Profiles of Health Competence Beliefs Among Young Adult Survivors of Childhood Cancer

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Purpose: The goal of this study was to identify profiles of young adult (YA)-aged cancer survivors' beliefs about their health and well-being. Survivors' beliefs and their associated psychosocial and demographic characteristics may be clinically useful in survivorship care. **Patients and methods:** YA survivors of pediatric leukemias ($n=51$), lymphomas ($n=24$), and solid tumors ($n=44$), aged 18–29 years old ($N=119$), were categorized using cluster analysis based on their responses to the Health Competence Beliefs Inventory, a measure assessing beliefs about their health, satisfaction with healthcare, autonomy, and cognitive competence. Profiles of beliefs generated by cluster analysis were examined using self-report measures of health problems, distress, demographics, and provider-reported health problems and cancer treatment intensity. **Results:** Three distinct clusters were identified: Adaptive ($n=54$), Low Autonomy ($n=25$), and Vulnerable ($n=40$). Adaptive survivors had positive beliefs, low distress, and minimal health problems. The Low Autonomy survivors were similar to those in the Adaptive cluster except they had low autonomy beliefs and the majority reported living with their parents. The Vulnerable cluster had more negative beliefs, the most medical problems, and the highest levels of distress. **Conclusion:** Health competence belief profiles identified unique subsets of YA survivors of pediatric cancer that have potentially distinct risk factors. Categorizing survivors by health belief patterns may help healthcare providers treat and educate their patients in ways that are tailored to individual survivors' needs and risks.

Key words: survivorship; health beliefs; developmental outcomes; psychological outcomes

THOUGH THE MAJORITY OF CHILDHOOD cancer patients survive (70%), a large portion of survivors (44%) have moderate to severe health problems from their disease and/or treatment.¹ Medical monitoring is recommended for early identification of late effects.^{1,2} During young adulthood, the responsibility for follow-up care shifts from parents to survivors, and healthcare utilization often becomes poor, with less than half of young adults adhering to follow-up recommendations.³

Young adult (YA)-aged survivors lag behind peers in key developmental milestones. For example, survivors are less likely to be married, employed, or living away from their parents than age-matched controls.^{4–7} Psychological distress triggered by the medical and emotional challenges of cancer diagnosis and treatment may be a risk factor. However, many

studies show that rates of traumatic stress, depression, and quality of life do not differ between adolescent and YA survivors of cancer and the general population.^{8–10}

Survivor beliefs offer an alternative to psychological symptoms for understanding their experiences.⁸ Beliefs are cognitive appraisals and interpretations about oneself and the world.¹¹ In the 21-item Health Competence Beliefs Inventory (HCBI), an empirically derived multidimensional scale,¹² four types of beliefs relating to YA health and well-being were identified. *Health Perceptions* reflect survivors' beliefs about their vulnerability and risk for health problems. *Satisfaction with Healthcare* refers to survivors' beliefs about the degree to which they feel understood and cared for by their healthcare providers. Higher *Cognitive Competence* scores indicate confidence in their ability to concentrate, remember, and learn

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information relative to peers. Higher *Autonomy* scores reflect a greater sense of independence from parents, both in their medical care and social lives. With the exception of Satisfaction with Healthcare, YA cancer survivors have significantly less positive beliefs (on the HCBI) when compared to healthy peers.⁸

Understanding beliefs may provide insight into thought patterns held by YA survivors who do not show clinical levels of psychological distress, but whose beliefs may be contributing to negative outcomes. Assessing beliefs has already been shown to be an accepted way to ascertain YA cancer survivors' well-being. Zebrack and Chesler found that survivors' subjective worries about their cancer and general health had a stronger relationship with their life outlook and self-image than did their objective physical late effects.¹³

Examining the associations among the four different HCBI beliefs may identify combinations of beliefs ("profiles"). Prior research reveals that belief profiles can serve as useful predictors. A study investigating beliefs about pain among chronic pain patients showed that while some hold either all positive or all negative beliefs, others have combinations of the two, and that these patterns predicted different pain-coping strategies.¹⁴ Similarly, six profiles of health locus of control predicted self-reported behavioral involvement and information seeking in healthcare.¹⁵ Identifying belief patterns among YA cancer survivors and pinpointing which demographic characteristics and psychosocial and developmental outcomes are associated with these patterns may reveal clinically meaningful subgroups of survivors for whom resources can be tailored.

