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Quality of Life Priorities of Childhood Acute Lymphoblastic Leukemia Survivors Enrolled in EORTC Studies, and a Comparison of Instruments

Jammbe Musoro[1] | Charlotte Sleurs[2,3] | Ali Rowsell[4] | Stefan Suciu[1] | Michal Kicinski[1] | Sofia Chantziara[4] |
Corneel Coens[1] | Madeline Pe[1] | Pierre Missotten[5] | Els Vandecruys[6] | Anne Uyttebroeck[7] | Marie-Françoise Dresse[8] |
Claire Pluchart[9] | Alina Ferster[10] | Claire Freycon[11] | Jutte Van Der Werff ten Bosch[12] | Pierre Rohrlich[13] |
Yves Benoit[6] | Caroline Piette[8] | Anne-Sophie Darlington[4] | On behalf of the European Organisation for Research and
Treatment of Cancer (EORTC) Quality of Life (QLG) and Children's Leukemia Group (CLG)

[1]European Organisation for Research and Treatment of Cancer (EORTC), Brussels, Belgium | [2]Department of Cognitive Neuropsychology, Tilburg University,
Tilburg, The Netherlands | [3]Department of Paediatric Oncology, KU Leuven, Leuven, Belgium | [4]Primary Care Research Centre, School of Primary Care,
Population Sciences and Medical Education, Faculty of Medicine, University of Southampton, Southampton, UK | [5]Unité de Psychologie de la Sénescence,
Université de Liège, Liège, Belgium | [6]Department of Pediatric Hemato-Oncology, Ghent University Hospital, Ghent, Belgium | [7]Department of Pediatric
Hemato-Oncology, University Hospital Leuven, Leuven, Belgium | [8]Division of Haematology-Oncology, Department of Paediatrics, University Hospital Liège
and University of Liège, Liège, Belgium | [9]Department of Pediatric Haematology and Oncology, CHU Reims, Reims, France | [10]Department of
Hemato-Oncology, HUDERF (ULB), Brussels, Belgium | [11]Department of Pediatric Hematology-Oncology, CHU Grenoble, Grenoble, France | [12]Department of
Pediatrics, UZ Brussel, Brussels, Belgium | [13]Pediatric Oncology, CHU Nice, Nice, France

Correspondence: Anne-Sophie Darlington (a.darlington@soton.ac.uk)

ABSTRACT

Purpose: Survivors of childhood cancer can suffer from long-term sequelae or decline in quality of life (QoL), for which careful and
standardized selection of outcome measures become more important. This study aims to assess different QoL-related outcomes
using three distinct questionnaires in an international study, identify the priorities of childhood ALL survivors via the administered
questionnaires, and investigate potential interrelationships among QoL domains across the questionnaires.

Methods: Childhood ALL survivors treated according to the EORTC CLG treatment protocols 58741, 58831/2, and 58881 were
recruited in Belgium and France and answered self-report QoL questionnaires, including the Short-Form Health Survey 12 (SF12),
the Quality-of-Life Systemic Inventory (QLSI), and the Impact of Cancer for Childhood Cancer Survivors (IOC-CS). To explore
which scales overlapped or were novel, Pearson correlations were used to explore associations. In addition, based on the QLSI,
we checked whether each of the top priorities of childhood ALL survivors were covered by the SF12 or IOC-CS, by mapping their
scales quantitatively and qualitatively.

Results: QoL data for 186 survivors were provided. Priority areas, as assessed by the QLSI, were vitality, physical abilities, memory, overall physical health, sleep, interaction with friends, love life. Love life was an important source of happiness (for 42%), and for some reported as the domain they were unhappiest in (13%). Quantitative mapping shows moderate correlations between the SF12 scales and IOC-CS scales: life challenges, body and health, thinking and memory, and socializing. Qualitative mapping highlighted additional important domains, specifically family, romantic and friendship relationships, and sleep and memory.

Conclusions: Our findings suggest that the measures complement each other, but are less valuable in isolation for ALL survivors. Using a cancer survivorship measure, combined with some additional items covering priorities might provide a more holistic picture.

