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Impact of Event Scale (IES): Psychometric properties in a Spanish sample with hereditary cancer risk

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Abstract: This study assessed the psychometric properties of the Impact of Event Scale (IES) in a Spanish sample at increased risk of hereditary cancer and the contribution of socio-demographic and clinical characteristics to predict cognitive intrusions and avoidance. A total of 766 patients participated in this cross-sectional study. Psychometric analyses of the IES were performed using exploratory and confirmatory factor analyses. The influences of socio-demographic and clinical characteristics were determined using multiple linear regression analyses. The exploratory analysis supported the original two-factor solution of the IES, and the confirmatory analysis added the cross-factor loading for item 12, characteristic for this population. Related to the socio-demographic and clinical variables, patient affected by cancer (β = -.19), sex (β = .15), previous psychiatric treatment (β = -.10), and age (β = -.08), were significant predictors of the intrusion subscale. Patient affected by cancer (β = -.19), sex (β = .13), and previous psychiatric treatment (β = -.14) were significant predictors of the avoidance subscale.

Keywords: Cognitive symptoms; psychometrics; genetic counseling; hereditary cancer; emotional distress

Escala del Impacto del Estresor (EIE): Propiedades psicométricas en una muestra española con riesgo de cáncer hereditario

Resumen: Este estudio evaluó las propiedades psicométricas de la Escala de Impacto del Estresor (EIE) en una muestra española con alto riesgo de cáncer hereditario, y la contribución de las características sociodemográficas y clínicas para predecir cogniciones de intrusión y evitación. Un total de 766 pacientes participaron en un diseño transversal. Los análisis psicométricos se realizaron a través de análisis factoriales exploratorios y confirmatorios. La influencia de las características sociodemográficas y clínicas se determinó llevando a cabo regresiones múltiples. El análisis exploratorio confirmó la solución original bifactorial del EIE, y el análisis confirmatorio añadió la carga factorial cruzada del ítem 12, que caracteriza a esta población. En las características sociodemográficas y clínicas, paciente afecto de cáncer (β = -.19), sexo (β = .15), antecedentes de tratamiento psiquiátrico (β = -.10), y edad (β = -.08), fueron predictores significativos de la subescala de intrusión. Paciente afecto de cáncer (β = -.19), sexo (β = .13), y antecedentes de tratamiento psiquiátrico (β = -.14) fueron predictores significativos de la subescala de evitación.

Palabras clave: síntomas cognitivos; psicometría; consejo genético; cáncer hereditario; malestar emocional

Introduction

The Impact of Event Scale (IES) is a short self-reporting inventory introduced many years ago to assess subjective distress related to a specific life event (Horowitz et al., 1979). The IES was developed in the context of the information processing model of stress response, as consisting of alternating phases of cognitive intrusion and avoidance or numbing responses (Creamer et al., 1992; Joseph, 2000).

Intrusions are manifested in excessive preoccupation, repeated thoughts and pangs of emotions, nightmares, and recurrent need to talk about this event. Likewise, the numbing and avoidance responses are considered as attempts to block out intrusive images, or refusal

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to talk about experience or name the word («cancer»). These responses could be considered as maladaptive coping strategies, and in excess are indicators of anxiety disorders. The IES had 15 items, seven of which measured intrusive symptoms such as thoughts, nightmares, feelings, and images associated with a specific event. The avoidance subscales had eight items, such as numbing of responsiveness, and avoidance of feelings and situations used to restore emotional equilibrium and reduce conceptual disorganisation. The term avoidance was used instead of denial, as a defence against intrusive thoughts (Creamer et al., 1992; Sundin & Horowitz, 2002).

The fact that the IES measured intrusion and avoidance thoughts, experiences which are central to the construct of post-traumatic disturbance, has led many researchers to use the IES as one of the earliest self-reporting instruments to evaluate trauma, though the IES had a limited measurement of post-traumatic stress disorder (PTSD) in general population (Briere & Elliot, 2002). Although soon it was used for exploring emotional distress in a variety of traumas (Sundin & Horowitz, 2002), the hyperarousal subscale, the third major symptom cluster of PTSD, was added on the revised version of the scale (IES-R, Weiss & Marmar, 1997). However, the IES was not developed to assess PTSD per se. The IES was originally developed to measure stress response syndrome, and later subjective distress. Nowadays, the original IES remains a measure based on a two-factor structure, intrusive and avoidant cognitive processes that mediate emotional responses and subsequent adjustment to stressful life events (Creamer et al., 1992; Joseph, 2000).

