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ORIGINAL ARTICLE

Design and Validation of a Questionnaire for Measuring Perceived Risk of Skin Cancer☆

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KEYWORDS
Risk perception;
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Abstract

Introduction: A perceived risk of cancer encourages preventive behavior while the lack of such a perception is a barrier to risk reduction. There are no instruments in Spanish to measure this perceived risk and thus quantify response to interventions for preventing this disease at a population level. The aim of this study was to design and validate a self-administered questionnaire for measuring the perceived risk of skin cancer.

Material and methods: A self-administered questionnaire with a visual Likert-type scale was designed based on the results of the analysis of the content of a survey performed in 100 patients in the Dr. Ladislao de la Pascua Skin Clinic, Distrito Federal México, Mexico. Subsequently, the questionnaire was administered to a sample of 359 adult patients who attended the clinic for the first time. As no gold standard exists for measuring the perceived risk of skin cancer, the construct was validated through factor analysis.

Results: The final questionnaire had 18 items. The internal consistency measured with Cronbach α was 0.824 overall. In the factor analysis, 4 factors (denoted as affective, behavioral, severity, and susceptibility) and an indicator of risk accounted for 65.133% of the variance.

Conclusions: The psychometric properties of the scale were appropriate for measuring the perception of risk in adult patients (aged 18 years or more) who attended the dermatology clinic.

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PALABRAS CLAVE
Percepción de riesgo;
Cáncer de piel;
Validación

Diseño y validación de un cuestionario para medir percepción de riesgo de cáncer de piel

Resumen

Introducción: El riesgo percibido en cáncer predice un comportamiento preventivo, y la falta de este es una barrera para la reducción del riesgo. No existe un instrumento en idioma español que mida la percepción de riesgo de cáncer de piel que sirva como medida de respuesta en intervenciones para prevenir esta enfermedad a nivel poblacional. El objetivo de este trabajo fue elaborar y validar un cuestionario autoadministrado para medir percepción de riesgo de cáncer de piel.

Material y métodos: Se elaboró un cuestionario autoadministrado con escala de respuesta tipo Likert pictórico en función de los resultados del análisis de contenido de una encuesta realizada a 100 pacientes del Centro Dermatológico Dr. Ladislao de la Pascua. Posteriormente se aplicó el cuestionario a una muestra de 359 pacientes adultos que acudían por primera vez a dicho centro dermatológico. Al no existir un estándar de oro para medir percepción de riesgo de cáncer de piel se realizó la validación de constructo mediante análisis factorial.

Resultados: El cuestionario final tiene 18 ítems, su consistencia interna medida por el alfa de Cronbach fue de 0,824 global. El análisis factorial mostró 4 factores que explicaron el 65,133% de la varianza, los cuales se denominaron: afectivo, conductual, gravedad, susceptibilidad y un indicador de probabilidad.

Conclusiones: Las propiedades psicométricas de la escala son adecuadas para medir la percepción de riesgo en personas adultas con una edad igual o mayor a 18 años usuarias de los servicios de salud en el área de dermatología.

Introduction

The incidence of skin cancer is increasing throughout the world, making this disease the most common malignant neoplasm in Mexico.[1] Basal cell carcinoma is the most frequent type (74%), followed by squamous cell carcinoma (14%), and melanoma (3%).[2] The risk factors for skin cancer are chronic or intermittent sun exposure,[3] history of sunburn,[4] use of tanning beds,[5] >15 melanocytic nevi,[6] family and personal history of skin cancer, phototype (light-colored eyes and fair skin and hair),[7] previous radiotherapy[8] and phototherapy,[9] immunosuppression associated with organ transplantation,[10] and exposure to carcinogens such as arsenic (contaminated water).[11]

Skin cancer can be prevented by means of behavioral measures, such as avoiding sun exposure and using sunscreen, which are associated with an individual's perception of the risk of skin cancer. A perceived risk of cancer encourages preventive behavior, while the lack of such a perception is a barrier to risk reduction. It is well known that information cannot produce an expected effect on behavioral change, and that an individual's motivation to change his/her behavior is affected by social and psychological variables. The model developed by Jackson and Aiken to investigate the intention to protect oneself from the sun and to sunbathe brings together the theory of planned behavior,[12] the health belief model,[13] and the protection motivation theory.[14,15] In the model, behavior associated with sun exposure is the result of 4 psychological variables: health beliefs, self-efficacy with respect to sun protection, attitudes toward sunbathing, and norms for protection and sunbathing. The intention of protecting oneself from the sun arises from an individual's perception of the risk of skin cancer, that is, those who feel threatened by or believe themselves prone to skin cancer will have the intention to protect themselves from the sun and avoid exposure to it.

