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Properties of the Shift and Persist Questionnaire in adolescent and young adult cancer patients and survivors: Validity, consistency, and interpretability

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Abstract

Purpose The Shift and Persist model provides an informative framework to understand how adolescent and young adult (AYA) cancer patients and survivors (ages 15–39) may withstand stress and thrive despite adversity. The goal of the present study was to examine the psychometric properties of the Shift and Persist Questionnaire (SPQ) in this population and provide guidelines for interpretation.

Methods AYA cancer patients and survivors were recruited via an online research panel. Participants reported demographics and health history and completed the SPQ and Patient-Reported Outcome Measurement Information System 29-item profile (PROMIS®-29). We evaluated the structural validity, internal consistency, and construct validity of the SPQ. Minimally important differences (MIDs) were estimated to inform SPQ score interpretation.

Results 572 eligible individuals completed the survey. On average, participants were aged 24 (SD = 7) at evaluation. Of the participants, 43.5% were female, 77.1% were white, and 17.5% were Hispanic (across races). The two-factor structure of the SPQ demonstrated very good structural validity (CFI > 0.95, SRMR < 0.08), and construct validity with PROMIS-29® domains (convergent *R*s = 0.17 to 0.43, divergent *R*s = − 0.11 to − 0.51). Internal consistency was adequate ($\omega = 0.76$–0.83). Recommended MIDs were 1 point for the Shift subscale, 1–2 point(s) for the Persist subscale, and 2–3 points for the total SPQ score.

Conclusion The SPQ is a psychometrically sound measure of skills that contribute to resilience in AYA cancer patients and survivors. MID recommendations enhance the interpretability of the SPQ in this population. Future studies examining shifting and persisting in this population may benefit from administering the SPQ.

Keywords Adolescent and young adult · Neoplasms · Resilience · Validity · Internal consistency · Interpretability

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Background

Nearly 90,000 adolescents and young adults (AYAs; ages 15–39) are diagnosed with cancer annually, and there are > 675,000 AYAs with a history of cancer currently living in the United States [1, 2]. Cancer diagnosis and treatment can be particularly disruptive for individuals in this age group since they are working to achieve many complex and important developmental tasks (e.g., completion of education, establishing a career, dating, marriage, and having children) [3–5]. Furthermore, AYAs with a history of cancer are more likely to report clinically significant psychological distress and lower health-related quality of life (HRQOL) than either older adults with cancer or AYAs who have not had cancer [6, 7]. Given these disparities, it is essential to identify factors that can mitigate the negative psychosocial impact of cancer on health outcomes.

Though there is an elevated prevalence of psychological distress and diminished HRQOL among AYA cancer patients and survivors, previous research has indicated that AYAs also display resilience (the process and outcome of successfully adapting to difficult life experiences), mitigating the impact of cancer on their quality of life [8–11]. However, many AYAs are not aware of the skills and resources they have or need to develop in order to adapt to cancer diagnosis, treatment, and survivorship. The Shift and Persist model, which posits that individuals who engage in acceptance and cognitive reappraisal to cope with experiences that threaten their well-being (shifting), and who endure adversities through finding meaning and maintaining optimism (persisting), provides a conceptual framework to understand how individuals withstand stress and thrive despite adversity [12]. This idea was initially proposed and tested as an explanatory model to understand why some individuals who experience adversity as a result of low socioeconomic status (SES) are able to maintain good physical health [13–15], but has since been extended to other significant, uncontrollable stressors such as ethnic-racial identity, social status, and experience of unfair treatment [16, 17]. Furthermore, there is an emerging body of evidence which suggests that shifting and persisting may also be beneficial for mental health outcomes [17, 18].