The update of the fifth version of the «Diagnosis and Statistical Manual of Mental Disorders» (DSM-5; APA, 2013) redefined cancer as a stressful event and made it difficult to diagnosis cancer related PTSD. In the criteria included about medical conditions, it noted that a life-threatening illness or debilitating medical state is not necessarily considered a traumatic event, unless it involved a sudden or catastrophic incident (APA, 2013). Therefore, cancer diagnosis is no longer considered a traumatic event, amongst other reasons because of existing therapies in oncology that improve diagnosis and increase survival rates with adequate health related quality of life. The previous response associated with the diagnosis of cancer with trauma to become a stressor or adverse event and should be reconsidered under the diagnosis of adjustment disorders (Ochoa-Arnedo et al., 2019). Accordingly, these experiences could be registered by IES characterizing a measurement of cancer specific distress.

Hereditary cancer risk may represent an increased health threat, demonstrating high levels of perceived risk to developing cancer. Thus, the information in genetic counselling for hereditary cancer can generate elevated psychological distress and cancer worries in this population (Bennet et al., 2008; Bish et al., 2002; Foster et al., 2002; Watson et al., 1999), similarly to cancer screening programs (Sandín et al., 2001). The use of IES in hereditary cancer research was conducted, on breast and ovarian cancer, to assess the impact of cancer related variables on psychological distress. These variables were referred to family history of cancer and parental or family members deceased due to cancer (Bratt et al., 2000; Erblich et al., 2000; Zakowski et al., 1997), demographic and clinical variables, such as age (Croyle et al., 1979; Foster et al., 2002), level of education (Croyle et al., 1979), carrier status on BRCA1 (Croyle et al., 1979), and personal history of cancer (Croyle et al., 1979). In this line, few studies had examined psychometric properties of the IES in a sample at increased risk of hereditary cancer (Thewes et al., 2001).

The purpose of this study was to assess the reliability and factor structure of the IES in a Spanish sample at increased risk of developing hereditary cancer. Additionally, the contribution of socio-demographic and clinical characteristics was evaluated to predict intrusion and avoidance cognitions related to cancer in this population.

Method

Study population

Participants were recruited from the Genetic Counselling Unit for Hereditary Cancer (GCUHC), from July 2018 to July 2020. Eligibility criteria included being 18 - 85 years old, ability to understand and read Spanish, and admitted to genetic cancer testing. Exclusion criteria included any prior or current severe mental disorders or major concurrent medical disease that seriously affected their cognitive performance or less than an eighth-grade education affecting their reading ability.

Procedures

This study was conducted as part of research to assess psychological distress from hereditary cancer testing. In clinical procedures at the GCUHC, patients are usually provided an introductory session and counselling prior to testing for learning about the mutation in the family. Following that, at the second appointment, blood was drawn to genetic analysis. In this second appointment,

participants were informed about the study by a genetic nurse, who recruited and enrolled the participants in this study after the blood test was done.

Questionnaires were completed in the presence of an investigator (a clinical psychologist), who was available to clarify any items. The study design was approved by the committee on ethics in research of the hospital. Informed consent was obtained from all participants included in the study.

Measurements

Socio-demographic and clinical characteristics were reported: These independent variables included age, gender, marital status, education level, having children or not, previous psychiatry treatment, having relatives affected with cancer or death by cancer, if patient was affected by cancer, and patient was included to begin the genetic study in their family (index patient), and germline mutations to test (BRCA1/BRCA2; MMR; APC; F/PGL; others).