According to Brewer et al,[16] the perception of risk is a construct comprising 3 dimensions associated with the damage caused if measures are not taken to prevent it. The 3 dimensions are probability of damage, constitutional susceptibility or vulnerability, and severity or degree of damage. The perception of the risk of skin cancer is the impression or sensation of threat we feel based on individual severity, probability, and susceptibility, which are the product of the attitudes and beliefs towards the intention to protect oneself from and/or expose oneself to sunlight.[17]

Several methods have been applied to measure the perceived risk of melanoma and nonmelanoma skin cancer (basal cell and squamous cell carcinoma). The most common method involves measuring risk absolutely and comparatively, that is, by asking individuals to estimate their personal risk and their risk compared with the population in general, respectively. The absolute forms include those associated with and not associated with preventive behavior. They also include cognitive and affective-type measures of perceived risk; the former reflect the probability of having skin cancer based on the objective risk (norms), the latter reflect the purely cognitive component (beliefs). In summary, the dimensions of the construct for perceived risk of skin cancer are as follows: probability, susceptibility, severity, affective dimension, and behavioral dimension.[15]

No Spanish-language instruments have been developed to measure perceived risk of melanoma and nonmelanoma skin cancer. Some instruments evaluate behavior, attitudes, and knowledge associated with sun exposure. However, it is necessary to develop an instrument to measure perception

of risk for use in future interventions to modify behavior with respect to sun exposure. The objective of the present work was to design and validate an instrument for measuring perceived risk of skin cancer (basal cell, squamous cell, and melanoma) in Mexicans aged >18 years. The instrument includes all 5 dimensions of the construct and is self-administered. The responses are given on a visual Likert-type scale of 7 options to make it easier to answer.

Materials and Methods

Design

The construct to be measured was *perceived risk of skin cancer*, which comprises 5 dimensions: probability, susceptibility, severity, affective, and behavioral. The items were prepared using an open-question survey to sample the content and terminology of the construct dimensions. The open questions were chosen based on previous studies and the opinion of the authors with the help of an expert in the design and validation of psychometric instruments. The questions are shown in Table 1. We surveyed 100 patients, 50% of whom had been diagnosed with skin cancer (Group 1) and 50% of whom had not (Group 2). All the patients were from the Dermatology-Oncology Clinic and Outpatient Clinic of Centro Dermatológico Dr. Ladislao de la Pascua. Group 1 included 25 men and 25 women, with a mean age of 59 years (37-92 years). The mean age was 61 years for women and 57 years for men. As for educational level, 52% had completed primary education, 12% secondary education, 19% university preparatory studies, and 17% an undergraduate degree. Group 2 included 25 men and 25 women, with a mean age of 37 years (18-69 years). The mean age was 35 years for women and 40 years for men. As for educational level, 20% had completed primary education, 34% secondary education, 34% university preparatory studies, and 12% an undergraduate degree. The content was analyzed qualitatively and by subject using words or sentences associated with the dimensions of the construct as the unit of analysis under the following categories: intention to sunbathe, intention to protect oneself from the sun, suntan, prevention of skin cancer, consequences, clinical symptoms, affective aspects, and constitutional and behavioral susceptibility. The summary of the content analysis is shown in Table 2. Based on the results of the survey, we drew up a proposal for an instrument based on 60 items distributed in 3 areas of incidence and 5 dimensions. Each dimension had 12 items distributed homogenously in 3 areas of incidence (absolute, comparative, and conditional), that is, 4 for each area. Table 3 shows all the items proposed according to the area of incidence and the corresponding dimension. Each item has 7 possible responses; therefore, the minimum score is 1 and the maximum 7 per item. A score of 1 corresponds to the smallest square on the pictorial Likert-type scale and 7 to the largest square, which lies immediately to the right of the question.