The Shift and Persist model warrants exploration in AYA cancer patients and survivors because shifting and persisting are skills that can be taught to AYAs to improve their ability to successfully adapt to cancer diagnosis, treatment, and survivorship. However, this model has not previously been applied to cancer populations, let alone AYA cancer patients and survivor. In order to test whether the Shift and Persist model is informative for understanding AYAs' adaptation to cancer, it is necessary to ensure that self-report measures of shift and persist strategies are psychometrically valid and interpretable in this population. To date, the most commonly used measure of these strategies is the Shift and Persist Questionnaire (SPQ). Versions of this brief measure of shifting and persisting strategies has previously been administered in studies of adolescents and parents from diverse socioeconomic backgrounds [14, 15, 18, 19], pediatric patients with asthma, mothers of adolescents with type 1 diabetes [13], and Latinx youth [17]. In the present study, we sought to evaluate the structural validity, internal consistency, and construct validity of the SPQ in AYA cancer patients and survivors. Furthermore, we used established procedures to estimate minimally important differences (MIDs) in SPQ scores to enhance measure interpretability.

Methods

Study procedures

All study procedures for this cross-sectional, observational study were approved by the Institutional Review Board of Northwestern University. Participants were recruited via an online research panel, Opinions for Good (Op4G) between January and March of 2015. All data collected were based on participant self-report, and clinical data were not verified. To be eligible for the study, participants were required to be aged 15–39 at the time of cancer diagnosis (any stage, excluding basal cell carcinoma), currently aged 15–39, and living in the United States. Individuals diagnosed only with basal cell carcinoma were excluded as these patients are less likely to report psychological distress than individuals with other types of skin cancer [20, 21]. In addition, participants could be no more than 5 years post completion of active treatment. Recruitment was stratified in equal groups by treatment status (on v. off active treatment). In this sample of panel participants who had already been diagnosed with cancer and were within the first 5 years post-treatment, this allowed us to ensure that both patients who were currently receiving treatment and patients in follow-up were adequately represented. Additionally, recruitment was stratified by age group (adolescents aged 15–17, emerging adults aged 18–25, and young adults aged 26–39) so that we could examine the impact of developmental stage on health-related quality of life. These findings have previously been published elsewhere [22]. Following screening to ensure eligibility, interested participants provided informed consent electronically and then completed self-report measures. Op4G excluded participants whose responses were suggestive of invalid responding (e.g., straight-lining, rapid responding). Additional details regarding their quality

control procedures are available at https://op4g.com/about/privacy/.

Measures

Participants completed a questionnaire battery that included clinical and demographic questions, the SPQ [15] and the PROMIS®-29 Profile [23].

Demographic questions included current age, sex, race, ethnicity, highest level of education completed, marital status, living situation, household income, and health insurance status. Clinical characteristics included age at diagnosis, primary diagnosis, treatment status (on v. off), and types of treatments received (surgery, radiation, and/or chemotherapy). Primary diagnosis was recoded by study staff as a blood (leukemia, lymphoma, and myeloma) or a solid tumor (all others) for use as a covariate given that the clinical trajectory of these patients often differs significantly. Furthermore, we used information regarding types of treatments received to capture and control for treatment intensity by creating an ordinal variable where 0 = surgery only, 1 = radiation (± surgery), 2 = chemotherapy (± surgery), and 3 = radiation and chemotherapy (± surgery).

The SPQ [15] was initially developed by as a battery of items drawn from existing measures of similar constructs and based on the theoretical notions of shifting and persisting. In order to validate the psychometric properties of this measure, it was administered to a sample of adolescents and adults from diverse socioeconomic backgrounds [15]. A confirmatory factor analysis revealed two distinct factors that aligned with the persist subscale (which consists of four items, including one that is reverse-coded) and the shift subscale (which consists of four items). Persist items focus on finding meaning and maintaining optimism in the context of adversity. Example items include "I feel my life has a sense of purpose" and "I believe there is a larger reason or purpose for my life." Shift items focus on engaging in acceptance and cognitive reappraisal. Example items include "When something stressful happens in my life, I think about what I can learn from the situation," and "When something doesn't turn out the way that I want, I think about what good things could come from the situation." For each item, participants are asked to indicate their level of agreement with the item from 1 (Disagree) to 4 (Agree). Sum scores are calculated for each subscale (range 4–16) and the full measure (range 8–32). Higher subscale scores indicate greater use of the strategy. This measure has previously demonstrated adequate reliability (Cronbach's alpha = 0.64–0.82), as well as convergent validity ($r = 0.25$–0.81) and divergent validity ($r = -0.27$–0.15) in a racially and socioeconomically diverse sample of 122 adolescents and 122 adults who did not have cancer [15]. While this measure has not previously been applied to cancer populations, versions of it have been used with patients who have other health conditions such as asthma [16].

