








# A powerful safety net: Social support moderates the association of quality of life deficits with suicidal ideation in long-term childhood cancer survivors

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## ABSTRACT

**Objectives:** Cancer survivors are at risk for suicidality. We aimed to expand the knowledge about protective factors and their interplay with risk factors by testing social support as a modifier of the association of Quality of Life (QoL) deficits with suicidal ideation.

**Research approach:** We surveyed  $N=633$  childhood cancer survivors (CCS) using validated questionnaires (EORTC Core Quality of Life questionnaire QLQ-C30, Patient Health Questionnaire PHQ-9). The interaction of QoL and social support was investigated using multiple linear regression analysis.

**Findings:** CCS reporting suicide attempts and current suicidal ideation (SI) had lower QoL. CCS with SI reported less social support. QoL and social support were independently associated with SI and interacted: among CCS with less social support, low QoL was more strongly associated with SI.



**Conclusion:** The results highlight the need for interdisciplinary survivorship care, and to focus on risk and protective factors to strengthen suicide prevention.

## KEYWORDS

cancer survivorship; suicide; protective factors; risk factors; social support

## Introduction

Individuals affected by cancer, including long-term survivors, are at risk for a range of mental distress symptoms including suicidal thoughts and behaviors (STBs). Several large reviews and meta-analyses confirmed an increased

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risk of suicide death in both women and men with cancer.<sup>1</sup> Recently, Du et al.<sup>2</sup> pooled the findings of 36 original studies and reported an increased incidence of suicide deaths in cancer patients (39.72 per 100,000 person-years). A systematic review found that prevalence rates of suicidal ideation ranged widely, from 0.7% to 46.3%,<sup>3</sup> highlighting the substantial heterogeneity concerning STBs among cancer patients and survivors.

To foster prevention and intervention efforts, identifying the variables that shape these diverging outcomes is of fundamental importance. The most recent systematic reviews highlighted risk factors such as cancer stage/prognosis (with small to medium effects), participants' age (with small to medium effects) and other sociodemographic characteristics including socioeconomic status/employment (whose effects ranged from small to large).<sup>3,4</sup> Among illness-related factors including late effects, studies have shown the relevance of Quality of Life (QoL) deficits, for example, functional limitations, and mental distress variables for STBs, primarily (diagnoses of) depression.<sup>5</sup> Late effects, psychological health and financial burden were all found to aggravate acute suicidal ideation in a qualitative study of US-American childhood cancer survivors (CCS).<sup>6</sup>

However, these review articles also show several limitations of the current research landscape. First, the majority of the included studies focused on patients while investigations of long-term survivors were comparatively scarce. This is a research gap as, for example, adult survivors of childhood cancer are – decades after diagnosis and treatment – still more likely to report STBs than their peers or representative comparison samples.<sup>6,7</sup> For instance, in a recent registry-based investigation, 8% of CCS reported suicidal ideation as opposed to 6% of the matched representative comparison sample;<sup>8</sup> and 2.8% reported suicide attempts<sup>9</sup> as opposed to 1.9% in representative population studies.<sup>10</sup> Furthermore, for CCS, the disease and its treatment interfere with important developmental tasks, schooling and first friendships, which is why psychosocial late effects that also include loneliness and social isolation are particularly consequential for them.<sup>11,12</sup>

Second, studies investigating psychosocial factors as risk or protective factors of STBs in cancer patients and survivors were scarce.<sup>13</sup> This also constitutes an omission as experts posit that suicidal crises are intimately shaped by a person's subjective experience<sup>14</sup> and only indirectly by the characteristics of their illness. In terms of research designs, this means that psychosocial factors should be considered as a mediating or moderating factor, that is, a variable that modifies how a person's physical illness is linked with suicidal crises.<sup>15</sup> This notion fits with most current conceptualizations of suicide risk as the outcome of a complex interaction of biological, psychological, and social factors.<sup>16</sup> A comprehensive systematic review with meta-analysis showed that no single risk factor explained a satisfying proportion of variance in risk in the population or high-risk samples.<sup>17</sup> Still, the statistical modeling of interaction terms – that is, the

formal implementation of the conception that multiple risk and protective factors work together – is rarely implemented in research.

Lastly, suicide research, including in the context of (psycho-)oncology, has heavily focused on risk instead of protective factors.<sup>13,17</sup> After all, the absence of a risk factor (e.g. loneliness) does not automatically imply the presence and further-reaching positive effects of a protective factor of the same domain (e.g. feelings of connectedness, social support). Focusing on protective factors, including positive psychological perspectives, will help to move away from a deficit-oriented model of mental distress and toward resources to improve cancer survivors' mental health.<sup>18,19</sup>

Staying with the focus on psychosocial factors, studies have tested associations with difficult interpersonal relationships,<sup>20</sup> living alone, social isolation, and loneliness.<sup>9</sup> By comparison, a recent systematic review identified only twelve studies relating social support to cancer patients' suicidal ideation (yielding a small, heterogeneous effect),<sup>21</sup> with none of the studies including long-term CCS.