Impact of Event Scale (IES; Horowitz et al., 1979; Spanish version, Báguena et al., 2001). This scale determines levels of distress in response to a specific stressful event. It is comprised of two subscales, one of these has seven items designed to measure intrusive thoughts and another of eight items to measure an avoidance subscale. In the current study, «cancer» served as the specific stressful event on the IES. Responders were asked to rate the items to describe episodes of distress related to cancer on a 4-point frequency scale, according to how often each had occurred in the past 7 days (1 = not at all, 2 = rarely, 3 = sometimes, 4 = often). A high score indicates frequent intrusive/avoidant thoughts about developing cancer. The total score was not calculated in this study. The internal consistency of the original subscales was good, using Cronbach's alpha, .78 for intrusion, and .82 for avoidance (Horowitz et al., 1979).

Statistical analyses

A cross-sectional study was designed. Non-parametric statistics, the Wilcoxon signed rank test, were used to compare characteristics of responder and non-responder participants. Scores were summarized using mean and standard deviation (*SD*). Psychometric analysis of the questionnaire was conducted, first, with an exploratory factor analysis with maximum likelihood factoring. Extracted factors were rotated by varimax rotation. Additionally, the reliability of items in each factor was examined by Cronbach's alpha. Then, based on exploratory factor analysis a confirmatory factor analysis was performed to calculate how items are associated with each factor, and to compare the model with different configurations of the items using structural equation modelling. Several model fit indices and their criteria were used to examine the goodness-of-fit of the model with the given dataset. That is, chi-squared (χ^2) and degree of freedom (*df*), comparative fit index (*CFI*), normed fit index (*NFI*), Tucker-Lewis index (*TLI*), and root mean squared error of approximation (*RMSEA*).

The influence of socio-demographic and clinical characteristics in psychological distress, measured with avoidance and cognitive intrusions, were investigated by multiple linear regression analyses. The socio-demographic and clinical characteristics, having children or not, previous psychiatry treatment, having relatives affected with cancer or death by cancer, if patient was affected by cancer, and index patient, were analysed as a dichotomous variable (1 = yes; 2 = no). Gender was also analysed dichotomously (1 = men; 2 = women). Age was analysed as a continuous variable, but participants were divided into three age groups (< 40, 41 - 59, < 60), these age groups were not indicative of any specific clinical characteristic and were arbitrary. Groups were compared using *ANOVA* or Student test. Participants with missing data were omitted from the respective analyses. Statistical analysis was performed using IBM SPSS for Windows, version 23.0 and AMOS for confirmatory factor analyses.

Results

Sample characteristics

Of the 881 patients recruited, 55 refused to participate because of lack of interest (n = 26), did not wear eyeglasses to read (n = 14), health issues (n = 8), and lack of time (n = 7). In addition, 60 patients did not meet the inclusion criteria due to low grade education (n = 42), presence of severe mental disorder or concurrent medical disease affecting their cognitive performance (n = 11), and inability to understand and read Spanish (n = 7), leaving a total of 766 participants (86.94%), who completed the questionnaire. There were no differences between responders and non-responders in gender (p = .25) and germline mutations (p = .85). The non-responders were significantly older than responders M = 63.65 (SD = 13.49) versus M = 47.96 (SD = 14.97), p = .000.

Most of the patients were women (n = 551, 72%), majority were married or living with a partner (n = 469, 61.2%). Median age of the sample was 48 years. Over a third had completed post-secondary education (n = 262,

34%). Most of them had one or more children (*n* = 539, 70.4%). The largest part of the sample had family histories of cancer (*n* = 617, 81.5%). BRCA1/BRCA2 were the greatest germline mutations tested (*n* = 540, 70.5%). Socio-demographic and clinical characteristics are presented in Table 1.

Table 1. Socio-demographic and clinical characteristics of the sample *(n* = 766)

Age (years)		
Mean (*SD*)	47.96 (13.49)	
Median	48	
Mode	47	
Range	18-84	
Gender	***n***	***%***
women	551	72
Age (years)		
Less to 40	205	26.8
41 to 59	404	52.7
60 or more	157	20.5
Marital Status		
Married/Partnered	469	61.2
Separate/Divorced/Widowed	123	16
Never married	174	22.8
Education Level		
Primary/secondary	283	37
Post-secondary	262	34
University studies	221	29
Having children		
None	227	29.6
One	185	24.2
Two	275	35.9
Three or more	79	10.3
Previous psychiatry treatment	119	15.5
Index patient	360	47
Affected patient	383	50
Relatives affected with cancer	617	80.5
Relatives deceased due to cancer	274	35.8
Germline mutations		
BRCA1/BRCA2	540	70.5
MMR†	110	14.4
APC††	36	4.7
F/PGL†††	23	3.0
Others††††	57	7.4

