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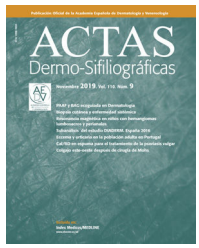

ORIGINAL ARTICLE

Validation of a Questionnaire Designed to Study Knowledge, Attitudes, and Habits Related to Sun Exposure Among Young Adults: The CHACES Questionnaire☆

N. Blázquez-Sánchez,[a,*] F. Rivas-Ruiz,[b] S. Bueno-Fernández,[c] S. Arias-Santiago,[d] M.T. Fernández-Morano,[a] M. deTroya-Martín[a]

[a] *Servicio de Dermatología, Hospital Costa del Sol, Marbella, Spain*
[b] *Unidad de Investigación, Hospital Costa del Sol, Marbella, Spain*
[c] *Departamento de Oftalmología y Optometría, Facultad de Farmacia, CEU San Pablo Universidad, Madrid, Spain*
[d] *Servicio de Dermatología, Hospital Virgen de las Nieves, Departamento de Dermatología, Universidad de Granada, Granada, Spain*

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Abstract Skin cancer prevention campaigns in schools have been shown to be both effective and cost-effective.

The success of such programs depends on the use of an appropriate design informed by a prior survey of the target population (pupils, teachers, and parents). There are, however, very few validated Spanish-language questionnaires designed to study the habits and knowledge of this population with respect to sun exposure in childhood and none designed for use with a young adult population.

Objective: To construct and validate a questionnaire designed to explore sun exposure behaviors in a young adult population.

Methodology: Two questionnaires were developed, one for adults (18+) and the other for young adults (11–17); both included demographic information, skin color, Fitzpatrick skin type, and history of sunburn as well as questions on knowledge, attitudes and practices related to sun exposure. The content was then piloted and its validity analyzed. The subsequent validation study was divided into 2 phases as follows: *1*) analysis of the validity and internal consistency of the items in a cross-sectional study of 1482 adults and adolescents, using exploratory factor analysis to test construct validity and Cronbach α to measure internal consistency; and *2*) evaluation of test-retest reliability in 39 individuals.

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* Corresponding author.
E-mail address: secretariadermatologia.ephcs@hcs.es (N. Blázquez-Sánchez).

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Results: The pilot study demonstrated the content validity of both questionnaires. Principal component analysis revealed that 2 components in each of the dimensions studied accounted for over 50% of the variance. A good correlation was found between the items studied. Validity was demonstrated in the first phase of the analysis with a Cronbach α of between 0.45 and 0.8 for all components except knowledge (0.335). In the second phase, test-retest reliability was demonstrated (absolute agreement >60%).
Conclusions: The psychometric properties of the questionnaire make it a valid and reliable tool for the study of knowledge, attitudes, and habits with respect to sun exposure in the young adult school population.
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PALABRAS CLAVE
Fotoprotección;
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Cuestionarios;
Validacion

Validación de un cuestionario para el estudio sobre hábitos, actitudes y conocimientos en fotoprotección en la población adultojuvenil: «cuestionario CHACES»

Resumen Las campañas escolares de prevención del cáncer cutáneo han demostrado ser eficaces y costo-efectivas. Su éxito depende de un adecuado diseño, basado en la encuestación previa de la población diana (alumnos, profesores y padres). Sin embargo, son escasos los cuestionarios validados en castellano que estudien hábitos y conocimientos sobre exposición solar en infancia, y nulos en la población adulto-juvenil.
Objetivos: Elaborar y validar un cuestionario que explore las conductas relacionadas con la exposición solar en población adulto-juvenil.
Metodología: Se elaboraron dos cuestionarios, dirigidos a población adulta (mayor de 18 años) y juvenil (11-17 años), incluyendo datos demográficos, color de piel, fototipo, quemaduras solares, prácticas, actitudes y conocimientos relacionados con la exposición solar. Tras el pilotaje y análisis de validez de contenido, se diseñó un estudio de validación en dos fases: I) Análisis de la validez y consistencia interna de los ítems (estudio trasversal sobre 1482 adolescentes-adultos, con estudio de validez de constructo (mediante análisis factorial exploratorio) y de consistencia interna (alfa de Cronbach)), II) Estudio de la estabilidad (test-retest sobre 39 sujetos).
Resultados: El pilotaje demostró la validez de contenido de sendos cuestionarios. El análisis de los componentes principales reveló dos componentes en cada dimensión estudiada, explicando más del 50% de la varianza. Todos los ítems mostraron buena correlación entre ellos. Se demostró validez en la fase I (coeficiente alfa de Cronbach entre 0,45-0,8, excepto el área de conocimientos(0,335)) y estabilidad en la fase II (acuerdo absoluto >60%).
Conclusiones: El cuestionario posee propiedades psicométricas que lo hacen válido y fiable para estudio de hábitos, actitudes y conocimientos en relación al sol en población escolar adulto-juvenil.
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Introduction

Skin cancer is currently the most frequent malignant neoplasm in humans. Its incidence has been increasing dramatically for some decades now,[1] and it has become a priority health problem, given that it generates considerable demand for care and high health care costs.[2] Skin cancer prevention campaigns are the best tool for reducing incidence, morbidity and mortality, and cost.[3–5] Nevertheless, the efficacy and cost-effectiveness of these campaigns depend on them having an appropriate design that is adapted to the needs of the target population. Therefore, a baseline study of habits, attitudes, and knowledge with respect to the dangers of sun exposure in target population groups is essential if we are to design primary prevention programs. The availability of questionnaires adapted to specific groups is indispensable, both when designing strategies and for subsequent evaluation of the results.

