






## ORIGINAL ARTICLE

# Differences in functioning between young adults with cancer and older age groups: A cross-sectional study

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## Abstract

**Objective:** This study aimed to explore whether young adults with cancer have different functioning compared to older age groups with cancer.

**Methods:** This study is a cross-sectional study including 654 adults ( $\geq 18$  years) with cancer. Exposure was age groups categorised as (1) young adults ( $n = 121$ ) = 18–39 years; (2) middle-aged adults ( $n = 406$ ) = 40–64 years; and (3) older people ( $n = 127$ ) =  $\geq 65$  years. Outcomes were physical, role, social and cognitive functioning. Analyses consisted of linear regression models.

**Results:** Middle-aged adults had a statistically significant worse physical functioning compared to young adults ( $-3.90$ : [95% CI:  $-6.84$ ;  $-0.95$ ]). The older age group also had a statistically significant worse physical functioning compared to young adults ( $-7.63$ : [95% CI:  $-11.29$ ;  $-3.96$ ]). Young adults had statistically significant lower role functioning ( $-7.11$ : [95% CI:  $-1.13$ ;  $-13.08$ ]) and cognitive functioning ( $-13.82$ : [95% CI:  $-7.35$ ;  $-20.29$ ]) compared to the older age group. There was no statistically significant difference in social functioning between the age groups.

**Conclusion:** Young adults with cancer seem to have other functioning problems compared with higher age groups. These findings support current research regarding the need to develop age-specific and appropriate rehabilitation services for young adults with cancer.

## KEYWORDS

cancer, rehabilitation, the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire, the International Classification of Functioning, Disability and Health, young adults

## 1 | INTRODUCTION

Worldwide, approximately 1 million young adults aged 18 to 39 are diagnosed annually with cancer (Barr, 2011; Fidler et al., 2017). A

growing body of literature shows that young adults with cancer are prone to have activity limitations and participation restrictions (Hauken et al., 2015; Kræftens Bekæmpelse, 2015; Odo & Potter, 2009; Sodergren, Husson, Rohde, Tomaszewska, Griffiths,

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et al., 2018; Sodergren, Husson, Rohde, Tomaszewska, Vivat, et al., 2018; Tanner et al., 2020); yet, more knowledge is needed regarding which activity and participation domains are affected.

The International Classification of Functioning, Disability and Health (ICF) is a framework providing a common understanding of health, functioning and disability (World Health Organization [WHO], 2002). The ICF is a biopsychosocial model describing that functioning is related to body functions and structure, as well as activity and participation. Personal and environmental factors together with the health condition impact functioning (WHO, 2002). The European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ C-30) is a highly used instrument in cancer rehabilitation to assess functioning (Aaronson et al., 1993) and hence also assess activity limitations and participation restrictions in the following function scales: physical, social, role and cognitive (Letellier et al., 2015).

It is well known that participation in work, education and other activities influences how people develop their identity and roles in life (Maersk et al., 2019; Stone et al., 2017). This may also affect their capacity for socialising with other people and belonging to communities (Maersk et al., 2019; Stone et al., 2017). A cancer diagnosis and the experience thereof may inhibit functioning and therefore have serious consequences for the activity and participation in everyday lives of young adults, which in turn may reduce their quality of life (Warner et al., 2016).

Improvements in cancer treatment have increased survivorship for most young adults (Barr et al., 2016). The treatment of young adults with cancer is, however, often more intrusive, multimodal and long-lasting than in older age groups because they are expected to tolerate stronger doses better (Coccia et al., 2018). This may cause long-term side effects that potentially may affect the young adults in re-establishing their everyday life (Warner et al., 2016). In addition, several studies show that people in older age groups with cancer are often more settled in their everyday lives and retain better coping strategies than younger people (Hernández et al., 2019; Marcum, 2013; Muñoz-Sánchez et al., 2018). Young adults with cancer may therefore be in a particularly exposed position because they are diagnosed during a period of their life in which they may be establishing relationships and a family, finishing their education or in the early stages of gaining employment (Geue et al., 2015; Quinn et al., 2015; Sodergren, Husson, Rohde, Tomaszewska, Vivat, et al., 2018; Warner et al., 2016). Because of where they are in life and in terms of development, young adults with cancer expectedly have needs and face problems that are different to those in older age groups with cancer (Kim et al., 2016). Although some studies have pointed to young adults with cancer as a population with special needs related to their life phase (Kim et al., 2016; Rabin et al., 2013), so far, no previous study has investigated if physical, social, role and cognitive function among young adults with cancer are different compared to people with cancer in older age groups.

