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## Assessing the Impact of Cancer among Dutch non-Hodgkin lymphoma survivors compared with their American counterparts: a cross-national study

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### Abstract

**Purpose**—To understand cultural differences in the impact of cancer (IOC), by (1) performing an independent psychometric evaluation of the Dutch version of the Impact of Cancer Scale version 2 (IOCv2) in a non-Hodgkin lymphoma (NHL) sample and (2) examining differences between Dutch and American NHL survivors in perceived impact of cancer and identify associations with socio-demographic and clinical characteristics.

**Methods**—Data collected from 491 Dutch and 738 American NHL survivors were used in this study. IOCv2 responses were obtained from all survivors; the Dutch survivors also completed the EORTC QLQ-C30, which measures quality of life.

**Results**—Exploratory factor analysis of the Dutch version yielded a factor solution similar to the American structure but with some subscales merging into single factors. Internal consistency was good; Cronbach's alpha was 0.88 for the Positive and 0.94 for the Negative summary scales. Large differences were observed between survivors, whereby Dutch survivors reported fewer Positive ( $\Delta -0.4, p < .001$ , effect size: 0.27) and more Negative ( $\Delta 0.2, p < .001$ , effect size: 0.13) impacts of cancer independent of socio-demographic and clinical characteristics.

**Conclusion**—Similar impact domains of the IOCv2 were observed in the Dutch sample, providing evidence that IOCv2 scales measure common and important survivor concerns across two different Western nations. Higher positive impacts for US survivors might be explained by more personal control and availability of supportive services. Future research should focus on determinants of the impact of cancer in both Dutch and American survivors to gain better understanding of the factors that might improve it and suggest how health care may be modified toward that end.

## Introduction

Advances in cancer treatment have led to an expansion in the number of cancer survivors in developed countries. Non-Hodgkin's lymphoma (NHL) is one of the diseases that has benefited from such advances. For both the Netherlands and the United States (US), the annual age-adjusted incidence of NHL is 1 in 5,000 persons, with approximately 3,000 new cases in the Netherlands<sup>1,2</sup> and 65,000 new cases in the US<sup>3</sup> annually. The number of NHL survivors has increased rapidly from 13,400 in 2001 to 19,600 in 2008 in the Netherlands<sup>1,2</sup> and from approximately 347,000 in 2001 to 454,000 in 2008 in the US<sup>3</sup>. An individual has a 1 in 50 chance of being diagnosed with NHL during his or her lifetime.

As cancer survivors live longer, they develop risks such as late effects of therapy and adverse physical and psychosocial long-term effects<sup>4</sup>. These long-term effects include persistent fatigue, depression, anxiety and marital disruption that can have a negative influence on survivors' health-related quality of life (HRQOL)<sup>5–10</sup>. While cancer survivors may be expected to return to normal life soon after treatment ends, they may continue to be burdened by the physical and psychosocial effects of the cancer and related treatments.

In a recent systematic review, we found that, on average, lymphoma cancer survivors have decreased HRQOL compared to the general population even several years post-diagnosis (i.e., no resolution at more than five years post-diagnosis)<sup>11</sup>. However, most survivorship studies lack the use of an instrument that addresses the unique concerns related to the cancer experience such as those measured by the impact of cancer (IOC) scale<sup>12–14</sup>. This self-reported questionnaire was developed in the US to measure positive and negative impacts of cancer that long-term survivors attribute to their cancer experience. A translation of the IOC into Dutch has been undertaken, but its psychometric properties have not been described.

Cultural differences may affect the perception of the impact of cancer on HRQOL<sup>15,16</sup>. Moreover, attitudes towards health practice and illness may also be defined by culture<sup>17</sup>. Therefore, we undertook an examination of two samples of NHL patients in the Netherlands and the US, and compared their responses to the IOC. To better understand the commonality of psychosocial problems between cultures, it is important to examine cross-national differences<sup>18</sup>. This undertaking will provide more knowledge of culture-specific determinants of psychosocial well-being.