Few questionnaires on sun protection with demonstrated psychometric properties have been developed in Spanish,[6,7] and their validity has only been proven in very specific population groups or sun exposure scenarios (children[6] and beachgoers[7]). Therefore, we need new studies that demonstrate the usefulness of the questionnaire in other sun exposure settings and population groups.

The objective of the present study was to draw up and validate a questionnaire in Spanish. The questionnaire—Ċuestionario sobre hábitos, actitudes y conocimientos sobre exposición solar en adolescencia y edad adulta» (CHACES)'' (''Knowledge, Attitudes, and Habits Related to Sun Exposure Among Adolescents and Adults: The CHACES Questionnaire'') was designed to

explore habits, attitudes, and knowledge with respect to sun exposure among participants aged >11 years.

Material and Methods

Design

In the first stage, an expert team of dermatologists and epidemiologists drew up the CHACES questionnaire by adapting a previous questionnaire created and validated by the same group in 2009 (''Cuestionario a pie de playa'' [''The Beach Questionnaire'']).[7] The adaptation involved an analysis of each item on the questionnaire by evaluating its content validity, with nuanced drafting of several questions in order to adapt it to schoolchildren and the addition of new items that would be considered of interest in this setting. The questionnaire approved by the committee was subsequently piloted by applying it to 10 health care professionals from Hospital Costa del Sol, Marbella, Spain. This approach aimed to identify ambiguous questions, possible errors, and difficulties in comprehension.

The second stage, or validation stage, involved an evaluation of the psychometric properties of validity and reliability. This stage consisted of a cross-sectional study in 2 phases:

none- *Phase I*, analysis of the construct validity and reliability-consistency of the questionnaire.
none- *Phase II*, analysis of the reliability-stability of the questionnaire.

Study Population and Sample

The study was performed in the south of Spain in the province of Málaga, in the western part of the Costa del Sol, which includes the area between the towns of Benalmádena and Torremolinos. This is a tourist area with a Mediterranean climate and more than 300 days of sunshine per year.[8,9] The study population comprised adolescents (aged 11–17 years) and adults (≥18 years). The sample was a convenience sample, chosen based on a single inclusion criterion, namely, complete fluency in spoken and written Spanish in order to be able to complete the questionnaire. The questionnaires considered valid for the study were those completed by individuals within the age range (older than 11 years) who provided responses for the variables of age, sex, and sunburn during the previous summer.

The minimum statistical power necessary to evaluate the validity and reliability of the items on the questionnaire was set at 200 individuals per group (40 items multiplied by 5).[10]

Ethics

No information other than that specified in the questionnaire was collected. However, all of the study data were recorded anonymously, with strict adherence to current national legislation and regulations on data protection. Consent to participate in the study was obtained before participants completed the questionnaire. The project was approved by the Clinical Research Ethics Committee of Hospital Costa del Sol, since it was performed within a public health framework.

Questionnaire

Two versions of the CHACES questionnaire were created, namely, an adolescent version (11–17 years) and an adult version (≥18 years) (See Appendix B Supplementary Material). The only differences between the 2 versions were the way the respondent was addressed (i.e., using the polite form ''usted'' in the adult questionnaire and the second person singular familiar pronoun ''tú'' in the adolescent version) and the inclusion of 4 additional items in the adult questionnaire (demographic data and sun exposure habits in the workplace).

The 2 versions of the questionnaire (adolescent and adult) are self-completed. The first has 39 items and the second 43. The questionnaires comprise the following sections: *1*) Request to participate, *2*) Personal and demographic data, and *3*) Information requested (in 3 large blocks: habits, attitudes, and knowledge with respect to sun exposure). These are used to explore the following fields:

1 *Demographic data* (5 common items in both questionnaires and 3 more in the adult version): sex, age, country of birth, town of residence, and educational level. The adult questionnaire also included profession, marital status, and whether or not the respondent had children aged under 12 years.
2 *Skin color* (1 item in both questionnaires): color of skin not exposed to sunlight (5 response categories).
3 *Fitzpatrick skin type* (1 item in both questionnaires with 4 response categories).
4 *Sun exposure habits* (4 similar items in both questionnaires and 2 more in the adult version): Sun exposure habits are evaluated in 2 different scenarios, namely, sunbathing at the beach or pool and sports or leisure activities in the open air. We explored both the number of days per year and the number of hours per day of sun exposure (5 response categories). The adult questionnaire also explored the number of days per year of sun exposure in the workplace (5 response categories).
5 *Sunburn in the previous year* (1 item in both questionnaires, with 5 response categories). Sunburn is defined as the presence of reddening and pain after exposure to sunlight.
6 *Sun protection behaviors when participating in activities in the open air* (7 items in both questionnaires): Six sun protection behaviors recommended by the World Health Organization are explored, as follows[11]: staying in the shade, using sunglasses, using a hat or cap, wearing long sleeves or trousers, avoiding sunlight during the middle of the day (11:00 to 17:00), and using high-factor sunscreen (sun protection factor). Likert-type responses (5 categories) are used. As for sun protection habits, the sun protection factor of the usual sunscreen is recorded (5 categories).
7 *Attitudes toward sun exposure* (10 items in both questionnaires): Attitude is defined as a general permanent positive or negative feeling. Attitudes to sun exposure and protection are investigated based on 3 dimensions

(health, cosmetic value, and pleasure/leisure). The questions are answered on a Likert-type scale (5 categories).