The PROMIS-29®Profile [23] is a well-validated survey that assesses seven of the most relevant HRQOL domains for people with chronic illness: anxiety, depression, fatigue, pain interference, sleep disturbance, physical function, and the ability to participate in social roles and activities. All items use a 5-point unidirectional verbal rating scale format to capture frequency or intensity of the specific domain except one item for pain intensity, which uses an 11-point unidirectional verbal rating scale. T-scores ($M = 50$, SD 10) were calculated for each of these domains based on established scoring procedures [23]. For all subscales, higher scores represent more of the underlying construct. For example, a high score on the depression subscale is indicative of greater depressive symptoms and likely lower quality of life; however, a high score on the ability to participate in social roles and activities subscale is indicative of greater social functioning and likely higher quality of life.

Statistical methods

We used the COnsensus-based Standards for the selection of health status measurement INstruments (COSMIN) checklist [24] to guide our evaluation and reporting of the measurement properties of the SPQ. Analyses described below were initially conducted with the full sample and then supplemented by repeating the analyses after excluding the participants who reported only receiving surgery from the data. We were intentional about excluding this subset of our sample given that there have been mixed findings regarding whether cancer patients who undergo surgery only experience the same levels of distress and reductions in quality of life as patients that undergo more intensive and/or multimodal treatment regiments [25–27]. Moreover, we thought that the use of persist strategies in particular (i.e., maintaining optimism and finding meaning *while enduring adversity*) may have differed as a function of the duration of treatment. While surgery for removal of a cancer tumor occurs on 1 day, other treatments such as chemotherapy and radiation occur over the course of weeks, months, or even years. The supplemental analyses revealed comparable findings in statistical significance and magnitude and are available as an online appendix.

Structural validity and internal consistency

A confirmatory factor analysis (CFA) was conducted using the lavaan 0.6–7 package in RStudio® to confirm measure structure using Maximum Likelihood (ML) estimation. For CFA analysis, it has been recommended that necessary sample size be determined based on a ratio of cases to free parameters. Estimates of this ratio range from 10:1 to 20:1

[28]. Our model required estimation of 17 parameters (eight variances, eight regressions, and one covariance), indicating that this study required a minimum sample size of 170–340. We examined three fit indices: the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean residuals (SRMR). COSMIN criteria [24] indicate that in order to have very good structural validity, at least two of the fit indices need to be within the established range (CFI ≥ 0.95, RMSEA ≤ 0.06, and SRMR ≤ 0.08). As such, we hypothesized that the proposed measurement model would demonstrate adequate model fit (2+ indices meeting established cut-offs). Following the CFA, McDonald's omega (ω) was calculated to evaluate internal consistency. COSMIN criteria [24] indicate that a $\omega \geq 0.90$ indicates very good internal consistency, while $\omega \geq 0.70$ indicates adequate internal consistency. We hypothesized that the SPQ would demonstrate adequate internal consistency (McDonald's omega ≥ 0.70).

Construct validity

Using IBM® SPSS® Statistics 26, partial correlations with the PROMIS-29® domains (controlling for household income, age, sex, cancer type, treatment status, and treatment types received) were used to evaluate convergent and divergent validity of the SPS. With regard to convergent validity, we hypothesized that the totals of the shift and persist subscales and the total SPQ score would be positively correlated with physical function and participation in social roles and activities. With regard to divergent validity, we hypothesized that the shift and persist subscales and the total SPQ score would be negatively correlated with anxiety, depression, fatigue, pain, and sleep disturbance.