With the broad goal of furthering our understanding of YA cancer survivors and ultimately improving the ability of healthcare providers to address the different needs of survivor subgroups, the aims of this study were: (1) to use cluster analysis to identify profiles of subgroups of YA cancer survivors characterized by patterns of health competence beliefs, and (2) to investigate demographic, psychosocial, and health-related correlates for each profile.

Patients and Methods

Participants

Childhood cancer survivors met eligibility criteria if they were diagnosed with cancer before age 21, were at least 5 years from diagnosis, completed treatment for cancer at least 2 years prior, spoke fluent English, and could read independently at the 5th grade level. Due to the potential for brain tumor survivors to experience difficulty in completing the study measures,¹⁶ they were excluded from the current study. Analyses were completed on a subset of survivors 18 years and older at study ($N=119$; $M=21.60$, $SD=2.60$). These patients are legally adults who are permitted to make medical decisions and generally given more autonomy over their care. The sample was 54% female, and mostly Caucasian ($n=107$; 89.9%). Years since diagnosis ranged from 4 to 25 years ($M=12.44$, $SD=5.05$). Survivors had leukemia ($n=51$; 43%), lymphoma ($n=24$; 20%), and solid tumors ($n=44$; 37%).

Procedure

This study is a secondary analysis of data from an Institutional Review Board-approved investigation examining health beliefs and outcomes of adolescent and YA cancer

survivors (more detail about the method may be found in the original paper⁸). Recruitment and data collection occurred during annual visits to the cancer survivorship program at The Children's Hospital of Philadelphia. The participation rate for the study was 86%. Participants provided written informed consent prior to completing questionnaires.

Measures

Clustering measure. Belief profiles were generated by analyzing participants' responses to the HCBI, a 21-item self-report measure of beliefs about health and well-being with four factors: Health Perceptions, Satisfaction with Healthcare, Cognitive Competence, and Autonomy (see Supplementary Appendix which can be viewed online at www.liebertpub.com/jayao). Higher scores indicate more positive beliefs. Internal consistency for each of the four factors was strong in this sample ($\alpha=0.72-0.87$).¹²

Validation measures. A demographic questionnaire and measures of psychological distress, health status, and treatment history were used to validate the clinical relevance of the profiles.

Psychological distress: The Brief Symptom Inventory 18 (BSI-18) is an 18-item standardized self-report symptom inventory of psychological distress.¹⁷ It produces a Global Severity Index (GSI) comprised of three subscales: depression, anxiety, and somatic symptoms. Internal consistency in this sample was strong ($\alpha=0.87$). The Post-Traumatic Stress Disorder Checklist-Civilian version (PCL-C) is a 17-item self-report measure of post-traumatic stress with three subscales: re-experiencing, avoidance, and arousal.¹⁸ Internal consistency was strong for the scale ($\alpha=0.91$), as well as for the subscales ($\alpha=0.74-0.89$).

Health problems and treatment intensity: The Health Knowledge Inventory (HKI) is a 35-item checklist of health problems with identical forms that were completed by participants and their survivorship providers.¹⁹ There are two categories of problems: Organic/Major (problems affecting major organ systems and/or a significant late effect) and Constitutional/Other (general complaints and/or less threatening medical problems). The total number of items endorsed is summed, as are the two categories. The Intensity of Treatment Rating Scale 2.0 (ITR-2) uses data about diagnosis, stage, and treatment modality abstracted from the medical record.²⁰ A pediatric oncologist and nurse practitioner, blind to patient identity, used these data to rate each patient's treatment. Inter-rater reliability for the full sample was $r_s=0.96$.⁸ Information regarding disease type and time since treatment ended were collected from medical records.

Demographic variables: Each participant completed a demographic questionnaire with items about current age, age at diagnosis, relationship status, employment, education, and living status (survivor lives with parents or not).