1 | Introduction

Acute lymphoblastic leukemia (ALL) remains the most common childhood cancer worldwide, accounting for 25% of childhood cancers with survival rates high at 90% in high income countries [1]. Over the last four decades, with changing treatment regimens and improvements in the management of acute toxicities [2], childhood cancer survivors (CCS), including ALL survivors have seen better outcomes and survival [3].

CCS generally face different physical, psychological, and psychosocial problems, compared to patients in the acute treatment phase or shortly after treatment [4], and these can last well into adulthood [5–7]. Long-term impacts can include social or family relationship problems and serious psychological problems [8–11], including post-traumatic stress [8, 9, 11, 12] and depression [13, 14]. Childhood ALL survivors can also experience continued social and emotional problems well into adulthood [4, 15–17], as well as neurocognitive or academic deficits and behavioral problems [18]. Despite these problems, being a CCS can also have a positive impact on quality of life (QoL). More specifically, some studies, including our recent evaluation of QoL in ALL survivors enrolled in the European Organisation for Research and Treatment of Cancer (EORTC) Children Leukaemia Group (CLG) 58LAE study [19], have suggested survivors to achieve similar or better QoL outcomes compared to healthy peers [10, 12, 20–22]. Psychological adjustment could explain these results, including changes in self-perception, psychological growth, reassessing life priorities, future plans, health, career, and social relationships [12, 21]. In addition, we also showed that these long-term QoL outcomes can be related to specific patient characteristics, where younger (<6 years), female, and relapsed patients might specifically be at higher risk when it comes to self-reported psychological QoL [23]. On the other hand, long-term ALL survivors who were treated with cranial radiotherapy, hematopoietic stem cell transplantation (HSCT), and/or very young patients at diagnosis and during treatment might specifically be at risk for lower scores on physical QoL scales [24].

Even though it is important to address all existing complaints, questionnaires that focus on physical health and treatment-related symptoms only, often become less relevant for long-term survivors years after treatment (and acute toxicities). In addition, many generic QoL tools often lacked psycho-social, educational, and cognitive issues, more pertinent to long-term survivors, such as school and work performance, relationships, sexuality and fertility, and life goals [12]. Most of the existing health-related QoL (HRQoL) tools do not incorporate the assessment of which HRQoL domains are prioritized by CCS, or important to them, but rather focus on the level of problems. This has led to an increasing need for more critical considerations for selecting outcome measures that cover the needs of CCS. Especially given that QoL can be affected by the differences between where a survivor expected their life to be and their current life circumstances. In order to reach a good balance between limited burden of questionnaires against relevance and gathering crucial information that is most important to patients, the aim of the current study is to examine the domains being measured across three assessment tools in a large international study, explore the priorities of long-term ALL survivors based on the administered questionnaires, and seek for interrelatedness between QoL instruments.

2 | Method

2.1 | Design

The current QoL evaluation is part of the larger EORTC CLG 58LAE (late adverse effects) project (ClinicalTrials.gov Identifier NCT01298388), which investigated long-term outcomes after childhood ALL. Eligible patients where childhood ALL survivors (≥18 years) enrolled in Belgium and France as children (<18 years) in the EORTC CLG treatment protocols 58741 (1971–1978), 58831/2 (1983–1989), and 58881 (1989–1998) [25]. Eligible patients for the QoL evaluation were those who had previously completed a socio-economic questionnaire ($n = 507$). Of these, 183 responded (36.1%), with three additional patients providing QoL data but not socio-economic data, resulting in a total of 186 respondents. Details on how data were obtained, and description of study participants have been published elsewhere [19].

At the time of the enrollment in studies 58741, 58831/2, and 58881, informed consent was sought according to local practice of each participating center and in accordance with the Declaration of Helsinki. The EORTC study 58LAE was approved by the Ethical Committees of the participating institutions, and informed consent was obtained from all patients, in accordance with the applicable national legislation.

2.2 | Measures

During the 58LAE study, survivors were invited to complete three questionnaires: the "Short-Form Health Survey 12 (SF12)"

[26], the "Impact of Cancer for Childhood Cancer Survivors (IOC-CS)" [12], and the "Quality of Life Systemic Inventory (QLSI)" [27]. In terms of choice of measures, the SF12 and IOC-CS were selected because they are both widely validated tools used to assess the general impact of health on daily life and the impact of cancer on survivors, respectively. The IOC-CS was specifically developed to assess outcomes for survivors of childhood cancer. The QLSI, also widely used to assess life priorities in the general population, was included alongside SF12 in this project to enable comparisons in life priorities and levels of domain-specific satisfaction between survivors and healthy controls [19].