Therefore, the aims of the present study were to (1) perform an independent psychometric evaluation of the Dutch version of the IOCv2 in a NHL sample and (2) explore differences between Dutch and American NHL survivors regarding the impact of cancer and identify associations with socio-demographic and clinical characteristics associated with the IOC score.

## Methods

### Participants

**Dutch sample**—NHL survivors aged 18 were identified using the Eindhoven Cancer Registry (ECR) to select all patients who were diagnosed with NHL between January 1<sup>st</sup>, 1999 and July 1<sup>st</sup>, 2009. We included all patients with indolent (including Chronic Lymphocytic Leukemia) and aggressive B-cell NHL as defined by the International Classification of Diseases for Oncology-3 codes (ICD-O-3)<sup>19</sup>. To identify and exclude patients who were deceased, the database was linked with the database of the Central Bureau for Genealogy, which collects data on all deceased Dutch citizens through the civil municipal registries.

Data collection took place in summer 2009 and was done within PROFILES (Patient Reported Outcomes Following Initial treatment and Long term Evaluation of Survivorship). PROFILES is a registry for the study of the physical and psychosocial impact of cancer and its treatment from a dynamic, growing population-based cohort of both short and long-term cancer survivors. PROFILES contains a large web-based component and is linked directly to clinical data from ECR. Details of the data collection method have been previously described<sup>20</sup>.

Of the 1026 eligible survivors who were assumed to have received an invitation, 824 (80%) returned survey materials. Non-respondents were more often diagnosed with indolent NHL (63% versus 54%,  $p < .05$ ) and less often diagnosed with stage I disease (19% versus 25%,  $p < .05$ ). There were no differences between respondents and non-respondents in gender or age.

**American sample**—NHL survivors were identified through Duke University Medical Center and University of North Carolina at Chapel (UNC) Hill Lineberger tumor registries in November 2004 as previously described<sup>21</sup>. Patients were eligible if 18 years old at diagnosis, and 2 years post-diagnosis. Prospective participants were mailed a self-administered survey. Of the 1195 eligible survivors who were assumed to have received an invitation, 886 (74%) returned survey materials. Participants, compared with non-participants, were less frequently African American (10% versus 20%,  $p < .001$ ) and older at study enrollment (mean age 62.9 versus 58.8 years  $p < .001$ ).

**Total sample**—To create more comparable samples, we selected those survivors with overlapping ICDO-3 codes, i.e. excluding survivors diagnosed with Chronic Lymphocytic Leukemia in the Dutch sample and survivors with T-cell and NK-cell NHL in the American sample. We also excluded survivors diagnosed 2 years post-diagnosis in the Dutch sample since the IOC was developed for longer term survivors and the US sample included only this population<sup>13,14</sup>. The total sample consisted of 1229 survivors, 491 Dutch and 738 American survivors (Figure 1). Institutional Review Board approval was obtained in both countries at all institutions participating in the study and written informed consent was obtained from each participant.

## Measures

The IOC presents statements regarding specific impacts of cancer to which respondents indicate their level of agreement from 1 (strongly disagree) to 5 (strongly agree). Initial psychometric scaling of a 81-item IOC questionnaire yielded the 41-item IOC version 1 (IOCv1)<sup>13,14</sup>. A more recent and comprehensive scaling of the IOC questionnaire yielded the 37-item IOC version 2 (IOCv2)<sup>12</sup>. The Dutch survivors completed the IOCv1, which is missing 7 items that are in IOCv2. A newly developed algorithm was used to impute the 7 missing IOCv2 item scores for the Dutch survivors based on their IOCv1 responses<sup>22</sup>. The American survivors completed the 81-item IOC questionnaire and had their responses scored as IOCv2 scales. Other reports from the American sample have used both the IOCv1 and IOCv2 scoring formats<sup>9,10</sup>.