Data analysis

Cluster analysis. Cluster analysis was used in this study because of its ability to create profiles of individuals based on the similarity of responses to selected variables.²¹ The variables of interest were the four HCBI scales: Health Perceptions, Satisfaction with Healthcare, Autonomy, and Cognitive Competence. Agglomerative hierarchical analysis was used

based on Ward's method with squared Euclidean distance as the measure of proximity.^{22,23} Percentage change of the agglomeration coefficient at each cluster stage,²⁴ as well as practical sample size considerations,²⁵ were used to identify the appropriate number of clusters (three). Stability of the results from the hierarchical analysis was assessed by applying non-hierarchical K-means analysis to the same data.²² The hierarchical and K-means methods assigned cases to clusters in very similar ways. Agreement was strong ($\kappa=0.76$, $p<0.01$), indicating stability of the three-cluster solution. All subsequent analyses were organized as follows:

Cluster characterization: To generate profiles, clusters were compared to identify their distinct features. One-way analysis of variance (ANOVA) with Tukey's Honestly Significant Difference (HSD) as the follow-up test were conducted using the four HCBI subscales to determine if the derived clusters differed significantly with respect to these scores. The research team then named the clusters based on their characteristics.

External validation: Demographic, health, and psychological distress measures were analyzed for differences among the clusters using Chi-square tests of dependence and Kruskal-Wallis tests of location. Sample sizes varied for each analysis due to missing data. Statistical significance criterion was held constant at the $\alpha=0.05$ level across all analyses. Data were analyzed using SPSS v18.0.

Results

Cluster analysis revealed three distinct profiles of health competence beliefs, which were named Adaptive, Low Autonomy, and Vulnerable to reflect each cluster's unique belief pattern. Demographic, health, and psychosocial differences between clusters characterized each profile and validated the clinical relevance of each. A summary of the significant characteristics distinguishing the clusters is presented in Table 1.

Cluster characterization

Profiles for the three-cluster solution are shown in Figure 1. One-way ANOVAs revealed statistically significant differences among the clusters for each subscale: Health Perceptions [$F(2, 116)=57.42$, $p<0.001$, $\eta^2=0.50$], Satisfaction with Healthcare [$F(2, 116)=5.83$, $p=0.004$, $\eta^2=0.09$], Autonomy [$F(2, 116)=77.63$, $p<0.001$, $\eta^2=0.19$], and Cognitive Competence [$F(2, 116)=13.22$, $p<0.001$, $\eta^2=0.57$].

Cluster 1: Adaptive. This cluster ($n=54$) was above average for every subscale ($\bar{z}=0.28-0.81$). Tukey HSD tests revealed that when compared to Cluster 3, the Adaptive cluster showed significantly higher scores on all belief subscales. For the Autonomy subscale, the Adaptive cluster also showed higher scores than Cluster 2 (Table 2).

TABLE 1. SUMMARY OF CLUSTER CHARACTERISTICS: KEY DIFFERENCES AND IMPLICATIONS*

	Cluster (% of sample)		
	Adaptive (45)	Low Autonomy (21)	Vulnerable (34)
HCBI subscale**			
Health Perceptions	Above average	Above average	Below Average
Satisfaction with Healthcare	Above average	Average	Below Average
Cognitive Competence	Above average	Average	Below Average
Autonomy	Above average	Below average	Below Average
Psychological distress (% meeting clinical criteria)			
General distress	2	8	18
Traumatic stress (re-experiencing)	23	24	50
Demographic characteristics (%)			
12th grade education or less	24	40	10
Live with parents	43	80	55
Implications for YA care	<ul style="list-style-type: none"> • Support competence • Reinforce positive beliefs and how they can facilitate adherence to care recommendations and achievement of goals 	<ul style="list-style-type: none"> • Evaluate reasons for low autonomy and whether increased autonomy is medical and developmentally-appropriate • Work with parents and patient to set and pursue developmentally-appropriate health management and personal goals 	<ul style="list-style-type: none"> • Further assess beliefs, including accuracy relative to patient medical and psychological status • Establish plan (education, support, cognitive behavioral therapy, community resources) to address beliefs/ set realistic goals to enhance disease management and quality of life

*All characteristics shown are based on significant differences among clusters.