Interpretability

For interpretability, we report minimally important differences (MIDs), which are differences in SPQ scale values that are perceived as clinically meaningful for patients. Both distribution- and anchor-based approaches were used to determine a range of MIDs for the SPQ by following established procedures that have been described in detail elsewhere [29, 30]. Briefly, for the distribution-based approach, we used one-third and one-half standard deviation to identify score differences associated with small to moderate and moderate effect sizes (respectively). For the anchor-based method, we examined the difference in SPQ scores with respect to ordered categories of another measure (the anchor—in this case, the domain scores of the PROMIS-29). Potential anchors were formed by first collapsing PROMIS-29® domain scores into ordered categories based on established cut points [23, 31]. Spearman correlations between potential anchors and SPQ scales were evaluated to ensure a moderate association ($r_s \geq 0.30$) prior to using the anchor for MID estimation. Score differences between adjacent, clinically distinct categories were used as estimates of the MID and effect sizes were calculated by dividing the score difference by the overall standard deviation for the sample. To identify usable anchor-based estimates, we (1) checked whether each category had at least 10 participants and (2) tested whether the anchor-based estimate had a plausible effect size of 0.2–0.8. MID estimates that met these a priori criteria were used to inform MID recommendations.

Results

Participants

Ultimately, 605 individuals completed the survey; however, 33 of these individuals were excluded as their only reported cancer diagnosis was basal cell carcinoma resulting in a final sample size of 572. Mean participant age was 21 (SD 6) at diagnosis (ranging from 15 to 39) and 24 (SD 7) at survey completion (ranging from 15 to 39). The majority of our participants self-identified as male, consistent with the higher rate of cancer diagnoses among young men compared to young women [2]. In this study, 24 participants (4.2%) self-reported as Asian, 49 (8.6%) self-reported as Black, 10 (1.7%) self-reported as Native American, 4 (0.7%) self-reported as Native Pacific Islander, 441 (77.1%) self-reported as White, 33 (5.8%) self-reported as multiracial, 9 (1.6%) self-reported that they were another race, and 2 (0.3%) chose not to report their race. With regard to ethnicity, 100 participants (17.5%) self-reported as being of Hispanic origin while 465 (81.3%) self-reported as non-Hispanic and 7 (1.2%) chose not to report their ethnicity. Though cancer incidence rates among AYAs are highest among non-Hispanic White individuals [2], this group was likely over-represented in our sample. Cancer type varied widely, but the three most commonly reported cancer types were leukemia ($n = 82$, 14.3%), breast ($n = 55$, 9.6%), and melanoma ($n = 52$, 9.1%). Frequencies for the 10 most common cancer types in our sample are presented in Table 1 and broadly consistent with national rates [2]. Across diagnoses, 164 (28.7%) participants reported that their cancer had spread to their lymph nodes, while 328 (57.3%) indicated it had not and 80 (14.0%) were unsure. Similarly, 65 (11.4%) participants reported that their cancer had spread to another part of their body, while 434 (75.9%) reported it had not and 73 (12.8%) were unsure. Just over half (51.4%) of participants reported receiving ongoing treatment. Participants were most commonly in community-based hospital settings (47.2%) with both chemotherapy and radiation (35.7%). Additional sample demographic and clinical characteristics are described in Table 1.