8 *Knowledge with respect to sun exposure* (10 items in both questionnaires): Ten basic concepts related to sun exposure and skin cancer are explored using dichotomous responses (true or false).

Validation Study: Statistical Analysis

In the first phase, an expert panel comprising dermatologists and epidemiologists evaluated the content validity of the questionnaire.

In the second phase, a validation study of the 2 questionnaires was performed; both were performed in parallel using the same statistical analysis plan. For each of the 2 phases, a descriptive analysis was performed of the demographic characteristics, attitudes toward sun exposure, and knowledge of sun exposure in the population samples included. We studied the frequency distribution (endorsement frequency) for all the sections.

Phase I, Study of Internal Reliability-Consistency and Construct Validity of the Questionnaire

We analyzed both the construct validity (ability of the items to measure what they purport to measure) and the internal consistency (homogeneity of the items that measure the same concept) for the items corresponding to the concepts of sun protection behaviors, attitudes toward sun exposure, and knowledge with respect to sun exposure. The statistical analysis enabled us to eliminate items with the poorest yield and redefine the corresponding dimensions.

The concept validity of habits of and attitudes to sun exposure was measured using an exploratory factor analysis of the main components based on transformation of the solutions using a varimax rotation for the 6 items with the same response scale in the sun protection behaviors. The adequacy of the factor analysis was verified using the Kaiser–Meyer–Olkin test and the Bartlett test of sphericity. We considered as valid those items with communalities greater than 0.3 and factor saturations greater than 0.4. The internal consistency of the items for each of the resulting factors was explored using the Cronbach α. As for the area of knowledge, concept validity was studied using the facility index, together with the discrimination index, and the Cronbach α value for global evaluation of the scale. Similarly, we studied the mean (SD) of the number of correct answers for the whole scale.

Phase II, or stability study

The stability of the questionnaire was studied using the test-retest technique. We evaluated concordance between the pre-post evaluation of each of the items (15 days between surveys) using the absolute agreement percentage and the κ value with Cicchetti weights including the respective 95% CI. In accordance with the criteria of Landis and Koch,[12] we considered as the minimum acceptable value per item a κ value greater than 0.20 (median degree of agreement); values greater than 0.6 were considered to indicate substantial agreement.

Results

In the first phase, after preparation of the questionnaire and evaluation of its content validity, we performed a pilot study with 10 health care professionals from Hospital Costa del Sol. The median response time was 11 and 12 minutes in the adolescent and adult versions, respectively. The responses were not concentrated in the 10% or 90% thresholds for any of the items.

In the second phase, we analyzed the psychometric properties of the questionnaires using 2 parallel studies with 2 different population groups, as follows:

Phase I, study of the internal reliability-consistency and construct validity of the questionnaire

These properties were analyzed using a first population sample of 1482 adults and adolescents obtained from the health care setting. The participants were recruited with the help of health care professionals working in public health centers in the western part of the Costa del Sol between April and September 2014. A total of 15 health centers and 109 professionals participated in collection of the questionnaires.

A total of 1482 questionnaires were completed (78.4% adults [≥18 years] and 21.6% adolescents [11–17 years]). The mean (SD) age in the 2 groups was 39 (8.6) and 13.9 (1.7) years, respectively, with a mean overall age of 33.7 (12.8) years. There was a female predominance (68.9% women and 31.1% men), and 90.5% of the population were Spanish. The educational level was medium-high in 85%; only 2% had no formal education (Table 1).

Skin color was mainly pale or intermediate (32.8% and 38.5%, respectively), with a homogeneous distribution of skin types I to IV, although values were slightly higher for skin type III (34.4%) (Table 1). More than 50% of the total population had been sunburnt the previous year; this was higher in adolescents (67.3% vs. 46.5% in adults). Sun exposure habits are shown in Table 1.

The frequency of use of different sun protection techniques and attitudes to sun exposure in each of the population groups surveyed is shown in Figs. 1 and 2.

The construct validity and internal consistency-reliability of the questionnaire was assessed by analyzing its 3 components independently: sun protection habits, attitudes, and knowledge.

Sun Protection Behaviors

The frequency distribution and item-to-scale correlation for the items on the questionnaire associated with sun protection behaviors is shown in Table 2. None of the items had a response category greater than 50%, thus indicating their consistency. The score on the Kaiser–Meyer–Olkin test was 0.703, with a P value of < .001 in the Bartlett test of sphericity. Therefore, the fit of the 6 items analyzed was correct.

Table 1 Epidemiological, Phenotypic, and Sun Exposure Characteristics of the Population Surveyed.