The Dutch survivors also completed the Dutch validated version of the European Organisation for Research and Treatment of Cancer (EORTC) QLQ-C30 which assesses HRQOL in cancer patients<sup>23</sup>. Response categories range from 1 to 4. After linear transformation, all scales and single item measures range in score from 0 to 100. A higher score on function scales and the global health and quality of life scale implies a better HRQOL, whereas for symptoms (scales and items) a higher score refers to more symptoms<sup>23</sup>.

For both samples, comorbidity was assessed with the Self-administered Comorbidity Questionnaire (SCQ)<sup>24</sup>. Marital status and educational level were also assessed in both samples. For the Dutch sample, clinical information was available from the ECR that routinely collects data on tumor characteristics, including date of diagnosis, tumor grade, histology, Ann Arbor stage<sup>25</sup>, primary treatment, and demographic characteristics, including gender and date of birth. Clinical data pertaining to the American sample were obtained from Duke University Medical Center and University of North Carolina at Chapel Hill Lineberger Tumor Registries and complemented with self-reported data.

### Statistical analysis

All statistical analyses were performed using SAS (version 9.1 for Windows; SAS Institute Inc., Cary, NC). P values of <.05 were considered statistically significant. Differences in socio-demographic and clinical characteristics between Dutch and American NHL respondents were assessed using chi-square and t-tests.

**Psychometric evaluation**—An exploratory factor analysis was conducted on the 37 items of the IOCv2 of the Dutch sample. Factors were extracted using principal components; the number of factors was selected using eigenvalue >1 and scree plots and promax rotation were performed. We repeated the factor analysis three times, with six, seven and eight factors, as the scree plot showed a stabilization point after six and eight factors. Internal consistency of the IOCv2 of the Dutch sample was measured using Cronbach's alpha. The Cronbach's alpha coefficient should reach 0.7 or above to be judged as good internal consistency and reliability<sup>26</sup>. Concurrent validity was evaluated by calculating Spearman correlation coefficients between IOCv2 scales and EORTC QLQ-C30 subscales. We hypothesized that the IOCv2 positive scales would be uncorrelated with the EORTC QLQ-C30, because they measure distinct constructs. We hypothesized that the IOCv2 negative scales would be substantially correlated with the EORTC QLQ-C30, because limitations in functioning and having cancer-related symptoms could have negative impacts on one's QOL.

**Comparison of Dutch and American survivors**—The mean IOCv2 scores of the Dutch NHL survivors were compared with the scores of the American NHL survivors using independent sample t-tests. Multivariate linear regression analysis was performed to investigate the independent association between socio-demographic and clinical variables and IOCv2 scales for the samples (Dutch and American) separately and for the total NHL sample. Since there were no large differences between countries in associations between IOCv2 scores and socio-demographic and clinical variables, only results of the total sample are presented.

## Results

### Sample characteristics

Comparisons between Dutch and American NHL survivors showed significant differences on most sociodemographic and clinical characteristics (all  $p < .001$ ) except for age, marital/partner status and NHL histology (Table 1). Dutch respondents were more often male, had on average a lower educational level and were less likely to be employed during study enrollment. Mean interval since diagnosis was shorter among Dutch survivors, who also had a smaller range of interval (i.e., standard deviation). Dutch survivors also reported fewer comorbid conditions. Despite statistically significant differences in disease stage and treatment, both survivor groups were most often diagnosed with stage I disease followed by stage IV disease, and chemotherapy and radiotherapy were the most common treatments

received. The mean age at the time of survey for both groups was 63 years and about 80% of survivors were married or in a committed relationship.

### Psychometric evaluation

**Exploratory factor analysis**—The six factor structure yielded the most interpretable solution. 'Health Awareness and Worry' emerged as a single factor as did 'Body Change Concerns and Life Interferences'. The additional factors represented the four other domains of the IOCv2, i.e. Meaning of Cancer, Positive Self-Evaluation, Altruism/Empathy, and Appearance Concerns (Appendix 1). Item IOC29 loaded higher on Meaning of Cancer than on Health Awareness (0.57 vs. 0.35). The emerging of Body Change Concerns and Life Interferences as a single domain was also observed in the factor analysis of the American NHL sample<sup>27</sup>. Cronbach's alpha was 0.88 for the Positive and 0.94 for the Negative Impact scales, respectively, and ranged from 0.75 to 0.93 for the subscales.