The SF12 [26], which is a shortened version of SF36, is a generic validated QoL tool, including 12 items, eight subscales: General Health, Physical Functioning, Bodily Pain, Role-Physical, Vitality, Social Functioning, Role-Emotional, and Mental Health; and two component scales: Physical Component Summary and Mental Component Summary [28]. The domains of SF12 were scored following the scoring method by Ware et al. [12, 29], with scores ranging from 0 (lowest health) to 100 (optimal health).

The IOC-CS is a validated disease-specific survivorship measure, which was translated from English to French and Dutch following the EORTC forward and back translation procedure [30]. It was designed specifically to assess long-term cancer survivorship issues. The IOC-CS consists of 45 items, which can be summarized into eight subscales: *Life Challenges, Body and Health, Talking with Parents, Personal Growth, Thinking and Memory Problems, Health Literacy, Socializing, and Financial Problems*. Subscales were scored by calculating the mean score (ranging from 1: "no impact of cancer" to 5: "a large impact of cancer") in respective subscales. For *Body and Health*, *Talking with Parents*, *Personal Growth*, *Socializing* and *Health Literacy* scales, higher mean scores represented a greater positive impact, while for *Life Challenges*, *Thinking and Memory Problems*, and *Financial Problems*, higher score values represented a greater negative impact.

The QLSI [27] has been described as a QoL measure, which measures goal attainment in areas of life priorities. Given the lack of validation in ALL patients and of scale measures, individual items were analysed. The instrument contains 28 items, each representing a life priority (covering 25 areas of life in total, see Table S1), where patients are asked to self-rate importance attached to each item. A score of "1" indicates the priority to be essential, whereas a score of "5" indicates the item not to be important to the patient. To assess which aspects of life are most important to survivors, they were also asked to select five of the 28 items they consider themselves "*the happiest*" about in their lives and five they consider themselves "*the unhappiest*" about in their lives. Finally, participants were also asked to identify five areas from the 28 items that are "*Most Positively Influenced*" and "*Most Negatively Influenced*" by having had cancer in their childhood. The term "priorities" will be used to refer to the rankings participants assign, and the choices they make in relation to both burden and importance of items.

2.3 | Analyses

2.3.1 | Identification of Survivors' Life Priorities as Assessed by the QLSI

Based on the QLSI, we report the top seven domains of life priority areas, which most respondents (i) considered as *high priority* domains (i.e., domains reported as *essential or very important)* (ii) considered themselves to be "*the happiest*" and "*the unhappiest*" about and (iii) considered as "*Most Positively Influenced*" and "*Most Negatively Influenced*" by their previous experience of having had cancer in their childhood. The reason to focus on the top seven domains for each of the categories only was to simplify the presentation of the results.

2.3.2 | Qualitative and Quantitative Mapping of the QLSI, SF12, and IOC-CS Content

Qualitative mapping: To assess whether important priorities of childhood ALL survivors were included in the SF12 and IOC-CS, we checked whether each of the top seven domains of the QLSI that were of *high priority* were covered by the SF12 or IOC-CS. The same kind of qualitative mapping was done for the top domains reaching the highest QLSI *(un)happiness* and *influence* ratings (ii and iii, respectively). Content-based mapping was based on collective expertise and knowledge of the authors to make a subjective assessment of where items and domains corresponded between measures.

Quantitative mapping: We investigated interrelatedness of the eight subscales of the IOC-CS with the eight subscales and two component scales of the SF12, using Pearson correlations. These were classified as negligible (<0.3), moderate ($0.30 \leq r < 0.45$), substantial ($0.45 \leq r < 0.6$), or high (≥ 0.6) [12]. Scales with negligible correlation values suggested domains to be relatively independent, whereas those with substantial to high correlations indicated possible overlap or interdependency.

