Protocol

A Web-Based, Positive Emotion Skills Intervention for Enhancing Posttreatment Psychological Well-Being in Young Adult Cancer Survivors (EMPOWER): Protocol for a Single-Arm Feasibility Trial

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Abstract

Background: Adolescent and young adult cancer survivors (AYAs) experience clinically significant distress and have limited access to supportive care services. Interventions to enhance psychological well-being have improved positive affect and reduced depression in clinical and healthy populations but have not been routinely tested in AYAs.

Objective: The aim of this protocol is to (1) test the feasibility and acceptability of a Web-based positive emotion skills intervention for posttreatment AYAs called Enhancing Management of Psychological Outcomes With Emotion Regulation (EMPOWER) and (2) examine proof of concept for reducing psychological distress and enhancing psychological well-being.

Methods: The intervention development and testing are taking place in 3 phases. In phase 1, we adapted the content of an existing, Web-based positive emotion intervention so that it would be suitable for AYAs. EMPOWER targets 8 skills (noticing positive events, capitalizing, gratitude, mindfulness, positive reappraisal, goal setting, personal strengths, and acts of kindness) and is delivered remotely as a 5-week, Web-based intervention. Phase 2 consisted of a pilot test of EMPOWER in a single-arm trial to evaluate feasibility, acceptability, retention, and adherence and to collect data on psychosocial outcomes for proof of concept. In phase 3, we are refining study procedures and conducting a second pilot test.

Results: The project was part of a career development award. Pilot work began in June 2015, and data collection was completed in March 2019. The analysis is ongoing, and results will be submitted for publication by May 2020.

Conclusions: If this intervention proves feasible and acceptable, EMPOWER will be primed for a subsequent large, multisite randomized controlled trial. As a scalable intervention, it will be ideally suited for AYA survivors who would otherwise not have access to supportive care interventions to help manage posttreatment distress and enhance well-being.

Trial Registration: ClinicalTrials.gov NCT02832154, https://clinicaltrials.gov/ct2/show/NCT02832154.
International Registered Report Identifier (IRRID): DERR1-10.2196/17078

(JMIR Res Protoc 2020;9(5):e17078) doi: 10.2196/17078

http://www.researchprotocols.org/2020/5/e17078/
KEYWORDS
emotions; telemedicine; happiness; eHealth; cancer; young adult; internet; mobile phone

Introduction

Background
Adolescent and young adult cancer survivors (AYAs) are an important underserved group at risk for significant psychological distress. There are approximately 70,000 new diagnoses of cancer annually in AYAs (aged 18-39 years) [1]. Currently, nearly 2 million people in the United States are living with or have survived being diagnosed with cancer as an AYA. Five-year survival rates of AYAs are high (>80%) [2], and AYAs have approximately 35 to 59 years of life expectancy remaining [3], underscoring the importance of posttreatment survivorship care. AYAs face unique challenges, given the physical, cognitive, and psychosocial developmental milestones disrupted as a result of cancer [4,5]. Notably, the prevalence of clinically significant depression or anxiety is much higher compared with older adults [6-12]. For older adults, cancer is a distressing event but a more normative experience in an aging population. In addition, older adults typically have greater experience in coping with major life events. For AYAs, a cancer diagnosis is routinely unexpected, considerably disruptive, and frequently socially isolating, factors that contribute to higher rates of psychological distress. Moreover, AYAs may have inadequate insurance coverage, limited financial assets, and experience significant work interruption, leading to greater financial strain and contributing to elevated distress [13,14]. Accordingly, AYAs can benefit from targeted, supportive care interventions to decrease distress and enhance well-being as they navigate posttreatment survivorship.

The National Cancer Institute has called for supportive care interventions in AYAs to address psychological health deficits [15]. Although a modest but growing number of psychosocial interventions have been developed for AYAs [16,17], including those that use electronic health (eHealth) modalities [18-20], none have included a focus on enhancing psychological well-being through positive emotions. eHealth interventions represent promising options for patient engagement, especially with digital natives such as AYAs, and provide opportunities for fostering user engagement, which is positively associated with intervention efficacy [21]. The vast majority of AYAs access the internet (94%-99%) [22] and own smartphones (92%-96%) [23]. As AYAs have shown that they prefer remotely delivered, on-demand interventions [24], there is a clear need and opportunity for eHealth interventions to positively impact AYAs’ psychological well-being. Moreover, although the deleterious effects of psychological distress are well researched, comparatively less attention has been focused on the benefits of psychological well-being. Psychological well-being is significantly associated with better health outcomes (better physical health [25] and lower risk of mortality in healthy and chronically ill samples [26-30]), is unique from the influence of distress, and includes domains that are inherently valued by patients (better relationships, more creativity, and better work quality [31]).

Objectives
In this protocol paper, we describe the development and pilot testing of a Web-based positive emotion skills intervention for posttreatment AYAs, Enhancing Management of Psychological Outcomes With Emotion Regulation (EMPOWER). We are adapting an existing multicomponent positive emotion skills intervention [32-36] and tailoring it for AYAs. EMPOWER is a 5-session intervention designed to teach participants 8 skills for increasing positive emotion in their daily lives.

The objectives of this investigation are to (1) test the feasibility and acceptability of a Web-based positive emotion skills intervention tailored for AYAs posttreatment and (2) examine proof of concept of the positive emotion skills intervention for reducing psychological distress (depression, anxiety, and anger) and enhancing psychological well-being (positive affect, life satisfaction, meaning and purpose, and general self-efficacy).

In addition, exploratory analysis will examine associations with other indicators of health-related quality of life (HRQOL: fatigue, pain interference, sleep disturbance, physical functioning, and social functioning) and health behaviors (diet, exercise, alcohol use, and smoking). Ultimately, this research seeks to develop an optimized Web-based positive emotion skills intervention for posttreatment AYAs, which will be tested in a future randomized controlled trial (RCT).

Methods

Overview
The intervention development and testing were planned for 3 phases. Phase 1 aimed to adapt a Web-based positive emotion skills intervention to maximize the acceptability and relevance of the intervention content for posttreatment AYAs. Phase 2 aimed to conduct a pilot test of EMPOWER in a single-arm trial to evaluate feasibility, acceptability, retention, adherence, and collect data on psychosocial outcomes for proof of concept. In phase 3, we incorporate any suggested modifications from the phase 2 pilot to address any potential challenges encountered from the first round of pilot testing and to ensure that we are maximizing our ability to recruit, retain, and support AYAs. These changes are followed by a second round of pilot testing. Planned accrual was 20 for phase 2 and 20 for phase 3.