Table 1 List of Open Questions for Design of the Items.

1. What are the advantages of sunbathing?
2. What are the disadvantages of sunbathing?
3. What are the advantages of using sunscreen?
4. What are the disadvantages of using sunscreen?
5. What are the advantages of having tanned skin?
6. What are the disadvantages of having tanned skin?
7. What adjectives come to mind when you think of skin cancer?
8. Who can have skin cancer?
9. How can skin cancer be avoided?

Since there is no gold standard for measuring perceived risk of skin cancer, the construct was validated. We selected patients who were attending Centro Dermatológico Dr. Ladislao de la Pascua for the first time. All patients were Mexican and aged $\geq$ 18 years. They all agreed to participate in the survey and gave their informed consent to do so. The sample size was calculated at 300 patients, considering that 5 patients were necessary for each item in the initial proposal. The patient sample was different from that selected for the design of the instrument. The instrument was administered to the group in the waiting room before the visit with the doctor.

Statistical Analysis

Frequency per item was analyzed to verify whether all the options were selected, and the upper and lower quartiles of each item were compared using the *t* test to evaluate discrimination. The directionality of the items was evaluated using contingency tables and the χ^2 test. Items shown to be discriminatory ($P < .05$, *t* test) and to have directionality ($P < .05$, χ^2 test) were analyzed using the Cronbach α to measure internal consistency or reliability. The Pearson correlation between the items was calculated. We then eliminated items with the following characteristics: correlation with the total < 0.30, multiple correlation squared <0.40, and high correlation (≥ 0.8) between items. From the items that showed a high correlation, we chose the one with the best profile according to the characteristics set out above. For the remaining items, we performed factor analysis using the principal component method. We calculated the z values and the percentile ranges to set the norms for standardizing the direct scores of the questionnaire in our study sample.

Results

The instrument was administered to 359 patients at the Outpatient Clinic of Centro Dermatológico Dr. Ladislao de la Pascua in March and April 2012. The demographic characteristics of the sample were as follows: 70.2% women and 29.8% men, with a mean (SD) age of 38 (14.4) years. Educational level was primary in 18.4% of cases, secondary in 22%, university preparatory in 34.5%, undergraduate in 22.6%, and postgraduate in 2.5%.

Of the 60 initial items on the questionnaire, replies were provided for each of the 7 options on the pictorial Likert scale. Items 1, 4, and 18 were not discriminatory and were eliminated. Items 6-12, 17, 19-20, 31-36, 38-44, 52, and 56-60 were eliminated owing to lack of directionality. Item 22 was the only one with a correlation with the total < 0.30, whereas 28, 30, and 46 had a squared multiple correlation

Table 2 Content Analysis.

Dimension	Category	Patients With Skin Cancer	% (n = 50)	Patients Without Skin Cancer	% (n = 50)
Behavioral	Intention to sunbathe Advantages	Absorption of vitamin D and calcium in the bones	34	Suntan	44
		None	34	Absorption of vitamin D and calcium in the bones	30
		Heat	18	Good for one's health	14
		Suntan	20	Heat	14
				None	12
				Pleasant	8
				Energy	8
				Necessary for the skin	4
				To relax	2
	Intention to sunbathe Disadvantages	Sunburn	62	Skin cancer	58
		Skin cancer	36	Sunburn	56
		Patches on the skin	24	Patches on the skin	38
		Skin disease	14	Skin irritation	18
		Skin aging		Darkening of the skin	
			14	Damage to the skin	12
				Headache	10
				Dried skin	6
				Skin aging	6
				Sweating	4
					4
	Advantages of having a suntan	Look good	38	Look good	64
		None	24	None	20
		Skin protected from the sun	18	Resistance to sunlight	8
	Disadvantages of having a suntan	Skin cancer	20	None	22
		Damage to the skin	18	Sunburn	20
		None	16	Dark skin	18
		Sunburn	12	Skin damage	18
		Delicate skin	6	Skin cancer	14
		Disease	4	Skin sensitive to the sun	
		Intense sun exposure	4	Intense sun exposure	10
		Patches on the skin	4		
					4
	Intention to protect oneself from the sun Advantages	Protects the skin from the sun's rays	74	Protects the skin from the sun's rays	58
		Prevents sunburn			
		Protects the skin from cancer	22	Prevents skin cancer	38
		Prevents diseases	20	Prevents burns	24
		Skin hydration	8	Cares for the skin	16
		I can stay out in the sun	8	Prevents patches on the skin	8
				No suntan	6
			6	Prevents premature aging	4
				I can stay longer in the sun	4