**Clusters were described according to their mean score for each HCBI subscale.

YA, young adult; HCBI, Health Competence Beliefs Inventory.

FIG. 1. Mean standardized Health Competence Beliefs Inventory (HCBI) subscale scores for each cluster.

Cluster 2: Low Autonomy. Tukey HSD tests showed that this cluster ($n=25$) had significantly lower autonomy scores than the other two clusters (Table 2). Autonomy was below average ($\bar{z} = -0.96$) and the mean z-score for Satisfaction with Healthcare and Cognitive Competence hovered around zero (-0.04 and 0.05 respectively). Average Health Perceptions remained high ($\bar{z} = 0.45$), at a similar level to the Adaptive cluster.

Cluster 3: Vulnerable. The third cluster ($n=40$) had the lowest average scores for all HCBI subscales other than Autonomy. Health Perceptions and Cognitive Competence were particularly low ($\bar{z} = -0.99$ and -0.55 respectively) for the Vulnerable cluster, with significantly lower values than both the Adaptive and Low Autonomy clusters. Satisfaction with Healthcare beliefs ($\bar{z} = -0.40$) were significantly lower than the Adaptive cluster (Table 2).

External validation

Demographics. There were no statistically significant differences among clusters for gender, current age, diagnosis, age at diagnosis, time since diagnosis, time since treatment ended, relationship status, or employment status. Living status [$\chi^2(2, N=119)=9.65, p=0.008$] and education [$\chi^2(2, N=119)=10.93, p=0.027$] differed by cluster. More survivors in the Low Autonomy cluster lived with their parents and fewer had post-secondary education than in the other two clusters (Table 3).

Health problems and treatment intensity. Clusters did not vary by treatment intensity (Table 4). Most survivors had treatments rated as Very or Most Intense (57%) on the ITR-2. However, clusters did vary by the number of medical problems. Survivors in the Vulnerable cluster had significantly more total medical problems for both patient report [$\chi^2(2, N=114)=11.10, p=0.004$] and provider report [$\chi^2(2, N=106)=9.82, p=0.007$]. When broken down by problem type, Vulnerable survivors showed significantly more problems for the Constitutional/Other category, but not for the Organic/Major category on both patient and provider reports (Table 4).

Psychological distress. There were statistically significant differences among the clusters for global severity on the BSI [$\chi^2(2, N=116)=9.35, p=0.009$]. Those in the Vulnerable cluster were significantly more distressed according to the BSI-GSI than members of either the Adaptive or Low Autonomy clusters, and had the highest percentage of survivors who fell into the clinical range for this measure (18%; Table 5). Additionally, a significantly higher proportion (50%) of survivors in the Vulnerable cluster met criteria for re-experiencing symptoms than in the other two clusters (Adaptive cluster = 23%; Low Autonomy cluster = 24%; Table 5). Kruskal-Wallis analysis of the PCL-C scores revealed that survivors in the Vulnerable cluster had significantly higher PCL-C scores on all three symptoms than survivors in the Adaptive cluster, and had higher arousal and avoidance scores than survivors in the Low Autonomy cluster (Table 5). Additionally, only the Vulnerable cluster had a portion of its members (10%) fall in the clinical range for the PCL-C Total score.

Discussion

The three identified profiles of health competence beliefs of YA-aged pediatric cancer survivors provide an innovative and clinically relevant understanding of this population at risk for ongoing health difficulties. Each profile was associated with different developmental, psychological, and health outcomes. These belief profiles provide an initial step toward matching survivors with interventions tailored to their views of themselves and their health (Table 1).

Consistent with prior research that most YA survivors are resilient, the largest cluster (45% of the sample) demonstrated positive beliefs and exhibited low levels of distress, had few

TABLE 2. COMPARISON OF CLUSTERS BY HEALTH COMPETENCE BELIEFS INVENTORY SUBSCALE

HCBI subscale	Cluster			p	η^2*
	Adaptive (n = 54)	Low Autonomy (n = 25)	Vulnerable (n = 40)		
	M (SD)	M (SD)	M (SD)		
Health Perceptions	19.7 (2.8) ^a	19.6 (2.0) ^a	14.1 (2.9) ^b	<0.01	0.50
Satisfaction with Healthcare	18.2 (2.0) ^a	17.4 (3.2) ^{a,b}	16.5 (2.2) ^b	<0.01	0.09
Cognitive Competence	16.3 (2.6) ^a	15.2 (1.3) ^a	13.5 (3.2) ^b	<0.01	0.57
Autonomy	16.9 (1.8) ^a	12.2 (1.9) ^b	13.4 (1.6) ^c	<0.01	0.19

Note: Values are in original scaling metric.