Participants were recruited through 2 comprehensive cancer centers (the Robert H Lurie Comprehensive Cancer Center [RHLCCC], and the Wake Forest Baptist Comprehensive Cancer Center [WFBCCC]) and supplemented by recruitment over social media. All participants were asked to provide daily emotion reports over the course of the 5-week intervention and received self-paced Web-based instruction and practice in skills for increasing their daily experience of positive emotion. Participants were assessed at baseline, at 8 weeks (immediately postintervention), and at 12 weeks. To minimize participant burden, we used brief and well-validated National Institutes of Health (NIH) Patient-Reported Outcomes Measurement
information System (PROMIS) and NIH Toolbox measures to assess most study outcomes.

Phase 1: Intervention Adaptation
As the first step in this phase, the study principal investigator (PI: JS) reviewed candidate interventions for potential adaptation and testing among AYA posttreatment survivors. The MARIGOLD intervention, developed by a lead collaborator (JM) for individuals with elevated depressive symptoms, provided the constellation of skills to promote positive emotions through emotion regulation and was tailored for Web-based delivery [35,36]. MARIGOLD is a 5-session intervention that teaches participants 8 empirically-based skills (ie, positive events, savoring, gratitude, attainable goals, mindfulness, positive reappraisal, personal strengths, and acts of kindness) to increase the frequency of positive emotions experienced in their lives. As AYAs are digital natives, having access to and comfort with digital technologies [22,23], this mode of intervention delivery was well suited for them.

In the second step of this process, the study team reviewed the intervention content with a particular focus on ensuring that the appropriate coping skills were represented, and the language used was applicable for posttreatment AYAs. As a third step in this process, we solicited stakeholder input from AYAs and their providers. Stakeholders reviewed the intervention content and provided feedback on the quality of advice (eg, Does this sound like something you can do?), their affective response (eg, Talk about how reading it made you feel.), and the appropriateness of images used in the lessons (eg, Some pages have a photo or video. Give your comments on that.). All feedback was reviewed and discussed by the full study team to finalize the intervention content before pilot testing.

Phase 2: Initial Pilot Testing

Study Population
Participant eligibility inclusion criteria included (1) able to read and understand English, (2) able to provide informed consent, (3) past history of a cancer diagnosis (excluding basal cell skin carcinoma), (4) 18 to 39 years of age at diagnosis, (5) currently within 0 to 5 years post active treatment, and (6) wireless internet connection or a home computer that is connected to the internet. Exclusion criteria included (1) evidence of cancer recurrence or a history of multiple primary cancers, (2) currently receiving palliative or hospice care, or (3) a significant psychiatric history. Our past work with posttreatment AYAs underscores the psychologically vulnerable posttreatment, reentry period, as they navigate new and sometimes recurring challenges to their psychological well-being [6,37-39]. Providing a Web-based, self-guided, well-being intervention during this critical transition phase helps address some of these unmet needs.

Study Procedures

Recruitment and Enrollment
With prior approval from the medical oncologists, study staff identified potential RHLCCC and WFBCCC patients from the electronic medical record. Potentially eligible patients were recruited through a direct in-clinic approach and mailed letters, followed by a phone call from a study team member. The recruitment call was followed by an email outlining the details discussed during the phone call and instructions on the next steps and a link to the screening questionnaire. The patients were then screened for eligibility using Qualtrics, a Web-based data collection tool that enables researchers to create study-specific websites for capturing participant data securely. Those who were ineligible were shown a message thanking them for their interest but informing them that they were not eligible for the study. Patients who were eligible were navigated to the consent form and initial study questionnaire on Qualtrics. On completion of the baseline questionnaire, all participants were asked to begin daily emotion reporting for 2 weeks before beginning the intervention.

Intervention Content
The EMPOWER intervention is a 5-session Web-based intervention that teaches 8 skills for increasing the frequency of positive emotions: (1) noting daily positive events [40-43], (2) capitalizing on or savoring positive events [44,45], (3) gratitude [46-48], (4) mindfulness [49-52], (5) positive reappraisal [53-58], (6) focusing on personal strengths [59-61], (7) setting and working toward attainable goals [57,58,62-64], and (8) small acts of kindness [65-69] (see Table 1). The skills are presented over 5 weeks. A week consists of 1 to 2 days of didactic material and several days of brief, real-life skills practice and reporting, with each day’s home practice taking approximately 20 to 30 min to complete. Participants cannot skip ahead, but they can return to old lessons or exercises if they choose. Most exercises are in diary format in which participants’ past responses are displayed next to their new ones so that every time the participant visits that exercise, they see their growing list of past positive experiences. All aspects of the intervention, including the didactics and skills practice, are self-guided and interactive. Additional details of the development of the intervention are published elsewhere [35,36].
Week 1  
**Positive events**  
Learning to recognize positive events (eg, a good conversation with a friend, a good cup of coffee) and the associated positive affect.

**Capitalizing**  
Practicing ways to amplify the experience of positive events (eg, taking an extra moment to savor the experience as it is happening, reliving the positive experience, telling someone else about the positive experience).

**Gratitude**  
Taking a moment to feel thankful or appreciative of the things you have in life (eg, family, a sunny day, a good night’s rest).

Week 2  
**Mindfulness**  
Learn and practice the awareness and nonjudgment components of mindfulness.

Week 3  
**Positive reappraisal**  
Understanding positive reappraisal and the idea that different forms of positive reappraisal can all lead to increased positive affect in the face of stress (eg, seeing the silver lining, finding out things were not as bad as they could have been, identifying good things that came out of the event).

Week 4  
**Personal strengths**  
Participant lists his or her personal strengths and notes how they may have used these strengths recently (eg, having a good sense of humor, being artistic).

**Achievable goals**  
Understanding the characteristics of attainable goals and setting some goals for the week.

Week 5  
**Acts of kindness**  
Understanding that small acts of kindness can have a big impact on positive emotions (eg, buying the person behind you in line a cup of coffee).

### Intervention Platform

Our Web intervention is delivered via a customized website built on Moodle, a courseware platform that is used by schools and universities worldwide. Moodle allows the delivery of text or video instruction as well as interactive activities such as journals and adaptive quizzes. Moodle is recognized as secure and well-tested software, and Health Insurance Portability and Accountability Act-compliant hosting is provided by the Northwestern University. All communications with the website use industry-standard transport layer security or secure sockets layer encryption. Another layer of security is provided by avoiding any use of personally identifiable information, medical information, or other sensitive information in the context of the intervention. Participants’ Moodle accounts are not linked to their real name or email address. Email and text message reminders are handled by a smartphone Ecological Momentary Assessment text messaging system that does use the participant’s name and email address, but that cannot be linked to their Moodle account. The design of our intervention website has been refined through a number of iterations based on user testing and feedback from study participants (eg, simplifying the interface and clearly labeling new material and exercises). We have also ensured that material is viewable on handheld, tablet, and laptop devices.