Table 2 (*Continued*)

Dimension	Category	Patients With Skin Cancer	% (n = 50)	Patients Without Skin Cancer	% (n = 50)
	Intention to protect oneself from the sun Disadvantages	None	38	Allergy	22
		High cost	12	Oily skin	22
		Allergy	8	High cost	14
		Skin disease	8	None	14
		Eye irritation	4	Sunburn	10
		Stains on clothes	2	Skin disease	8
				Patches on the skin	8
				Timetable for application	6
				Color and smell of the agent	6
	Prevention of skin cancer	No sun exposure	58	No sun exposure	60
		Use sunscreen	52	Use sunscreen	56
		Use a hat, parasol, and sunglasses	12	Take care of oneself	18
		Protect oneself from the sun	10	Visit the doctor	10
		Visit the doctor	8	Information	10
		Take care of oneself	6	Healthy diet	4
		Information	6		
Severity of skin cancer	Consequences	Death	22	Death	26
		Dangerous/severe	18	Disease	18
		Disease	16	Financial costs	6
		Malignant	8	Surgery	4
		Incurable	8	Malignant	4
		Complications	4	Treatment	4
		Worsening	4		
		Surgery	4		
		Progressive	2		
		Financial cost	2		
	Clinical presentation	Pain	16	Pain	26
		Patches	6	Damaged skin	16
		Pruritus	4	Patches	12
		Tumor	4	Blisters	4
		Scaling	4	Pruritus	4
		Spots	4	Sunburn	2
		Damaged skin	4		
		Crust	2		
		Secretion	2		

Table 2 (*Continued*)

Dimension	Category	Patients With Skin Cancer	% (n = 50)	Patients Without Skin Cancer	% (n = 50)
Affective		Fear	20	Depression	10
		Concern	10	Sadness	6
		Depression	4	Concern	4
		Sadness	6	Impotence	4
		Distress	2	Fear	4
		Desperation	2		
		Uncertainty	2		
Individual susceptibility	Constitutional	All/any	30	All	32
		White skin	20	White skin	10
		Delicate/sensitive skin	10	Delicate/sensitive skin	6
		Genes/heredity	4	Sick individuals	2
				Genes/heredity	2
	Behaviors	Persons who spend long periods exposed to	24	Persons who are exposed to	24
		sunlight	18	sunlight	18
		Persons who are exposed to sunlight	18	Persons who spend long periods	6
		Persons who are exposed to sunlight without		exposed to sunlight	
		protection		Persons who are exposed to	
		Persons who do not use sunscreen	10	sunlight without protection	
		Persons who do not visit the doctor	4		

Table 3 Proposed Instrument With Classification of Items (n = 60).

