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Psychometric evaluation of the spiritual perspective scale for adolescents and young adults with cancer

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ABSTRACT

Objective: To evaluate the reliability and validity of the spiritual perspective scale (SPS) for adolescents and young adults with cancer.
Methods: The study was conducted with 277 adolescents and young adults with cancer aged 10–24 years who were recruited from Taiwan and Korea. The reliability of the SPS was assessed using Cronbach's α. Its factor structure was determined by exploratory factor analysis. Known-group validity was tested by comparing resilience scores between two groups and between countries using *t* test.
Results: Cronbach's α values for the SPS was 0.94, and item–total correlation values ranged from 0.53 to 0.84. Factor analysis generated two factors (spiritual behaviors and spiritual beliefs) that explained 78.02% of the total variance, with factor loadings ranging from 0.51 to 0.94. Participants with lower resilience had significantly lower spirituality scores compared to those with higher resilience ($t = 3.13$, $P = 0.002$). The SPS scores were not significantly different between participants in Taiwan and Korea ($t = 1.09$, $P = 0.276$). However, the spiritual beliefs subscale scores did show a significant difference between these groups ($t = 2.74$, $P = 0.007$).
Conclusions: The spiritual perspective scale is a valid and reliable tool for measuring the spirituality of adolescents and young adults with cancer in Taiwan and Korea. The SPS showed sensitivity in detecting variations in spiritual beliefs between adolescents and young adults with cancer in Taiwan and Korea.

Introduction

Adolescents and young adults (AYAs) were a unique group in the cancer setting due to their specific needs and cancer related experiences.[1] Globally, there has been a slight rise among AYAs with cancer,[2] with Taiwan and Korea seeing a notable increase in diagnose.[3,4] The cancer survival rates of AYAs have not improved as much as those of pediatric and older adult patients.[3,5] The navigation of the challenges of cancer diagnosis and treatment is complex and burdensome for AYAs, due to their developmental stages[2] and the occurrence of major physical and psychological changes during this period.[6,7] Furthermore, cancer and its treatment often cause unpleasant physical and psychological symptoms, and patients additionally experience ongoing uncertainty and fear of recurrence.[8–11] This situation often disrupts patients' education and mastery of critical developmental tasks, leading to parental dependence, social isolation, reduced cognitive and academic abilities, identity issues, and existential threats.[12–14] Subsequently, growing evidence shows the importance of assessing spirituality among AYAs with cancer.[15,16]

Spirituality is a broad concept characterized by the search for meaning or direction in life,[17,18] connection with others and/or a higher power, and self-transcendence.[14,17,19,20] AYAs perceive spirituality as entailing wisdom, connectedness, joy, wonder, moral sensitivity, and compassion, and define it as the human search for meaning[14] and identity focused on normalcy.[21] Spirituality facilitates the reconstruction of self-identity and rebuilding of relationships with others and a higher power.[16,22–24] Spirituality is important for AYAs with cancer and considered to protect against a host of negative health outcomes, especially cancer[25,26] by helping them overcome challenges and find meaning in their illnesses.[21] Enhanced spirituality also helps AYAs with cancer navigate disease-related psychological challenges,[27] foster gratitude,

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elevate their self-esteem, strengthen their faith, and find purpose in their cancer journeys,[28] ultimately promoting positive adaptation and resilience.[23,29,30] For example, AYAs who participated in an intervention targeting the enhancement of spirituality reported that their coping style changed from emotion oriented to problem oriented, with improvement in coping overall.[31,32]

Unmet spiritual needs can cause distress and disrupt well-being by worsening physical and psychological symptoms.[33–35] However, there is limited understanding of AYAs' spirituality, especially among Korean and Taiwanese AYAs with cancer. Since spirituality is abstract, multidimensional, and influenced by social and cultural factors,[20,21,36–39] it's crucial to explore this phenomenon from their perspectives. Spirituality has been measured, for example, by assessing degrees of religiousness and spirituality (with the Brief Multidimensional Measure of Religiousness/Spirituality),[40] spiritual quality of life (with the Spiritual Well-Being Scale),[41] religious coping [with the Religious Coping Scale (RCOPE)],[42] religious behaviors (with the Religious Orientation Scale),[43] and religious beliefs, practice and community (with the Systems of Belief Inventory).[44] These instruments were developed for adults, without full consideration of the developmental characteristics of AYAs, some of them are too lengthy (e.g., RCOPE has 105 items), and most of them reflect Western Christian spirituality and religion.[45] Additionly, religion and spirituality differ in practice, and the essential distinction between spirituality and religionis particularly important when caring for AYAs with cancer.[39] Religion is an organized, community-based belief system involving outward practices, while spirituality is personal, inward, and emotionally driven.[14] Spirituality may exist without religious belief.[46] This highlights the need to validation an assessment tool that is both developmentally and culturally appropriate.