### Acceptability Interview

Research staff conduct a 30-min audio-recorded, postintervention phone interview with all participants approximately 1 week after the intervention is complete to gather acceptability data. Participants are asked to rank order their favorite intervention skills, their intentions to practice each of the skills, and their plans for continued practice. In addition, they are asked whether or not they would recommend the intervention to a friend or someone newly diagnosed with cancer.

### Participant Incentives

Each participant is paid US $10 for each completed assessment for a maximum of US $30. In addition, participants are paid US $0.25 for each of three daily emotion assessments over the two separate 2-week reporting periods (4 weeks; 28 possible daily reports, up to US $21 per participant). In total, participants are compensated a maximum of US $51 for their participation in the study and are paid in full on completion of the study via a virtual gift card.

### Fidelity Monitoring

We record how frequently participants visit the website and how many times they complete the daily practice exercises for each skill. This information can be used in dose-response analyses to determine if greater exposure to the exercises leads to stronger intervention effects. We monitor participant progress during the study and contact participants who appear to be having trouble or disengaging from the intervention. Our experience indicates that even very brief human contact can increase participants’ commitment to the intervention. Participants receive an email or phone call from a study staff member if they fail to visit the website for more than 3 days in a week. Participants who cannot be reached or who do not resume visiting the website but also do not ask to leave the study are recontacted once per week for 3 weeks. After that time, they are counted as noncompleters, although we still try to contact them to obtain postintervention measures. Participants who do not reach the final lesson at the end of 10 weeks are also
considered noncompleters and asked to take the postintervention measures at that time.

**Measures**

Patients complete self-report questionnaires throughout the intervention designed to evaluate state and mood-based aspects of psychological well-being as well as related patient-reported outcomes that may be impacted (ie, HRQOL and health behaviors) as a result of changes in psychological well-being. Psychological well-being includes both negative and positive aspects and is assessed by daily emotion reports (ie, run-in period before the intervention, end of day recall during the intervention, and run-out period after the intervention) and by weekly recall measures at baseline (pretest), approximately 8 weeks after baseline (posttest), then at 12 weeks (follow-up). The HRQOL and health behavior measures are also administered at baseline/pretest, posttest, and then follow-up (see Multimedia Appendix 1). All measures are completed from home via participants’ PCs. In addition to the measures listed below, we assess key demographics (race/ethnicity, education, household income, and insurance status), cancer type, time since diagnosis, type of treatment, and time since treatment.

**Daily Emotion Reports**

Daily frequency of positive and negative affect is assessed using modified versions of the NIH Toolbox positive affect short form [70] and the NIH PROMIS depression and anxiety short forms [71]. Participants are asked to respond to each item in terms of how they feel today. During the 2-week run-in/run-out period (weeks 1 and 2 and weeks 11 and 12), all participants complete the daily emotion reports 3 times per day with respect to their emotions at that moment. The purpose of the run-in period is to address any technical issues that participants experience, to ensure participants are comfortable reporting their emotions, to evaluate compliance with completing these reports, and to provide a pre- and postcomparison of state-based affective experiences. Furthermore, the study is designed with a relatively intensive engagement process, and we sought to identify participants who were willing and able to comply with the modest but frequent assessments, didactics, and skills practice that are part of EMPOWER. If participants do not complete at least nine daily reports in a week’s time, they are excluded from further participation in the study. In this circumstance, the participant is notified by email. One week before the 12-week assessment point, participants are contacted and asked to provide the last 2 weeks of daily emotion reporting in time to complete the final assessment. During the 5-week intervention, participants complete the end of day recall at the end of each day with respect to their emotions that day.

**Psychological Well-Being**

Psychological well-being is assessed with NIH Toolbox short forms, capturing 3 common components: positive affect, life satisfaction, and meaning and purpose [70]. In addition, the NIH PROMIS general self-efficacy short form [72] is administered, as it is a closely related construct to psychological well-being and positively associated with better health-related outcomes.

**Health-Related Quality of Life**

We use the PROMIS global health items to assess overall HRQOL [73] and the PROMIS-29 [74,75] to assess domain-specific aspects of HRQOL. The PROMIS global scale consists of 10 items that assess general health, including overall physical and mental health. The PROMIS-29 consists of 29 items that assess physical functioning, anxiety, depression, fatigue, sleep disturbance, social functioning, pain interference, and pain intensity. These PROMIS measures are supplemented with additional items from the PROMIS physical function short form [76] and the PROMIS anger short form [71]. These measures were included to identify potential signal relationships for psychological well-being and HRQOL.

**Health Behaviors**

Healthy behaviors often associated with enhanced coping and better psychological adjustment are assessed [77]. Physical health behaviors include diet [78], exercise [79], alcohol consumption [78], and cigarette smoking [78].

**Phase 3: Subsequent Pilot Testing**

Primary outcomes will be reviewed and evaluated by the study team. If any outcomes are suboptimal (poor adherence, retention, and accrual), modifications to study procedures will be discussed by the team and implemented to attempt to improve these primary outcomes. A second round of pilot testing will then be conducted to evaluate the same primary and secondary outcomes with a new sample of AYA survivors. Study population, measures, and analytic plans are expected to remain largely unchanged.

**Analysis Plan**

**Analysis of Primary Objectives**

Accrual will be estimated as the number of patients accrued divided by the number of months of accrual. A 95% CI for the monthly accrual rate will be calculated based on the Poisson distribution. The refusal rate will be estimated as the number of patients who refuse to participate divided by the number eligible. Retention will be primarily defined as the proportion of patients who provide 8-week and 12-week data. Patients who discontinue the intervention (refuse phone calls) but complete the outcome assessments will be counted in the numerator for calculating retention. Retention estimates will be calculated overall and by site. Adherence to the intervention will be calculated as the number of intervention sessions completed, the frequency of completing exercises, and the number of website visits. We will calculate and report the mean adherence across all individuals as well as the proportion of patients who completed 3 or more sessions. Several measures will be used to quantify acceptability, including quantitative measures and interviews. Means and the proportion responding affirmatively to the highest 2 responses for each question will be combined, and exact 95% CIs will be calculated for these estimates.