No.	Item	Dimension	Incidence
1	My risk of skin cancer is low	Probability	Absolute
2	My risk of skin cancer is high		
3	I think I am at risk of skin cancer		
4	I do not think I am at risk of skin cancer		
5	People with white skin have a greater risk of skin cancer	Susceptibility	
6	We are all at risk of skin cancer		
7	Sunbathing for long periods can cause skin cancer		
8	Sunbathing without sunscreen can cause skin cancer		
9	Skin cancer is curable if it is detected on time	Severity	
10	Skin cancer is a severe disease		
11	Skin cancer is fatal		
12	Skin cancer is painful		
13	I am afraid of skin cancer	Affective	
14	I am worried about skin cancer		
15	Having skin cancer makes me sad		
16	Having skin cancer makes me depressed		
17	Sunburn increases my risk of skin cancer	Behavioral	
18	Sunbathing is good for your health		
19	Sunbathing can damage your skin		
20	Using sunscreen prevents skin cancer		
Compared with other people of my age:			
21	I have a greater risk of skin cancer	Probability	Comparative
22	I have less risk of skin cancer		
23	I would be depressed if I had skin cancer	Affective	
24	I am more afraid of skin cancer		
Compared with other people of the same sex:			
25	I have a greater risk of skin cancer	Probability	Comparative
26	I have less risk of skin cancer		
27	I am worried about having skin cancer	Affective	
28	I am less afraid of having skin cancer		
People at more risk of skin cancer than me			
29	Have white skin	Susceptibility	Comparative
30	Do not visit the doctor		
31	Work in the sun		
32	Sunbathe		
33	Tan	Behavioral	
34	Do not use sunscreen		
35	Have sunburn		
36	Have patches on their skin		
Compared with other diseases, skin cancer:			
37	Is more dangerous	Severity	Comparative
38	Has many complications		
39	Is fatal		
40	Is very expensive		
I have a greater risk of skin cancer if:			
41	I use sunscreen	Probability	Conditional
42	I spend too long in the sun		
43	I visit the doctor		
44	I protect myself from the sun		
45	I had sunburn	Susceptibility	
46	I have a lot of moles on my body		
47	I have white skin		
48	My parents have skin cancer		
49	I work in the sun	Behavioral	
50	I play sports in the open air		
51	I tan		
52	I do not take care of my skin		

Table 3 (*Continued*)

No.	Item	Dimension	Incidence
For me, skin cancer means:			
53	Death	Severity	Conditional
54	Pain		
55	Losing my job		
56	Financial costs		
57	Concern	Affective	
58	Depression		
59	Sadness		
60	Fear		

Table 4 Analysis of Items.

Item	Pearson r for Item/Total	r^2	Cronbach α
2	0.369	0.535	0.879
3	0.383	0.572	0.879
5	0.409	0.523	0.878
14	0.494	0.717	0.877
16	0.55	0.829	0.875
21	0.567	0.724	0.875
23	0.526	0.597	0.876
24	0.594	0.714	0.874
26	0.3	0.514	0.881
27	0.633	0.663	0.873
29	0.465	0.578	0.877
37	0.462	0.402	0.878
45	0.358	0.452	0.88
47	0.457	0.589	0.877
48	0.301	0.48	0.882
49	0.342	0.59	0.88
50	0.37	0.436	0.88
51	0.33	0.649	0.881
53	0.5	0.581	0.876
54	0.459	0.525	0.878
55	0.391	0.427	0.879

< 0.40. A high correlation was recorded between items 14, 16, and 21 and items 13, 15, and 25, respectively, (r = 0.803, 0.883, and 0.815). Those with the best profile were selected, and items 13, 15, and 25 were eliminated. Table 4 presents the results for the correlations and the Cronbach α of those items that proved to be discriminatory and have directionality. A total of 39 items were eliminated; the Cronbach α or reliability of the instrument with the 21 items selected was 0.851. The factor analysis with orthogonal rotation was subsequently performed using the principal components method, since the correlations between the items were low to medium. Coefficients < 0.40 were excluded. According to the percentage of variance explained and the break in the scree test, 5 real factors were identified. Items 21, 37, and 47 were repeated in more than 1 factor with factor weights > 0.40; therefore, they were eliminated. Finally, 18 items remained, and the total Cronbach α was 0.824. Four factors (affective aspects, behavioral aspects, severity, and susceptibility) and an indicator of risk accounted for 65.133% of the variance. Table 5 shows the factors, their items, and the explained variance.

Each item has 7 possible options for response, with a minimum score of 1 and a maximum of 7 per question. Since the final questionnaire has 18 items, the minimum score is 18 and the maximum 126.

The linear standard qualification according to the z values showed that the mean (SD) total punctuation of the sample was 83.0529 (19.96225), whereas the median was 81 points with an interquartile range of 28 points. These findings enable us to interpret the results in subsequent applications of the questionnaire by comparing the final score with that obtained by our study sample, from which we obtained the norm for standardization.

The instrument is enclosed as an appendix.

Discussion

The validated questionnaire enables us to measure the construct *perceived risk of skin cancer*. No specific instruments

Table 5 Factors Used in the Instrument.