3 | Results

3.1 | Participants

Of 1418 childhood ALL survivors who were eligible for the 58LAE project, 507 answered a socio-economic questionnaire and were therefore eligible for the QoL evaluation. A total of 183 responded (36.1%) and three additional patients provided QoL data, but no socio-economic data, which provided a total of 186 respondents for this evaluation. Out of the 186 ALL survivors who completed at least one of the three QoL questionnaires, 174 (93.5%) completed the SF12, with 163 (93.7%) answering all items and 11 (6.3%) leaving some items unanswered. For the IOC-CS, 142 (76.3%) survivors participated, with 115 (81%) completing all items and 27 (19%) having missing responses. Similarly, 143 (76.9%) survivors completed the QLSI, with 130 (90.9%) providing full responses and 13 (9.1%) having missing items. The median age of participants was 27.6 years (range: 18–52 years), and

TABLE 1 | Top 7 domains (assessed by the QLSI) reported by respondents as *essential* or *very important* (*high priority* domains).

Domains	*n* (%)
Vitality (having energy to do things)	118 (63.4)
Physical abilities (ability to walk, climb stairs, etc.) (↓)	115 (61.8)
Overall physical health (+/↑/↓)	114 (61.3)
Sleep (ability to sleep well) (−)	112 (60.2)
Interaction with your friends (+/↑)	106 (57.0)
Love life/emotional life/life as a couple (+/−) (signs of affection, understanding, communication)	105 (56.5)
Memory (ability to remember things to do, some words, past and future events, etc.) (↓)	104 (55.9)

Note: +/− indicates a domain that was also indicated as Happiest/Unhappiest about, respectively. ↑/↓ indicates a domain that was also indicated as Most Positively Influenced/Most Negatively Influenced by cancer experience, respectively.

109 (58.6%) women compared to 77 (41.4%) men completed the questionnaires. The majority of childhood ALL survivors (61.8%) were younger than 6 years old at diagnosis. The median time between diagnosis and completion of the questionnaires for the study was 20.5 years (range: 12–41 years). Details on the socio-demographic and clinical characteristics of the respondents have been previously published [19].

3.2 | Areas of Life Priorities of Survivors as Assessed by the QLSI

In Table 1, the top seven domains that were indicated by respondents as *high priority* domains are reported. Detailed proportions of respondents classifying a priority as "*high priority*" for each of the investigated QLSI domains are shown in Table S1.

An overview of the top domains that survivors were most (un-)happy about, and that were mostly influenced by the disease, are presented in detail in Table 2. Nearly all the domains identified as high priority by at least half of the patients (55.9% or more) in Table 1 also ranked among the top domains where patients felt either the happiest or unhappiest, or those most negatively or positively influenced by the disease, as shown in Table 2. More specifically, *Physical abilities* as well as *Overall physical health* were divergent, in the sense that patients could experience these domains as being positively as well as negatively influenced by the disease. However, this reporting of "largely influenced" was observed in a small minority of patients (max. 10.75%), while a larger proportion (i.e., 1/4) of patients were *Happiest* about their physical health (26.34%). Another important priority of patients was *Sleep*, which appeared to be a domain that about one in five patients were also *Unhappiest* about (18.28%).

Finally, regarding relationships, *Love life/emotional life/life as a couple* was indicated as a priority, which patients were also either *Happiest* or *Unhappiest* about, compared to other domains. Nevertheless, more patients were *Happiest* (42.47%) about this

domain rather than *Unhappiest* (13.33%). With regard to *Interaction with your friends* as a high priority, this domain appeared to be both "*Most Positively Influenced*" as well as a domain of which patients were most happy about.

3.3 | Qualitative Mapping of the QLSI, SF12, IOC-CS

When comparing the QLSI domains with the IOC-CS and SF12 instruments, some of the abovementioned life priorities were sufficiently addressed. *Physical abilities* (ability to walk, climb stairs, etc.), *Absence of physical pain*, *Vitality* (having energy to do things), and *Overall physical health* (QLSI) broadly matched with *Body and Health* scales (SF12 and IOC-CS). The content of the physical health items for the IOC-CS, focussed more on patient perceptions about body, health, diet, and well-being, covered in the IOC-CS subscale *Body and Health* (see Table 3 for items in this subscale).