Table 1 Sample demographic and clinical characteristics

Variable	*M*	(SD)
Age at diagnosis	20.82	(6.40)
Age at survey completion	23.59	(7.10)
Variable	*N*	(%)
Category		
Sex		
Female	249	(43.5%)
Male	323	(56.5%)
Race		
Asian	24	(4.2%)
Black/African American	49	(8.6%)
Multiracial	33	(5.8%)
Native American	10	(1.7%)
Native Pacific Islander	4	(0.7%)
White/Caucasian	441	(77.1%)
Other	9	(1.6%)
Not reported	2	(0.3%)
Ethnicity		
Hispanic	100	(17.5%)
Non-Hispanic	465	(81.3%)
Not reported	7	(1.2%)
Marital status		
Divorced	10	(1.7%)
Living with partner	17	(3.0%)
Married	101	(17.7%)
Separated	5	(0.9%)
Single, never married	437	(76.4%)
Widowed	2	(0.3%)
Living situation		
Live alone	123	(21.5%)
Live with others	449	(78.5%)
Education level		
Less than high school	186	(32.5%)
High school/GED	114	(19.9%)
Some college	109	(19.1%)
College graduate	130	(22.7%)
Graduate degree	33	(5.8%)
Household income		
Less than $25,000	35	(6.1%)
$25,000–$49,999	113	(19.8%)
$50,000–$99,999	297	(51.9%)
$100,000 or more	120	(21.0%)
Not reported	7	(1.2%)
Health insurance (current)		
No	104	(18.2%)
Yes	468	(81.8%)
Primary cancer diagnosis		
Brain	36	(6.3%)
Breast	55	(9.6%)
Cervical	22	(3.8%)

Table 1 (continued)

Variable *Category*	*N*	(%)
Hodgkin lymphoma	32	(5.6%)
Leukemia	82	(14.3%)
Lung	38	(6.6%)
Melanoma	52	(9.1%)
Stomach	28	(4.9%)
Testicular	31	(5.4%)
Thyroid	26	(4.5%)
Other[a]	170	(29.7%)
Cancer type[b]		
Blood	137	(24.0%)
Solid tumor	435	(76.0%)
Treatment status		
Off treatment	278	(48.6%)
On treatment	294	(51.4%)
Treatments received		
Surgery only	72	(12.6%)
Radiation[c]	152	(26.6%)
Chemotherapy[c]	144	(25.2%)
Radiation & chemotherapy[c]	204	(35.7%)
Treatment facility		
Academic medical center	255	(44.6%)
Community-based hospital	270	(47.2%)
Private practice	47	(8.2%)

[a]Other cancer types less frequently represented in our sample included bone, ovarian, non-Hodgkin lymphoma, kidney, colorectal, hepatobiliary, esophageal, head and neck, bladder, sarcoma, central nervous system, and myeloma

[b]Participants reported their primary cancer type, which was then coded by study staff as a blood cancer (leukemia, lymphoma, myeloma) or solid tumor (all others)

[c]Includes participants who received this treatment regardless of whether they underwent surgery

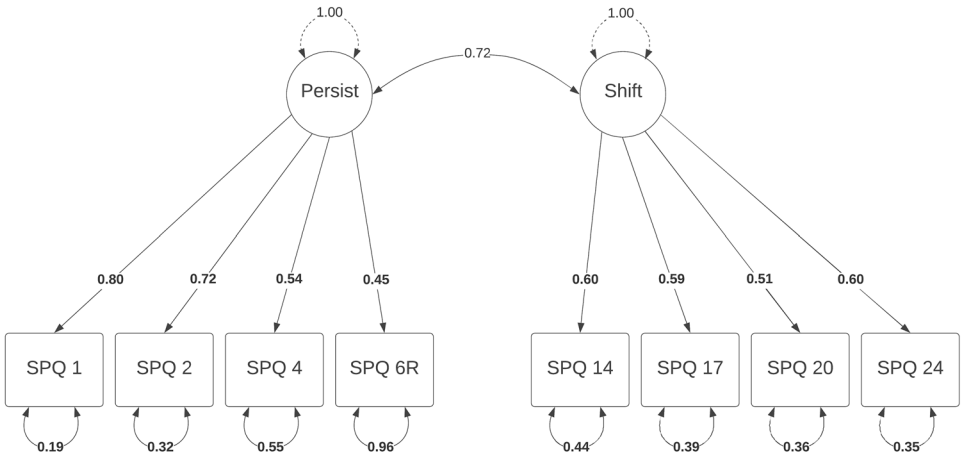

Fig. 1 Measurement model of the Shift and Persist Questionnaire with loadings from the confirmatory factor analysis