Factor	1	2	3	4	5[a]
Name	**Affective**	**Behavioral**	**Severity**	**Susceptibility**	**Probability**
Items (factor weight)	24 (0.833)	51 (0.852)	53 (0.825)	29 (0.846)	2 (0.856)
	16 (0.796)	49 (0.851)	54 (0.810)	5 (0.773)	3 (0.850)
	27 (0.783)	48 (0.737)	55 (0.707)	26 (0.492)	
	23 (0.747)	45 (0.724)			
	14 (0.722)	50 (0.676)			
Cronbach α	**0.884**	**0.842**	**0.781**	**0.647**	**0.814**
Percentage of variance explained	**17.343**	**15.757**	**11.387**	**11.342**	**9.305**

[a] Indicator

have been designed to measure this construct. Perceived risk of skin cancer has been investigated using focus groups and interviews.[18] Questionnaires used at population level, such as the Health Information Trends Survey, measure the perceived risk of cancer by posing 3 questions associated with the probability of having skin cancer in the affective dimension.[19] Bränström et al.[21] measured the perceived risk of skin cancer using 3 questions on individual probability, the incidence of this type of cancer in Sweden, and the probability compared with another individual of the same age. However, the study by Janssen et al.[17] compared the different forms of operationalization or design of questions for measuring this construct. The purpose-designed questionnaire comprised 14 and 13 questions from the dimensions of probability and severity, respectively. The results show us that the comparative and conditional questions are better predictors of sun protection behavior. The only available Spanish-language instrument is that of De Troya-Martín et al.,[20] which measures knowledge and attitude associated with sun exposure; therefore, we consider that, to date, our questionnaire is the only one designed to measure *perceived risk of skin cancer* and that, together with the questionnaire of De Troya-Martin et al., it can be used to measure the impact of interventions aimed at preventing melanoma and nonmelanoma skin cancer.

The final version of the questionnaire is short (only 18 items) and easy to complete, since it is based on a pictorial scale. As with most psychometric instruments, it requires a cover sheet with instructions and trained staff to help with comprehension and completion. Unlike previous questionnaires, it measures the 5 dimensions of the construct *perceived risk of skin cancer*. Consistent with Janssen et al.,[17] it was necessary to use structured items comparatively and conditionally; however, the dimensions of severity and probability only included items of absolute structure. The appearance and content validity of the instrument was achieved by having a representative set of items, which were formulated according to the bibliographic review, construct content sampling, author consensus, and the final review by an expert in the design and validation of psychometric instruments. In addition, we demonstrated the construct validity of the questionnaire using factor analysis, which made it possible to eliminate items that did not have the necessary profile. The consistency or internal reliability of the instrument is good, and we intend to apply temporal consistency tests such as test-retest. As this is an instrument that measures perceived risk, it is not absolutely necessary to measure internal reliability; however, internal consistency must be determined.

The main limitation of this instrument is that associated with the characteristics of the study sample. The sample chosen for validation of the instrument comprised patients attending a reference dermatology clinic in Mexico; most were women, and mean age was 38 years. In addition, the objective of our instrument was to measure perceived risk of skin cancer involving sun exposure, namely, basal cell carcinoma, squamous cell carcinoma, and melanoma, since prevention in these neoplasms focuses on avoiding risk behavior associated with sun exposure. However, there are other risk factors that, by their very nature, cannot be modified.

Perceived risk of skin cancer is an extremely useful measure in studies of clinical interventions to prevent skin cancer, since dissemination of information on skin cancer is not sufficient to ensure that preventive measures are adopted. Furthermore, it is essential that people realize that they are at risk of skin cancer so that they can modify their behavior with respect to sun exposure and protection.[21] Therefore, improved perception of risk would be associated with behaviors aimed at sun protection. This is the reason why we propose that perceived risk be used to modify behavior and that the information provided to the general public and to high-risk groups should impact individuals in such a way that they perceive or identify the risk.

In summary, this validated Spanish-language questionnaire serves as a measurement tool in intervention studies on approaches to preventing skin cancer.

Ethical Disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this investigation.

Confidentiality of data. The authors declare that they have followed their hospital's protocol on the publication of data concerning patients and that all patients included in the study have received sufficient information and have given their written informed consent to participate in the study.

Right to privacy and informed consent. The authors declare that no private patient data are disclosed in this article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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