Reed's 10-item spiritual perspective scale (SPS) measures respondents' spiritual beliefs and related behaviors,[47] with spirituality defined as the inclination to derive significance by connecting with aspects beyond the self in a manner that empowers, rather than diminishes, the individual.[48] This conceptualization aligns with AYAs' perception of spirituality. The SPS was developed in the Western context and has been translated into several languages for application in various cultural contexts and populations, such as those in Persian,[49] Korea,[50] and Taiwan.[51] However, the psychometric properties of the SPS for Asian AYAs with cancer have not been assessed sufficiently, leading to uncertainty about whether this instrument is adequate for the assessment of spirituality across this diverse population and limiting the understanding of research results obtained with it.[52,53] Thus, this study assessed the psychometric characteristics of the SPS for AYAs with cancer. The hypotheses tested were: (1) that the SPS would show acceptable reliability; (2) that its factor structure would adequately reflect the spirituality of these populations; (3) that it would exhibit known-group validity, with SPS scores being higher among AYAs with cancer and more resilience than among those with less resilience; and (4) that it would be sufficiently sensitive to detect differences between AYAs with cancer in Taiwan and Korea.

Methods

Study design & participants

For this cross-sectional, methodological study, participants were recruited from the inpatient and outpatient pediatric hematology and oncology units of three medical teaching hospitals in Taiwan (June 2019–November 2020) and one university-affiliated hospital and one non-profit organization (the Korean Leukemia Foundation) in South Korea (June 2019–August 2020). The inclusion criteria were: (1) diagnosed with pediatric cancer, (2) aged 10–19 years (adolescents) and 20–24 years (young adults) at the time of assessment, (3) current treatment or remission status, and (4) ability and willingness to complete questionnaires. The exclusion criteria were: (1) developmental delay or mental illness, and (2) terminal or hospice cancer stage.

Sample size estimation

The G Power software (version 3.1.9.4) was used to calculate the sample size in this study. The conditions set were correlation: point biserial model, effect size = 0.20, $\alpha = 0.05$, and power = 0.90. The calculation indicated that 255 participants were needed. The performance of exploratory factor analysis (EFA), including fewer than 20 items with data from 100 to 200 participants, is reasonable.[54]

Ethical considerations and data collection

The medical ethics committees at all study sites and university with which the researchers were affiliated approved this study. At clinical sites, potential study participants were screened by medical providers before the research assistants approach the potential study participants. Once potential study participants agreed to attend this study, then detailed oral and written explanations of the study were given to potential participants. Prior to data collection, the researchers obtained written parental/legal guardian consent and permission for minors (age < 19 years in Korea and < 20 years in Taiwan) and written consent from young adults, as required by the institutions from which they were recruited. The participants were informed of their rights and their ability to withdraw from the study at any time. Then, they were asked to complete the questionnaires in a private, quiet environment. All data were de-identified. If participants felt tired, they took a rest or completed the survey at home and returned it at their next clinic visit. The survey took about 30 minutes to complete.

Measures

Demographic data

A descriptive demographic information, including the participants' country of residence, age, gender, educational level, cancer diagnosis, and time since diagnosis, were collected.

Spiritual perspective scale

The SPS scale was developed from Reed (1987).[47] This tool assesses the frequency of spiritual behavior (4 items) and the extent of respondents' agreement with statements about spiritual beliefs (6 items). Responses are structured by a 6-point Likert scale ranging from 1 ("not at all"/"strongly disagree") to 6 ("about once a day"/"strongly agree"). Higher scores indicate more frequent spiritual behavior or greater spiritual belief. The SPS had translated into Korean and Mandarin, and test its psychometric properties in Korean elders[50] and Taiwanese nursing students.[51] Cronbach's α values for the Korean and Taiwanese versions of the SPS are 0.97[50] and 0.94,[51] respectively. The Korean[50] and Taiwanese versions[51] of the SPS were used in this study.