To provide age-specific and appropriate rehabilitation to young adults with cancer and optimise their chances for the continuing

development of adult life roles, relationships and obligations in society, it is necessary to investigate the possible differences in functioning between the age groups (Rabin et al., 2013). The present study aims to examine which kind of functioning problems young adults with cancer report and whether these are different compared to those in older age groups with cancer.

## 2 | METHODS

### 2.1 | Study design and setting

This cross-sectional study was conducted at REHPA, the Danish Knowledge Centre for Rehabilitation and Palliative Care. REHPA shares and contributes to knowledge within the field of rehabilitation and palliative care for people suffering from life-threatening diseases in Denmark (REHPA, 2020). The present study is reported according to the principles of Strengthening the Reporting of Observational Studies in Epidemiology (von Elm et al., 2008). According to the Regional Committee on Health Research Ethics for Southern Denmark, the present study was not notifiable. The Danish Data Protection Agency approved the collection (18/27843). The participants received verbal and written information about the study procedures, and both verbal and written consents were obtained.

### 2.2 | Participants

Included participants were those who had attended residential stays at REHPA from 2017 to 2020. The residential stays included workshops with a focus on physical training, symptoms, mindfulness, motivation, sexuality and existential needs. Participants were included based on the following criteria: (1) adults with cancer ( $\geq 18$  years); (2) reported a need for rehabilitation; and (3) had sufficient Danish skills to fill out questionnaires and participate in interviews. Although they had a rehabilitation need, they were required to manage self-care independently. The participants had to be referred by their general practitioner or by a doctor at the hospital.

### 2.3 | Data collection

Data were extracted from a clinical research database established by REHPA. Only baseline data were used, that is, prior to the participants who entered the residential stay at REHPA. The data from the clinical database are used for quality development and for research purposes. Both demographic and standardised questionnaires were included in the database. One of the questionnaires is the EORTC QLQ C-30, which is a cancer-specific questionnaire composed of both functioning, health-related quality of life and symptoms scales (Aaronson et al., 1993). The clinical database has been described in detail elsewhere (REHPA, 2020).

## 2.4 | Variables

### 2.4.1 | Outcome

The outcomes were assessed using the EORTC QLQ C-30 (Aaronson et al., 1993). Four functional scales assessing activity limitations and participation restrictions were included in the present study: physical functioning, social functioning, role functioning and cognitive functioning (Letellier et al., 2015; WHO, 2002). Both the functioning and the symptoms scales range in scores from 0 to 100 (Fayers et al., 2001). Higher scores represent higher levels of functioning or higher levels of symptoms (Fayers et al., 2001). Differences of 10 points are considered clinically important (Osoba et al., 1998). A study by Johnsen et al. (2009) has suggested the following categorisation of the functioning scores:  $\leq 33.3$  corresponds to having severe problems,  $\leq 66.7$  equals moderate problems and  $> 66.7$  equals having minor or no problems. The EORTC QLQ C-30 is a validated and reliable instrument in people with cancer (Aaronson et al., 1993).

### 2.4.2 | Descriptive data

Included demographic and clinical data were age, gender, in a relationship, living alone, employment status and cancer diagnosis. In addition, pain, fatigue, nausea/vomiting, dyspnoea, insomnia, appetite, constipation and diarrhoea were also included from the EORTC QLQ C-30 (Aaronson et al., 1993).