**Concurrent validity**—The correlations between IOCv2 Positive scales and the EORTC QLQ-C30 were all below 0.30, supporting the distinctive content of the IOCv2 Positive scales from this HRQOL measure (Appendix 2). With respect to IOCv2 Negative scales we observed an overall pattern of moderate ( $r$  0.30) to substantial correlation ( $r$  0.45) with the EORTC QLQ-C30. The strongest correlation was observed between IOCv2 Body Change Concerns and Fatigue of the EORTC QLQ-C30 ( $r=0.61$ ).

### Comparison of Dutch and American survivors

Significant differences were observed between Dutch and American NHL survivors on all IOCv2 scales (all  $p<.01$ ) except for Meaning of Cancer and Life Interferences (Table 2). Dutch survivors scored lower on the Positive Impact subscales (i.e., Altruism/Empathy, Health Awareness and Positive Self-Evaluation) and higher on the Negative Impact subscales (i.e., Appearance Concerns, Body Change Concerns and Worry). The difference on the Positive Impact Summary scale was larger compared to the Negative Impact Summary scale (0.4 vs. 0.2 points, both  $p<.01$ ).

Multivariate linear regression analysis also showed lower Positive IOCv2 scores and higher Negative IOCv2 scores ( $p<.001$ ) for Dutch survivors (Table 3). Based on the total sample of Dutch and American NHL survivors, females scored significantly higher on several Positive Impact subscales and on Appearance Concerns. Older survivors scored significantly lower on both Positive and Negative Impact Summary scales. In addition, higher educated survivors showed less Altruism/Empathy, survivors without a partner reported more Worry, and survivors who were not employed or were retired showed less Life Interferences.

With respect to the clinical characteristics, survivors with a longer survival time post-diagnosis showed higher Positive Self-Evaluation scores, and less Negative Impacts on Body Change Concerns, and Worry. Survivors with an aggressive NHL histology reported less Worry. Furthermore, survivors with more advanced disease stage, especially stage IV disease, showed higher scores on Health Awareness and on all Negative Impact scales. Survivors treated with chemotherapy reported a higher Positive Self-Evaluation and Positive Impact Summary scale as well as higher scores on Body Change Concerns. Lastly, survivors with three or more comorbidities had higher Negative Impact subscale scores.

### Discussion

The findings of this study show that similar impact domains were observed for Dutch and American NHL survivors, providing evidence that the IOCv2 measures common and important survivor concerns across two different Western nations. The internal reliability

and consistency of the Dutch scales were good and construct validity was observed between the IOCV2 negative scales and the EORTC QLQ-C30. Unfortunately, we could not evaluate the construct validity of the IOCV2 Positive Impact subscales, since the Dutch study did not have a relevant questionnaire that measured positive growth.

We also observed significant differences between Dutch and American NHL survivors, whereby Dutch survivors reported less positive impacts and more negative impacts of cancer. These differences, combined with construct validity, suggest that the IOCV2 scales are able to distinguish between cultures of the impacts of cancer, and this questionnaire is thus culturally sensitive.

One explanation for these differences might be that living in different cultures cultivates other psychological resources which influence health. The structure of a society, such as the social safety net and health care systems, contributes to shaping population health and attitudes towards health care<sup>28</sup>. Individuals in the US are socialized to rely more on individual resources compared with collective resources in Western Europe<sup>16,29</sup>. In the US, health care programs fall under the responsibility of the individual<sup>30,31</sup>, whereas in the Netherlands they are administered by the government<sup>32,33</sup>. To be more responsible for one's own health care creates a situation wherein control must be exercised. This sense of control is reflected in the emergence of a patient autonomy movement that began in America during the 1970s. Since then, a shift was made from a more paternalistic relationship between physicians and patients to a more equal relationship<sup>34,35</sup>, whereby information provision is one of the key elements of patient autonomy<sup>36</sup>. Studies have shown that personal control is associated with better self-reported health<sup>37,38</sup> since individuals who believe that they have some degree of control over their lives may be more likely to take action in difficult situations<sup>39</sup>. Furthermore, the sense of personal control is more prevalent in North America than in Europe<sup>15</sup>, which might result in the ability to alter perceptions of the cancer experience in a more positive way among American survivors.