This work aimed to contribute to filling these research gaps by investigating social support as a protective factor among CCS. Previous research on STBs has shown that social relationships are of crucial importance and that their relevance extends into the context of childhood cancer survivorship.<sup>22,23</sup> Against this background, we assumed that social support might be particularly important for cancer survivors who are affected by late effects, such as physical illness, pain, mental distress, and functional limitations impairing independent living.<sup>24</sup> In previous investigations in CCS, late effects conferred an especially high risk of STBs.<sup>7,25</sup> At the same time, CCS face diverse social challenges (e.g. social isolation, difficulties making friends, experiences of social exclusion), so it is unclear whether survivors in need can rely on significant others.<sup>11,12</sup>

We chose to explicitly model the interaction of QoL deficits and social support as both aspects have been shown to be important, independent influencing factors of suicidal crises in cancer patients and survivors (as summarized above). Furthermore, the test of such a moderating effect is in keeping with the biopsychosocial model<sup>26</sup> of mental health and illness as well as modern, evidence-based models of suicide which posit the interaction of multiple risk/protective factors of different domains.<sup>16,27,28</sup>

The following hypotheses were tested:

1. Low QoL is an independent risk factor for suicidal ideation in CCS.
2. More social support is an independent protective factor for suicidal ideation in CCS.
3. QoL and social support interact in the statistical prediction of suicidal ideation: There is a moderation effect in the sense that among CCS with comparatively more social support, the association of low QoL and a higher frequency of suicidal ideation is weaker; and the association is stronger among CCS with comparatively less social support.

## Design/research approach

### Participants

CCS were recruited in cooperation with the German Childhood Cancer Registry (GCCR). The nationwide GCCR systematically documents patients with childhood cancer residing in Germany since 1980.<sup>29</sup> German CCS were eligible for participation if diagnosed with neoplasia according to the International Classification of Childhood Cancer (ICCC-3)<sup>30</sup> between 1980 and 1990 before the age of 15, if registered at the GCCR, and if they had received antineoplastic treatment at one of 34 participating pediatric cancer centers. Survivors of Hodgkin lymphoma and a small group of former nephroblastoma patients could not be enrolled as they had taken part in other trials. A total of 2,894 eligible survivors were invited to take part in the studies Cardiac and Vascular late Sequelae in long-term Survivors of Childhood Cancer (CVSS) (clinicaltrials.gov-nr.: NCT02181049) and Psychosocial long-term effects, health behavior, and prevention among long-term survivors of cancer in childhood and adolescence (PSYNA). This invitation was accepted by 1,002 CCS who were medically examined at the study center (between 2013/09 and 2016/02). After excluding 51 individuals due to subsequent malignant neoplasms, the baseline sample included 951 participants. A second assessment 1.5–2 years later (that reached  $N=633$  CCS) consisted of a computer-assisted personal interview (CAPI) on health status and medical history and mailed questionnaires concerning psychosocial aspects. As this was the only assessment that included the QoL- and social support measures, the present investigation relies on the data from this second assessment and employs a cross-sectional design. The study procedure and participants' characteristics including treatment-related information, diagnoses, and current medical data have been presented in more detail elsewhere.<sup>31</sup>

CVSS and PSYNA are carried out in accordance with the ethical standards of the institutional research committee (approved by the ethics review committee of Rhineland-Palatinate Chamber of Physicians, nr. 837.453.13(9138-F)) and with the Declaration of Helsinki. Participants gave written informed consent for study participation and data retrieval.

### Methods

*Sociodemographic information* including date of birth, sex/gender, level of education, and socioeconomic status (SES) was assessed via self-report as part of the CAPI at the study center. As part of this interview, participants were also asked about previous suicide attempts (lifetime). SES was modeled in line with the established procedure or large cohort studies (such as the Gutenberg Health Study (GHS) whose platform was used to conduct the study assessments). It followed an established procedure<sup>32</sup> and combined information about the level of education, income, and type of

profession, resulting in an aggregated index ranging from 3 – indicating the lowest possible SES – to 21 – indicating the highest possible SES.

CCS' *illness- and treatment-related information* was abstracted from primary health records of former treating medical centers and/or centrally documented individual therapy data available at the Society for Pediatric Oncology and Hematology's (GPOH) study centers. It was validated by trained medical staff.