## 2.5 | Statistical analysis

Normally distributed continuous data were presented using mean value and standard deviation (SD). Categorical data were presented by means of frequencies and percentages. Univariate and multiple linear regression analyses were used to explore differences in age groups regarding the four outcomes, all entered as continuous variables: physical functioning, social functioning, role functioning and cognitive functioning. Age was categorised into three groups a priori based on current literature: (1) young adults with cancer = 18 to 39 years (Jørgensen et al., 2018); (2) middle-aged adults with cancer = 40 to 64 years; and (3) older people with cancer =  $\geq 65$  years (Mols et al., 2018). The age range of young adults is not consistently defined in the literature (Richter et al., 2015), but they are generally individuals aged between 15 and 39 years (Richter et al., 2015). We defined young adults as between 18 and 39 years as you are legally adult at this age, and REHPA only included participants from 18 years of age. Furthermore, in Denmark, older people are often defined as  $\geq 65$  years where they often are retired from the workforce (Sundhedsstyrelsen, 2019). Analyses were performed with and without adjusting for the most common and important confounders according to the literature: gender (Liang et al., 2008), living

alone (Lim & Kua, 2011) and pain (Gauthier et al., 2018; Rustøen et al., 2005). Living alone was dichotomised into yes/no, while pain was dichotomised into no pain ( $\leq 33.3$ ) and pain ( $> 33.3$ ) (Johnsen et al., 2009). Quantile-quantile (Q-Q) plots were used to test for model assumptions. The model assumptions were met, including normal distribution of residuals. Only complete cases regarding each of the four outcomes were included in the analyses. Estimates were presented with 95% confidence intervals (CIs). Analyses were performed using STATA 16. *p*-values below 0.05 were considered statistically significant.

## 3 | RESULTS

Two participants were excluded because of several missing answers in the outcome measures. The final eligible sample consisted of 654 participants.

### 3.1 | Descriptive data

The distribution of the socio-demographic and clinical characteristics for each age group is presented in Table 1. Young adults had a mean age of 32.1 years (SD = 5.1), while middle-aged adults had a mean age of 53.4 years (SD = 6.8), and mean age for older people was 71.1 years (SD = 4.8). There was a minority of men represented in this study (18.8%). Most of the participants were in a relationship (62.5%). Overall, 33.6% of the participants were on sick leave, 27.5% were retired and only 4.8% were working full time.

Table 2 presents the functioning scores for each age group and their degree of problems. The mean functioning scores were relatively high in all age groups, particularly for physical functioning. Most of the age groups reported no problems with physical functioning, and they typically had moderate problems across the remaining domains. Very few participants had severe problems (see Table 2).

### 3.2 | Main results

The regression analyses show that middle-aged adults and older people had statistically significant worse physical functioning compared to young adults (middle-aged adults:  $-3.90$ : [95% CI:  $-6.84$ ;  $-0.95$ ];  $p = 0.009$ ; older people:  $-7.63$ : [95% CI:  $-11.29$ ;  $-3.96$ ];  $p = 0.000$ ). In contrast, young adults had statistically significant worse role functioning compared with the older people ( $7.11$ : [95% CI:  $1.13$ ;  $13.08$ ];  $p = 0.020$ ). The same is cognitive function where a clinically significant worse score was observed in cognitive functioning between young adults and older people, with a difference of  $> 10$  points ( $13.82$ : [95% CI:  $7.35$ ;  $20.29$ ];  $p = 0.000$ ). No other significant differences were found (Table 3).