Structural validity

To evaluate the structural validity of the SPQ, we conducted a CFA to evaluate a two-factor structure (see Fig. 1). The fit indices were as follows: CFI 0.95; RMSEA 0.08; SRMR 0.05. Thus, both the CFI and SRMR were within the established range, indicating very good structural validity according to COSMIN criteria [24]. All items loaded on predicted factors: for the persist factor, loadings ranged from 0.45 to 0.80; for the shift factor, loadings ranged from 0.51 to 0.60. As expected, the shift and persist factors had a high level of covariance ($r = 0.72$, $p < 0.001$).

Internal consistency

Once measurement structure was established, McDonald's omega was calculated using the psych and MBESS packages in RStudio®. For the model specified using lavaan during CFA, $\omega = 0.83$, indicating adequate internal consistency [24]. Using the procedures outlined by Dunn et al. [32] McDonald's omega was calculated for each subscale as well: $\omega = 0.77$ for Shift and $\omega = 0.76$ for Persist, both indicating adequate internal consistency.

Construct validity

To evaluate convergent and divergent construct validity, a total score for each of the subscales was calculated and averaged across the sample. For the shift subscale, the average total score was 10.85 (SD 2.60); for the persist subscale, the average total score was 11.46 (SD 2.90). In addition, a shift and persist score was calculated by summing the shift total score and persist total score for each participant ($M = 22.31$, SD 4.84). Partial correlations (controlling for age, sex, household income, cancer type, treatment status, and treatment type) of these three scores with the domain scores of the PROMIS-29®were calculated. Both subscales and the total SPQ score were positively correlated with greater physical functioning and participation in social roles and activities (Rs = 0.18 to 0.43) providing support for the convergent validity of the SPQ. Additionally, both subscales and the total SPQ score were negatively associated with anxiety, depression, pain, fatigue, and sleep disturbance (Rs = −0.11 to −0.50) providing support for the divergent validity of the SPQ. All correlations are presented in Table 2.

Interpretability

For distribution-based MIDs, one-third and one-half of the standard deviation for each SPQ scale were calculated to provide estimates which ranged from 0.87 to 2.42. For cross-sectional anchor-based analyses, each PROMIS-29®domain score was categorized as Within Normal Limits (WNL), Mild, Moderate, or Severe based on previously established cut points [23]. Spearman correlations between PROMIS-29®category for each domain and SPQ scales ranged from 0.06 to 0.51. MID estimates were not calculated for anchors with a correlation of less than 0.30 for the Persist subscale and the Shift and Persist total score. However, no anchors met this criterion for the Shift subscale; therefore, for the Shift subscale only, we included anchors with small to moderate correlations (> 0.15). Additional details regarding MID estimates are available in Online Resource 1.

In total, 45 MID estimates were calculated for the SPQ scales (11 for the Shift subscale, 20 for the Persist subscale, and 14 for the Shift and Persist total score). Of the estimates calculated, 65% met our criteria for determining the MID. The most common reason for excluding an MID estimate was the effect size for the adjacent category difference was less than 0.2. Very few estimates were discarded because the effect size was greater than 0.8, and none were discarded due to the sample size for one of the categories being compared was less than 10. Usable cross-sectional MID estimates ranged from 0.71 (0.27 SD) to 1.30 (0.50 SD) for the Shift subscale, 0.93 (0.32 SD) to 2.26 (0.78 SD) for the Persist Scale, and 1.26 (0.26 SD) to 2.84 (0.59 SD) for the Shift and Persist total score. The minimum, maximum, median, and

Table 2 Partial correlations among subscales of the SPQ and the PROMIS-29®controlling for age, sex, household income, cancer type, treatment status, and treatment type

