronbach's α (parents) = 0.79	Not available	Not available	Not available
Health Literacy for School-Aged Children (HLSAC) (Okan, y otros,	3,853 children in 7th-9th grade (aged 13-15 years) 5 components of HL: theoretical knowledge,	INTERNAL CONSISTENCY Pilot study (16 items): Cronbach's α (total) = 0.94. α of each component	CONTENT VALIDITY Face validity by a group of experts who developed the instrument. The contents of the final version were	FACTORIAL VALIDITY Confirmatory Factor Analysis. Pilot study (16 items). Final version (10 items).	Not available

2018) (Paakari, Torppa, Kannas, & Paakari, 2016)	practical knowledge, critical thinking, self-awareness, and citizenship	ranged between 0.75 and 0.84. Test-Retest (16 items): Structural equation modelling (1 factor) = 0.83; Structural equation modelling (5 factors): theoretical knowledge: 0.88; practical knowledge: 0.81; critical thinking: 0.81; self-awareness: 0.88; citizenship: 0.90 Final version (10 items) Cronbach's α (total) = 0.93; α (theoretical knowledge) = 0.77; α (practical knowledge) = 0.74; α (critical thinking) = 0.74; α (self-awareness) = 0.69; α (citizenship) = 0.73	consulted with adolescents. Quantitative data on CVI not available.	Regression analysis between the two versions: the final version predicts 97% of the variance of the previous instrument (R2 = 0.97, p < 0.01)

*Cronbach's α > 0.7 indicates good internal consistency;
**item-total correlation (α) α 0.40 indicates good internal consistency;
*** CVI > 0.80 good content validity (Waltz et al., 1991); +E > 3 shows unidimensionality of the components.

RINSAD

Journal of Childhood and Health, Revista Infancia y Salud (RINSAD) ISSN-L: 2695-2785, arises from the collaboration between administrations Portugal, Galicia, Castilla y León, Extremadura and Andalusia within the project **Interreg España-Portugal RISCAR** and aims to disseminate scientific articles related to child health, contributing to researchers and professionals in the field a scientific basis where to know the advances in their respective fields.

The two main orientations of the RINSAD magazine are:

a) Researchers related to childhood and health.
b) Professionals in the sector.

Total cost of the project (indicative): 2.418.345,92 €

Total approved FEDER: 1.813.759,48 €

Interreg España - Portugal RISCAR, **Universidad de Cádiz** project and **Departamento Enfermería y Fisioterapia del Universidad de Cádiz**.