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Original Article

Alexithymia and professional quality of life in radiation oncology: The moderator effect of the professional profile

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ABSTRACT

Background and purpose: Cancer care can be taxing. Alexithymia, a personality construct characterized by difficulties in identifying and describing feeling and emotions, an externally-oriented thinking style and scarcity of imagination and fantasy, is significantly correlated with higher levels of both secondary traumatic stress (STS) and burnout and lower levels of compassion satisfaction in medical professionals in radiation oncology. In this study, we aimed to assess the difference in professional quality of life (QoL) and the association with alexithymia in this multidisciplinary field depending on the specific profession (radiation/clinical oncologist, RO; medical physicist, MP; radiation therapist, RTT).

Material and methods: The study was conducted via an online questionnaire, receiving 1500 submissions between May and October 2018. Alexithymia was assessed via the Toronto Alexithymia Scale (TAS-20) and professional QoL was evaluated using the Professional Quality of Life Scale (ProQoL) version 5. Comparisons between the RO, RTT, and MP groups were performed by ANOVA or MANOVA, followed by Bonferroni corrected ANOVAs for continuous variables, and Pearson's chi-square test for categorical variables. The effect size was determined by calculating partial eta-squared (η^2).

Results: Profession had a moderator role on the correlation between alexithymia and STS, with RO being at a higher risk than MP and RTT. Further, the results of this study demonstrate the relevant point prevalence of decreased well-being at work even for professional categories such as MP despite the more technical profile and reduced interaction with patients.

Conclusions: This study demonstrates the importance of alexithymia as a factor contributing to decreased professional QoL amongst radiation oncology professionals. Alexithymic ROs are impacted to a higher extent compared to MPs and RTTs by the indirect exposure to patients suffering. It is worth addressing these observations in professional education, aiming to improve QoL for healthcare personnel.

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Radiation oncology is a medical discipline based on the clinical use of ionizing radiation to treat cancer patients [1,2]. It consists of a multi-professional framework, comprising different occupational profiles such as radiation and/or clinical oncologists (ROs), medical

physicists (MPs), radiation therapists (RTTs) and radiobiologists [1]. All professionals are involved, to various extent, in the specific steps of cancer treatment with radiotherapy, including delivery of multimodal personalized cancer treatments, safe utilisation of advanced technologies and optimisation of therapeutic processes [2]. Those with direct patient/caregiver contact are frequently confronted with death and suffering [3]. Those having a more technically-oriented professional profile are confronted, on a daily basis, with the challenges of ensuring a safe and accurate delivery

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of treatments, dealing with technical issues and promoting a good communication within staff [4]. On a general level, radiation oncology professionals are requested to face increasing productivity requirements, balancing patient caseload, demanding regulatory requirements and limited professional autonomy, potentially experiencing 'administrative fatigue' [5,6]. In this highly demanding, patient-centered working environment, a considerable proportion of radiation oncology professionals experience personal discomfort with different physiological manifestations, including personal fatigue and emotional distress, anxiety and depressive symptoms, and burnout, with potential consequences on professional well-being and performance at work as shown by three recent studies [3–5]. Therefore, we investigated the professional quality of life (QoL) amongst radiation oncology professionals, evaluating the levels of 'compassion fatigue' and 'compassion satisfaction' comparing the three professional disciplines (ROs, MPs, RTTs) and assessed the potential correlation with the personality traits of alexithymia and empathy [3–5]. We previously demonstrated that alexithymia, a personality trait characterized by difficulties in identifying and describing feelings and emotions, an externally-oriented thinking style and reduced imagination and fantasy, was significantly correlated with higher levels of both secondary traumatic stress and burnout and lower levels of compassion satisfaction at work [3–5]. The level of professional well-being in radiation oncology may vary amongst the three professional profiles, depending on the specific characteristics of the different disciplines, together with working duties and dynamics, organizational characteristics and different levels of interaction with the patient.

Therefore, the goal of this study is to assess the difference in professional QoL in radiation oncology depending on the specific profession. In particular, to better understand the possible mechanisms underlying the association between alexithymia and professional QoL, we developed a moderation model to explore whether the professional profile serves as a moderator of the relationship between alexithymia and well-being at work amongst different radiation oncology professionals.