PROMIS-29®Subscale	Unadjusted *M* (SD)	Shift subscale	Persist subscale	Shift & persist
Anxiety	60.74 (11.42)	−0.17**	−0.34**	−0.30**
Depression	58.37 (10.82)	−0.28**	−0.50**	−0.45**
Fatigue	55.77 (10.28)	−0.11*	−0.32**	−0.25**
Pain	57.74 (9.27)	−0.13*	−0.37**	−0.29**
Sleep disturbance	53.79 (8.21)	−0.16**	−0.34**	−0.29**
Physical function	41.94 (9.39)	0.18**	0.41**	0.34**
Participation in social roles and activities	46.12 (9.79)	0.19**	0.43**	0.35**

*$p < 0.05$, **$p < 0.001$

interquartile ranges of usable cross-sectional estimates for each scale are presented in Table 3.

Given the uncertainty and variability inherent in any empirically derived value, we sought to recommend MID ranges rather than single-point estimates. In this study, the interquartile ranges were used as the recommended MID range and rounded to the nearest integer to facilitate interpretation of an individual patient's score, which can only change by a whole number on the SPQ scales. For the Shift subscale, both interquartile range values rounded to 1; thus, we recommend 1.0 as a single-point estimate of the MID. For the Persist subscale, we recommend an MID range of 1.0–2.0, while for the Shift and Persist total score, we recommend an MID range of 2.0–3.0. Recommended MIDs and estimated effect sizes are summarized in Table 3. In using the recommended MIDs, the exact value may depend on the population, context, and clinical decision. Other factors such as severity, troublesomeness of the measure at baseline, and whether the MID applies to improving or worsening condition should also be taken into account.

Discussion

This is the first study to examine the psychometric properties of, and establish guidelines for, the interpretation of the SPQ among a sample of AYA cancer patients and survivors. Our findings suggest that the two-factor model of the SPQ demonstrated good model fit and acceptable internal consistency in this population. Furthermore, associations with the PROMIS-29®domains provided strong evidence for the convergent and divergent validity of the SPQ. Overall, these findings indicate that the SPQ is a brief, valid, and reliable measure for evaluating the use of shift and persist strategies among AYA cancer patients and survivors. Our results align with the growing body of literature suggesting that shifting and persisting may be important skills in promoting resilience, which can protect against negative mental health outcomes among AYA cancer patients and survivors [9, 33–36], and raise the possibility that these protective effects may extend to physical health outcomes as has been demonstrated in other populations experiencing uncontrollable stressors [12, 14–16, 37].

Additionally, we used a combination of distribution- and anchor-based approaches to establish MIDs for the SPQ scale and subscales. As interventions that seek to promote skills that contribute to resilience among AYA cancer patients and survivors are developed and evaluated, it will be important to utilize validated measures to evaluate changes in participants' use of these strategies. By establishing MIDs for the SPQ, we have determined when a score difference is likely meaningful to patients. Other measures of resilience such as the Connor-Davidson Resilience Scale [38] have been increasingly used among AYA cancer patients and survivors. This measure evaluates self-perceived resilience, as well as resilience resources such as self-efficacy. In contrast, the SPQ more directly measures specific strategies that contribute to resilience. Including the SPQ in future studies may help us understand *how* AYAs adapt to cancer diagnosis, treatment, and survivorship.

Clinical implications

The findings from the present study suggest that the SPQ is a valid measure of the use of shifting and persisting strategies in AYA cancer patients and survivors. However, the cross-sectional design of this study did not allow us to evaluate the reliability and responsiveness of the SPQ in this population, nor the persistence of these skills over time. Thus, there is a need for well-designed observational studies to do so. Additionally, work to evaluate the core components and impact of resilience-focused interventions is ongoing, and such interventions have been shown to be beneficial for improving resilience and related outcomes in AYA survivors. For example, Rosenberg and colleagues found that the Promoting Resilience in Stress Management (PRISM)