Additionally, the hospitals where the American NHL survivors were treated have well-developed programs in cancer survivorship care. For example, support groups are readily available and Duke University Medical Center provides free psychosocial counseling and UNC social workers were available to assist patients free of charge. A recent study reported that social support is associated with more positive and less negative Impacts of cancer (Smith et al., under review). Therefore, the higher positive and lower negative impact scores of the American survivors might be ascribed partly to having received more social support. Other evaluation of the sample demonstrated that females scored significantly higher on the positive impacts of cancer (Smith et al., review). However, in the Dutch sample no differences in impact between men and women were observed, which may reflect other differences between the genders across the two samples.

Our results related to the impact of cancer are largely consistent with another Dutch study of 562 melanoma survivors<sup>40</sup>. In both studies, it appeared that time since diagnosis, tumor stage, and comorbidity were found to be associated with negative impacts of cancer.

The present study had some limitations. Although the response rate was high for both samples and information was available on socio-demographic and clinical characteristics of the non-respondents in both samples, it remains unknown whether non-respondents declined to participate in the study because of poor health. In addition, the seven missing items for the IOCV2 were calculated with a newly developed algorithm which has not been tested in other samples yet. Furthermore, the US data were collected from two institutions only, which limits the heterogeneity of the American sample.

In spite of these limitations, this study provides important information about the valid use of the IOCv2 in the Netherlands and with a preliminary look at the cross-national difference of the IOCv2 between Dutch and American NHL survivors. Results suggest that Dutch NHL survivors have lower positive and higher negative impacts of cancer compared with their American counterparts. Higher positive impacts for US survivors might be explained by more personal control and availability of supportive services. Future research should focus on determinants of the impact of cancer in both Dutch and American survivors to gain better understanding of the factors that might improve it.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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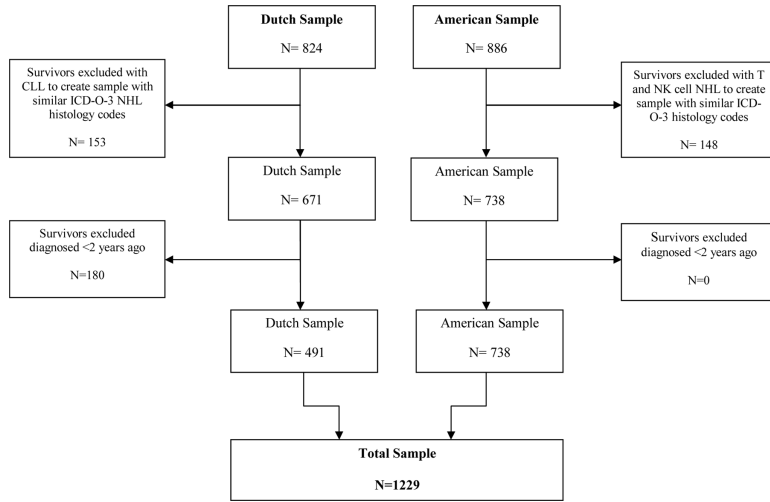
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**Figure 1.** Flow diagram of the data sample structure.  
 Note. Flow diagram of the data sample structure, excluding patients with non-similar International Classification of Diseases for Oncology-3 (ICD-O-3) codes and those diagnosed less than two years post-diagnosis. CLL=Chronic Lymphocytic Leukemia, NHL=non-Hodgkin lymphoma, NK=natural killer.