*Quality of life* was assessed using the EORTC QLQ-C30.<sup>33</sup> It comprises 30 items (five functioning scales: physical, role, emotional, social, and cognitive; three symptom scales: fatigue, pain, nausea/vomiting; global health status/QoL scale comprising two items; single items dyspnea, appetite loss, insomnia, constipation, diarrhea, financial difficulties). In line with the manual,<sup>34</sup> scales and single items were transformed to range from 0 to 100. The sum score was calculated following Giesinger et al.,<sup>35</sup> Gundy et al.<sup>36</sup> as the mean of the five functioning scales and the symptom scales (excluding global QoL and financial difficulties). This operationalization was supported by psychometric investigations, including tests of internal consistency which yielded  $\alpha$  values above 0.7.<sup>37</sup>

*Social support* was captured by the six-item short version of the Perceived Social Support Questionnaire (F-SozUK-6; acronym for the German original title: Fragebogen zur Sozialen Unterstützung). It assesses the level of perceived social support using a 5-point Likert scale with the endpoints 1 (= not true at all) and 5 (= very true), an example item is: "There is someone very close to me whose help I can always count on." The sum score is calculated as the mean value of the single items.<sup>38</sup> The scale showed good internal consistency in the present sample ( $\omega = 0.84$ ).

Information about *suicidal ideation* was drawn from the Patient Health Questionnaire's depression module (PHQ-9). The PHQ-9 assesses the frequency of the nine diagnostic criteria of major depression over the past two weeks (0=not at all, 1=several days, 2=more than half the days, 3=nearly every day) and has shown good internal consistency ( $\alpha = 0.87$ ) in representative population samples.<sup>39</sup> The item assessing suicidal ideation is worded "How often have you been bothered by thoughts that you would be better off dead or of hurting yourself in some way?". It has been used both as a continuous value and in a binary fashion (0=not at all; 1=any frequency of suicidal ideation) and has shown its validity, for example, it outperformed the suicidal ideation item included in the Columbia Suicide Severity Rating Scale,<sup>40</sup> and it predicted suicide deaths<sup>41</sup> and attempts.<sup>42</sup>

### **Statistical procedure**

The interpretation of regression coefficients and effect sizes follows Cohen.<sup>43</sup> Analyses were conducted using R version 4.0.3 and the packages *lm.beta*, *lmtest*, *ggplot2*, *jplot*, and *interactions*. *P*-values denote two-tailed tests, with  $p < .05$  being considered statistically significant.

In addition to descriptive analyses and group comparisons (independent t-tests), we conducted multiple linear regression models of suicidal ideation; first, a base model to test the contribution of the single predictors alongside each other and second, to evaluate the main research question of whether social support modifies the association between QoL and suicidal ideation, we modeled the respective interaction term. Besides these main constructs of interest, we included participants' sex/gender, age at assessment and SES as adjustment variables as previous research has shown that these variables were associated with both QoL and suicide risk in cancer patients, survivors and other samples.<sup>16,44</sup> QoL and social support were both entered as the sum score of the respective instrument (EORTC QLQ-C30 and F-SozUK-6). The predictors were mean-centered before they were included in the interaction term, and a statistically significant interaction was further probed using the Johnson-Neyman procedure to identify regions of significance for the moderator variable.<sup>45</sup>

An a-priori sample size calculation showed that the sample was large enough for the planned linear regression analysis with six predictors to detect even medium effect sizes of  $f^2 = 0.15$  (assuming a probability level of 0.05 and a desired statistical power level of 0.8) as the minimum required sample size was estimated at  $N=97$ . Further, we calculated the variance inflation factor (VIF) which indicated no concerning levels of multicollinearity as all values were below 3 (with 10 being the critical threshold<sup>46</sup>)

Due to the small number of individuals reporting suicide attempts, we report associations of the constructs of interest with this variable only descriptively.

## Findings

### *Sample characteristics*

The total sample comprised  $N=633$  cancer survivors. At the time of the study assessment, they were  $M=34.92$  ( $SD=5.70$ ) years old and 44.4% ( $N=281$ ) of them were women. Their characteristics are presented in more detail in [Table 1](#).

Univariate comparisons showed that the 56 CCS (8.8% of the sample) who reported suicidal ideation (operationalized as the binary coding of the PHQ-9 item) reported both lower QoL ([Figure 1](#)) and less social support ([Figure 2](#)), with a smaller effect size for the latter difference.