Note. †MMR = MisMatch Repair (MLH1, MSh2, MSh6 or PMS2); ††APC = Adenomatous Polyposis Coli; †††F/PGL = Feocromocitoma/ Hereditary Paraganglioma; ††††Others = included CDH1gene; PALB2; CDKN2A;TP53; CHEK2; STK11; RET (in Multiple Endocrine Neoplasia type 2); VHL (von hippel-lindau).

Factor structure of the IES amongst patients at increased risk of developing hereditary cancer

A factor analysis with principal components followed by normalized varimax rotation of the 15 items was conducted. Principal factor solution yielded 2 factors with eigenvalues greater than 1. The Kaiser-Meyer-Olkin measure of sampling was .94, and the Bartlett Test of Sphericity yielded a chi squared approximately equal to 6043,274 (*DF* = 105, *p* = .000), indicating the appropriateness of the factor analysis. The two-factor solution, accounted for 57.65% of the total variance explained, and supported the intrusion and avoidance subscale structure. The intrusion items (1, 4, 5, 6, 10, 11, 14) had Factor 1 loadings ranging from .79 to .59. A little discrepancy in the replication of the intrusion factor structure was that one intrusion subscale item (Item 14. «*Any reminder brought back feelings about it*»), had also factor loading more than .5 into avoidance factor. Factor 2 was defined by avoidance items (2, 3, 7, 8, 9, 12, 13, 15), with loadings from .76 to .54. Once again, one item (Item 12. «*I was aware that I still had a lot of feelings about it but I did not deal with them*») of the avoidance subscale was found to have marginal factor loading on the intrusion subscale as well. Factor loadings of each item in the rotated components are presented in Table 2.

Mean score in each item of IES showed that subjective distress of patients, immediately after the genetic cancer test and before the results, was in avoidance response with a high score on item 3 («*I tried to remove it from my memory*»), item 13 («I *tried not to think about it*»), item 2 (« I *avoided letting myself get upset when I thought about it or was reminded of it*»), and intrusive thoughts with high score on item 14 («*any reminder brought back feeling about it*»), item 1 («*I thought about it when I didn't mean to*») and item 11 («*other things kept making me think about it*»).

Internal consistency was calculated with Cronbach's alpha for the intrusion and avoidance subscales, and Cronbach's alpha was found to be .89 and .86 respectively. The questionnaire was found to be homogeneous with satisfactory correlations between each item and total scores ranged from .74 to .52. Mean (*SD*) answers of each item as well as item total correlation coefficients are shown in Table 2.

Confirmatory factor analysis was used to assess the factor structure of the IES in a Spanish sample at increased risk of developing hereditary cancer. Three confirmatory factor analytic models were specified on the basis of theoretical considerations **(**Horowitz et al., 1979**),** later research (Thewes et al.,

Table 2. Factorial solution with factor loadings, item-total correlation coefficient, *M* (*SD*) scores of each item

	Factor [a]		Item-total correlation	*M*	*SD*
	I	II			
IES1. Pienso en ello cuando no quiero hacerlo	**.65**	.46	.73	2.13	.96
IES2. No me permito a mí mismo/a preocuparme o molestarme cuando pienso en ello		**.64**	.55	2.21	1.04
IES3. Trato de apartarlo de mi cabeza	.35	**.70**	.69	2.51	1.20
IES4. Tengo problemas en dormir o permanecer despierto/a porque me vienen a la cabeza imágenes o pensamientos sobre ello.	**.77**	.26	.67	1.74	.97
IES5. Tengo emociones fuertes sobre ello.	**.79**	.29	.70	1.81	.96
IES6. Sueño con ello.	**.78**		.54	1.35	.70
IES7. Me aparto de todo aquello que me lo recuerde.		**.71**	.62	1.75	1.02
IES8. Me siento como si no fuese real.	.26	**.58**	.54	1.79	1.05
IES9. Intento no hablar de ello.		**.68**	.52	1.81	1.03
IES10. Aparecen en mi mente imágenes sobre ello.	**.74**	.30	.68	1.74	.92
IES11.Otras cosas me hacen pensar sobre ello	**.62**	.39	.66	2.01	.95
IES12. Me doy cuenta de que todavía siento muchas emociones sobre ello, pero no me enfrento a ellas.	**.53**	**.54**	.71	1.83	.96
IES13. Intento no pensar en ello.	.29	**.76**	.71	2.25	1.13
IES14.Cualquier cosa que me lo recuerde me produce emociones sobre ello.	**.59**	**.52**	.74	2.21	1.05
IES15. Mis emociones sobre ello están entorpecidas, apagadas.	.28	**.55**	.54	1.73	.93
Eigenvalues	7.37	1.2			
% of variance cumulative	28.90	57.65			