Methods

The PRO BONO study was developed within the Young European Society for Radiotherapy and Oncology (yESTRO) Committee. A snowball sampling strategy was employed, wherein the participants were initially recruited, on a voluntary basis, via email, social media and other ESTRO communication channels.

Data was collected between May and October 2018. The questionnaire was administered through an online platform (SurveyMonkey Inc., San Mateo, California, USA; www.surveymonkey.com), collecting socio-demographic and professional information, while protecting anonymity of the respondents. Participants did not receive any incentive to complete the survey.

A total of 2002 participants took part in the study and 1538 fully completed the online survey. No significant differences were observed between ROs, RTTs, and MPs who completed the survey and those who dropped out [ROs dropped out: 233 (22%), completed: 828 (78%); RTTs dropped out: 123 (24%), completed: 399 (76%); MPs dropped out: 111 (26%), completed: 308 (74%); $\chi^2(2) = 3.470$, $p = 0.176$].

Measures

Alexithymia was assessed via the Toronto Alexithymia Scale (TAS-20) [7,8], while professional QoL was evaluated using the Professional Quality of Life Scale (ProQoL), version 5 [9,10] (for a detailed description of both measures please refer to [3–5]).

Statistical analyses

The statistical analyses were carried out with the Statistical Package for Social Science, version 25.0 (IBM SPSS Statistics for Macintosh, Armonk, NY, USA).

Indices of asymmetry and kurtosis were used to test for normality of the data. Values for asymmetry and kurtosis between -1 and $+1$ were considered acceptable in order to prove normal univariate distribution.

First, comparisons between the RO, RTT, and MP groups were performed by means of one-way analyses of variance (ANOVAs) or one-way multivariate analysis of variance (MANOVA), followed by Bonferroni corrected ANOVAs, for continuous variables, and Pearson's chi-square test (χ^2) for categorical variables. The effect size was determined by calculating partial eta-squared (η^2).

Secondly, moderated models of regression analyses were used to test the moderation effect of profession in the relationship between alexithymia and professional QoL. Following a standard procedure, the measure of alexithymia was centred before performing the moderation analysis, in order to avoid potentially problematic multicollinearity with the interaction term [11]. Moreover, considering that our moderator variable (profession) was made up of three categories (RO, RTT, and MP), two dummy variables (ROs vs. RTTs and ROs vs. MPs) were preliminarily created, using the most represented group (RO) as a baseline sample against which the other two groups were compared. Moderation was examined by constructing three separate hierarchical regression models that included ProQoL subscales, as dependent variables, and profession and alexithymia, in the first step, and two multiplicative terms representing the interaction between profession and alexithymia, in the second step, as predictor variables. The level of significance for all statistical tests was set at $p < 0.05$.

Results

Sociodemographic and work-related characteristics

Sociodemographic and professional characteristics are presented in Table 1 for the three professional categories. Significant differences between the three groups were found in terms of age, and marital status. Similarly, the three groups differed significantly in certain work-related variables: the number of years in the field and the rate of being in 'on call shifts'.

Alexithymia and professional quality of life

The comparisons between the three professions with respect to alexithymia and professional QoL scores are shown in Table 2.

As far as alexithymia is concerned, a one-way MANOVA revealed a significant difference between the three groups on the combined subscales scores of the TAS-20, Pillai's trace = 0.018, $F(6, 3062) = 4.687$, $p < 0.001$, partial $\eta^2 = 0.01$. Follow up post-hoc univariate ANOVAs showed that only the TAS-20 DDF factor score ($p = 0.004$; partial $\eta^2 = 0.01$) was statistically significant different between the three groups, using a Bonferroni adjusted α level of 0.017. In particular, Tukey's honestly significant difference (HSD) post-hoc tests revealed a significant difference between the RO and MP groups (-0.73 , 95% CI $(-1.29$ to $-0.16)$, $p = 0.007$), and between the RTT and MP groups (-0.82 , 95% CI $(-1.46$ to $-0.18)$, $p = 0.008$).