Haase Adolescent Resilience in Illness Scale

The single-factor 15-item Haase Adolescent Resilience in Illness Scale (HARS)[55] was used to measure participants' thoughts and emotions concerning how they handle their lives. Responses are structured by a 6-point Likert scale raging from 1 ("strongly disagree") to 6 ("strongly agree").[56] Higher scores reflect greater resilience. The internal consistency of the HARS ranges from 0.84 to 0.86;[57] its concurrent validity has been tested with measures of self-transcendence ($r = 0.56$, $P < 0.01$) and self-esteem ($r = 0.48$, $P < 0.01$).[58] HARS has validated among Korean adolescents with leukemia[59] and Taiwan adolescent brain tumor survivors.[60] In this study, Cronbach's α values of the SPS was 0.83 and Cronbach's α in both Taiwanese and Korean versions of the SPS was 0.83.

Data analysis

The statistical analyses were performed using SPSS software (version 22.00 for Windows; Armonk, NY: IBM Corp.). Participants with missing data were excluded from the sample. Descriptive statistics were

calculated to assess the participants' demographic and clinical characteristics. Mean values with standard deviations (SD), and percentages for descriptive variables, were calculated. Independent *t* tests and analysis of variance were used to assess group differences in demographic data. As SPS item analyses, ceiling and floor effects and item–total correlation (ITC, reflecting item-score reliability) were examined.[61] The internal consistency reliability of the SPS was examined by calculating Cronbach's α values (0.80–0.90, very good; > 0.90, should consider shortening the scale).[62] The sample was divided into two groups according to the mean HARS score (scores below the mean were assigned to group 1) and two countries for the examination of known-group validity using the independent-samples *t* test. EFA with the criterion of eigenvalue > 1 and scree plot testing were performed to test the construct validity of the SPS for the study population.[63] Principal components were used to extract factors. Item factor loadings < 0.30 were considered to be poor.[64]

Results

Study sample

Of 289 participants, data from 277 with complete data were analyzed. The demographic characteristics of the study participants are summarized in Table 1. The participants were recruited in Taiwan (50.2%) and Korea (49.8%). More than half (53.8%) of the participants were male, and the mean age was 17.28 (range, 10–24) years. More than 40% of the participants had been diagnosed with hematological cancer, and 50.9% had been diagnosed more than 3 years previously.

SPS structure and item properties

The mean SPS score was 2.79 (SD = 1.23). Participants gave the full range of item responses (1–6). Mean item scores ranged from 2.53 to 3.22; they were highest for items 5 (3.22 ± 1.59), 7 (3.07 ± 1.64), and 9 (3.03 ± 1.63) and lowest for items 3 (2.26 ± 1.52), 4 (2.53 ± 1.84), and 2 (2.55 ± 1.67; Table 2). Mean scores for items assessing spiritual behaviors ranged from 2.26 to 2.77, and those for items assessing spiritual beliefs ranged from 2.62 to 3.22. Ceiling effects were low and floor effects ranged from 23.1% to 49.5%, the latter percentage being for item 4 (Table 2).

Table 1
Demographic characteristics of the participants ($N = 277$).

Variables	*n*	%
Country		
Taiwan	139	50.2
Korea	138	49.8
Gender		
Male	149	53.8
Female	128	46.2
Time since diagnosis ($n = 275$)		
< 1 year	70	25.3
1–2 years	19	6.9
2–3 years	47	17.0
4–6 years	53	19.1
> 6 years	88	31.8
Education ($n = 270$)		
Elementary	30	10.8
Junior high school	66	23.8
Senior high school	90	32.5
College/ University	86	31.1
Master	5	1.8
Diagnosis ($n = 272$)		
Hematology	117	42.2
Lymphoma	49	17.7
Brain tumor	30	10.8
Solid tumor	81	29.2
	M	SD
Age (years)	17.28	3.74

Note: M, mean; SD, standard deviation.

Internal consistency

Cronbach's α coefficient for the total SPS score was 0.94, indicating good internal consistency. Coefficients for the spiritual behavior and belief subscales were 0.88 and 0.95, respectively. ITC values ranged from 0.53 to 0.84 (Table 2).