*For effect size η^2 , 0.01 = small effect, 0.06 = medium effect, 0.14 = large effect.²⁶

^{a,b,c}Different superscripts within the same row indicate that there is a statistically significant difference between clusters ($p < 0.05$).

M, mean; SD, standard deviation.

TABLE 3. DEMOGRAPHIC CHARACTERISTICS OF THE FULL SAMPLE AND BY CLUSTER

Measure	Cluster							
	Adaptive (n=54)		Low Autonomy (n=25)		Vulnerable (n=40)		Full sample (N=119)	
	Mdn	M (SD)	Mdn	M (SD)	Mdn	M (SD)	Mdn	M (SD)
Age								
Current age	22	21.6 (2.7)	21	20.8 (2.4)	23	22.1 (2.6)	22	21.6 (2.6)
Age at diagnosis	10	8.6 (6.0)	8	8.0 (5.1)	11	10.3 (5.3)	10	9.2 (5.6)
Time since diagnosis (years)	12	12.7 (4.8)	12	12.8 (5.5)	10	11.8 (5.1)	12	12.4 (5.0)
Time from end of treatment (years)	10	10.4 (5.2)	9	10.4 (5.9)	8	9.2 (4.9)	9	10.0 (5.2)
Gender: <i>n</i> (%)								
Female	26 (48%)		15 (60%)		23 (58%)		64 (54%)	
Diagnosis: <i>n</i> (%)								
Leukemia	25 (46%)		13 (52%)		13 (33%)		51 (43%)	
Lymphoma	10 (19%)		3 (12%)		11 (28%)		24 (20%)	
Solid tumor	19 (35%)		9 (36%)		16 (40%)		44 (37%)	
Employment: <i>n</i> (%)								
Work for income	43 (80%)		18 (72%)		32 (80%)		93 (78%)	
Living status: <i>n</i> (%)*								
Away from parents	31 (57%)		5 (20%)		18 (45%)		54 (45%)	
Relationship status: <i>n</i> (%)								
In a relationship	22 (45%)		6 (25%)		13 (36%)		41 (38%)	
Education level: <i>n</i> (%)*								
High school or less	13 (24%)		10 (40%)		4 (10%)		27 (22%)	
Some college	25 (46%)		7 (28%)		26 (65%)		58 (49%)	
Graduated college	16 (30%)		8 (32%)		10 (25%)		34 (29%)	

Note: Because of missing data, *n* sizes varied: Adaptive cluster=49–54; Low Autonomy cluster=24–25; Vulnerable cluster=36–40.

Due to rounding not all percentages add to 100%

*Differences between clusters were significant ($p < 0.05$).

Mdn, median; M, mean; SD, standard deviation.

medical problems, and largely lived independently.²⁷ Though survivors in the Adaptive cluster are doing well, healthcare providers should be cognizant of their highly positive Health Perceptions and ensure that they understand their risk factors for late effects, as only 35% of survivors were aware that serious health problems could develop as a consequence of their cancer treatments.²⁸ Overconfidence in one's health may lead survivors to feel immune to potential late effects that can develop with time. It is essential that survivors in the Adaptive cluster are encouraged to continue engaging in monitoring and preventative care.

The high rate of dependent living status among the Low Autonomy cluster merits consideration. In longitudinal analyses of healthy YA samples, those living at home were less likely to show an improvement in depressed affect and reported later transition to adult roles when compared to those who lived independently.^{29,30} Among a sample of adult survivors of pediatric cancer, depression and dependent living were strongly associated.⁵ Participants in this study did not suffer from severe cognitive deficits, and those in the Low Autonomy cluster had few medical problems. Consequently, dependent living status in the Low Autonomy cluster more likely reflects the psychosocial costs of surviving pediatric cancer, as opposed to neuropsychological deficits.