Regarding the professional QoL, a one-way MANOVA showed a significant difference between the three groups on the subscale scores of the ProQoL, Pillai's trace = 0.052, $F(6, 3062) = 13.598$, $p < 0.001$, partial $\eta^2 = 0.03$. Follow-up univariate ANOVAs revealed that all the three subscales scores of the ProQoL (ProQoL CSS, $p = 0.001$, partial $\eta^2 = 0.01$; ProQoL BS, $p < 0.001$, partial

Table 1

Sociodemographic and professional characteristics of the 3 professional groups for those who fully completed the online survey ($N = 1535$). Mean (SD) or percentage, ANOVA (F) or chi-squared (χ^2) test are listed.

	RO Group ($N = 828$)	RTT Group ($N = 399$)	MP Group ($N = 308$)	Test (df)	p
Age (years)	41.82 (10.64)	38.95 (9.88)	39.97 (9.63)	$F(2, 746.73) = 11.695$	<0.001*
Gender				$\chi^2(2) = 46.123$	<0.001
M	393 (47.5%)	115 (28.8%)	155 (50.3%)		
F	435 (52.5%)	284 (71.2%)	153 (49.7%)		
Marital Status				$\chi^2(6) = 19.691$	0.003
Single	153 (18.5%)	110 (27.6%)	74 (24%)		
Married/Cohabitant	639 (77.2%)	269 (67.4%)	219 (71.1%)		
Divorced	31 (3.7%)	15 (3.8%)	15 (4.9%)		
Widowed	5 (0.6%)	5 (1.3%)	0 (0%)		
Years in the field				$\chi^2(2) = 23.639$	<0.001
≤10	456 (55.1%)	163 (40.9%)	142 (46.1%)		
>10	372 (44.9%)	236 (59.1%)	166 (53.9%)		
'On call' shifts				$\chi^2(2) = 32.696$	<0.001
No	366 (44.2%)	235 (58.9%)	181 (58.8%)		
Yes	462 (55.8%)	164 (41.1%)	127 (41.2%)		
Valued by Supervisor				$\chi^2(2) = 4.803$	0.091
No	238 (28.7%)	124 (31.1%)	73 (23.7%)		
Yes	590 (71.3%)	275 (68.9%)	235 (76.3%)		
Valued by Colleagues				$\chi^2(2) = 2.298$	0.317
No	119 (14.4%)	64 (16.0%)	37 (12%)		
Yes	709 (85.6%)	335 (84.0%)	271 (88%)		

RO: Radiation Oncologists; RTT: Radiotherapy Technologists; MP: Medical Physicists.

* Significant difference: ROs vs. RTTs, $p < 0.01$; ROs vs. MPs, $p < 0.05$.

Table 2

Alexithymia and Professional QoL scores for the RO, RTT, and MP professionals who fully completed the online survey ($N = 1535$). Mean (SD) or percentage, ANOVA (F) or chi-squared (χ^2) test are listed.