Construct validity

Two factors (spiritual behaviors and spiritual beliefs) with eigenvalues > 1.0 (6.69 and 1.11, respectively) that together explained 78.0% of the total variance were extracted (Table 2). The Kaiser–Meyer–Olkin value for the SPS was 0.93, indicating excellent sampling adequacy and relatively compact patterns of correlation.[65] Bartlett's test of sphericity yielded significant results ($\chi^2 = 2494.28$, $P < 0.001$), reflecting relationships between variables.[65] After rotation, the two factors had loadings ranging from 0.51 to 0.94. The loadings for the six SPS items describing spiritual beliefs (items 5–10) ranged from 0.78 to 0.94, and those for the four items originally classified as describing spiritual behaviors (items 1–4) ranged from 0.51 to 0.93 (Table 2). The two subscales correlated significantly ($r = 0.71$, $P < 0.010$; Table 3).

Known-group validity

Spirituality showed a positive and significant correlation with resilience.[66] Therefore, the known-group validity of SPS was examined by using the resilience scale. The mean score of HARS was 4.38. Using mean score on HARS scale to define two groups for the examination of known-group validity (participants with scores below the mean were assigned to group 1, $n = 134$). There were significant differences on SPS scores between groups ($t = 3.13$, $P = 0.002$, Table 4). Thus, AYAs with cancer who reported more resilience had higher SPS scores.

Total SPS scores did not differ significantly between participants in Taiwan and Korea ($t = 1.09$, $P = 0.276$), but spiritual beliefs subscale scores did distinguish these cohorts ($t = 2.74$, $P = 0.007$; Table 5). Additionally, the scores for spiritual beliefs items 6, 7, 9, and 10 (describing spiritual guidance seeking, the importance of spirituality, and spiritual views) were significantly higher for Taiwanese than for Korean participants. Scores for the spiritual behavior item 4 (engagement in private prayer) were significantly lower in the Taiwanese than in the Korean cohort (Table 5).

Discussion

This study assessed the psychometric of the SPS for AYAs with cancer in Taiwan and Korea. The SPS showed acceptable reliability and had a suitable factor structure for measuring spirituality in these populations. The highest SPS item scores in this study were for items 5, 7, and 9, demonstrating that the participants had strong spiritual beliefs. This result is consistent with previous findings and may reflect the participants' use of spiritual beliefs to influence their ways of life and form harmonious relationships, or as an internal source of power and energy during their cancer journeys.[17,67] Spiritual beliefs are particularly important for AYAs with cancer, who are at risk of inferior physical and psychosocial outcomes due to their disease, its treatment, and concurrent developmental identity struggles.[20]

Surprisingly, the lowest SPS item score in this study was for the spiritual behavior item 3. This item may not be not sufficiently sensitive for measuring spiritual behavior in the study population. Asian AYAs with cancer may experience more purpose in life by doing things for their family members or peers, rather than by reading material.[23,67] Indeed, spiritual behavior is socially, rather than individually, oriented in Asian society. Overall, however, our findings demonstrate the sensitivity of SPS items for various populations, indicating their suitability for the measurement of spirituality among Asian AYAs with cancer.

Table 2
Descriptive statistics and SPS item loadings for Asian AYAs with cancer ($N = 277$).

SPS item	Mean	SD	%Ceiling	%Floor	ITC	Rotated factor pattern	
						Factor 1	Factor 2
Spiritual behavior	2.52	1.43					
1. How often do you mention spiritual matters?	2.77	1.66	6.9	34.3	0.71		0.90
2. How often do you share with others the problems and joys of living according to your spiritual beliefs?	2.55	1.67	6.1	41.2	0.70		0.84
3. How often do you read spiritually related material?	2.26	1.52	4.0	46.9	0.53		0.93
4. How often do you engage in private prayer or meditation?	2.53	1.84	10.5	49.5	0.57		0.51
Spiritual beliefs	2.97	1.45					
5. Forgiveness is an important part of my spirituality.	3.22	1.59	5.4	23.1	0.62	0.78	
6. I Need guidance to make spiritual decisions.	2.88	1.61	4.7	32.9	0.76	0.94	
7. Spirituality is a significant part of my life.	3.07	1.64	6.9	28.5	0.81	0.87	
8. I Feel close to God or a higher power.	2.62	1.62	4.7	39.0	0.73	0.84	
9. Spiritual views have an influence on my life.	3.03	1.63	5.4	27.8	0.73	0.92	
10. My spirituality is especially important to me because it answers many questions about the meaning of life.	2.96	1.68	7.2	31.8	0.84	0.94	
Eigenvalue						6.69	1.11
Cumulative percentage						66.88	78.02
Internal consistency reliability						0.95	0.88

SPS, spiritual perspective scale; AYAs, adolescents and young adults; SD, standard deviation; ITC, item–total correlation.