Besides these domains that were addressed in SF12 and IOC-CS, some life priorities appear to be newly represented in the QLSI. Regarding socializing, domains of the IOC-CS include *Talking with Parents* and *Socializing* and the SF12 includes *Social Functioning*. However, the QLSI differentiates family, romantic and friendship relationships (see Table S1), of which the latter two were indicated as highest priorities. Furthermore, *Memory* and *Sleep* appeared as important priorities as well, which are not specifically addressed in the SF12 nor the IOC-CS.

Most of the SF12 scales showed moderate to substantial correlations with the life challenges, *Body and Health*, *Thinking and Memory Problems*, and *Socializing* scales of the IOC-CS (Table 3). The strongest correlation (0.6) was observed between the *General Health* scale of the SF12 and *Body and Health* scale of the IOC-CS. Negligible correlations were observed between all SF12 scales and three IOC-CS scales; *Talking with Parents*, *Personal Growth*, *Health Literacy*. These domains therefore seem to be unaddressed in SF12.

4 | Discussion

We aimed to explore QoL domains included by three different questionnaires to examine the domains of importance to long-term childhood ALL survivors. We conclude that overall, the measures complement each other, as no single measure individually covered all aspects of QoL. In addition, the IOC-CS and QLSI provided specific additional items shedding light on aspects of QoL, which might best provide a holistic picture of the issues faced by childhood ALL survivors.

Our exploration of priorities with the QLSI reported certain priorities in survivors' lives including: *Vitality, Physical abilities, Memory, Overall physical health, Sleep, Interaction with friends, Love life*. In addition, this questionnaire showed that survivors were *Happiest* regarding their *Love life, Interaction with family and Interaction with friends*, while they were *Unhappiest* regarding *Peace of mind, Self-esteem*, and *Financial matters*, but also *Love life* again.

TABLE 2 | An overview of the top items of areas of life priorities for ALL survivors as covered by QLSI (N = 186).

A: *Happiest domains* Domains in which respondents consider themselves as "the happiest"	n (%)	B: *Unhappiest domains* Domains in which respondents consider themselves as "the unhappiest"	n (%)	C: *Most Positively Influenced domains* Domains in which respondents consider as "most influenced" positively by having had cancer	n (%)	D: *Most Negatively Influenced domains* Domains in which respondents consider as "most influenced" negatively by having had cancer	n (%)
Love life/emotional life/life as a couple (signs of affection, understanding, communication)	79 (42.47)	Peace of mind (not being worried, anxious or preoccupied or upset)	40 (21.51)	Interaction with your family (parents, siblings, etc.)	43 (23.12)	Peace of mind (not being worried, anxious or preoccupied or upset)	37 (19.89)
Interaction with your family (parents, siblings, etc.)	69 (37.10)	Self-esteem (overall opinion of yourself)	35 (18.82)	Self-esteem (overall opinion of yourself)	26 (13.98)	Self-esteem (overall opinion of yourself)	22 (11.83)
Interaction with your friends	60 (32.26)	Financial matters (incomes, allowance, etc.)	35 (18.82)	Interaction with your friends	20 (10.75)	Overall physical health	20 (10.75)
Overall physical health	49 (26.34)	Sleep (ability to sleep well)	34 (18.28)	Overall physical health	17 (9.14)	Concentration and attention	18 (9.68)
Paid work	41 (22.04)	Concentration and attention	28 (18.28)	Morale	15 (8.06)	Physical abilities (ability to walk, climb stairs, etc.)	17 (9.14)
Interaction with your children	37 (19.89)	Upkeep of the house/flat	25 (13.44)	Interaction with your children	14 (7.53)	Memory (ability to remember things to do, some words, past and future events, etc.)	13 (6.99)
Where you live (home, neighborhood, surroundings, etc.)	37 (19.89)	Love life/emotional life/life as a couple (signs of affection, understanding, communication)	25 (13.44)	Spiritual, philosophical, or religious life	13 (6.99)	Spiritual, philosophical, or religious life	13 (6.99)

TABLE 3 | Pearson correlations between the subscale scores of the IOC-CS vs. SF12.