	RO Group ($N = 828$)	RTT Group ($N = 399$)	MP Group ($N = 308$)	Test (df)	p
<i>Alexithymia</i>					
TAS-20 DIF	15.51 (5.61)	15.72 (5.02)	16.04 (5.78)	$F(2, 1532) = 1.037$	0.355
TAS-20 DDF	12.08 (3.60)	11.98 (3.47)	12.81 (3.76) ^a	$F(2, 1532) = 5.454$	0.004*
TAS-20 EOT	19.82 (3.89)	19.63 (3.58)	19.29 (3.56)	$F(2, 1532) = 2.324$	0.098
TAS- 20 Total	47.42 (10.93)	47.33 (9.63)	48.13 (10.21)	$F(2, 745.35) = 0.669$	0.513
<i>Non alexithymic</i>	561 (67.8%)	278 (69.7%)	202 (65.6%)	$\chi^2(4) = 2.355$	0.671
<i>Borderline</i>	160 (19.3%)	79 (19.8%)	64 (20.8%)		
<i>Alexithymic</i>	107 (12.9%)	42 (10.5%)	42 (13.6%)		
<i>Professional QoL</i>					
ProQoL CSS	37.96 (5.90)	38.16 (5.93)	36.59 (5.69) ^a	$F(2, 1532) = 7.498$	0.001*
Low	218 (26.3%)	105 (26.3%)	93 (30.2%)	$\chi^2(4) = 10.627$	0.031
Average	377 (45.5%)	172 (43.1%)	153 (49.7%)		
High	233 (28.1%)	122 (30.6%)	62 (20.1%)		
ProQoL BS	25.58 (5.61)	24.51 (5.73) ^b	26.10 (5.49)	$F(2, 1532) = 7.886$	<0.001*
Low	208 (25.1%)	135 (33.8%)	64 (20.8%)	$\chi^2(4) = 18.010$	0.001
Average	364 (44.0%)	162 (40.6%)	151 (49.0%)		
High	256 (30.9%)	102 (25.6%)	93 (30.2%)		
ProQoL STSS	24.13 (6.00) ^c	23.01 (5.66)	21.81 (5.79)	$F(2, 1532) = 18.632$	<0.001*
Low	151 (18.2%)	91 (22.8%)	98 (31.8%)	$\chi^2(4) = 31.145$	<0.001
Average	410 (49.5)	212 (53.1%)	139 (45.1%)		
High	267 (32.2%)	96 (24.1%)	71 (23.1%)		

RO: Radiation Oncologists; RTT: Radiotherapy Technologists; MP: Medical Physicists; TAS-20: Twenty-item Toronto Alexithymia Scale; TAS-20 DIF: Difficulty identifying feelings subscale of the Toronto Alexithymia Scale; TAS-20 DDF: Difficulty describing feeling subscale of the Toronto Alexithymia Scale; TAS-20 EOT: Externally oriented thinking subscale of the Toronto Alexithymia Scale; ProQoL CSS: Compassion Satisfaction Scale of the Professional Quality of Life Scale; ProQoL BS: Burnout Scale of the Professional Quality of Life Scale; ProQoL STSS: Secondary Traumatic Stress Scale of the Professional Quality of Life Scale. 'Low' and 'High' refer to a score below the 25th percentile or above the 75th percentile, respectively, whereas 'Average' includes the intermediate scores.

^a Significant difference: RO vs. MP, $p < 0.01$; RTT vs. MP, $p < 0.01$.

^b Significant difference: RO vs. RTT, $p < 0.01$; RTT vs. MP, $p < 0.01$.

^c Significant difference: RO vs. RTT, $p < 0.01$; RO vs. MP, $p < 0.01$; RTT vs. MP, $p < 0.05$.

* Significant difference according to Bonferroni correction ($0.05/3 = 0.017$) for follow-up univariate ANOVAs.

$\eta^2 = 0.01$; ProQoL STSS, $p < 0.001$, partial $\eta^2 = 0.02$) were statistically significant different between the three groups, using a Bonferroni adjusted α level of 0.017. Particularly, regarding the ProQoL CSS, Tukey HSD post-hoc tests showed a statistically significant difference between the RO and MP groups (1.37, 95% CI (0.45 to 2.28), $p = 0.001$), and between the RTT and MP groups (1.57, 95% CI (0.52 to 2.61), $p = 0.001$). As far as the ProQoL BS is concerned, Tukey HSD post-hoc tests revealed a statistically significant differ-

ence between the RO and RTT groups (1.07, 95% CI (0.27 to 1.88), $p = 0.005$), and between the RTT and MP groups (-1.60, 95% CI (-2.59 to -0.60), $p = 0.001$). Finally, for the ProQoL STSS, Tukey HSD post-hoc tests showed a statistically significant difference between the RO and RTT groups (1.12, 95% CI (0.28 to 1.96), $p = 0.005$), between the RO and MP groups (2.33, 95% CI (1.41 to 3.24), $p < 0.001$), and between the RTT and MP groups (1.21, 95% CI (0.16 to 2.25), $p = 0.019$).

Profession, alexithymia, and professional QoL: moderation models

Three hierarchical multiple regression analyses were performed to examine whether adding the interaction terms (TAS-20 $\times$ Profession) to the regression models may act as a moderator of the relationship between alexithymia and the different dimensions of professional QoL. The full results of the three regression analyses are reported in Appendices A–C; the final models for each regression analysis are shown in Table 3.