Note.[a] Suppressed coefficients less than .25. In bold factor loading > .50

2001)**,** and previous exploratory factor analyses done in the current study. The first model tested, Model 1, was based on the two components of the original IES, containing all 15 items. The second, Model 2, specified two-factor modelling, intrusion and avoidance, with a cross-factor loading for item 12. Finally, Model 3 was conducted with the original two-factor with additional cross-factor loading for items 12 and 14, on the basis of the result of our previous exploratory factor analysis. The fit indices for the three confirmatory factor models are reported in Table 3. Although the chi-square values were significant for all tested models, this should not lead to a rejection of any model because of the large sample size increases the power of the test and chi-square tends to be significant. In these cases, examination of the other fit indices is warranted. In addition, the large sample size in this study gave robustness to the test by avoiding the contamination from the outliers that may appear in the variability of the fit indices when compared to the classical points (Rojas-Torres, 2020). The fit indices suggested that Model 2 represented an adequate explanation of the data, and the other models were slightly different from the IES structure. Model 2 was based on the two components of the original IES with additional cross-factor loading for item 12. A schematic representation of this model is presented in Figure 1.

Table 3. Fit indices for confirmatory factor analyses of the IES on Spanish sample with hereditary cancer risk

Model	$\chi 2$	*df*	*p*	*CFI*	*NFI*	*TLI*	*RMSEA*
Model 1. Original two-factors	663.770	89	.00	.90	.89	.87	.09
Model 2. Cross-factor item 12	802.418	88	.00	.91	.90	.88	.08
Model 3. Cross-factor items 12 and 14	565.632	87	.00	.92	.90	.88	.08