	Adolescents n = 320 (21.6%)	Adults n = 13 176 (78.4%)	Total N = 1482 (100%)
[0,1–4] *Sex*			
Male	150 (47.6%)	310 (26.6%)	460 (31.1%)
Female	165 (52.4%)	855 (73.4%)	1.020 (68.9%)
[0,1–4]			
[0,1–4] *Age*			
Mean (SD)	13.9 (1.7)	39 (8.6)	33.7 (12.8)
[0,1–4]			
[0,1–4] *Nationality*			
Spanish	299 (94.9%)	1039 (89.3%)	1338 (90.5%)
Non-Spanish	16 (5.1%)	125 (10.7%)	141 (9.5%)
[0,1–4]			
[0,1–4] *Educational level*			
No formal education	2 (0.6%)	25 (2.2%)	27 (1.9%)
Primary	44 (14%)	146 (12.8%)	190 (13.1%)
Secondary	174 (55.2%)	447 (39.2%)	621 (42.7%)
Higher (university)	95 (30.2%)	521 (45.7%)	626 (42.4%)
[0,1–4]			
[0,1–4] *Marital status*			
Single	–	137 (11.8%)	137 (11.8%)
Married/with partner	–	915 (79%)	915 (79%)
Widow	–	9 (0.8%)	9 (0.8%)
Separated/divorced	–	97 (8.4%)	97 (8.4%)
[0,1–4]			
[0,1–4] *Children under 12 years of age*			
Yes	–	434 (37.8%)	434 (37.8%)
No	–	714 (62.2%)	714 (62.2%)
[0,1–4]			
[0,1–4] *Skin color*			
Very pale	21 (6.7%)	91 (7.8%)	112 (7.6%)
Pale	75 (24%)	408 (35.1%)	483 (32.8%)
Intermediate	148 (47.4%)	419 (36.1%)	567 (38.5%)
Dark	67 (21.5%)	240 (20.7%)	307 (20.8%)
[0,1–4]			
[0,1–4] *Skin type (Fitzpatrick)*			
I	108 (34.6%)	146 (12.7%)	254 (17.4%)
II	110 (35.3%)	221 (19.2%)	331 (22.6%)
III	59 (18.9%)	444 (38.6%)	503 (34.4%)
IV	35 (11.2%)	340 (29.5%)	375 (25.6%)
[0,1–4]			
[0,1–4] *Habits: Sunbathing, days of sun per year*			
Under 5 d	8 (2.5%)	143 (12.4%)	151 (10.3%)
6–30 d	85 (27.2%)	438 (38%)	523 (35.7%)
31–90 d	145 (46.3%)	429 (37.2%)	574 (39.2%)
More than 90 d	75 (24%)	143 (12.4%)	218 (14.9%)
[0,1–4]			
[0,1–4] *Habits: Sports, outdoor leisure, days of sun per year*			
Under 5 d	45 (14.5%)	419 (38.4%)	464 (33.2%)
6–30 d	73 (23.5%)	319 (29.3%)	392 (28%)
31–90 d	92 (29.6%)	180 (16.5%)	272 (19.4%)
More than 90 d	101 (32.5%)	172 (15.8%)	273 (19.5%)
[0,1–4]			
[0,1–4] *Habits: Sunbathing, hours of sun per day*			
None	11 (3.5%)	88 (7.7%)	99 (6.8%)
1–2 h	99 (31.8%)	412 (35.9%)	511 (35%)
3–4 h	120 (38.6%)	352 (30.7%)	472 (2.4%)
5–6 h	51 (16.4%)	103 (9%)	154 (10.6%)
More than 6 h	30 (9.6%)	193 (16.8%)	223 (15.3%)

Table 1 (*Continued*)

	Adolescents n = 320 (21.6%)	Adults n = 13 176 (78.4%)	Total N = 1482 (100%)
[0,1–4]			
[0,1–4] *Habits: Sports, outdoor leisure activity, hours of sun per day*			
None	15 (4.9%)	304 (28.2%)	319 (23%)
1–2 h	153 (49.5%)	498 (46.2%)	651 (46.9%)
3–4 h	99 (32%)	113 (10.5%)	212 (15.3%)
5–6 h	31 (10%)	44 (4.1%)	75 (5.4%)
More than 6 h	11 (3.6%)	119 (11%)	130 (9.4%)
[0,1–4]			
[0,1–4] *Sunburn*			
No	103 (32.7%)	624 (53.5%)	727 (49.15)
Yes	212 (67.3%)	543 (46.5%)	755 (50.9%)