Regarding the ProQoL STSS, the final model explained a significant amount (22%) of the secondary traumatic stress variance, $F(5, 1529) = 84.130, p < 0.001$. Significant predictors were found to be both profession (ROs vs. RTTs, $\beta = -0.081, p = 0.001$; ROs vs. MPs, $\beta = -0.167, p < 0.001$) and TAS-20 total score ($\beta = 0.472, p < 0.001$), as well as the interaction term (TAS-20 $\times$ ROs vs. MPs, $\beta = -0.063, p = 0.016$).

In order to examine better the moderation effect, the significant interaction was plotted, using the PROCESS macro 3.4 for SPSS. As shown in Fig. 1, the slope of the correlation curve is more pronounced for the RO group, suggesting that the level of alexithymia has a significantly higher impact on the ProQoL STSS scores for ROs compared to MPs.

For the other subscales of the ProQoL, no moderating effect of profession in the relationship between alexithymia and professional QoL was detected (Table 3).

Discussion

With the PRO BONO project, we investigated the professional QoL, including burnout, amongst radiation oncology professionals, focusing on its correlation with the personality constructs of alexithymia and empathy [3–5]. On a cross-sectional design, we provided data on more than 1500 professionals working in 94 countries as ROs, MPs and RTTs. In the present study, we compared the three dimensions of the professional well-being (compassion satisfaction, secondary traumatic stress and burnout), as assessed by the PROQoL scale, among the three professional profiles working in the field of radiation oncology.

The point-prevalence for burnout found in our study is in line with the literature data of professionals working in the field of clin-

ical oncology [12–14]. Nevertheless, differences were found, with respect to professional QoL, among the 3 professional profiles investigated. With respect to compassion satisfaction, MPs had a significantly higher proportion of respondents scoring below the 25th percentile (low level of satisfaction) and a lower proportion scoring above the 75th (high level of satisfaction). With respect to burnout, MPs were found to be not significantly different than ROs. Both had significantly lower proportions of respondents scoring below the 25th percentile (low level of burnout) and higher proportions scoring above the 75th (high level of burnout), compared to RTTs. However, unlike MPs, ROs had also a significantly higher proportion of respondents showing a high level and a lower proportion showing a low level of secondary traumatic stress symptoms, compared to MPs and RTTs.

In general, most of the professional distress experienced by healthcare providers involved in oncology is derived from the management of patients, including being confronted with death on a daily basis, taking critical decisions on treatment options crucial for therapeutic success and communicating proficiently with patients and caregivers [3]. This also applies to ROs, particularly involved in patient care, in which the high levels of secondary traumatic stress could account for the high levels of burnout. However, this is likely not the case for MPs, since they are to a far lesser extent involved in the face-to-face management of patients compared to ROs. Given the crucial role of MPs in treatment planning, together with careful control of delivery safety and global quality assurance of the radiotherapy processes, these professionals can often be exposed to consistent pressure from colleagues and supervisors with an effect on professional well-being. This pressure and workload may have been increased in the last decades due to the increasing complexity of radiotherapy treatment techniques and multimodal cancer care that introduced new challenges for radiation oncology professionals/MPs [4,15]. A recent study described a lower level of personal accomplishment for MPs in New Zealand, compared to other professionals having a higher level of patient contact [16]. Excessive workload, lack of recognition and lack of professional development opportunities were found to be significant risk factors for decreased professional QoL, together with organizational stressors, structural and environmental conditions (time and efficiency pressure, participation in decision-making,

Table 3

Final models of the hierarchical multiple regressions with Compassion Satisfaction (ProQoL CSS), Burnout (ProQoL BS), and Secondary Traumatic Stress (ProQoL STSS) as dependent variables and alexithymia as predictor variable, moderated by profession ($N = 1535$).