We also conducted comparisons between individuals who reported previous suicide attempts ( $N=18$ ) and the rest of the sample. While the groups did not differ with respect to social support ( $p = .19$ ), those with a history of suicide attempts reported lower QoL ( $M=69.26$ ,  $SD=25.06$  vs.  $M=86.04$ ,  $SD=20.93$ ,  $t(602) = 3.33$ ,  $p = .001$ ,  $d=0.80$ ).

### **Multiple linear regression of suicidal ideation**

We first report on the base model that did not include an interaction term. Here, both QoL and social support had statistically significant associations with suicidal ideation: Both higher QoL and more social support were associated with lower levels of suicidal ideation. Age, sex/gender, and socioeconomic status played no significant role in the statistical prediction of suicidal ideation (Table 2).

### **Testing social support as a modifier of the association between QoL and suicidal ideation**

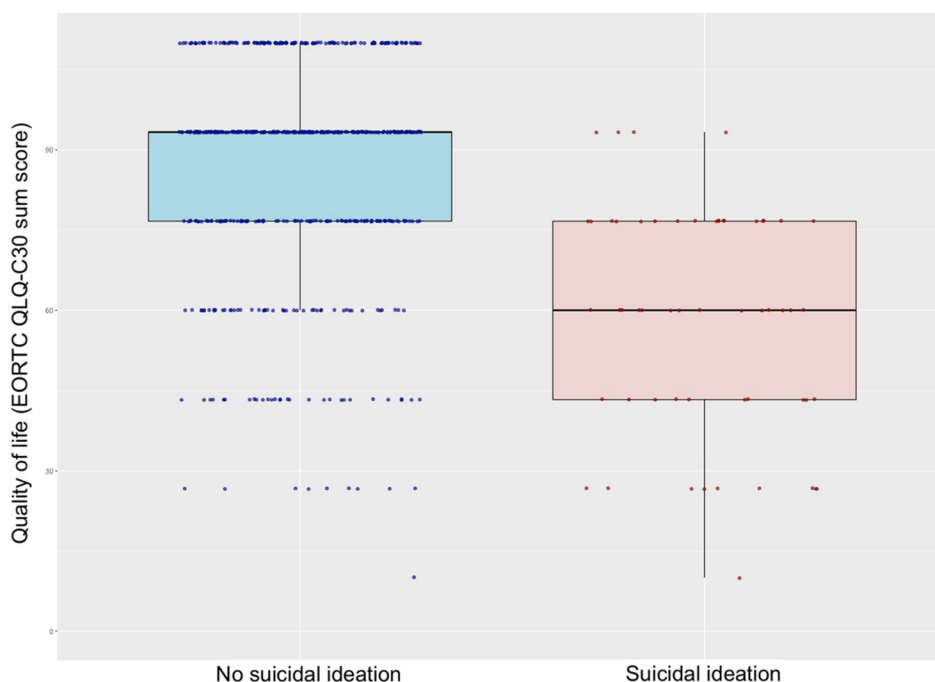
In the second multiple linear regression model that now included an interaction term (Table 3), again, both higher QoL and more social support were independently associated with a lower frequency of suicidal ideation. There was also a statistically significant interaction: Figure 3 shows how the level of social support modified the association of QoL and suicidal ideation in the direction that more social support buffered the effects of lower QoL on suicidal ideation.

To examine the validity of this observation more closely, we tested the statistical significance of the simple slopes, that is, the association of the predictor QoL with suicidal ideation at the different levels of the moderator variable social support. The tests supported the findings, in particular for the middle and lower ranges of social support. For values of social support one standard deviation below the sample mean (at 3.56), the association of QoL and suicidal ideation was  $B = -0.03$  [SE = 0.00],  $t = 10.07$ ,  $p < .001$ . At the sample mean (4.32), it was  $B = -0.01$  [SE = 0.00],  $t = 7.28$ ,  $p < .001$ . Values for social support one standard deviation above the sample mean (5.07) could not be interpreted in a meaningful way as they would have

**Table 1.** Sample characteristics.

	Childhood cancer survivors (N=633)
Sociodemographic characteristics	
Women (N, %)	281 (44.4)
Age at study assessment (M, SD)	34.92 (5.70)
High school education (N, %)	381 (60.2)
Socioeconomic status (M, SD)	13.26 (4.52)
Disease-related information	
Age at diagnosis (M, SD)	6.34 (4.38)
Diagnosis group (N, %)	
Leukemias	267 (42.2)
Lymphomas	64 (10.1)
CNS tumors	84 (13.3)
Others	218 (34.4)
Quality of life, social support and suicidal ideation	
Quality of life (EORTC QLQ-C30 sum score) (M, SD)	86.26 (14.25)
Social support (F-SozUK-6 sum score)-(M, SD)	4.32 (0.76)
Suicidal ideation-(PHQ-9 item) (M, SD)	0.11 (0.39)
History of suicide attempts (N, %)	18 (2.8)

Note: Table shows baseline data. CNS: central nervous system.