SF12 scales	IOC-CS scales							
	Life Challenges (−)	*Body and Health* (+)	*Talking with Parents* (+)	*Personal Growth* (+)	*Thinking and Memory Problems* (−)	*Health Literacy* (+)	*Socializing* (+)	*Financial Problems* (−)
Physical functioning	**−0.32**	**0.44**	0.18	−0.09	−0.22	0.12	**0.30**	−0.20
Role-Emotional	**−0.40**	**0.42**	0.17	−0.17	**−0.37**	0.21	0.29	**−0.30**
Bodily Pain	**−0.30**	**0.35**	0.24	−0.13	−0.27	0.18	**0.34**	−0.22
General Health	**−0.48**	**0.60**	0.29	−0.11	**−0.35**	0.27	**0.37**	−0.10
Vitality	−0.27	**0.37**	−0.02	−0.13	**−0.32**	0.04	0.18	−0.02
Social Functioning	**−0.50**	**0.47**	0.29	−0.12	**−0.41**	0.22	0.41	−0.27
Role-Physical	**−0.54**	**0.48**	0.29	−0.09	**−0.48**	0.19	**0.39**	−0.26
Mental Health	**−0.50**	**0.47**	0.21	−0.14	**−0.38**	0.20	**0.53**	−0.10
Physical Component Summary	−0.24	**0.36**	0.16	−0.12	−0.19	0.16	0.21	−0.20
Mental Component Summary	**−0.53**	**0.47**	0.22	−0.11	**−0.45**	0.17	**0.44**	−0.15

Note: Bold figures represent moderate ($0.30 \leq r < 0.45$) to substantial ($0.45 \leq r < 0.6$) correlations. For the IOC-CS, higher mean scores represent a greater positive impact (+) for Body and Health, Talking with Parents, Personal Growth, Socializing and Health Literacy scales, while for Life Challenge, Thinking and Memory Problems, and Financial Problems, higher score values represent a greater negative impact (−). For SF12, higher scores represent better health.

Based on the qualitative mapping, in which the domains across the three measures were assessed in terms of overlap and novelty, additional domains of importance to survivors were highlighted by the QLSI. Specifically family, romantic, and friendship relationships were remarkable domains, which aligns with previous literature that suggests CCS experience social and emotional problems well into adulthood [4, 5, 8, 16]. Similarly, *Sleep* and *Memory* were also highlighted as important, which are only limitedly addressed in general QoL measurements. Even though these domains received limited attention in existing quantitative QoL measurements, these daily life symptoms have both been related to general QoL in earlier target studies on both cognition [30–32] as well as sleep [33, 34]. Given that long-term survivors indicate these domains of high priority, these findings give insight into QoL domains of significance for those who have survived ALL some time ago, with a mix of focus on relationships, as well as a focus on longstanding physical manifestations of disease and treatment in problems with sleeping and memory.

The absence of *Intimate Relations*, or *Love Life/Life as a couple* from the IOC-CS and SF12 was notable. Given that *Love Life/Life as a couple* was an area of life that childhood ALL survivors were *Happiest* with based on the QLSI, this appears important and matches what we know about the re-prioritizing of social relationships for CCS. Our findings also affirm Zebrack and colleagues' reports that existing HRQoL measures do not adequately address many of the issues faced by long-term CCS, including relationships with family, friends, partners, sexuality, and fertility [12].

The correlation matrix between questionnaire subscales, assessing various constructs, indicates mainly convergent validity. Positive correlations between the positive directed scales of IOC-CS and SF12 suggest good convergent validity. Similarly, the negative directed scales of IOC-CS and positive scales of SF12 consistently exhibit negative correlations, reinforcing convergent trends. Notably, these correlations consistently align without unexpected reversals, affirming overall convergence. Most correlations between scales measuring different constructs were generally relatively low, with only 32 out of 80 correlations being moderate to substantial. These lower correlations may indicate potential divergent validity, highlighting the added value of specific IOC-CS subscales 35 that are not covered by the generic SF12 measure. Zebrack et al. focussed on concepts within domains specific to young adult survivors, based on the contemporary literature [12]. The IOC-CS *Life Challenges* and *Thinking and Memory Problems* domains showed a strong correlation with many of the SF12 scales and a particularly strong correlation with the *Mental Component Summary*. It is reasonable that there is an emotional, psychological aspect to *Life Challenges*. We observed a moderate association between *Life Challenges* and *Physical Functioning*, suggesting poorer *Physical Functioning* linked to more *Life Challenges*, which was stronger than previously reported by Zebrack et al. In addition, Zebrack et al. observed a stronger correlation between *Life Challenges* and *Vitality* (−0.40), suggesting lower overall *Vitality* when facing more *Life Challenges* [12]. Both of these findings could be linked to differences in time since diagnosis, with survivors having a longer time since diagnosis in our study (i.e., on average