**Analysis of Secondary Objective**

Quantitative outcomes will be assessed by a covariance pattern model for repeated measures to examine the change in patient-reported outcomes over time.
Power and Sample Size

Although this is a pilot study, and we will not be testing the efficacy of the intervention, we want to estimate feasibility, acceptability, and changes in patient-reported outcomes with a fair degree of precision. With a total of 40 patients, we can estimate CIs around means within SD 0.31 and proportions within SD 15.5%, with 95% CI. Assuming 20% of the patients may drop out, we could estimate CIs for means within SD 0.35 and proportions within SD 17.3% for measures evaluated at the end of the study.

Results

Phase 1: Intervention Adaptation

The project was part of a career development award, funded in September 2011, and the pilot work began in June 2015 with intervention adaptation efforts. We first reviewed the MARIGOLD Web-based protocol in detail, and skills that were too narrowly focused on the protocol’s prior target of treating depression were removed (ie, behavioral activation). The skills sequence remained the same with the exception of mindfulness, which was substituted for behavioral activation in week 2. Next, the study team reviewed the content language of the intervention and changed terms or phrases to reflect the experiences of having had cancer. For example, content language for the skill of positive reappraisal was changed to reflect commonly experienced feelings and cognitions of cancer survivors. Finally, 4 AYA stakeholders (a pediatric oncologist and AYA Medical Director, a clinical psychologist and Director of AYA Oncology, and 2 posttreatment AYA survivors) reviewed the EMPOWER intervention and provided feedback. All stakeholder input was reviewed and discussed by the study team, and minor modifications were made to content language (eg, adding fear as a commonly experienced unpleasant emotion among cancer survivors) and images (eg, substituting an image in the Strengths lesson for one that is more broadly applicable to cancer survivors who may have physical limitations) to finalize the intervention before pilot testing.

Phases 2 and 3: Pilot Testing

Recruitment began for phase 2 in October 2015, and recruitment began for phase 3 in April 2017. Data collection was completed in March 2019. Data analysis is currently ongoing, and the first results are expected to be submitted for publication in May 2020.

Discussion

Principal Findings

This paper describes the study protocol for adapting and pilot testing the EMPOWER intervention, a Web-based positive emotion skills intervention for AYA cancer survivors. In this study, we are tailoring an existing positive emotions intervention to align with the needs and preferences of posttreatment AYAs and then piloting the intervention over two waves of data collection to refine study procedures. Our short-term goal for this work is to produce a multicomponent, emotion regulation intervention that is feasible and acceptable to AYA cancer survivors for future testing as part of a larger RCT.

Strengths and Limitations

There are a number of strengths to this research study. First, psychosocial interventions to promote psychological well-being are infrequently tested in cancer survivorship despite their potential beneficial effects. In a meta-analysis of interventions that impact well-being outcomes in cancer, 28 RCTs with positive affect outcomes were identified, yielding an overall increase in positive affect (g=0.35) [80]. However, only 36% (10/28) of those RCTs were specifically designed to target positive affect, and only 11% (3/28) of those interventions were focused on posttreatment cancer survivors [81-83]. Our dual approach will allow us to impact psychological well-being by reducing and shortening psychological distress as well as increasing and sustaining psychological well-being.

Second, EMPOWER uses a Web-based eHealth strategy that is accessible via desktop PC, tablet PC, or smartphone (both iPhone and Android systems). As already noted, AYAs are digital natives and leveraging their technological aptitude for multicomponent, tailored intervention delivery allows us to match their needs and preferences to supportive care content. Moreover, because EMPOWER is scalable, it can be simultaneously delivered to a limitless number of AYAs at multiple and geographically diverse sites. Treatment integrity and fidelity to EMPOWER remain fully intact, reducing threats to internal validity. Thus, there is great long-term potential to reach AYAs who are underserved and might not typically have access to psychosocial services through community-based practices where a majority receive care [84,85].

Third, our approach uses state-of-the-art systems in the measurement of patient-reported outcomes by including emotional, physical, and social health measures from the NIH Toolbox [70,86,87] and NIH PROMIS [88-90]. These psychometrically robust measurement systems have been systematically created through rigorous qualitative and quantitative science methodologies, yielding measures that are reliable, valid, and responsive. Moreover, the static short forms were created by selecting the best performing items that provide coverage to a range of constructs, which helps to minimize respondent burden without sacrificing measurement precision. Thus, we can assess more content-relevant domains with fewer questions.

Despite these strengths, it is worth noting the potential limitations to our work. First, we are conducting a single-arm trial for this pilot study and not randomizing participants to a control arm. Although an RCT is indeed the gold standard of intervention research, the single-arm approach is a defensible strategy when examining primary outcomes of feasibility and acceptability for a small pilot study. As part of a future strategy with this research, we are planning to conduct a large RCT. Second, we are not screening participants into the study based on moderate to high distress scores as some emotional well-being interventions typically do. Although such an approach might result in larger effect sizes for our psychological outcomes (both distress and well-being), this would prevent us from exploring the potential benefits of this intervention for those who may not have clinically significant levels of distress but could benefit from improved emotional well-being.
nonetheless. That said, we are screening out noncompliant participants with our run-in period, and this may result in a selection bias toward a highly motivated and compliant sample. Third, AYA cancer survivors have some of the poorest participation rates in cancer clinical trials (both therapeutic and supportive care) [91-94]. Recruiting AYAs involves significant time and resources. As there is a clear need for interventions that can help improve their psychological well-being, our work is a necessary first step.

Finally, our emphasis on interventions to enhance psychological well-being is not intended to deny, minimize, or otherwise ignore the significant stress of being diagnosed with and treated for cancer as an AYA or the deleterious impact it has on patients’ psychological and physical health. Nor is it advocating a superficial don’t worry, be happy approach to dealing with their illness. Rather, we are suggesting that if we broaden our focus to include a wider range of coping strategies, including interventions to promote psychological well-being, we will better equip AYAs to manage the deleterious effects of stress [95].

Conclusions
The goal of this work is to adapt and pilot test a Web-based, emotion regulation intervention designed to enhance positive emotions among AYA posttreatment cancer survivors. If EMPOWER proves feasible and acceptable, it will be primed for a subsequent large, multisite RCT. As a scalable intervention, it will be ideally suited for AYA survivors who would otherwise not have access to supportive care interventions to help manage posttreatment distress and enhance well-being.

Acknowledgments
The research reported in this publication was supported by the National Cancer Institute of the NIH under award number K07CA158008 (PI: JS). LM was supported by NCI R25 CA122061 (PI: Nancy Avis).