Table 3 Summary of distribution- and anchor-based MID estimates

SPQ scale	Shift		Persist		Shift & Persist	
	n	(%)	*n*	(%)	*n*	(%)
Usable estimates	5	(45)	15	(75)	11	(79)
	Points	Effect size	Points	Effect size	Points	Effect size
Minimum	0.71	0.27	0.93	0.32	1.26	0.26
25th percentile	0.87	0.33	1.30	0.45	1.70	0.35
Median	0.91	0.35	1.47	0.51	2.20	0.45
75th percentile	1.03	0.39	1.72	0.59	2.54	0.52
Maximum	1.30	0.50	2.26	0.78	2.84	0.59
MID Recommendation	1.0	0.38	1.0–2.0	0.34–0.69	2.0–3.0	0.41–0.62

intervention not only increased AYAs' self-perceived resilience, it improved cancer-specific quality of life and hopeful patterns of thought, and decreased depressive symptoms [39]. Future studies of resilience-focused interventions for AYA cancer patients and survivors could consider including the SPQ as a mediating factor of patient-centered outcomes such as HRQOL. It may be a particularly useful measure given that it has been validated in AYA cancer patients and survivors, assesses (and differentiates between) shifting and persisting strategies, and has previously been validated in diverse, underserved patient populations [15, 17, 19, 40].

Study limitations

This study has a few limitations. First, our participants were predominately white and insured. Thus, our findings may underestimate the degree to which shift and persist strategies are used by disadvantaged AYAs. Previous research has indicated that the shift and persist model has strong explanatory power in racial and ethnic minority children from socioeconomically disadvantaged families [12, 14, 17]. Accordingly, it will be important to establish the cross-cultural validity of the SPQ among AYAs who are also racial and/or ethnic minorities or uninsured. Second, though we used rigorous quality control procedures to ensure responses received were valid, participants' clinical information was obtained through self-report, which can be an unreliable modality for certain types of clinical information (e.g., disease stage). As such, we were not able to conduct additional exploratory analyses for other subgroups of interest (e.g., patients with early stages vs. advanced stages of cancer). Third, for the Shift subscale of the SPQ, we used a lower cutoff of correlation with categorical anchors (0.15) than the Persist subscale or the SPQ total score (0.30; see "Methods" section). Still, we had fewer usable MID estimates for the Shift subscale than for the Persist subscale or the SPQ total score, limiting our confidence in this estimate. Finally, our study was a secondary analysis of a cross-sectional data set. As such, we were unable to evaluate temporal changes or stability in the use of shift and persist strategies. Furthermore, this meant that our options for the evaluation of the SPQ's construct validity were limited. The PROMIS-29® is a well-validated measure of quality of life which was adequate for this purpose; however, using a measure of meaning making or coping may have been more appropriate.

Conclusions and future directions

Overall, these findings indicate the SPQ is a brief, valid, and reliable measure for evaluating the shift and persist model among AYA cancer patients and survivors. Future studies of the SPQ in AYA cancer patients and survivors should focus on recruiting participants from clinic-based settings to ensure a representative sample, particularly with regard to race, ethnicity, and insurance status. Additionally, studies applying the shift and persist model in this and other populations should employ longitudinal designs to examine the reliability and responsiveness of the SPQ. Such studies might also consider using single-item anchors to measure clinically meaningful with patient change to improve our understanding of the clinical implications of this instrument [41]. The use of single items rather than scales is helpful for enhancing interpretability as the categories are explicitly defined, rather than based on arbitrary cut-offs. Finally, the construct validity of the SPQ should be examined using gold-standard measures that assess constructs more similar to shifting and persisting such as coping and meaning making. By improving our understanding of how people withstand stress and thrive in spite of adversity, we will be better able to support those who are most at risk of adverse outcomes and ultimately enable them to achieve more positive outcomes.

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Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Consent to participate Op4G obtained consent from all adult participants and assent from all adolescent participants included in the study. For adolescent participants (< 18 years), Op4G obtained permission from a parent/guardian for their participation in the panel.

Ethical approval This study was approved by the Northwestern University Institutional Review Board and was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

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