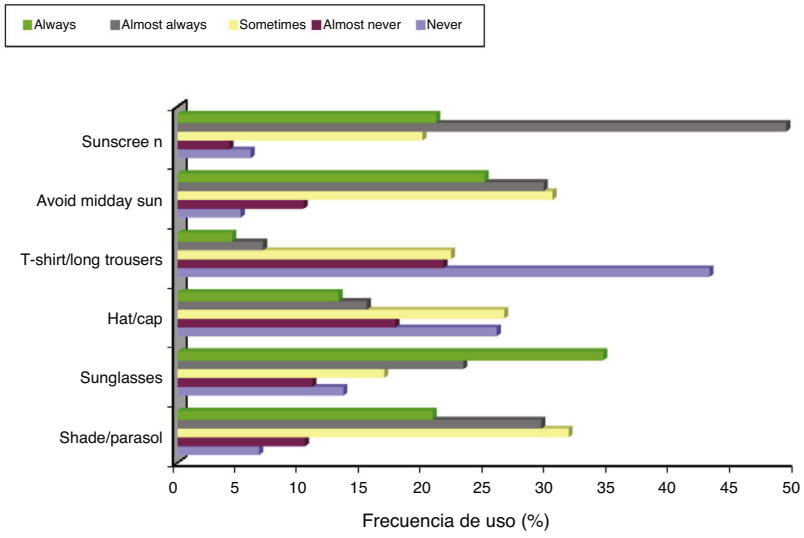

Figure 1 Sun protection behaviors: frequency distribution (% of the total).

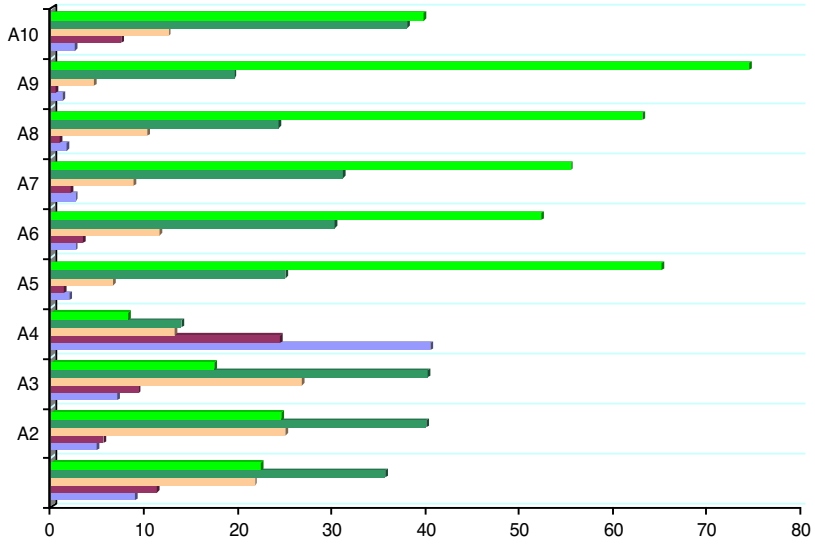

Figure 2 Attitudes toward sun exposure. Frequency distribution.

Table 2 Frequency Distribution for Sun Protection Behaviors and Attitudes to the Sun in the Population Surveyed.

[0,1–8] Frequency Distribution, %							
		Never, %	Almost Never, %	Sometimes, %	Almost Always, %	Always, %	Element-Total Correlation
[5,0] Sun protection behavior	Shade-sun umbrella	6.6	10.3	31.6	29.4	20.6	0.467
	Sunglasses	13.4	10.9	16.7	23.1	34.4	0.395
	Hat-cap	25.8	17.6	26.4	15.3	13.0	0.407
	T-shirt/long trousers	43	21.5	22.1	6.7	4.3	0.278
	Avoiding sun in the middle of the day	5.1	10.1	29.8	29.1	24.4	0.450
	Using sun protection cream	3.8	6	16.7	25.4	47.2	0.366
		Totally Agree, %	Disagree, %	Indifferent, %	Agree, %	Totally Agree, %	Element-Total Correlation
[9,0] Attitudes associated with the sun (AS)	AS 1	8.8	11.1	21.4	35.1	22.1	0.467
	AS 2	4.9	5.5	24.6	39.3	24.1	0.395
	AS 3	6.8	9.1	25.6	39.4	17.1	0.407
	AS 4	39.7	24.0	13.0	13.6	8.0	0.278
	AS 5	1.8	1.4	6.5	24.6	64.1	0.450
	AS 6	2.6	3.3	11.4	29.8	51.6	0.115
	AS 7	2.6	2.1	8.6	30.6	54.5	0.374
	AS 8	1.6	0.9	10.1	23.8	62.1	0.554
	AS 9	1.1	0.5	4.4	19.2	73.3	0.488
	AS 10	2.4	7.4	12.3	37.4	39.1	0.200

AS 1, I like sunbathing; AS 2, I like being tan; AS 3, I feel good when I'm sunbathing; AS 4, I don't like using sunscreen; AS 5, It's worth the trouble to use sunscreen; AS 6, I prefer to be in the shade than in the sun in the middle of the day; AS 7, I'm concerned about sunburn when I sunbathe; AS 8, I'm concerned about marks and wrinkles that can be caused by sunbathing; AS 9, I'm concerned about getting skin cancer from sunbathing; AS 10, It's easy to protect yourself from the sun by wearing a hat and clothes that cover your skin.

Factor analysis did not determine the loss of items on the questionnaire and showed that they all clustered in 2 components: component 1, which included sun protection measures not related to clothing (shade-sun umbrella, sunglasses, avoiding the sun in the middle of the day, and sunscreens); and component 2, which covers all measures associated with clothing (hat/cap and t-shirt/long trousers).

The communalities were between 0.5 and 0.64, with the exception of item 2 (''Use of sunglasses'', 0.369), and the factor saturations of the 2 components exceeded the value of 0.5 and thus accounted for 55.34% of the variance.