Conflicts of Interest
None declared.

Multimedia Appendix 1
Study timeline.
[DOCX File, 14 KB-Multimedia Appendix 1]

Multimedia Appendix 2
Peer-reviewer report from NIH.
[PDF File (Adobe PDF File), 135 KB-Multimedia Appendix 2]

References
1. National Cancer Institute. Adolescents and Young Adults with Cancer: : Types of Cancers in Young People URL: https://www.cancer.gov/types/aya [accessed 2016-09-22]
2. Barr RD, Ferrari A, Ries L, Whelan J, Bleyer WA. Cancer in adolescents and young adults: a narrative review of the current status and a view of the future. JAMA Pediatr 2016 May 1;170(5):495-501. [doi: 10.1001/jamapediatrics.2015.4689] [Medline: 26999630]
3. The World Bank. Life Expectancy at Birth, Total (Years) URL: http://data.worldbank.org/indicator/SP.DYN.LE00.IN [accessed 2018-11-01]
4. Zebrack B. Information and service needs for young adult cancer survivors. Support Care Cancer 2009 Apr;17(4):349-357. [doi: 10.1007/s00520-008-0469-2] [Medline: 18543006]
5. Zebrack BJ. Psychological, social, and behavioral issues for young adults with cancer. Cancer 2011 May 15;117(10 Suppl):2289-2294 [FREE Full text] [doi: 10.1002/cncr.26056] [Medline: 21523748]
6. Yanez B, Garcia SF, Victorson D, Salsman JM. Distress among young adult cancer survivors: a cohort study. Support Care Cancer 2013 Sep;21(9):2403-2408 [FREE Full text] [doi: 10.1007/s00520-013-1793-8] [Medline: 23568764]
7. Kwak M, Zebrack BJ, Meeske KA, Embry L, Aguilar C, Block R, et al. Trajectories of psychological distress in adolescent and young adult patients with cancer: a 1-year longitudinal study. J Clin Oncol 2013 Jun 10;31(17):2160-2166. [doi: 10.1200/JCO.2012.45.9222] [Medline: 23650425]
8. Park EM, Rosenstein DL. Depression in adolescents and young adults with cancer. Dialogues Clin Neurosci 2015 Jun;17(2):171-180 [FREE Full text] [Medline: 26246791]
9. Sansom-Daly U, Wakefield C. Distress and adjustment among adolescents and young adults with cancer: an empirical and conceptual review. Transl Pediatr 2013 Oct;2(4):167-197 [FREE Full text] [doi: 10.3978/j.issn.2224-4336.2013.10.06] [Medline: 26835313]
10. Muffly LS, Hlubocky FJ, Khan N, Wroblewski K, Breitenbach K, Gomez J, et al. Psychological morbidities in adolescent and young adult blood cancer patients during curative-intent therapy and early survivorship. Cancer 2016 Mar 15;122(6):954-961 [FREE Full text] [doi: 10.1002/cncr.29868] [Medline: 26749023]
11. Sheppard VB, Harper FW, Davis K, Hirpa F, Makambi K. The importance of contextual factors and age in association with anxiety and depression in Black breast cancer patients. Psychooncology 2014 Feb;23(2):143-150 [FREE Full text] [doi: 10.1002/pon.3382] [Medline: 24150907]

12. Lang MJ, David V, Giese-Davis J. The age conundrum: a scoping review of younger age or adolescent and young adult as a risk factor for clinical distress, depression, or anxiety in cancer. J Adolesc Young Adult Oncol 2015 Dec;4(4):157-173 [FREE Full text] [doi: 10.1089/jayao.2015.0005] [Medline: 26697266]

13. Landwehr MS, Watson SE, Macpherson CF, Novak KA, Johnson RH. The cost of cancer: a retrospective analysis of the financial impact of cancer on young adults. Cancer Med 2016 May;5(5):863-870 [FREE Full text] [doi: 10.1002/cam4.657] [Medline: 26853096]

14. Ketterl TG, Syrjala KL, Casillas J, Jacobs LA, Palmer SC, McCabe MS, et al. Lasting effects of cancer and its treatment on employment and finances in adolescent and young adult cancer survivors. Cancer 2019 Jun 1;125(11):1908-1917. [doi: 10.1002/cncr.31985] [Medline: 30707763]

15. Smith AW, Seibel NL, Lewis DR, Albritton KH, Blair DF, Blanke CD, et al. Next steps for adolescent and young adult oncology workshop: An update on progress and recommendations for the future. Cancer 2016 Apr 1;122(7):988-999 [FREE Full text] [doi: 10.1002/cncr.29870] [Medline: 26849003]

16. Barnett M, McDonnell G, DeRosa A, Schuler T, Philip E, Peterson L, et al. Psychosocial outcomes and interventions among cancer survivors diagnosed during adolescence and young adulthood (AYA): a systematic review. J Cancer Surviv 2016 Oct;10(5):814-831 [FREE Full text] [doi: 10.1007/s11764-016-0527-6] [Medline: 26920873]

17. Walker E, Martins A, Aldiss S, Gibson F, Taylor RM. Psychosocial interventions for adolescents and young adults diagnosed with cancer during adolescence: a critical review. J Adolesc Young Adult Oncol 2016 Dec;5(4):310-321. [doi: 10.1089/jayao.2016.0025] [Medline: 27486837]

18. Kato PM, Cole SW, Bradlyn AS, Pollock BH. A video game improves behavioral outcomes in adolescents and young adults with cancer: a randomized trial. Pediatrics 2008 Aug;122(2):e305-e317. [doi: 10.1542/peds.2007-3134] [Medline: 18676516]

19. Valle CG, Tate DF, Mayer DK, Allicock M, Cai J. A randomized trial of a Facebook-based physical activity intervention for young adult cancer survivors. J Cancer Surviv 2013 Sep;7(3):355-368 [FREE Full text] [doi: 10.1007/s11764-013-0279-5] [Medline: 23532799]

20. Devine KA, Viola AS, Coups EJ, Wu YP. Digital health interventions for adolescent and young adult cancer survivors. JCO Clin Cancer Inform 2018 Dec;2:1-15 [FREE Full text] [doi: 10.1200/CCI.17.00138] [Medline: 30652583]

21. Perski O, Blandford A, West R, Michie S. Conceptualising engagement with digital behaviour change interventions: a systematic review using principles from critical interpretive synthesis. Transl Behav Med 2017 Jun;7(2):254-267 [FREE Full text] [doi: 10.1007/s13142-016-0453-1] [Medline: 27966189]