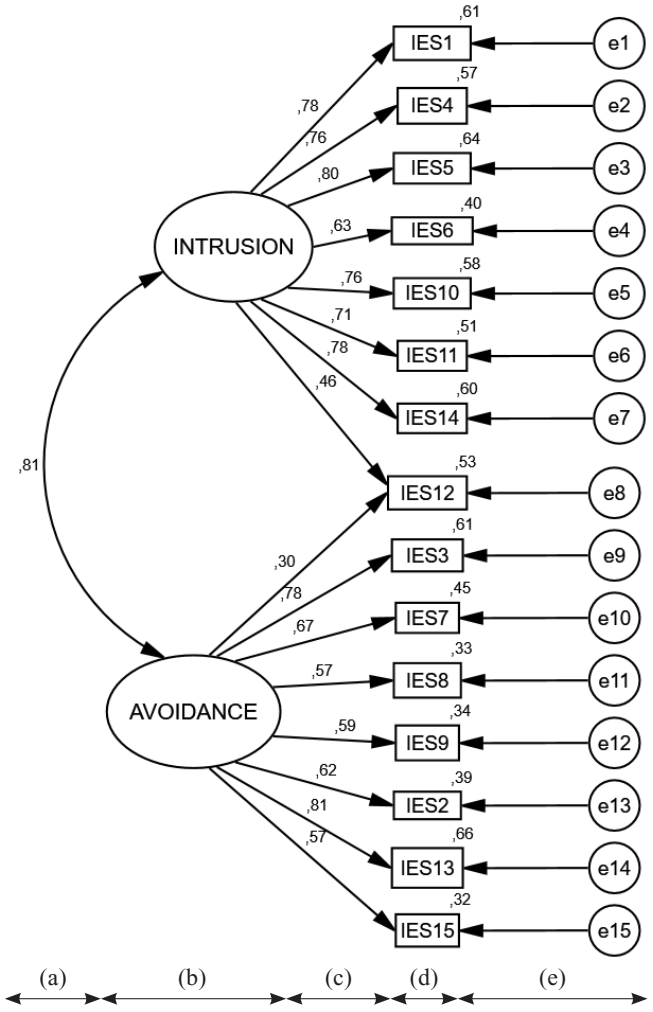

Figure 1. Hypothesized model of factorial structure of the IES on Spanish sample with hereditary cancer risk. *Note*. (a)Correlations between factors (IES subscales); (b)The IES factors (IES subscales); (c) Standardized factor loading; (d) The IES item; (e) Error variance.

Socio-demographic and clinical characteristics related to intrusion and avoidance subscales

Multiple regression analyses with enter method were computed to explore the contribution of socio-demographic and clinical variable in each dependent variable, avoidance and intrusion factors. On the intrusion variable, the model provided $R^2 = .11$, adjusted $R^2 = .10$, *SD* error estimate 5.57, *DW* = 1.96. The model predicted the intrusion variable as statistically significant, F (11, 750) = 8.68, $p < .00$. From socio-demographic and clinical variables, only four variables added statistically significant prediction to the IES intrusion, that is, patient affected by cancer, gender, previous psychiatric treatment, and age, results are included at Table 4. On the avoidance variable, the model provided $R^2 = .11$, adjusted $R^2 = .10$, *SD* error estimate 5.71, *DW* = 1.82. The model predicted the avoidance variable as statistically significant, F (11, 749) = 8.73, $p < .00$. From socio-demographic and clinical variables, only three variables added statistically significance to the prediction of IES avoidance, that is, patient affected by cancer, gender, and previous psychiatric treatment, results are included at Table 4. The multiple regression analyses indicated that no other variables showed a significant predictive contribution.

Comparing significant socio-demographic and clinical variables, it was suggested that intrusive and avoidance thoughts were significantly higher on patients affected previously by cancer, having had psychiatric treatment in the past, and being female, results are showed at Table 5. Moreover, intrusive thoughts about cancer increase with younger age, ANOVA was carried out to examine differences between age groups. Although the scores were higher in middle age, from 41 to 59 years, the results showed no significant differences between age groups (less to 40 years old, $M = 14.78$, $SD = 6.115$; from 41 to 59 years old, $M = 15.06$, $SD = 5.834$; 60 or more years old, $M = 14.31$, $SD = 5.657$; $F = .916$, $p = .401$).

Discussion

The IES questionnaire has been successfully proposed in the assessment of subjective distress related to cancer in a large number of GCUHC in Spain (Gil, 2005). The current study assessed the psychometric properties of the IES in a Spanish sample of patients attended immediately after a genetic cancer test was performed, and before collecting the results. Exploratory and confirmatory factor analyses were used to examine attributes related to underlying IES factors, as well as to determine how items across subscales are associated with each factor. While the factor structure of the IES in this study appeared consistent with the original factor structure introduced by Horowitz et al. (1979), some items showed slight discrepancies, particularity items 12 and 14. These items did not load on their target dimension of the original scale loading together on avoidance and intrusion factor. On confirmatory analyses, the fit indices suggested that the two-factor structure with additional cross-factor loading for item 12 was appropriate in this particular population. Similar findings, regarding factorial loading of the item 12 into both constructs, were found amongst women at increased risk of hereditary breast cancer (Thewes et al., 2001), and others validation studies (Smith et al., 2008).