**TABLE 1** Participant characteristics

	All participants (n = 654)	YAC (n = 121)	MAC (n = 406)	OPC (n = 127)
Age, mean (SD)	52.8 (13.5)	32.1 (5.1)	53.4 (6.8)	71.1 (4.8)
Woman, n (%)	524 (81.2)	99 (83.9)	346 (86.3)	79 (62.7)
Missing, n (%)	9 (1.4)	3 (2.5)	5 (1.2)	1 (0.8)
In a relationship, n (%)	387 (62.5)	67 (57.3)	247 (65.2)	73 (59.4)
Missing, n (%)	35 (5.4)	4 (3.3)	27 (6.7)	4 (3.1)
Living alone, n (%)	241 (37.1)	44 (36.4)	138 (34.2)	59 (46.8)
Missing, n (%)	4 (0.6)	0 (0.0)	3 (0.7)	1 (0.8)
Occupational status, n (%)				
Retired	177 (27.5)	13 <sup>a</sup> (10.9)	52 <sup>a</sup> (13.1)	112 (88.9)
Sick leave	216 (33.6)	44 (36.9)	170 (42.7)	2 (1.6)
Flexjob <sup>b</sup>	18 (2.8)	4 (3.4)	14 (3.5)	0 (0.0)
Unemployed	12 (1.9)	2 (1.7)	9 (2.3)	1 (0.8)
Working part time <sup>c</sup>	129 (20.1)	29 (24.4)	93 (23.4)	7 (5.6)
Working <sup>d</sup>	31 (4.8)	7 (5.9)	24 (6.0)	0 (0.0)
Studying	7 (1.1)	7 (5.9)	0 (0.0)	0 (0.0)
Other	53 (8.2)	13 (10.9)	36 (9.0)	4 (3.2)
Missing	11 (1.7)	2 (1.7)	8 (2.0)	1 (0.8)
Primary tumour site, n (%)				
Breast cancer	250 (42.9)	35 (35.5)	188 (50.3)	27 (24.5)
Haematological	75 (12.9)	24 (24.2)	32 (8.6)	19 (17.3)
Gastrointestinal	63 (10.8)	5 (5.1)	48 (12.8)	10 (9.1)
Gynaecological	60 (10.3)	12 (12.1)	37 (9.9)	11 (10.0)
Head and neck	51 (8.7)	11 (11.1)	26 (7.0)	14 (12.7)
Lung	34 (5.8)	3 (3.0)	20 (5.3)	11 (10.0)
Prostate and/or testicular	24 (4.1)	2 (2.0)	8 (2.1)	14 (12.7)
Skin cancer	7 (1.2)	3 (3.0)	3 (0.8)	1 (0.9)
Bladder and/or kidney cancer	7 (1.2)	0 (0.0)	5 (1.3)	2 (1.8)
Other	12 (2.1)	4 (4.0)	7 (1.9)	1 (0.9)
Missing, n (%)	71 (10.9)	22 (18.2)	32 (7.9)	17 (13.4)
EORTC QLQ C-30: Symptoms <sup>e</sup> , n <sup>f</sup> (%)				
Pain	423 (64.7)	67 (55.4)	268 (66.0)	88 (69.3)
Fatigue	574 (87.8)	110 (90.9)	355 (87.4)	109 (85.8)
Nausea/vomiting	81 (12.4)	17 (14.1)	40 (9.9)	24 (18.9)
Dyspnoea	336 (51.4)	48 (39.7)	205 (50.5)	83 (64.4)
Insomnia	531 (81.2)	92 (76)	344 (84.7)	95 (74.8)
Appetite	238 (36.4)	36 (29.8)	134 (33.0)	68 (53.5)
Constipation	259 (39.6)	50 (41.3)	149 (36.7)	60 (47.2)
Diarrhoea	270 (41.3)	49 (40.5)	158 (38.9)	63 (49.6)

Abbreviations: EORTC QLQ C-30, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; MAC, middle-aged adults with cancer (40–64 years); OPC, older people with cancer (≥65 years); SD, standard deviation; YAC, young adults with cancer (18–39 years).

<sup>a</sup>Early retirement. In Denmark, it is possible to get an early retirement (monthly payment from the state) if you have a chronic disease that permanently affects your ability to work.

<sup>b</sup>Flexjob is a Danish labour market political initiative aimed to provide a job for citizens who are not able to perform an ordinary job and not sick enough to go into early retirement.

<sup>c</sup>Working part time: working under 37 h a week.

<sup>d</sup>Working: working full time which in Denmark is 37 h.

<sup>e</sup>For all symptoms, only one answer is missing.

<sup>f</sup>Number of participants experiencing symptoms according to Johnsen et al. (2009): Symptoms scores >33.3 = 'no symptom' and ≤33.3 = 'yes symptom' on the EORTC QLQ C-30.