Predictor variables	B	β	t	R ²	F	ΔR^2	ΔF
<i>ProQoL CSS</i>				0.17	62.746**	0.001	0.744
ROs vs. RTTs	0.173	0.013	0.529				
ROs vs. MPs	-1.215	-0.083	-3.384**				
TAS 20 (Centred)	-0.219	-0.388	-12.793**				
TAS-20 (Centred) X ROs vs. RTTs	-0.036	-0.030	-1.100				
TAS-20 (Centred) X ROs vs. MPs	0.008	0.006	0.226				
<i>ProQoL BS</i>				0.29	125.174**	0.01	1.389
ROs vs. RTTs	-1.042	-0.081	-3.594**				
ROs vs. MPs	0.305	0.022	0.958				
TAS 20 (Centred)	0.269	0.498	17.752**				
TAS-20 (Centred) X ROs vs. RTTs	0.040	0.034	1.360				
TAS-20 (Centred) X ROs vs. MPs	0.039	0.032	1.281				
<i>ProQoL STSS</i>				0.22	84.130**	0.003	2.923
ROs vs. RTTs	-1.100	-0.081	-3.426**				
ROs vs. MPs	-2.469	-0.167	-7.016**				
TAS 20 (Centred)	0.268	0.472	16.003**				
TAS-20 (Centred) X ROs vs. RTTs	-0.026	-0.021	-0.801				
TAS-20 (Centred) X ROs vs. MPs	-0.082	-0.063	-2.411*				

ProQoL CSS: Compassion Satisfaction Scale of the Professional Quality of Life Scale; ProQoL BS: Burnout Scale of the Professional Quality of Life Scale; ProQoL STSS: Secondary Traumatic Stress Scale of the Professional Quality of Life Scale; RO: Radiation Oncologists; RTT: Radiotherapy Technologists; MP: Medical Physicists; TAS-20: Twenty-item Toronto Alexithymia Scale.

* $p < 0.05$.

** $p < 0.01$.

Fig. 1. Illustration for the moderation effect of group (Profession) in the relationship between alexithymia (TAS-20) and professional quality of life (ProQoL STSS).

professional autonomy, role conflicts) [17,18]. This provides evidence about the importance of this type of stressors in radiation oncology.

In line with previous studies on the general population [19,20], alexithymia was found to have a point prevalence ranging from 10.5% (for RTTs) to 13.6% (for ROs) in the cohort we analysed. Alexithymia is a dimensional trait that is normally distributed in the population and is slightly more prevalent in men [19,21]. This could partially explain the slightly lower prevalence in the RTT group compared to ROs and MPs, since RTTs had a higher proportion of female professionals (71.2% for RTTs vs 52.5% and 49.7% for ROs and MPs, respectively). The significant correlation between alexithymia and all three domains of professional QoL (compassion satisfaction, burnout and secondary traumatic stress) was confirmed within the whole cohort for the three professions (RO, MP and RTT) in the hierarchical multiple regression models, highlighting its important role in the modulation of well-being at work in the field of radiation oncology.

Since radiation oncology professionals are a heterogeneous group in terms of educational background, working duties, responsibility and exposure to patient's needs, we hypothesized a different effect of alexithymia on ProQoL according to the professional category. We hence proposed a moderation model to investigate the role of the profession as a moderator of the correlation between alexithymia and professional well-being. Profession had no role in moderating burnout or compassion satisfaction with respect to the level of alexithymia. This means that, even though the presence of alexithymia has a significant effect on both professional satisfaction and burnout, these effects are comparable between the 3 professional profiles, and therefore additional differences between the groups lies outside the mere presence of alexithymia. This further highlights the fact that professional satisfaction and burnout are multifactorial sets of instances pertinent to environmental and psychological aspects

of an individual at work and therefore deserve multifaceted considerations [22].