For young adults with special healthcare needs, a smooth transition from pediatric to adult-oriented care requires survivors to develop a sense of medical and personal independence.³¹ Low Autonomy survivors who have not yet achieved

this independence may attempt to delay transition to adult-oriented care centers where parental involvement is less accepted. Consequently, they may miss out on medical expertise more relevant to their stage of life.³²

For those in the Vulnerable cluster, perceived health vulnerability and distress may reflect awareness of their medical problems. The negative Cognitive Competence beliefs held by these survivors may reflect real deficiencies related to neurocognitive and educational problems or may reflect low self-esteem (brain tumor survivors, a subset of survivors that was not included in this analysis, likely also experience negative cognitive competence beliefs due to the neurological sequelae of their treatments). Most pediatric cancer survivors indicate scholastic and job competence in line with norms, but there is a subset of survivors that show both lower self-esteem and lower perceptions of self-competency than sibling controls.³³ It could be useful to explore how accurately beliefs about their cognitive abilities reflect their true competence. This potential discrepancy could help healthcare providers understand and address survivors' concerns about their cognitive abilities.

The combination of health concerns, elevated avoidance symptoms, and relatively lower satisfaction with healthcare may lead survivors in the Vulnerable cluster to avoid healthcare settings that remind them of difficult treatments.²⁸ Additionally, uncertainty regarding their health may be an impediment to behavior changes that may improve their medical status. In prior research, adult cancer survivors who felt less in control of their health adopted fewer positive health

TABLE 4. HEALTH MEASURES OF THE FULL SAMPLE AND BY CLUSTER

Measure	Cluster							
	Adaptive (n=54)		Low Autonomy (n=25)		Vulnerable (n=40)		Full sample (N=119)	
	Mdn	M (SD)	Mdn	M (SD)	Mdn	M (SD)	Mdn	M (SD)
Health Knowledge Inventory								
Total problems (patient) ^a	5.0	5.2 (3.9)	4.5	4.6 (3.4)	7.0	7.6 (3.9)	5.0	5.9 (4.0)
Total problems (provider) ^a	3.0	3.2 (2.7)	3.0	3.0 (2.3)	4.0	4.5 (1.9)	3.5	3.5 (2.5)
Organic/major (patient)	2.5	2.8 (2.4)	2.0	2.4 (1.6)	3.0	3.6 (2.3)	3.0	3.0 (2.2)
Organic/major (provider)	1.0	1.8 (1.8)	2.0	1.9 (1.5)	2.0	2.3 (1.2)	2.0	1.9 (1.5)
Constitutional/other (patient) ^a	2.0	2.5 (1.9)	2.0	2.2 (2.1)	4.0	4.0 (2.0)	3.0	2.9 (2.1)
Constitutional/other (provider) ^a	1.0	1.4 (1.3)	1.0	1.1 (1.3)	2.0	2.3 (1.3)	1.0	1.6 (1.4)
	n (%)		n (%)		n (%)		N (%)	
Intensity of Treatment Intensity Rating Scale 2.0								
Least or Moderate Intense	26 (49%)		9 (36%)		12 (32%)		47 (41%)	
Very or Most Intense	27 (51%)		16 (64%)		25 (68%)		68 (59%)	

Note: Because of missing data, *n* sizes varied: Adaptive cluster=51–53; Low Autonomy cluster=22–25; Vulnerable cluster=33–39.

^aThere is a statistically significant difference between the Vulnerable cluster and the other two clusters (Adaptive and Low Autonomy) ($p < 0.05$).

Mdn, median; *M*, mean; *SD*, standard deviation.