**TABLE 2** EORTC QLQ C-30 functioning scores for each age group ( $n = 654$ )

Age groups	Physical functioning <sup>a</sup> Means (95% CI)	Social functioning <sup>a</sup> Means (95% CI)	Role functioning <sup>a,b</sup> Means (95% CI)	Cognitive functioning <sup>a</sup> Means (95% CI)
YAC	81.7 (79.3; 84.1)	64.9 (60.1; 69.7)	58.0 (53.5; 62.5)	56.7 (51.9; 61.5)
MAC	76.3 (74.8; 77.9)	62.8 (60.2; 65.4)	56.7 (54.3; 59.2)	57.2 (54.6; 59.8)
OPC	71.9 (69.0; 74.8)	65.7 (61.7; 69.8)	62.1 (57.8; 66.3)	69.7 (65.2; 74.1)
Age groups	Physical functioning	Social functioning	Role functioning	Cognitive functioning
YAC, $n$ (%)				
No problem	102 (84)	40 (33)	27 (22)	36 (30)
Moderate problem	18 (15)	58 (48)	61 (50)	47 (39)
Severe problem	1 (1)	23 (19)	33 (27)	38 (31)
MAC, $n$ (%)				
No problem	290 (71)	135 (33)	87 (21)	113 (28)
Moderate problem	109 (27)	168 (41)	190 (47)	179 (44)
Severe problem	7 (2)	103 (25)	128 (32)	114 (28)
OPC, $n$ (%)				
No problem	71 (56)	37 (29)	32 (25)	60 (47)
Moderate problem	51 (40)	66 (52)	62 (49)	49 (39)
Severe problem	5 (4)	24 (19)	33 (26)	18 (14)

Abbreviations: CI, confidence interval; EORTC QLQ C-30, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; MAC, middle-aged adults with cancer (40–64 years); OPC, older people with cancer ( $\geq 65$  years); YAC, young adults with cancer (18–39 years).

<sup>a</sup>Score ranges from 0 to 100; a higher score represents higher functioning.

<sup>b</sup>One missing answer. Functioning score:

$\leq 33.3$ : severe activity limitations and participation restrictions,  $\leq 66.7$ : moderate activity limitations and participation restrictions,  $> 66.7$ : no activity limitations and participation restrictions according to Johnsen et al. (2009).

**TABLE 3** Multiple linear regression analyses of the differences in functioning between the age groups

Age groups	Crude Physical functioning (95% CI) ( $n = 654$ )	Adjusted Physical functioning (95% CI) ( $n = 645$ ) <sup>b</sup>	$p$ -value	Crude Social functioning (95% CI) ( $n = 654$ )	Adjusted Social functioning (95% CI) ( $n = 645$ ) <sup>b</sup>	$p$ -value	Crude Role functioning (95% CI) ( $n = 653$ ) <sup>a</sup>	Adjusted Role functioning (95% CI) ( $n = 644$ ) <sup>a,b</sup>	$p$ -value
YAC	Ref	Ref		Ref	Ref		Ref	Ref	
MAC	-5.33 (-8.47; -2.18)	-3.90 (-6.84; -0.95)	0.009	-2.07 (-7.40; 3.27)	-1.14 (-6.28; 4.00)	0.664	-1.24 (-6.34; 3.87)	0.94 (-3.85; 5.74)	0.700
OPC	-9.75 (-13.61; -5.89)	-7.63 (-11.29; -3.96)	0.000	0.87 (-5.67; 7.42)	3.05 (-3.36; 9.45)	0.351	4.08 (-2.17; 10.34)	7.11 (1.13; 13.08)	0.020
Age groups	Crude Cognitive functioning (95% CI) ( $n = 654$ )	Adjusted Cognitive functioning (95% CI) ( $n = 645$ ) <sup>b</sup>	$p$ -value						
YAC	Ref	Ref							
MAC	0.43 (-4.90; 5.77)	1.25 (-3.94; 6.44)	0.636						
OPC	12.94 (6.39; 19.48)	13.82 (7.35; 20.29)	0.000						

Abbreviations: CI, confidence interval; MAC, middle-aged adults with cancer (40–64 years); OPC, older people with cancer ( $\geq 65$  years); YAC, young adults with cancer (18–39 years).