Conversely, the correlation between alexithymia and secondary traumatic stress was significantly moderated by the profession, with ROs exposed to a higher level of STS, the level of alexithymia being equal. STS is defined as the post-traumatic stress from which professionals dedicated to care may suffer due to the indirect exposure to others' trauma and is directly correlated to intensity and duration of exposure to working stressors [23,24]. It is made up of different dimensions including compassion fatigue, shattered assumptions and psychological symptoms [23]. Compassion fatigue, the emotional part of STS, is a state of emotional exhaustion resulting from continued exposure to compassion stress, which is highly prevalent in patient-centred environments such as those of radiation oncology. Shattered assumptions, the cognitive part of STS, refer to the way continuous exposure to traumatic events may shatter a person's assumptions, beliefs or values about the inner self and the external world [24]. Symptoms include those related to post-traumatic stress disorder, including intrusion (being disturbed by images, thoughts, memories related to the trauma), avoidance (behaviours aimed at escaping suffering and the trauma object) and arousal (excess energy caused by the anxiety response displayed towards the trauma object).

STS is correlated with physical and mental health and found to have a profound impact on job's performance [25]. ROs were found to be more prone to STS in case of alexithymia. This can be explained by the specific characteristics of the RO profession, which requires to a higher extent compared to technical professions, direct contact with both patients and caregivers and to be confronted with death and suffering on a daily basis. The diminished ability to accurately describe and express emotions, and the deficits in perception and cognitive interpretations of emotions of subjects with alexithymia is thought to impair the regulation of emotion in the interpersonal communication, hindering empathic

abilities and proficient interactions, and thus enhancing the emotional distress in the working environment and potentially impairing the doctor-patient relationship [21].

This study has also some limitations. First, cross-sectional studies do not allow certain conclusions about causal direction to be drawn. Secondly, the use of self-reported instruments might have led to underestimation of, for example, the presence of frank alexithymic traits in individuals falling into borderline cut-off scores. Longitudinal studies on radiation oncology professionals including performance-based instruments or structured interviews are needed to better clarify whether alexithymia significantly contributes to decreased professional QoL over time.

Despite these limitations, our results demonstrate the important contribution of alexithymia to decreased professional QoL amongst radiation oncology professionals. Profession had a moderator role on the correlation between alexithymia and STS, with ROs being at a higher risk than MPs and RTTs. Further, we demonstrated the relevant point prevalence of decreased well-being at work even for professional categories such as MP despite a supposedly lower chance to interact with patients and a more technical professional profile.

These findings call for action. Different mitigation strategies have already been proposed [26]. Some of them include organization-directed interventions and involve initiative for task restructuring, work evaluation and supervision, management support, communication training and counselling. Others are individual-directed interventions and comprise programs to enhance job competencies, to improve coping skills and resilience and to train in managing negative emotions [3].

The negative contribution of alexithymia in decreasing the professional QoL suggests that efforts should be made to teach radiation oncology professionals to work skilfully with emotions. Considering that alexithymia can be easily screened for, precocious identification of individuals at risk should be routinely performed. Emotional awareness should be incorporated into medical education, with specific programs focusing on emotional regulation strategies, emotional intelligence and tools to better deal with emotions including psychological training, mindfulness meditation and narrative medicine [22]. Radiation oncology professionals should not ignore, detach from nor distance from emotions, but learn to work with emotions. Periodically, focus groups on emotions and role playing could be implemented for radiation oncology professionals, in order to further prevent the risk of burnout.

However, our findings also underlined the importance of profession-targeted strategies. While ROs could benefit above all from emotion-focused interventions aimed at reducing the onset of secondary traumatic stress symptoms, different strategies could be applied for MPs. Indeed, organizational stressors, excessive workload and pressure, and lack of recognition were found to be the main significant risk factors for decreased professional satisfaction and increased risk of burnout amongst MPs [17,18]. A recent study investigated a new clinical role for MPs in direct patient care [27]. In this study, MPs routinely met with patients to take responsibility for the technical aspects surrounding patient care, explaining treatment planning, the delivery process and all technical questions regarding radiation therapy. This clinical trial showed that MPs can successfully be integrated into a new patient consultative role within the radiation oncology care team and that physicist-patient consults could decrease patient anxiety and increase patient satisfaction [27]. The direct management of patients could also increase the recognition and the level of compassion and professional satisfaction for MPs, and thus reducing their risk of burnout. At the same time, the decreased patient anxiety could have the indirect effect to reduce the emotional workload of ROs, with thus a beneficial effect on all radiation oncology professionals.

Conflict of interest

The authors disclose No conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radonc.2021.01.033>.

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