Table 3
SPS score correlations.

	SPS score		
	SPS score	Spiritual behavior	Spiritual beliefs
Spiritual behavior	0.89**	1	
Spiritual beliefs	0.95**	0.71**	1

SPS, spiritual perspective scale. $^{**}P < 0.01$.

Table 4
Known group validity on SPS between high and low resilience groups.

	M	SD	*t*	*P*
Group 1 with lower resilience ($n = 134$)	2.53	1.26	3.13	0.002
Group 2 with higher resilience ($n = 143$)	3.03	1.38		

M, mean; SD, standard deviation; SPS, spiritual perspective scale. Using mean score on resilience scale to define two groups for the examination of known-group validity (participants with scores below the mean were assigned to group 1).

The Cronbach's α coefficient for SPS was 0.94, and ITC values ranged from 0.53 to 0.84 in this study. The former value is similar to those reported for the original instrument administered to older healthy white adults (0.93), non–terminally ill and terminally ill subjects (both 0.95),[47] and pregnant African American women (0.91).[68] To determine whether scale items represent the same concept, coherence among items is checked.[69] ITC assessment determines whether elements in the test set contradict the collective behavior observed for the other elements, potentially warranting their removal.[62] Although lacking a universal threshold, ITC coefficients ≥ 0.30 generally reflect adequate reliability.[62] These results indicate that the SPS had acceptable reliability and can be applied to measure the spirituality of AYAs with cancer in Taiwan and Korea.

Our study hypotheses were confirmed. This study demonstrated that the two-factor SPS is reliable and valid for administration to AYAs with cancer in Taiwan and Korea. The two-factor structure adequately reflects this group's spirituality and suggests that spiritual beliefs and behaviors are distinct components. Although the original SPS yields a single score without subscales, Reed (1987)[47] classified its items as describing spiritual behaviors and beliefs. Item 4 (describing engagement in private prayer or meditation) had a low factor loading and the largest floor effects in this study, indicating that the study participants generally did not perform this behavior. This result is similar to the previous study, which found that the spiritual health of Taiwanese adolescents tends to emphasize connection with self or others rather than transcendent aspects, such as meditation, prayer, or connecting with the supernatural.[33] Additionally, religion was not a predictor of spirituality for childhood cancer pa-

Table 5
Known-group validity of the SPS for AYAs with cancer in Taiwan and Korea.

SPS item	Taiwan ($n = 139$)		Korea ($n = 138$)		*t*	*P*
	M	SD	M	SD		
Spiritual behavior	2.39	1.14	2.66	1.67	1.56	0.119
1. How often do you mention spiritual matters?	2.72	1.47	2.83	1.85	0.53	0.595
2. How often do you share with others the problems and joys of living according to your spiritual beliefs?	2.49	1.50	2.62	1.83	0.63	0.529
3. How often do you read spiritually related material?	2.09	1.27	2.43	1.72	1.88	0.061
4. How often do you engage in private prayer or meditation?	2.28	1.59	2.78	2.03	2.30	0.023
Spiritual beliefs	3.20	1.27	2.73	1.58	2.74	0.007
5. Forgiveness is an important part of my spirituality.	3.19	1.48	3.25	1.68	0.31	0.756
6. I Need guidance to make spiritual decisions.	3.30	1.48	2.48	1.64	4.32	0.001
7. Spirituality is a significant part of my life.	3.40	1.42	2.74	1.77	3.44	0.001
8. I Feel close to God or a higher power.	2.80	1.56	2.45	1.67	1.80	0.073
9. Spiritual views have an influence on my life.	3.32	1.47	2.75	1.74	2.96	0.003
10. My spirituality is especially important to me because it answers many questions about the meaning of life.	3.22	1.52	2.71	1.80	2.53	0.012
Total score	2.89	1.09	2.70	1.55	1.09	0.276

AYA, adolescent and young adult; M, mean; SD, standard deviation; SPS, spiritual perspective scale.