<sup>a</sup>One missing answer.

<sup>b</sup>Nine missing answers on the confounder of gender.

## 4 | DISCUSSION

This cross-sectional study adds to the existing evidence that shows that young adults have different problems and needs than other age groups with cancer. Our findings show different

patterns in functioning due to age. Cognitive functioning levels in younger adults were especially concerning. Hence, our findings support current research regarding the need to develop age-specific and appropriate rehabilitation services for young adults with cancer.

## 4.1 | Functioning between age groups

A meta-analysis by Quinten et al. (2015) and a cross-sectional study by Mols et al. (2018) found physical functioning to be worse with increasing age. This is consistent with the results of our study where the two older groups had a worse physical functioning compared with young adults. Both studies addressed cancer-specific diseases (melanoma and thyroid cancer) with age ranges (18–49 and 18–35 years) different from our study. The comparability between our study and the other studies is therefore questionable but still confirms our finding of older adults with cancer ( $\geq 65$  years) being more impaired in self-care and mobility (Mols et al., 2018; Quinten et al., 2015). Yet, our findings were not clinically relevant, which is important to bear in mind. We found no other differences between young adults with cancer and middle-aged adults with cancer. An explanation could be that the two groups were too comparable to be able to detect any differences. This assumption is supported by the overall largely identical socio-demographic data profile in the two groups. Most of the young adults also had an age close to 40 years. The cross-sectional study by Mols et al. (2018) also found the two youngest groups (18–35 and 36–64 years) to be more homogeneous compared with the oldest group ( $\geq 65$  years). It is therefore not unanticipated that the greatest heterogeneity in our study existed between young adults with cancer and older people with cancer. However, there were some differences in symptom scores between the age groups. Despite these differences, it may not have been an important factor in terms of explaining the differences in functioning between the age groups. A previous study indicates that symptoms are not associated with functioning (Sampedro Pilegaard et al., 2020). Another finding from our study was that young adults with cancer reported worse role functioning compared with older people with cancer. If impairments affect the ability to participate in everyday life, or external factors create circumstances that prevent participation, then identity may be threatened (Kielhofner, 2008). This is particularly problematic for young adults with cancer, for whom life roles and development of identity primarily lie within work, education and leisure time, and for whom being less able to participate in these activities is associated with decreased health (Odo & Potter, 2009; Smith et al., 2013; Sodergren, Husson, Rohde, Tomaszewska, Vivat, et al., 2018). Besides the difference in role functioning between young adults and older people with cancer, there were also differences in cognitive functioning. This is an important finding, as the difference between young adults and older people with cancer was clinically relevant, albeit the 95% CI also shows that it could have been the opposite. Nevertheless, it calls for an increased focus on cognitive functioning when providing rehabilitation for young adults with cancer. This is also illustrated in an exploratory study by Sodergren, Husson, Rohde, Tomaszewska, Griffiths, et al. (2018) where young adults with cancer aged 18–25 reported difficulties with concentrating when engaging in daily activities because they worried too much about being sick and how it would interfere with their future life plans. Generally, older people with cancer experience less psychological distress after diagnosis, enabling them to better adapt to their decreased functioning compared with young adults with

cancer (Muñoz-Sánchez et al., 2018). It is somewhat surprising that no differences were found in social functioning between the three age groups, especially as previous research shows that young adults with cancer have difficulties with social relations after receiving invasive and long-term cancer treatment (Quinten et al., 2015; Warner et al., 2016).