TABLE 5. PSYCHOLOGICAL DISTRESS MEASURES OF THE FULL SAMPLE AND BY CLUSTER

Measure	Cluster							
	Adaptive (n = 54)		Low Autonomy (n = 25)		Vulnerable (n = 40)		Full Sample (N = 119)	
	Mdn	M (SD)	Mdn	M (SD)	Mdn	M (SD)	Mdn	M (SD)
Brief Symptom Inventory-18								
Depression	50.0	50.7 (8.4)	52.0	54.1 (7.9)	54.5	54.8 (9.5)	50.0	52.8 (8.9)
Anxiety ^a	48.0	49.6 (8.3)	47.0	47.3 (8.0)	50.0	52.9 (9.4)	48.0	50.2 (8.8)
Somatic ^b	48.0	49.2 (7.9)	48.0	49.4 (9.1)	56.0	55.1 (7.8)	52.0	51.2 (8.5)
Global Severity Index (GSI) ^b	51.0	50.5 (8.4)	51.0	51.5 (8.3)	54.0	55.8 (7.6)	52.0	52.5 (8.4)
	n (%)		n (%)		n (%)		N (%)	
GSI Clinical Cut-Off Met [†]	1 (2%)		2 (8%)		7 (18%)		10 (8%)	
Post-Traumatic Stress Disorder Checklist - Civilian								
Total ^b	22.0	24.8 (8.5)	22.0	24.3 (7.2)	27.5	31.1 (11.8)	23.0	26.8 (9.9)
Re-Experiencing ^c	6.0	7.3 (3.5)	7.0	7.2 (2.7)	7.0	9.1 (4.4)	7.0	7.8 (3.8)
Avoidance ^b	9.0	9.7 (3.1)	8.0	9.6 (3.1)	10.0	12.0 (5.0)	9.0	10.4 (4.0)
Arousal ^b	7.0	7.9 (3.2)	7.0	7.6 (2.3)	9.0	10.1 (3.9)	8.0	8.6 (3.5)
	n (%)		n (%)		n (%)		N (%)	
Clinical Cut-Off Met for Total [†]	0 (0%)		0 (0%)		4 (10%)		4 (3%)	
Re-experiencing Criteria Met*	12 (23%)		6 (24%)		20 (50%)		38 (32%)	
Arousal Criteria Met	10 (19%)		2 (8%)		16 (40%)		28 (24%)	
Avoidance Criteria Met	3 (6%)		2 (8%)		7 (18%)		12 (10%)	

Because of missing data, *n* sizes ranged: Adaptive cluster = 53–54; Low Autonomy cluster = 23–25; Vulnerable cluster = 38–40.

^aThere is a statistically significant difference between the Low Autonomy cluster and the Vulnerable cluster ($p < 0.05$).

^bThere is a statistically significant difference between the Vulnerable cluster and the other two clusters (Adaptive and Low Autonomy) ($p < 0.05$).

^cThere is a statistically significant difference between the Adaptive cluster and the Vulnerable cluster ($p < 0.05$).

^{*}Differences between clusters were significant ($p < 0.05$).

[†] Clinical cut-off score: PCL-C Total > 50 and BSI-GSI > 63.

Due to rounding not all percentages add to 100%.

Mdn, median; *M*, mean; *SD*, standard deviation

behavior changes than survivors who felt more in control;³⁴ Vulnerable cluster survivors may not feel sufficient self-efficacy to make positive changes to their health practices. Survivors with beliefs of poor cognitive competence may also become overwhelmed by medical information and recommendations. Pediatric providers can take this into account during the process of transition to adult-based care and prioritize more time toward communication of healthcare information and management strategies.

Limitations

The reliability of the identified profiles must still be established by replicating the analysis in a larger and more ethnically diverse sample. Though we excluded brain tumor survivors because of their potential cognitive deficits, future research should include this important group of survivors, as well as survivors of other cancers not represented in this sample. The current sample was recruited from patients attending a survivorship clinic; replicating the results in a broader population of survivors is also imperative to understand the significance of beliefs more broadly.

Future directions

Incorporating a brief assessment of health-related beliefs into clinical practice may assist pediatric oncology healthcare providers in identifying YA survivors of pediatric cancer at risk for poor psychological, developmental, and healthcare utilization outcomes as they transition to adulthood and adult-oriented healthcare. Subsequent to research that establishes the association between belief profiles and outcomes in a larger and more heterogeneous sample, a brief assessment of beliefs may guide interventions to promote quality of life and adherence to health recommendations and medical monitoring in adulthood.

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