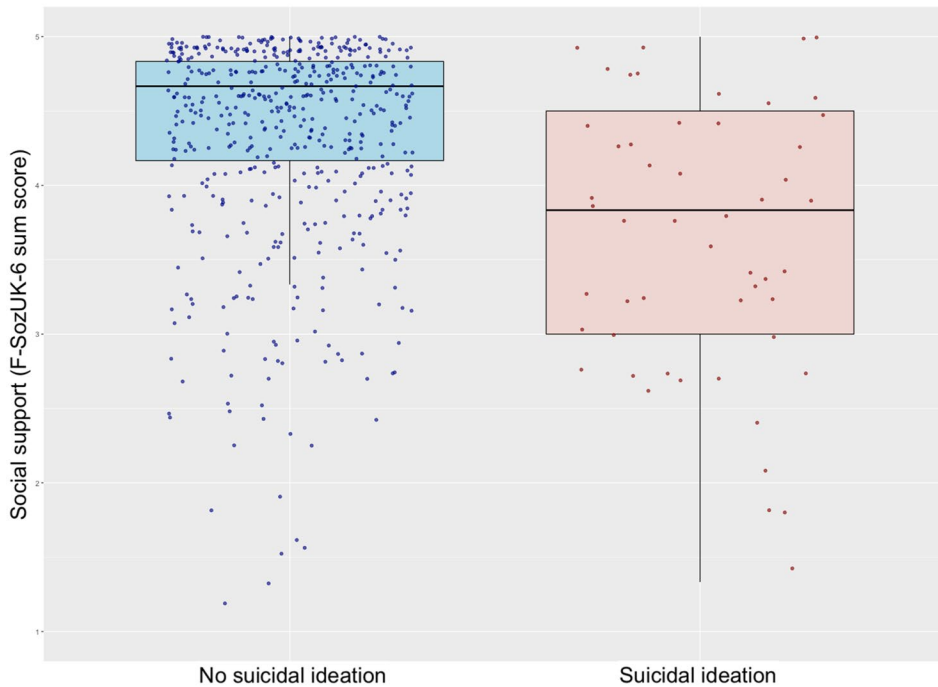
**Figure 1.** Comparison of individuals with and without current suicidal ideation concerning self-reported quality of life. A higher EORTC QLQ-C30 sum score (range: 0–100) indicates better overall quality of life. The group difference was statistically significant, with lower QoL among those with suicidal ideation ( $M=58.51$ ,  $SD=21.15$  vs.  $M=87.80$ ,  $SD=19.70$ ,  $t(629) = 10.55$ ,  $p < .001$ ,  $d=1.48$ ).

been higher than the possibly observable values of the questionnaire instrument (underscoring the generally high levels of social support reported by participants). Therefore, we calculated the value and significance of the predictor QoL at the highest observed value of the moderator (exactly 5); which yielded  $B = -0.01$  [ $SE = 0.00$ ],  $t = 7.20$ ,  $p < .001$ .

These results can be summarized as follows: In the context of more social support, QoL deficits are less relevant in the statistical prediction of suicidal ideation.

### Conclusions/interpretation

This work aimed to expand the knowledge about the interplay of risk and protective factors associated with suicidal ideation in long-term CCS. We focused on QoL deficits, comprising many common late effects, and social support. As previous research has highlighted cancer survivors' increased vulnerability, strengthening suicide prevention in this population is an important focus of research and practice alike.



**Figure 2.** Comparison of individuals with and without current suicidal ideation concerning self-reported social support. Higher values on the F-SozUK-6 (range: 1–5) indicate more social support. The group difference was statistically significant, with individuals with suicidal ideation reporting lower levels of social support ( $M=3.67$ ,  $SD=0.94$  vs.  $M=4.38$ ,  $SD=0.71$ ,  $t(629) = 6.83$ ,  $p < .001$ ,  $d=0.96$ ).