Table 4. Regression analyses of socio-demographic and clinical variable in avoidance and intrusion factors (n = 766)

	Intrusion				Avoidance			
	B(SE)	β	*t*	*p*	*B(SE)*	β	*t*	*p*
Constant	19.49 (2.33)		8.34	.00	19.05 (2.39)		7.96	.00
Age	-.74 (.34)	-.08	-2.17	.03	-.36 (.35)	-.04	-1.04	.29
Gender	1.96 (.48)	.15	4.03	.00	1.84 (.50)	.13	3.69	.00
Marital status	-.03 (.27)	-.00	-.11	.90	.23 (.28)	.02	.82	.41
Education Level	.06 (.17)	.01	.35	.72	.10 (.17)	.02	.57	.56
Having Children	.47 (.51)	.03	.93	.35	.67 (.52)	.05	1.28	.19
Psychiatry Treatment	-1.73 (.56)	-.10	-3.07	.00	-2.32 (.57)	-.14	-4.03	.00
Patient affected	-2.33 (1.08)	-.19	-2.15	.03	-2.37 (1.10)	-.19	-2.14	.03
Index Patient	.06 (1.09)	.00	.05	.95	.07 (1.12)	.00	.07	.94
Relatives affected cancer	.53 (.61)	.03	.87	.38	.87 (.63)	.05	1.39	.16
Relatives death cancer	-.66 (.46)	-.05	-1.42	.15	-.33 (.47)	-.02	-.70	.48
Germline mutation	-.28 (.17)	-.05	-1.64	.10	-.08 (.17)	-.01	-.47	.63

Table 5. Comparison of socio-demographic and clinical variables, in avoidance and intrusion factors (n = 766)

	Intrusion			Avoidance		
	M (SD)	*t*	*p*	*M (SD)*	*t*	*p*
Gender:		-7.44	.00		-6.38	.00
Men	12.55 (4.93)			13.71 (5.33)		
Women	15.71 (5.97)			16.74 (6.06)		
Psychiatry Treatment		3.369	.001		4.29	.00
Yes	16.49 (6.10)			18.05 (6.35)		
No	14.53 (5.78)			15.50 (5.88)		
Patient affected		7.131	.000		7.40	.00
Yes	16.30 (5.94)			17.46 (5.89)		
No	13.36 (5.42)			14.33 (5.74)		

According to cognitive processing theory (Creamer et al., 1992), the scores on the items of the IES in this study to assess the impact of the genetic cancer test described oscillations on cognitive responses characterized with median scores for the avoidance subscale (with items 3, 13, and 2) and for intrusive thoughts (items 14, 1, 11). These cognitive processes included blocking thoughts to reduce immediate distress about cancer, pending the genetic test results, and to examine thoughts about the personal meaning of the cancer threatening their family. Subsequently, mean scores in each item might be assessed by a clinical psychologist at the genetic counselling unit with patients who had experienced much more this distressing event, and who were more predisposed to develop cancer distress.

In the Spanish genetic cancer sample, satisfactory internal consistency for IES intrusion and avoidance subscales (α = .89 and α = .86, respectively) were found, magnitudes of coefficients alpha were adequate and higher than those reported for the original scale (α = .78 and α = .82, Horowitz et al., 1979), with major scores than means found in others studies (Pietrantonio et al., 2003; Sundin & Horowitz, 2002), and similarity to others of genetic testing for breast cancer risk (α = .89 and α = .94, (Smith et al., 2008); α = .88 and α = .84 (Thewes et al., 2001).

Regarding influence of the socio-demographic and clinical variables to explain cognitive distress, the model accounted for 10% of the variance to IES intrusion, similarly to IES avoidance. Perhaps we have to consider additional variables that influence intrusion and avoidance cognitions related to cancer risk. The sample's characteristics, such as marital status, education level, if having children or not, having relatives affected with cancer or death by cancer, if patient was included to begin the genetic study in their family, or different germline

mutations to test, had no substantial contribution in explaining intrusion and avoidance factors in this study. Therefore, we did not detect main effects of these socio-demographic variables on IES subscales, similarly to previous studies (Croyle et al., 1979). But, in other studies, having family history of cancer with parental cancer death were related to higher levels of intrusive thoughts, and avoidance response (den Heijer et al., 2013; Erblich et al., 2000; Zakowski et al., 1997). The IES intrusion score correlated with the number of family member diagnosed with, and deceased, due to cancer (Bratt et al., 2000). Moreover, in cancer screening behaviours positive interaction between cancer intrusive and avoidance scores and number of affected relatives by cancer, significantly predicted less adherence to cancer screening behaviour (Bratt et al., 2000; Schwartz et al., 1995), in parallel with perceived family cancer risk (Schwartz et al., 1995).