The analysis of internal consistency showed a Cronbach α of 0.63 for the first component (shade/sun umbrella, sunglasses, avoiding the sun in the middle of the day, and sunscreens) and 0.45 for the second (hat/cap and t-shirt/long trousers) (Table 3).

Attitudes Toward Sun Exposure

Table 2 shows the frequency distribution and the item-to-scale correlation for the items associated with attitudes toward sun exposure. Even though a slight ceiling effect was observed for some items, none had a response category greater than 80%, thus demonstrating their consistency.

The exploratory factor analysis initially demonstrated the poor fit of 2 items: A4 (''I don't like using sunscreen''; communality, 0.22) and A10 (''It's easy to protect yourself from the sun by wearing a hat and clothes that cover your skin''; communality, 0.17). Given the poor fit of these 2 items, we decided to modify item A4 by making it more positive (''I like using sunscreen''). The subsequent factor analysis of the components with A4 rotated enabled the item to be fitted (Table 3).

The Kaiser–Mayer–Olkin value was 0.778 ($P < .0001$ in the Bartlett sphericity test); therefore, the fit for the items analyzed was correct. The factor saturations of the 2 components exceeded the value of 0.4 and thus explained 54.4% of the variance.

Therefore, all of the items explored in the attitudes toward sun exposure were maintained and grouped into 2 components: component 1 covered attitudes to sun protection measures and the harmful effects of the sun (use of creams, use of hats/clothing, shade, and effects such as burns, spots/wrinkles, and skin cancer); and component 2, which included general attitudes on liking the sun (desire to sunbathe and get a suntan and/or considering the sun as a source of health) (Table 3).

The internal consistency analysis revealed a Cronbach α of 0.729 for the first component (attitudes to sun protection measures and the harmful effects of the sun) and 0.861 for the second component (general attitudes on liking the sun). The 10 items were maintained, with none excluded, since the Cronbach α value decreased with respect to that of its component in all items when it was deleted, except for items A4 and A10, in which it increased slightly (Table 3).

Table 3 Rotated Component Matrix and Internal Consistency Analysis for Sun Protection Practices Attitudes Toward Sun Exposure (AS).

		Communality	Percentage of Variance	[0,5–6] Components		Cronbach α[a]	Cronbach α if Item Deleted
				1	2		
Sun protection practices[b]	Shade/sun umbrella	0.569	37.74%	0.735	0.169	**0.637**	**0.594**
	Sunglasses	0.369		0.509	0.332		0.620
	Avoidance during the middle of the day	0.506		0.675	0.230		0.600
	Using sunscreen	0.626		0.784	0.108		0.628
	Hat/cap	0.606	17.59%	0.220	0.747	**0.453**	**0.614**
	T-shirt/long trousers	0.643		0.025	0.802		0.656
Attitudes toward sun exposure (AS)[b]	A1	0.817	29.769	0.032	0.903	**0.861**	0.756
	A2	0.743		0.018	0.663		0.832
	A3	0.726		0.001	0.852		0.820
	A4*	0.223		−0.468	−0.063	**0.729**	0.745
	A5	0.451	24.678	0.669	0.051		0.685
	A6	0.455		0.534	−0.401		0.709
	A7	0.577		0.743	−0.157		0.664
	A8	0.681		0.820	0.098		0.658
	A9	0.610		0.778	0.064		0.679
	A10*	0.169		0.407	−0.056		0.739

[a] Cronbach α values are shown in bold and indicate adequate internal consistency of the items. The text underlined in blue shows the percentage of variance explained by the set of items in each case.

[b] Sun protection practices and attitudes toward sun exposure. Factor analysis and internal consistency of the items with transformation of item A4, rotated (A4*= ''I like to use sunscreen'').

Knowledge About Sun Exposure

A total of 1333 persons completed the items on knowledge. The mean number of right answers was 6.86 (1.33), with no significant differences between the 3 groups analyzed ($P < .440$). However, the adolescent group had the lowest level of knowledge (6.5 vs. 7.4 for teachers and 7.1 for parents).

The facility index was calculated for the 10 items and showed all the values to be extreme (none were between 0.4 and 0.6). The discrimination index in all cases was below 0.25. The Cronbach α was 0.335, thus necessitating deletion of 5 items to obtain a modest Cronbach α (greater than 0.5) (Table 4). Nevertheless, we decided to maintain these 5 items, given that they were very stable, in order to replicate them in future populations.

Phase II, or Analysis of the Stability of the Questionnaire

The stability of the questionnaire was analyzed using a test-retest approach. A group of 39 adolescents/adults were surveyed at 2 time points separated by an interval of 2 weeks. The respondents were recruited by the research team. We analyzed the stability of the items associated with skin type, exposure habits, sun protection behaviors, and attitudes toward and knowledge of sun exposure by studying the absolute percentage and κ value with Cicchetti weights for each of these items (Table 5).