**Table 2.** Multiple linear regression of suicidal ideation.

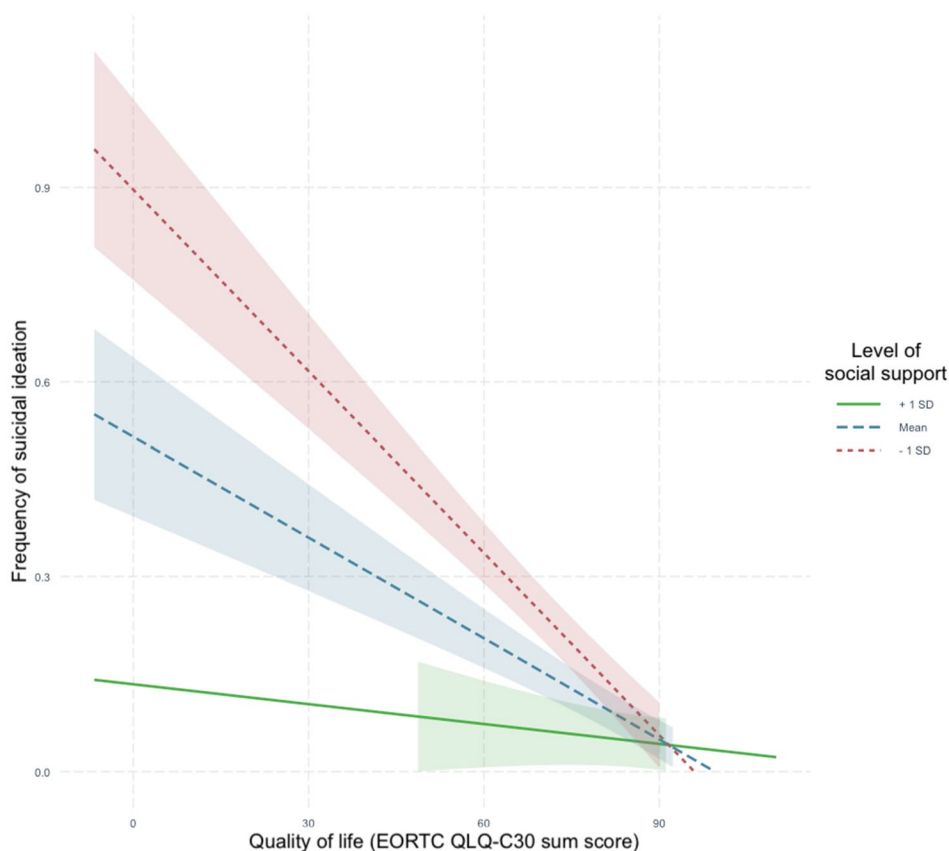
	<i>B</i> (SE)	$\beta$	<i>p</i>
Intercept	0.91 (0.14)		<b>&lt;.001</b>
Sex/gender	0.01 (0.03)	.01	.82
Age at assessment	0.00 (0.00)	.00	.74
Socioeconomic status	−0.00 (0.00)	−0.02	.64
QoL	−0.01 (0.00)	−0.30	<b>&lt;.001</b>
Social support	−0.08 (0.02)	−0.16	<b>&lt;.001</b>

Note. Sex/gender coded 0= male, 1= female. Model statistics:  $F(5, 614) = 23.71$ ,  $p < .001$ , adj.  $R^2 = .159$ . Statistically significant *p*-values are printed in bold.

**Table 3.** Multiple linear regression of suicidal ideation including the interaction of QoL and social support.

	<i>B</i> (SE)	$\beta$	<i>p</i>
Intercept	2.70 (2.95)		<b>&lt;.001</b>
Sex/gender	0.00 (0.03)	.00	0.99
Age at assessment	0.00 (0.00)	.00	0.99
Socioeconomic status	0.00 (0.00)	−0.01	0.79
QoL	−0.03 (0.00)	−1.58	<b>&lt;.001</b>
Social support	−0.50 (0.07)	−0.97	<b>&lt;.001</b>
QoL × social support	0.01 (0.00)	1.77	<b>&lt;.001</b>

Note. Sex/gender coded 0= male, 1= female. Model statistics:  $F(6, 613) = 28.62$ ,  $p < .001$ , adj.  $R^2 = .211$ .



**Figure 3.** Visualization of the interaction of quality of life and social support in the statistical prediction of suicidal ideation. The figure depicts the association of QoL (EORTC QLQ-C30 sum score, with higher values indicating better QoL) and social support (F-SozUK-6 sum score, with higher values indicating more social support). The blue line shows the association between QoL and suicidal ideation at the sample mean level of social support, the red line shows the association at one standard deviation below the sample mean level of social support, and the green line shows what the association would be for one standard deviation above the sample mean level of social support (which is an extrapolation). Shading indicates 95% confidence intervals. Significance tests of the simple slopes at different levels of the moderator variable confirmed statistical significance for the sample mean value and one standard deviation below.