22. Pew Research Center. 2019 Jun 12. Internet/Broadband Fact Sheet URL: https://www.pewinternet.org/fact-sheet/internet-broadband/ [accessed 2020-02-05]

23. Pew Research Center. 2019 Jun 12. Mobile Fact Sheet URL: https://www.pewinternet.org/fact-sheet/mobile/ [accessed 2010-02-05]

24. Rabin C, Simpson N, Morrow K, Pinto B. Intervention format and delivery preferences among young adult cancer survivors. Int J Behav Med 2013 Jun;20(2):304-310. [doi: 10.1007/s12228-012-9227-4] [Medline: 22328444]

25. Pressman SD, Cohen S. Does positive affect influence health? Psychol Bull 2005 Nov;131(6):925-971. [doi: 10.1037/0033-2909.131.6.925] [Medline: 16351329]

26. Chida Y, Steptoe A. Positive psychological well-being and mortality: a quantitative review of prospective observational studies. Psychosom Med 2008 Sep;70(7):741-756. [doi: 10.1097/PSY.0b013e31818105ba] [Medline: 18725425]

27. Moskowitz JT. Positive affect predicts lower risk of AIDS mortality. Psychosom Med 2003;65(4):620-626. [doi: 10.1097/01.spm.0000073873.74829.23] [Medline: 12883113]

28. Steptoe A, Wardle J. Positive affect measured using ecological momentary assessment and survival in older men and women. Proc Natl Acad Sci USA 2011 Nov 8;108(45):18244-18248 [FREE Full text] [doi: 10.1073/pnas.1108922108] [Medline: 22042845]

29. Moskowitz JT, Epel ES, Acree M. Positive affect uniquely predicts lower risk of mortality in people with diabetes. Health Psychol 2008 Jan;27(1S):S73-S82. [doi: 10.1037/0278-6133.27.1S.573] [Medline: 18248108]

30. Liu B, Floud S, Pirie K, Green J, Peto R, Beral V. Does happiness itself directly affect mortality? The prospective UK Million Women Study. The Lancet 2016 Feb;387(10021):874-881. [doi: 10.1016/s0140-6736(15)01087-9]

31. Lyubomirsky S, King L, Diner E. The benefits of frequent positive affect: does happiness lead to success? Psychol Bull 2005 Nov;131(6):803-855. [doi: 10.1037/0033-2909.131.6.803] [Medline: 16351326]

32. Moskowitz JT, Carrico AW, Duncan LG, Cohn MA, Cheung EO, Batchelder A, et al. Randomized controlled trial of a positive affect intervention for people newly diagnosed with HIV. J Consult Clin Psychol 2017 May;85(5):409-423 [FREE Full text] [doi: 10.1037/ccp0000188] [Medline: 28333512]

33. Cohn MA, Pietrucha ME, Saslow LR, Hult JR, Moskowitz JT. An online positive affect skills intervention reduces depression in adults with type 2 diabetes. J Posit Psychol 2014 Jan 1;9(6):523-534 [FREE Full text] [doi: 10.1080/17439760.2014.920410] [Medline: 25214877]
34. Cheung EO, Cohn MA, Dunn LB, Melisko ME, Morgan S, Penedo FJ, et al. A randomized pilot trial of a positive affect skill intervention (lessons in linking affect and coping) for women with metastatic breast cancer. Psychooncology 2017 Dec;26(12):2101-2108 [FREE Full text] [doi: 10.1002/pon.4312] [Medline: 27862646]
35. Cheung EO, Addington EL, Bassett SM, Schuette SA, Shiu EW, Cohn MA, et al. A self-paced, web-based, positive emotion skills intervention for reducing symptoms of depression: protocol for development and pilot testing of MARIGOLD. JMIR Res Protoc 2018 Jun 5;7(6):e10494 [FREE Full text] [doi: 10.2196/10494] [Medline: 29871853]
36. Addington EL, Cheung EO, Bassett SM, Kwok I, Schuette SA, Shiu E, et al. The MARIGOLD study: Feasibility and enhancement of an online intervention to improve emotion regulation in people with elevated depressive symptoms. J Affect Disord 2019 Oct 1;257:352-364. [doi: 10.1016/j.jad.2019.07.049] [Medline: 31302525]
37. Munoz AR, Kaiser K, Yanez B, Victorson D, Garcia SF, Snyder MA, et al. Cancer experiences and health-related quality of life among racial and ethnic minority survivors of young adult cancer: a mixed methods study. Support Care Cancer 2016 Dec;24(12):4861-4870 [FREE Full text] [doi: 10.1007/s00520-016-3340-x] [Medline: 27435322]
38. Victorson D, Garcia SF, Lampert S, Salsman JM. A qualitative focus group study to illuminate the lived emotional and social impacts of cancer and its treatment on young adults. J Adolesc Young Adult Oncol 2019 Dec;8(6):649-659. [doi: 10.1089/jayao.2019.0028] [Medline: 31329494]
39. Salsman JM, Garcia SF, Yanez B, Sanford SD, Snyder MA, Victorson D. Physical, emotional, and social health differences between posttreatment young adults with cancer and matched healthy controls. Cancer 2014 Aug 1;120(15):2247-2254 [FREE Full text] [doi: 10.1002/cncr.28739] [Medline: 24888335]
40. Krause N. Positive life events and depressive symptoms in older adults. Behav Med 1988;14(3):101-112. [doi: 10.1080/08964289.1988.9935131] [Medline: 3167237]
41. Lewinsohn PM, Clarke GN, Hoberman HM. The Coping With Depression Course: review and future directions. Can J Behav Sci 1989;21(4):470-493. [doi: 10.1037/h0079846]
42. Lewinsohn PM, Amenson CS. Some relations between pleasant and unpleasant mood-related events and depression. J Abnorm Psychol 1978 Dec;87(6):644-654. [doi: 10.1037/0021-843x.87.6.644] [Medline: 739087]
43. Lewinsohn PM, Sullivan JM, Grosscup SJ. Changing reinforcing events: An approach to the treatment of depression. Psychother 1980;17(3):322-334. [doi: 10.1037/h0085929]
44. Langston CA. Capitalizing on and coping with daily-life events: expressive responses to positive events. J Pers Soc Psychol 1994;67(6):1112-1125. [doi: 10.1037/0022-3514.67.6.1112]
45. Bryant FB. A four-factor model of perceived control: avoiding, coping, obtaining, and savoring. J Pers 1989;57(4):773-797. [doi: 10.1111/j.1467-6494.1989.tb00449.x]
46. Emmons RA. Thanks! How the New Science of Gratitude Can Make You Happier. New York: Houghton Mifflin Harcourt; 2007.
47. Kashdan TB, Usowatte G, Julian T. Gratitude and hedonic and eudaimonic well-being in Vietnamese war veterans. Behav Res Ther 2006 Feb;44(2):177-199. [doi: 10.1016/j.brat.2005.01.005] [Medline: 16389060]
48. Lyubomirsky S, Schkade D, telescope of an intervention to improve well-being. Psyche 2005 Jun;9(2):111-131. [doi: 10.1016/0278-6133(97)00040-3]
49. Kabat - Zinn J. Mindfulness - based interventions in context: past, present, and future. Clin Psychol 2003 Jun;10(2):144-156. [doi: 10.1093/psychon.bpg016]
50. Grossman P, Fung E, Dyer K, Reade C, Edwards L, Williams J. Mindfulness training as an intervention for fibromyalgia: evidence of postintervention and 3-year follow-up benefits in well-being. Psychother Psychosom 2007;76(4):226-233. [doi: 10.1159/000101501]
51. Zinn J. Mindfulness-based stress reduction for cancer patients. J Psychosoc Oncol 1988;6(1):187-215. [doi: 10.1080/08904128808213027]
52. Chesney MA, LaFleur M, Morales M, Cates CL, London NJ, Fieldman R, et al. Enhancing mental health of therapists in training. Train Educ Prof Psychol 2007 May;1(2):105-115. [doi: 10.1037/h0079846]
53. Carver CS, Scheier MF. Full-Scale measures of situational coping and coping dispositions in a stressful transaction. J Pers Soc Psychol 1994 Jan;66(1):184-195. [doi: 10.1037/0022-3514.66.1.184] [Medline: 8126648]
54. Moskowitz JT, Folkman S, Collette L, Vittinghoff E. Coping and mood during aids-related caregiving and bereavement. Ann Behav Med 1996 Mar;18(1):49-57. [doi: 10.1007/BF02903939] [Medline: 24203643]
55. Moskowitz JT, Hult JR, Bussolari C, Acree M. What works in coping with HIV? A meta-analysis with implications for coping with serious illness. Psychol Bull 2009 Jan;135(1):121-141. [doi: 10.1037/a0014210] [Medline: 19210056]
56. Antoni MH, Scheierman N, Ironson G. Cognitive-Behavioral Stress Management. England: Oxford University Press; 2007.
59. Koole SL, Smeets K, van Knippenberg A, Dijkstraheu A. The cessation of rumination through self-affirmation. J Pers Soc Psychol 1999;77(1):111-125. [doi: 10.1037/0022-3514.77.1.111]