**Table 1**

Socio-demographic and clinical characteristics of Dutch and American non-Hodgkin lymphoma survivors.

	Dutch Respondents N=491	American Respondents N=738	
	N (%)	N (%)	P-value
<b>Gender</b>			<b>&lt;.001</b>
Male	290 (59)	363 (49)	
Female	201 (41)	375 (51)	
<b>Age at time of survey: mean (SD)</b>	63.0 (12.5)	63.0 (13.3)	.98
<50 years	71 (15)	111 (15)	
50–64 years	174 (35)	273 (38)	
65+ years	246 (50)	339 (47)	
<b>Education<sup>§</sup></b>			<b>&lt;.001</b>
Low	111 (23)	81 (11)	
Medium	291 (61)	353 (49)	
High	74 (16)	284 (40)	
<b>Marital/partner status</b>			.16
Married/committed	390 (81)	567 (78)	
Not married/committed	92 (19)	164 (22)	
<b>Employment status</b>			<b>&lt;.001</b>
Currently employed	116 (25)	287 (42)	
Not employed or retired	339 (75)	400 (58)	
<b>Years since diagnosis: mean (SD)</b>	5.3 (2.2)	10.2 (7.3)	<b>&lt;.001</b>
2–4 years	263 (54)	180 (24)	
5–7 years	153 (31)	223 (26)	
8–10 years	75 (15)	151 (17)	
>10 years	0	293 (32)	
<b>NHL histology</b>			.89
Indolent	226 (46)	314 (43)	
Aggressive	265 (54)	374 (54)	
Unknown	0	50 (6)	
<b>NHL stage at diagnosis</b>			<b>.001</b>
I	153 (31)	183 (28)	
II	93 (19)	149 (18)	
III	75 (15)	133 (17)	
IV	146 (30)	205 (24)	
Unknown <sup>#</sup>	24 (5)	68 (13)	
<b>Primary treatment/ treatment</b>			<b>&lt;.001</b>
Radiotherapy	148 (30)	363 (49)	
Chemotherapy	343 (70)	618 (84)	
Biologic	0	224 (30)	
Active surveillance <sup>+</sup>	78 (16)	0	

	Dutch Respondents N=491	American Respondents N=738	
	N (%)	N (%)	P-value
Transplant <sup>*</sup>	28 (6)	126 (17)	
Surgery	33 (7)	237 (33)	
<b>Self-reported comorbidity</b>			<b>&lt;.001</b>
No comorbid condition	136 (30)	75 (10)	
1 comorbid condition	138 (31)	135 (19)	
2 comorbid conditions	93 (21)	141 (19)	
> 2 comorbid conditions	86 (19)	374 (52)	

Note.

<sup>§</sup> Education levels included low = no/primary school; medium = lower general secondary education/vocational training; or high = pre-university education/ high vocational training/university

<sup>#</sup> Tumor stage could not be determined in some subtypes of indolent non-Hodgkin Lymphoma.

<sup>+</sup> Patients are under active surveillance and receive no therapy.

<sup>\*</sup> Transplant= autologous stem cell or bone marrow transplantation.

**Table 2**

Comparison of mean scores of the IOCV2 sub and total scales between Dutch and American non-Hodgkin's lymphoma survivors.