20.5 years since diagnosis [range: 12.9–46 years] vs. 15.4 years [range: 2–37 years], respectively). Hence, *Physical Functioning* and *Vitality* distributions could change over time, resulting in different associations with *Life Challenges* impacting *Physical Functioning*.

The overall lack of strong correlations (i.e., ≥0.6) between scales on SF12 and IOC-CS was not surprising, as the IOC-CS was designed as a specific independent new tool. Results suggest that SF12 and IOC-CS complement each other, and that IOC-CS provides an additional layering of issues absent in SF12, showing that IOC-CS has the potential to provide information about issues faced by CCS not covered by the generic SF12. The IOC-CS subscales that potentially offer added value to SF12, indicating divergent validity, are Talking to Parents, Personal Growth, Health Literacy, and Financial Problems. Adequate measurement strategies for survivors are an evolving issue, as demonstrated by ongoing work of a cancer survivorship questionnaire by EORTC Quality of Life Group to address the lack of a comprehensive HRQoL measure for cancer survivors [35, 36]. Whilst combining measures might be seen as risking overburdening respondents, often for survivors, measurement of HRQoL is less frequently needed and therefore, the length of the measures or using a combination of measures is not likely to be experienced as onerous, especially if the questions are relevant to them.

One important limitation of our study is that we cannot exclude potential selection bias due to the relatively lower number of participants who completed QoL ($n = 186$) compared to all participants in the current study ($n = 507$). However, the distributions of demographic/clinical characteristics were compared between these two groups [19], as well as between the participants and patients who were either lost to follow-up or refused to participate in the current study [37]. These additional comparisons showed similar distributions in patient characteristics. Furthermore, the recruitment of participants exclusively from Belgium and France in this study may restrict the generalizability of the findings. Another limitation is that even though we assessed life priorities in addition to domain-specific satisfaction, the identified life priorities were limited to those measured with the QLSI questionnaire. Additionally, patients were not involved in the design or choice of measurements. Although the selection of QoL measures was based on earlier validation in (childhood) oncology, we cannot rule out that the selection of QoL measures used in this study may have influenced our results. This approach differs from a standard EORTC Quality of Life Group (QLG) measurement development phase I study, which identifies patient-relevant issues through literature review, interviews with patients, and healthcare professionals. It is important to highlight that work is ongoing within the EORTC QLG to understand QoL challenges faced by adolescents and young adults (AYA) with cancer, and children with cancer. The focus extends to understanding the domains crucial for the well-being of cancer survivors, both as AYA and survivors of childhood cancer, exploring both the commonalities and distinctions between these two groups. Finally, long-term health conditions that could have influenced QoL, such as relapse, endocrine disorders, and long-term neurotoxicity, were not recorded for the majority of patients [23, 38], making it challenging to assess their potential impact on our findings. Hence, the current study mainly provided new insights at group level. Future studies could incorporate individual risk factors and latent profile analyses, to further address underlying inter-subject variability in HRQoL priorities and levels of satisfaction.

5 | Conclusion

IOC-CS and QLSI independently provide important details to understand the priorities and HRQoL outcomes of long-term childhood ALL survivors. This confirms that existing HRQoL measures do not adequately address many important issues and that using a combination of measures might best provide a holistic picture of CCS needs. We suggest that using a cancer survivorship measure, such as the IOC-CS, combined with some additional items covering priorities identified in measure like the QLSI, might provide a more holistic picture of the priorities and QoL outcomes of long-term adult CCS. Whether this means combining two or three measures or the creation of a new measure for long-term survivors requires more research.

Ethics Statement

This study was performed in line with the principles of the Declaration of Helsinki. The EORTC study 58LAE was approved by the ethical committees of the participating institutions.

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.