60. Taylor SE, Lobel M. Social comparison activity under threat: downward evaluation and upward contacts. Psychol Rev 1989 Oct;96(4):569-575. [doi: 10.1037/0033-295x.96.4.569] [Medline: 2678204]

61. Taylor SE, Kemeny ME, Aspinwall LG, Schneider SG, Rodriguez R, Herbert M. Optimism, coping, psychological distress, and high-risk sexual behavior among men at risk for acquired immunodeficiency syndrome (AIDS). J Pers Soc Psychol 1992;63(3):460-473. [doi: 10.1037/0022-3514.63.3.460]

62. Carver CS, Scheier MF. Origins and functions of positive and negative affect: a control-process view. Psychol Rev 1990;97(1):19-35. [doi: 10.1037/0033-295x.97.1.19]

63. Lent RW, Singley D, Sheu H, Gainor KA, Brenner BR, Treisman D, et al. Social cognitive predictors of domain and life satisfaction: exploring the theoretical precursors of subjective well-being. J Couns Psychol 2005;52(3):429-442. [doi: 10.1037/0022-0167.52.3.429]

64. Brunstein JC, Schultheiss OC, Grässmann R. Personal goals and emotional well-being: the moderating role of motive dispositions. J Pers Soc Psychol 1998 Aug;75(2):494-508. [doi: 10.1037/0022-3514.75.2.494] [Medline: 9731321]

65. Musick MA, Wilson J. Volunteering and depression: the role of psychological and social resources in different age groups. Soc Sci Med 2003 Jan;56(2):259-269. [doi: 10.1016/s0277-9536(02)00025-4] [Medline: 12473312]

66. Oman D, Thoresen CE, Phan AT, Choi S, Liu Z, Yao JC. Comparison of health-related quality of life in patients with neuroendocrine tumors with quality of life in the general US population. Pancreas 2012 Apr;41(3):461-466. [doi: 10.1097/MPA.0b013e318222fbc2] [Medline: 22242138]

67. Moen P, Dempster-Clayton D, Williams RM. Successful aging: a life-course perspective on women's multiple roles and health. Am J Sociol 1992 May;97(6):1612-1638. [doi: 10.1086/229941]

68. Penner LA, Dovidio JF, Piliavin JA, Schroeder MA. Providing social support may be more beneficial than receiving it: results from a prospective study of mortality. Psychol Sci 2003 Jul;14(4):320-327. [doi: 10.1111/1467-9280.14461] [Medline: 12807404]

69. Brown SL, Nesse RM, Vinokur AD, Smith DM. Penner LA, Dovidio JF, Piliavin JA, Schroeder MA. Providing social support may be more beneficial than receiving it: results from a prospective study of mortality. Psychol Sci 2003 Jul;14(4):320-327. [doi: 10.1111/1467-9280.14461] [Medline: 12807404]

70. Salsman JM, Lai J, Hendrie HC, Butt Z, Zill N, Pilkonis PA, et al. Assessing psychological well-being: self-report instruments for the NIH Toolbox. Qual Life Res 2014 Feb;23(1):205-215 [FREE Full text] [doi: 10.1007/s11136-013-0452-3] [Medline: 23771709]

71. Pilkonis PA, Choi SW, Reise SP, Stover AM, Cellai D, PROMIS Cooperative Group. Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS). Depression, anxiety, and anger. Assessment 2011 Sep;18(3):263-283 [FREE Full text] [doi: 10.1177/1073191111416167] [Medline: 21697139]

72. Salsman JM, Schalet BD, Merluzzi TV, Park CL, Hahn EA, Snyder MA, et al. Calibration and initial validation of a general self-efficacy item bank and short form for the NIH PROMIS. Qual Life Res 2019 Sep;28(9):2513-2523. [doi: 10.1007/s11136-019-02198-6] [Medline: 31140041]