Within the present sample, using a binary coding of the PHQ-9 item, the prevalence of suicidal ideation was 8.8% which is comparable to a previous investigation of a larger sample ( $N=2,968$ ) drawn from the Childhood Cancer Survivor Study: Recklitis et al.<sup>7</sup> had included CCS' siblings as a comparison sample and found that the rates of suicidal ideation were elevated among CCS (7.8% vs. 4.6%); which was in line with results from Germany<sup>8</sup> and previous findings from the US.<sup>6,25</sup> The prevalence of 2.8% of lifetime suicide attempts in the present sample also appears to be higher than among other, non-cancer-survivor-groups: By comparison, only 1.8% of a recently drawn representative sample of the German population

reported lifetime suicide attempts, and this sample included the whole age range up to over 90 years.<sup>10</sup> We are not aware of studies on CCS reporting on lifetime suicide attempts, but concerning suicidal behavior in the last year, a report from the St. Jude Lifetime Cohort study found lower rates among CCS than in the general population.<sup>6</sup>

Research has shown that even for individuals whose disease and treatment were decades ago, they still had an impact on their health and well-being. Late effects can have implications for all areas of life and significantly reduce overall QoL (compared to people without cancer).<sup>11,47</sup> The present results - modeling the responses to the suicidal ideation item as a continuous variable for a more nuanced approach - are in line with previous evidence that established QoL deficits as a risk factor for suicidal ideation in long-term CCS.<sup>6,7</sup>

Similarly, the positive implications of social support for mental health in the context of cancer have been reported in a variety of samples (albeit only including patients and no long-term CCS), including its negative association with suicidal ideation.<sup>21</sup> For CCS, there is evidence for a positive association of social support with general well-being (even after controlling for depression symptoms)<sup>48</sup> and in adolescent and young adult survivors, a negative association of social support with stress was demonstrated.<sup>49</sup> Additionally, an investigation of adult breast cancer survivors showed that social support accounted for half of the protective effects of optimism on mental health.<sup>50</sup> Previous qualitative studies gave insight into the diverse ways in which family and peer support influenced adolescent and young adult cancer survivors' recovery and mental health trajectory throughout acute care and survivorship.<sup>51</sup> However, they also mentioned how painful and difficult navigating a lack of support was for them, and there is quantitative evidence that (young) cancer survivors are at risk for social isolation and receive less social support than their peers.<sup>52</sup>

### **Limitations**

The cross-sectional survey design cautions against interpretations regarding the direction of effects. For instance, while studies tend to interpret QoL deficits as contributing to suicidal crises, it is also possible that suicidal individuals view their QoL particularly negatively and thus score comparatively low on the EORTC QLQ-C30. However, the EORTC QLQ-C30 items can be assumed not to be particularly affected by response biases, for example, questions such as how often help was needed with eating, dressing, washing or using the toilet.

In order to test the effects of social support on suicidal ideation in survivors with different levels of QoL deficits, prospective, interventional studies are needed. Further, although the results give insight into the

particular risk constellations of long-term CCS, an under-researched and vulnerable population, a limitation lies in the relatively low frequency/low number of individuals reporting suicidal ideation, limiting the statistical power of the present investigation. Further, we could not confirm the statistical significance of the simple slope of the moderator variable social support one standard deviation above the sample mean as this value fell outside the range of possibly observable values for this instrument. This indicates that the surveyed CCS reported – overall – rather more than less social support. The sample mean value was also higher than the mean value of the representative general population sample of the validation study as reported by Kliem et al.,<sup>38</sup> with an independent *t*-test performed on the summary data yielding a statistically significant difference ( $M=4.32$ ,  $SD=0.76$  vs.  $M=4.01$ ,  $SD=0.76$ ,  $t(3139) = 9.12$ ,  $p = .001$ ,  $d=0.41$ ). Along the same lines, the large proportion of CCS in this sample who obtained an educational qualification that qualifies them to enter higher education indicates a possible self-selection bias. Therefore, particularly vulnerable CCS (with low QoL, low social support and affected by other disparities such as low educational attainment/socioeconomic status) might be underrepresented by the present study sample. Still, taking this limitation into account, the comparatively high prevalence of both suicidal ideation and past suicide attempts observed in the present study is a pressing argument for the need for increased attention to and research in this area.

Suicidal ideation and suicide attempts were both measured using a single item. Previous research has already highlighted measurement issues, e.g. as a reason for diverging estimates of prevalence rates.<sup>6</sup> Other issues are the highly variable nature of suicidal ideation and potential response biases as suicide is a highly stigmatized topic and therefore, more indirect assessments or clinical interviews might be preferable methods of assessment.