Other's variables such as gender, if patient was affected by cancer or previous psychiatry treatment, were significant predictors of cognitive distress. Regarding gender, men and women reported differences on cognitive distress, and women expressed higher levels of avoidance and cognitive intrusion about developing cancer, according to previous Spanish validation of the questionnaire (Báguena et al., 2001). In this sample with high risk of hereditary cancer, a patient that was affected previously by cancer showed high cognitive distress, especially strong intrusive and avoidance reactions, perhaps due to their own fears of newly developing cancer. In this line, previous research showed that affected women were significantly worried about developing cancer and raised perception of risk (Bish et al., 2002). The intrusive and avoidance processes about their cancer experience may be a meaningful proxy for their cancer specific distress. However, prior research showed that the main effect of personal history of cancer on intrusion but did not on the avoidance subscale (Croyle et al., 1979). That is, other studies showed no significant differences between participants with or without personal cancer histories on distress, including intrusive and avoidance thoughts with response to testing (Smith et al., 2008). In general, psychological distress tended to decrease or show little change over time regardless of results received (Smith et al., 2008; Sandín et al., 2001). In another study, recurrent cognitive intrusion may suggest an adaptive process, in a similar setting to that in which a patient suffered cancer that allowed them to integrate a stressful event into their lives (Creamer et al., 1992; Joseph, 2000). Previous psychiatric treatment was related to higher scores on avoidance and intrusive thoughts. It was reflected at findings from previous research about baseline anxiety related to distress, over subsequent assessments and after genetic testing (Croyle et al., 1979; Pietrantonio et al., 2003), independently of genetic risk assessment (Bennet et al., 2008) and following the report to carry gene mutation (Watson et al., 1999). Furthermore, the frequency of intrusive thoughts mediated their impact on background levels of anxiety and depression symptomatology (Bennet et al., 2008). Over time, levels of distress in cancer genetic testing, that is, levels of intrusion and avoidance, were either lower or similar compared to baseline, this suggested that the worries triggered by the actual threat that cancer might be diagnosed decreased or remained constant over time, genetic cancer testing per se did not atteniate this effect (den Heijer et al., 2013; Smith et al., 2008; Watson et al., 1999), similarly to prevention measures such as screening tests (Sandin et al., 2001). In the current study, there was significant effect of age on cognitive intrusion. Group of median age, from 41 to 59 years old, had more cognitive intrusion about cancer, but there were no significant differences between the age groups. There was no significant effect of age on avoidance scores. In other studies, age had no effect on intrusion or avoidance scores of the IES, but younger women expressed higher levels of cancer worry than older women (> 50 years old) (Foster et al., 2002; Watson et al., 1999).

The following limitations of the study should be considered: This study is a cross-sectional design; we can study how the variables related to one and another at the time of data collection but cannot draw conclusions about causality. No conclusions can be drawn with regard to the convergent validity because data was not correlated with other similar questionnaires. We have found limited updated references, and the most recent studies are carried out with the revised version of the IES.

In summary, this study has showed that the Spanish version of the IES in our sample is a consistent instrument, with a robust structure, and adequate fit indices to warrant its use as a brief clinical screen. Support has been provided for the valid distinction between avoidance and cognitive intrusion for Spanish patients with increased risk of developing hereditary cancer. These data illustrated subjective distress experienced as a result of genetic cancer testing was particularly prevalent amongst women, patients affected previously by cancer, or patients with previous psychiatry treatment. Given that this is the focus characteristics of patients with high risk to experience avoidance and cognitive intrusion about cancer, it is important that they continue to receive genetic counselling prior to testing in order to address concerns and continue to be supported medically and psychologically after testing was conducted.

Whereas DSM-5 modified diagnostic criteria about PTSD related to cancer, the IES provided an unchanging standard measure of subjective distress in patients at increased risk of developing hereditary cancer. IES might be described as the gold standard self-reporting instrument in processing cognitive stress for almost 50 years (Sundin & Horowitz, 2003). Considering the socio-demographic variables indicated in the current study, that increased experience of troublesome intrusive and avoidance cognitions about cancer, it could be important in these patients to continue to receive additional counselling or interventions after testing in order to address concerns and be supported over time.

Conflicts of interest

The authors have no conflicts of interest to declare.

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