tients.[70] This item may need to be reworded, given the difference in spiritual behaviors between Western and Eastern cultures, with such independent practices of self-expression/dialogue discouraged in the latter.[22,71] Likewise, engagement in private prayer or meditation may be not prevalent in Asian culture. In a previous study that assessed and compared the spiritual needs of Korean and North American individuals, researchers discovered that Korean patients with chronic illness rated the importance of their relationship with God significantly lower than North American patients.[35] Taiwanese AYA cancer survivors experienced relationships with others as the source of their meaning of survival, and found purpose in life by doing things for their family members and peers.[23] Additionally, Chinese AYAs with cancer reported that their spiritual needs included self-awareness, connection with others, and connection with supernatural powers by chanting and wearing amulets.[67] Asian AYAs generally wear protective amulets and make meaning of their existence by engaging in such socially oriented spiritual behaviors. Moreover, the spiritual behaviors of AYAs with cancer are influenced by their family members and caregivers, and serve as alternative, complementary tools for coping with anxiety related to cancer and its treatment.[72] Thus, the performance of item 4 in this study may also reflect semantic interpretation differences; additional research is needed to determine whether this item is appropriate for Asian populations.

As anticipated, our findings confirm the known-group validity of the SPS. SPS scores demonstrated the instrument's known-group validity. Spirituality demonstrated a positive significant correlation with resilience.[66] This connection implies that spirituality, focusing on self-awareness, mindfulness, and a sense of belonging beyond traditional religious practices, could play a more significant role in helping individuals navigate life's challenges and bounce back from adversity.[73] The SPS also demonstrated sensitivity in detecting variations between AYAs with cancer in Taiwan and Korea, especially in spiritual beliefs (items 6, 7, 9, and 10). This finding might be explained by previous findings showing that Korean AYAs reported low spiritual needs.[74] Additionally, the mean scores for spiritual behaviors (2.52 ± 1.43) and spiritual beliefs (2.97 ± 1.45) were lower than those of American AYAs with cancer (4.0 ± 1.5 and 4.5 ± 1.3, respectively).[75] This finding aligns with previous findings which showed that Korean patients with chronic, life-threatening conditions reported low spiritual needs compared to North American counterparts.[35] The differences between these groups might reflect the shaping of spirituality by different environments, peer interactions, values/attitudes, and social norms.[76] Thus, SPS scores may reflect country-specific characteristics of the spirituality of AYAs with cancer; further r research is needed to accumulate more evidence from cohorts in different countries.

Implications for nursing practice and research

The SPS could be used to evaluate spiritual behaviors and beliefs in AYAs with cancer in Taiwan and Korea. Health care providers can tailor interventions to foster the spirituality of AYAs with cancer. Future studies are recommended. First, identify specific types of spiritual behaviors in AYAs with cancer in Asia, considering the social orientation of spirituality in these societies. Second, explore trends in spiritual beliefs and behaviors across different stages of illness in their cancer journey.

Limitations

There were limitations should be addressed. First, the findings are generalizable only to AYAs with cancer in Taiwan and Korea. Second, the two SPS factors were explicitly identified with a sample of 10–24-year-olds with no cognitive problems or communication barriers. Last, since the enrollment period was during the COVID-19 pandemic, participants were those who needed to receive treatment in the pediatric ward or blood monitoring at the outpatient clinic. Pediatric cancer survivors might have avoided visiting the hospital and postponed their check-ups, leading to a smaller number of sample size, which makes it unsuitable to conduct confirmatory factor analysis (CFA) validation.

Conclusions

This study showed that the SPS can be used effectively to assess the spirituality of AYAs with cancer in Taiwan and Korea. The instrument showed adequate reliability and validity. EFA revealed a two-factor structure (spiritual behaviors and spiritual beliefs). These results can support future spirituality assessments and interventions aimed at fostering positive outcomes in AYAs with cancer in Asia. Further assessment is needed to confirm the instrument's suitability in diverse cultural contexts.

Ethics statement

The study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital, Duke University, and Severance Hospital (IRB No. 20200060, Pro00105744, 2019-0263-003). All participants provided written informed consents.

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CRediT authorship contribution statement

Chin-Mi Chen: Conceptualization, Methodology, Formal analysis, Validation, Writing – Original Draft; Heeyeon Son: Methodology, Data collection, Data curation, Investigation, Writing – Original Draft; Yvonne Yueh-Feng Lu: Methodology, Investigation. Li-Min Wu: Conceptualization, Methodology, Investigation, Project administration, Data curation, Formal analysis, Supervision, Validation, Writing – Reviewing and Editing. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

The authors declare no conflict of interest.

Data availability statement

The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Declaration of generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

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