### ***Implications for psychosocial providers***

Our study indicates that QoL deficits and a lack of social support interact in statistically predicting an especially high risk of suicidal ideation. At the same time, it showed that comparatively higher levels of social support can mitigate the implications of lower QoL for suicide risk. This shows the need for the continuation of multi-professional care even after a person is considered cured and no longer in treatment. Also, when screening for mental distress more generally or suicide risk more specifically, both *risk* and *protective* factors (as well as their combinations) should be considered. Going from there, a comprehensive, multidisciplinary approach could be used to address suicidal ideation in long-term CCS: Whereas some QoL

deficits could be mitigated (e.g. pain, sleep difficulties), others are likely not readily modifiable (e.g. functional limitations). In the latter cases, survivors might need other measures of support to foster their social participation and well-being.

Indeed, social support has often been investigated with regard to the acute treatment phase,<sup>53</sup> but it might decline afterwards when patients become (long-term) survivors.<sup>12</sup> Thus, for providers, it is important to be aware of the diversity of CCS' potential challenges and that they affect multiple domains of life; hence, not only issues that are primarily medical in nature.

Thus, practitioners should be cautious not to approach cancer survivors with the preconceived idea that the most difficult phase is behind them, but rather conduct an individual assessment of their (social support) needs. For survivors reporting QoL deficits necessitating tangible help with everyday activities as well as a lack of support from family or friends, care providers could pave the way to receiving needs-based assistance, such as home health aides. If there is a greater need for emotional support, providers could refer survivors to self-help groups, lower-threshold interventions fostering connectedness such as phone buddies, or professional individual offers such as counseling or psychotherapy. As social isolation, loneliness, and mental distress are common among CCS, all of these topics as well as their interrelations should be taken seriously and explored in depth.

Previous research suggests a multi-pronged approach to foster social support in CCS, meaning that different types of interventions targeting CCS' particular needs might be pertinent: A recent systematic review by Deegan et al.<sup>56</sup> distinguished social recreational (e.g. camps, group-based programs), educational (e.g. social skills training), and cognitive-behavioral interventions. However, none of these studies had empirically tested the interventions' effects on reducing suicidal ideation. From the perspective of suicide prevention, one-to-one interventions (e.g. support by email, text, message, face-to-face, telephone, mail) provided by professionals (e.g. psychiatrists, psychologists, nurses) as well as nonprofessionals (e.g. parents and volunteers) were found to be effective<sup>54</sup> – but these studies did not include cancer patients or survivors. Besides general social support interventions, the LIFECommunity study was an example of an intervention specifically designed to foster social support in CCS:<sup>55</sup> This six-month long mobile-based social networking program was found to be especially used by cancer survivors with unmet needs for social support (e.g. lack of support from friends and family, little family interaction). While the evaluation of this program did not emphasize suicidal ideation either, we think that it is a promising concept future efforts concerning suicide prevention in CCS could build on. In general, social support interventions were found to significantly reduce the risk of dying by suicide (pooled RR = 0.48, 95%-CI: .27; .85<sup>54</sup>). However, results of this meta-analysis showed mixed findings as the risk of

suicide attempts did decline in social intervention groups, but was not significantly reduced compared to control groups.

In conclusion, this work contributes to a deeper understanding of the interplay between risk and protective factors associated with suicidal ideation in long-term CCS. It highlighted both the enduring impact of cancer and its treatment on the health and well-being of survivors as well as potentially modifiable influencing variables. The findings underscore CCS' need for the provision of not just medical aftercare, but also psychosocial support offers which should be part of a comprehensive, individual-needs-based approach to suicide prevention. As the rates of STBs among CCS are higher compared to the general population, strengthening suicide prevention efforts in this vulnerable group remains a crucial focus for both research and practice.

### Acknowledgements

We thank all former childhood cancer patients who underwent clinical examination for this study, all participating and supporting medical centers, the study centers of the GPOH, the staff of the GHS, and the staff of the treatment data retrieval team.

### Disclosure statement

No potential conflict of interest was reported by the authors.

### Funding

The CVSS was funded by the German Research Foundation (DFG) (SP1381/2-1&2, FA1038/2-1&2, WI3881/2-1&2). PSYNA was funded by the German Cancer Aid (DKH) (70112165, 70113623). P.S. Wild is funded by the Federal Ministry of Education and Research (BMBF01EO1503). T. Schwinn and J. Hirschmiller are funded by the project TASC by the German Cancer Aid (DKH) (70114431).

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### Data availability statement

The datasets presented in this article are not readily available because the written informed consent of the study participants is not suitable for public access to the data and this

concept was not approved by the local data protection officer and ethics committee. Access to data at the local database in accordance with the ethics vote is offered upon request at any time. Interested researchers make their requests to the Principal Investigators of the CVSS/PSYNA study. Requests to access the datasets should be directed to Philipp.Wild@unimedizin-mainz.

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