## 4.2 | Focus of rehabilitation for young adults with cancer

Current rehabilitation research for young adults with cancer has paid more attention to the effect of exercise to improve physical function than it has to facilitate other aspects of everyday life (Richter et al., 2015; Wurz & Brunet, 2019); yet a growing body of evidence shows that young adults with cancer still have difficulties and unmet needs with activities and participation in everyday life (Hauken et al., 2014; Richter et al., 2015; Warner et al., 2016). Hence, to provide appropriate rehabilitation for young adults with cancer that they find relevant and meaningful, the intervention focus must target their specific needs and problems. Our findings suggest that there may be a difference in cognitive and role function between young adults and older age groups with cancer. These findings confirm existing research regarding that young adults differ markedly from other cancer age groups (Kim et al., 2016; Rabin et al., 2013) and, thus, support the need to develop an age-specific and appropriate rehabilitation programme for young adults with cancer (Broholm-Jørgensen et al., 2022; Rabin et al., 2013). Our findings may indicate that future rehabilitation interventions should include components that address psychosocial aspects of everyday life like participation in education, work and leisure activities. Furthermore, in recognition of their decreased cognitive functioning, future rehabilitation interventions should try to support their general concentration, which is an important aspect of cognitive functioning in regard to their ability to work and to finish their education. A study by Hauken et al. (2014) emphasises the importance of including components focusing on work/school and leisure activities when developing interventions for young adults with cancer. The study also reports that young adults with cancer benefit from a goal-oriented and multicomponent intervention with physical activity, psycho-education, peer-to-peer support and continuous follow-up on goal-setting in order to increase participation (Hauken et al., 2014). However, more research is needed. Future research should synthesise existing scientific evidence and identify patient preferences and clinical knowledge informing the content of an age-specific and appropriate rehabilitation programme for this group of people. This kind of knowledge is important to develop an evidence-based rehabilitation programme for young adults with cancer.

## 4.3 | Methodological considerations

Although few participants had missing values in the outcome measures in the EORTC QLQ C-30, there are some methodological



considerations that need to be addressed in our study. First, the age range represented in the literature emphasises inconsistencies in how to define young adults from middle-aged adults and adolescence (Alliance, 2006; Geue et al., 2019; Sodergren, Husson, Rohde, Tomaszewska, Griffiths, et al., 2018). It is worth considering whether a narrower age range would better reflect the specific needs related to each stage of life (Quinn et al., 2015; Sodergren, Husson, Rohde, Tomaszewska, Griffiths, et al., 2018). Thus, it is questionable whether the age range of young adults chosen for this study captures the functioning problems reflected in both the youngest and the oldest participants of the young adults with cancer age group. Second, most of the participants in this study were women between 40 and 64 years with breast cancer who were well functioning, which affect the representativeness of the study sample. On the other hand, the study had a relatively large group of young adults with cancer, which provide diversity to some extent. Only participants who were able to manage self-care independently were offered a residential stay at REHPA. These people may therefore tend to have better functioning compared with the wider population of people with cancer. This is also reflected in the functioning scores, where few participants reported severe problems. It is therefore likely that the results of this study are only representative of the better functioning people with cancer. To strengthen the generalizability to people with cancer, future studies should include people that are not able to manage self-care independently. For instance, future studies could use a standardised instrument to screen potential participants and, thus, also include those with decreased ability to manage self-care, which would ensure a better representativeness of the whole cancer population. Finally, we adjusted for some of the most important confounding factors according to the research literature (Gauthier et al., 2018; Liang et al., 2008; Lim & Kua, 2011; Rustøen et al., 2005), but it could have been relevant to adjust for others as well (Devins et al., 2006; Roick et al., 2019; Rowland & Bellizzi, 2014), including time since diagnosis, previous or current cancer treatment, other diagnoses and stage of disease. As the present study uses secondary data, it was not possible to include such data. The identified differences among the three groups may therefore not only be explained by age alone but may be caused by other confounding factors.

## 5 | CONCLUSION

Young adults with cancer seem to have other functioning problems compared with higher age groups. Particularly, they had problems with cognitive demanding tasks as well as general memory. These findings support current research regarding the need to develop age-specific and appropriate rehabilitation services for young adults with cancer.

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## CONFLICTS OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

## DATA AVAILABILITY STATEMENT

The data were stored in the Research Electronic Data Capture.

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