With respect to skin type, exposure habits, and sun protection behaviors, all values for the intraclass correlation coefficient were above 0.55 in all of the items except 3: ''Habits: days per year - Sunbathing'' (0.46), ''Sun protection behaviors - Hat/cap'' (0.49), and ''Sun protection behaviors - Avoiding the sun in the middle of the day'' (0.52), although the absolute percentage of agreement was in fact higher for these 3 items (61.5%, 51.4%, and 60.5%, respectively). The percentage of absolute agreement is higher than 60% for all the items, except ''Sun protection behaviors - hat/cap'' (51.4%).

As for attitudes toward and knowledge of sun exposure, the intraclass correlation coefficient values were mainly low (0.15–0.78). Subsequent analysis of the percentage of absolute agreement revealed a marked increase in these values for all of the items. The percentage of absolute agreement was higher than 60% for all the items, except 3: ''Attitudes - I like being tan'' (53.8%), ''Attitudes - I prefer to be in the shade than in the sun in the middle of the day'' (55.3%),

Table 4 Analysis of Facility and Discrimination of Knowledge of Sun Exposure.

Valid Percentage	Facility Index	Discrimination Index (Crude)	Discrimination Index (Filter)
C1	0.90	0.25	0.26
C2	0.96	0.24	0.29
C3	0.66	0.22	0.31
C4	0.13	0.01	
C5	0.85	0.25	0.35
C6	0.92	0.14	
C7	0.88	0.21	0.26
C8	0.28	−0.04	
C9	0.32	0.08	
C10	0.95	0.00	

and ''Attitudes - It's easy to protect yourself from the sun by wearing a hat and clothes that cover your skin'' (56.4%).

Discussion

We present the recently designed CHACES questionnaire, a questionnaire on habits, attitudes, and knowledge with respect to sun exposure in adolescents and adults. The questionnaire proved to be a valid instrument for exploring these areas in persons aged more than 11 years. CHACES was written in Spanish and is available in 2 versions: the adolescent version (individuals aged 11–17 years) and an adult version (individuals aged ≥18 years). The main difference between the two lies in the adaptation of the language used for each population. The validation studies revealed appropriate psychometric properties in each of the versions, thus making it the second questionnaire available in Spanish with guaranteed validity and reliability for the study of sun exposure behaviors in Spanish adolescents and adults.

Very few questionnaires on sun exposure have validated their measurement properties. To our knowledge, the only questionnaires published in Spanish with these characteristics are The Beach Questionnaire[7,13] (which is aimed at sunbathers on the beach) and the children-specific ''CHRESI'' questionnaire.[6] CHACES was drawn up by a group of experts based on rigorous methodological criteria[14] using the questionnaire that had been created and validated by The Beach Questionnaire group in 2009.

CHACES offers various advantages over its original version, The Beach Questionnaire. On the one hand, it is adapted to 2 specific age groups (adolescents and adults); on the other, it extends the settings for evaluation of sun protection practices. Unlike the original questionnaire, CHACES makes it possible not only to examine sun exposure practices on the beach, but also to assess sports and leisure activities in the open air. Furthermore, the adult version also includes a study of these practices in the workplace. Thus, the questionnaire makes it possible to identify areas of greater exposure in each population and thus target specific educational activities.

CHACES can be considered complementary to the CHRESI questionnaire.[6] CHRESI is aimed specifically at children and enables the study of sun exposure habits in individuals aged 0–10 years. In both its versions, CHACES is aimed at individuals aged more than 11 years. Thus, joint use of both instruments is a valuable tool for the overall study of sun exposure behaviors, including the various groups that make up the educational community, namely, children, adolescents, parents, and teachers. CHACES enables us to detect areas for improvement at the different levels of the educational system and to design more effective campaigns for prevention of skin cancer among schoolchildren.

Several questionnaires in English have been validated for the study of sun exposure habits and attitudes to sun exposure,[15–17] although these would need to be translated and culturally adapted for use in Spain. They all have psychometric properties equivalent to those of the questionnaires prepared by our team. As for content, these questionnaires mainly explore sun protection behaviors (SEPI questionnaire[15] and SEBI questionnaire[16]) and attitudes toward sun exposure (RASP-B[17]), both of which are also explored in CHACES. Similarly, Day et al.[18] recently created an English-language scale for assessing knowledge of skin cancer, which has acceptable psychometric characteristics.

The results of the validation study showed the instrument's measurement quality. Internal consistency was acceptable both for the group of items associated with sun protection behaviors and for those associated with attitudes toward sun exposure, with no item being deleted in the final version. These 2 groups of items were grouped, respectively, into 2 components, with appropriate levels of reliability. The items related to knowledge showed lower discriminatory capacity, thus implying the need for further studies to improve this section of the questionnaire. It is necessary to identify new items that better assess the population based on its level of knowledge. Nevertheless, knowledge had little effect on sun exposure behavior,[18] although if the research so required, it would be advisable to construct a specific questionnaire. Lastly, the questionnaire proved viable in the population tested owing to its brevity (10–15 minutes) and the clarity of the questions, as well as to the ease with which the results can be interpreted.