IOCV2 Scale	Dutch Respondents N=491				American Respondents N=738				Δ	p-value	Effect size r
	Mean	SD	Range	Mean	SD	Range	Mean	SD			
Altruism/Empathy	3.3	0.8	1-5	3.9	0.9	1-5	-0.6	<.001	<b>0.33</b>		
Health Awareness	3.2	0.9	1-5	3.7	0.9	1-5	-0.5	<.001	<b>0.27</b>		
Meaning of Cancer	2.7	0.9	1-5	2.7	1.1	1-5	0	.12	0		
Positive Self-Evaluation	3.4	0.8	1-5	3.9	1.0	1-5	-0.5	<.001	<b>0.27</b>		
Appearance Concerns	1.8	0.9	1-5	1.7	0.9	1-5	0.1	<b>.004</b>	0.06		
Body Change Concerns	2.6	1.0	1-5	2.4	1.2	1-5	0.2	<b>.002</b>	0.09		
Life interferences	2.0	0.7	1-5	2.0	0.7	1-4.8	0	.62	0		
Worry	2.8	1.0	1-5	2.6	1.0	1-5	0.2	<.001	<b>0.10</b>		
Positive Impact Scale	3.1	0.6	1-4.9	3.5	0.8	1-5	-0.4	<.001	<b>0.27</b>		
Negative Impact Scale	2.4	0.8	1-4.9	2.2	0.7	1-4.8	0.2	<b>.001</b>	<b>0.13</b>		

Note. IOCV2= Impact of Cancer Scale version 2.

**Table 3**

Multivariate linear regression analyses of IOCv2 sub and total scales of Dutch and American non-Hodgkin lymphoma survivors (N=1229).

Country	Positive impact scale				Negative impact scale				Worry
	Altruism/ Empathy	Health Awareness	Meaning of cancer	Positive self-Evaluation	Appearance Concerns	Body Changes	Life interferences		
USA	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
The Netherlands	-0.25**	-0.25**	-0.05	-0.23**	0.16**	0.13**	0.08	0.13**	0.13**
<b>Gender</b>									
Male	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Female	0.10**	0.07	0.06	0.11**	0.14**	0.00	-0.01	0.02	0.02
<b>Age</b>									
Low	-0.13**	-0.16**	-0.17**	-0.09	-0.18**	-0.10*	-0.16**	-0.17**	-0.17**
Medium	0.04	0.02	0.02	0.05	-0.02	-0.05	-0.03	-0.01	-0.01
High	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
<b>Marital/partner status</b>									
Partner	-0.08	-0.00	-0.07	-0.06	0.01	-0.06	-0.03	0.06	0.06
No partner	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
<b>Employment status</b>									
Currently employed	0.02	0.06	-0.04	0.01	0.06	0.05	0.01	0.08*	0.08*
Not employed/retired	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
<b>Years since diagnosis</b>									
Low	0.01	-0.03	0.03	0.10*	-0.15**	-0.19**	-0.06	-0.16**	-0.16**
High	0.04	-0.03	0.03	0.10*	-0.15**	-0.19**	-0.06	-0.16**	-0.16**
<b>NHL histology</b>									
Indolent	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Aggressive	0.01	-0.01	0.02	0.01	-0.05	-0.02	0.01	-0.09*	-0.09*
<b>NHL stage</b>									
I	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
II	0.09	0.07	0.07	0.05	0.09	0.05	0.06	0.10*	0.10*
III	0.08	0.08	0.08	0.05	0.12*	0.10*	0.10	0.10*	0.10*
IV	0.09	0.14**	0.03	0.05	0.16**	0.13*	0.14**	0.15**	0.15**
<b>Chemotherapy</b>									

	Positive impact scale				Negative impact scale			
	Positive subscales		Negative subscales		Positive subscales		Negative subscales	
	Altruism/ Empathy	Health Awareness	Meaning of cancer	Positive self-Evaluation	Appearance Concerns	Body Changes	Life interferences	Worry
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	0.09*	0.01	0.05	0.16**	0.02	0.13**	0.03	0.01
<b>Radiotherapy</b>								
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	-0.04	0.00	-0.09	0.01	0.01	-0.00	-0.02	0.01
<b>Comorbidity</b>								
None	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
1	-0.03	-0.05	-0.01	-0.02	0.07	0.10	0.08	0.07
2	-0.01	0.03	0.01	-0.01	0.11*	0.11*	0.09	0.09
3 or more	0.01	0.05	-0.02	-0.03	0.23**	0.32**	0.31**	0.21**

Note. IOCv2= Impact of Cancer Scale version 2;

\* p<0.01;

\*\* p<.001