The present questionnaire is limited by the use of a convenience sample and possible response bias (stemming from the exploration of behaviors using reported information). While the internal consistency of the questionnaire was generally adequate in its 3 components, limitations were detected with respect to values for sun protection behaviors (communalities < 0.35 and a Cronbach α < 0.5), possibly owing to the low sample size.[19] Furthermore, the discriminatory capacity of the questionnaire was limited in the section on knowledge; therefore, it would be necessary to perform

Table 5 Proportion of Absolute Agreement and the Intraclass Correlation Coefficient of the CHACES Questionnaire. Items Associated With Skin Type, Sun Exposure Habits, Sun Protection Behaviors, Attitudes to Sun Exposure, and Knowledge.

Items	Absolute Agreement, %	κ Value	[0,4–5] 95% CI	
			Lower	Upper
B1 – Skin type – What is the natural color of your skin?	87.2	0.84	0.71	0.97
B2 – Skin type – Reaction of the skin to sun exposure in the middle of the day	76.9	0.60	0.38	0.83
[0,1–5] *Sun exposure habits*				
C1 - Habits - Days per year - Sunbathing	61.5	0.46	0.22	0.69
C2 - Habits - Days per year - Sports/leisure	71.1	0.69	0.52	0.86
C3 - Habits - Days per year - Working in the open air	63.2	0.56	0.38	0.73
C4 - Habits - Hours per day - Sunbathing	73.7	0.75	0.61	0.90
C5 - Habits - Hours per day - Sports/leisure	60.5	0.59	0.39	0.78
C6 - Habits - Hours per day - Working in the open air	77.8	0.64	0.41	0.87
D1 - Sunburn the previous summer	76.9	0.60	0.40	0.81
[0,1–5]				
[0,1–5] *Sun protection behaviors*				
E1 - Behaviors - Shade-sun umbrella	75.7	0.71	0.53	0.89
E2 - Behaviors - Sunglasses	73.7	0.70	0.51	0.90
E3 - Behaviors - Hat/cap	51.4	0.49	0.27	0.71
E4 - Behaviors - T-shirt/long trousers	62.2	0.55	0.37	0.74
E5 - Behaviors - Avoiding the sun in the middle of the day	60.5	0.52	0.30	0.75
E6 - Behaviors - Use of sunscreens	71.1	0.62	0.43	0.82
E7 - Behaviors - Sunscreen protection index	82.1	0.68	0.46	0.91
[0,1–5]				
[0,1–5] *Attitudes toward sun exposure*				
F1 - Attitudes - I like sunbathing	64.1	0.77	0.66	0.87
F2 - Attitudes - I like being tan	53.8	0.67	0.54	0.80
F3 - Attitudes - I feel good when I'm sunbathing	75.7	0.78	0.64	0.92
F4 - Attitudes - I don't like using sunscreen	63.2	0.57	0.36	0.78
F5 - Attitudes - It's worth taking the trouble to use sunscreen	69.2	0.25	0.02	0.47
F6 - Attitudes - I prefer to be in the shade than in the sun in the middle of the day	55.3	0.28	0.03	0.52
F7 - Attitudes - I worry about sunburn when I sunbathe	60.5	0.15	−0.07	0.36
F8 - Attitudes - I'm concerned about the spots and wrinkles I can get when I sunbathe	69.2	0.43	0.21	0.65
F9 - Attitudes - I worry that I can get skin cancer from sunbathing	63.2	0.31	0.10	0.51
F10 - Attitudes - It's easy to protect yourself from the sun by wearing a hat and clothes	56.4	0.25	0.01	0.50
[0,1–5]				
[0,1–5] *Knowledge about sun exposure*				
G1 - Knowledge - Using UV-A tanning cabins before age 30 increases the risk of melanoma	97.4	0.65	0.03	1.00
G2 - Knowledge - UV radiation causes your skin to age more quickly	100.0			
G3 - Knowledge - There's no risk of the effects of radiation if we stay in the shade	78.9	0.21	−0.18	0.59
G4 - Knowledge - Using creams is the best way to protect yourself from the sun...	82.1	0.64	0.42	0.87
G5 - Knowledge - Once your skin is tan, there's no need to use...	100.0			
G6 - Knowledge - Babies aged under 1 year should not be directly exposed to the sun	89.7	−0.04	−0.10	0.02
G7 - Knowledge - You must use increased sun protection when the UV index is > 3	94.9	0.47	−0.15	1.00
G8 - Knowledge - Dark clothing protects you from the sun more than light clothing	64.9	0.22	−0.11	0.54
G9 - Knowledge - You should sunbathe for at least 1 h per day	89.7	0.73	0.48	0.98
G10 - Knowledge - Children should used sunscreen with a protection factor ≥ 30	94.9	0.47	−0.15	1.00

Abbreviation: CHACES, Cuestionario sobre hábitos, actitudes y conocimientos sobre exposición solar en adolescencia y edad adulta (Knowledge, Attitudes, and Habits Related to Sun Exposure Among Adolescents and Adults: the CHACES Questionnaire).

future studies that improve this aspect of the questionnaire and confirm its sensitivity to change.

In conclusion, the CHACES questionnaire fulfills the requirements of international guidelines on the validation of subjective health measurement instruments,[20] which is available in Spanish and whose psychometric characteristics are similar to those of other published questionnaires. The advantage of CHACES is that it makes it possible to explore attitudes and behaviors with respect to sun exposure in different population groups and in different settings. Therefore, it is an appropriate tool for future epidemiological studies on sun protection.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.adengl.2020.08.006.

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