73. Hays RD, Revicki DA, Spritzer KL, Cellai D, PROMIS Cooperative Group. Item banks for measuring physical and mental health summary scores from the patient-reported outcomes measurement information system (PROMIS) global items. Qual Life Res 2009 Sep;18(7):873-880 [FREE Full text] [doi: 10.1007/s11136-009-9496-9] [Medline: 19543809]

74. Beaumont JL, Cellai D, Reise SP, Stover AM, Cellai D, PROMIS Cooperative Group. Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS). Depression, anxiety, and anger. Assessment 2011 Sep;18(3):263-283 [FREE Full text] [doi: 10.1177/1073191111416167] [Medline: 21697139]

75. Beaumont JL, Cellai D, Reise SP, Stover AM, Cellai D, PROMIS Cooperative Group. Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS). Depression, anxiety, and anger. Assessment 2011 Sep;18(3):263-283 [FREE Full text] [doi: 10.1177/1073191111416167] [Medline: 21697139]

76. Salsman JM, Pustejovsky JE, Schueller SM, Hernandez R, Berendsen M, McLouth LE, et al. Psychosocial interventions for cancer survivors: A meta-analysis of effects on positive affect. J Cancer Surviv 2019 Dec;13(6):943-955. [doi: 10.1007/s11764-019-00811-8] [Medline: 31741250]
81. Hoffman DL. The effects of a practice of gratitude on quality of life and depression in head and neck cancer survivors. In: DAI-B 77/02(E), Dissertation Abstracts International. Ann Arbor, MI: ProQuest Dissertations Publishing; 2015.

82. Kovacs AH. Research Gate. 2003. Kovacs AH. The Design and Evaluation of a Brief Intervention to Enhance Well-being Among Women With Breast Cancer Completing Chemotherapy. DAI:64:76 URL: [https://www.researchgate.net/publication/34985820_Kovacs_AH_The_design_and_evaluation_of_a_brief_intervention_to_enhance_well-being_among_women_with_breast_cancer_completing_chemotherapy_DAI6476] [accessed 2020-03-19]

83. Shao D, Gao W, Cao F. Brief psychological intervention in patients with cervical cancer: a randomized controlled trial. Health Psychol 2016 Dec;35(12):1383-1391. [doi: 10.1037/hea0000407] [Medline: 27513477]

84. US Department of Health and Human Services, National Institutes of Health, National Cancer Institute, LIVESTRONG. National Cancer Institute. 2006. Closing the Gap: Research and Care Imperatives for Adolescents and Young Adults With Cancer URL: [https://www.cancer.gov/types/aya/research/ayao-august-2006.pdf] [accessed 2006-04-06]

85. Zebrack B, Mathews-Bradshaw B, Siegel S, LIVESTRONG Young Adult Alliance. Quality cancer care for adolescents and young adults: a position statement. J Clin Oncol 2010 Nov 10;28(32):4862-4867. [doi: 10.1200/JCO.2010.30.5417] [Medline: 20855821]

86. Gershon RC, Wagster MV, Hendrie HC, Fox NA, Cook KF, Nowinski CJ. NIH toolbox for assessment of neurological and behavioral function. Neurology 2013 Mar 12;80(11 Suppl 3):S2-S6 [FREE Full text] [Medline: 23479538]

87. Salsman JM, Butt Z, Pilkonis PA, Cyranowski JM, Zill N, Hendrie HC, et al. Emotion assessment using the NIH Toolbox. Neurology 2013 Mar 12;80(11 Suppl 3):S76-S86 [FREE Full text] [doi: 10.1212/01.wnl.0000413876.24573.65] [Medline: 23479549]

88. Cella D, Choi SW, Condon DM, Schalet B, Hays RD, Rothrock NE, et al. PROMIS Adult Health Profiles: efficient short-form measures of seven health domains. Value Health 2019 May;22(5):537-544. [doi: 10.1016/j.jval.2019.02.004] [Medline: 31104731]

89. Cella D, Riley W, Stone A, Rothrock N, Reeve B, Yount S, PROMIS Cooperative Group. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005-2008. J Clin Epidemiol 2010 Nov;63(11):1179-1194 [FREE Full text] [doi: 10.1016/j.clinepi.2010.04.011] [Medline: 20685078]

90. Garcia SF, Cella D, Clauser SB, Flynn KE, Lad T, Lai J, et al. Standardizing patient-reported outcomes assessment in cancer clinical trials: a patient-reported outcomes measurement information system initiative. J Clin Oncol 2007 Nov 10;25(32):5106-5112. [doi: 10.1200/JCO.2007.12.2341] [Medline: 17991929]

91. Downs-Canner S, Shaw PH. A comparison of clinical trial enrollment between adolescent and young adult (AYA) oncology patients treated at affiliated adult and pediatric oncology centers. J Pediatr Hematol Oncol 2009 Dec;31(12):927-929. [doi: 10.1097/MPH.0b013e3181ed0c2f] [Medline: 19855302]

92. Parsons HM, Harlan LC, Seibel NL, Stevens JL, Keegan TH. Clinical trial participation and time to treatment among adolescents and young adults with cancer: does age at diagnosis or insurance make a difference? J Clin Oncol 2011 Oct 20;29(30):4045-4053 [FREE Full text] [doi: 10.1200/JCO.2011.36.2954] [Medline: 21931022]

93. Sanford SD, Beaumont JL, Snyder MA, Reichek J, Salsman JM. Clinical research participation among adolescent and young adults at an NCI-designated Comprehensive Cancer Center and affiliated pediatric hospital. Support Care Cancer 2017 May;25(5):1579-1586 [FREE Full text] [doi: 10.1007/s00520-016-3558-7] [Medline: 28074288]

94. Collins CL, Malvar J, Hamilton AS, Deapen DM, Freyer DR. Case-linked analysis of clinical trial enrollment among adolescents and young adults at a National Cancer Institute-designated comprehensive cancer center. Cancer 2015 Dec 15;121(24):4398-4406 [FREE Full text] [doi: 10.1002/cncr.29669] [Medline: 26393950]

95. Moskowitz JT. Coping interventions and the regulation of positive affect. In: Folkman S, editor. The Oxford Handbook of Stress, Health, and Coping. New York: Oxford University Press; 2011.

**Abbreviations**

AYA: adolescent and young adult cancer survivor
eHealth: electronic health
EMPOWER: Enhancing Management of Psychological Outcomes With Emotion Regulation
HRQOL: health-related quality of life
NIH: National Institutes of Health
PI: principal investigator
PROMIS: Patient-Reported Outcomes Measurement Information System
RCT: randomized controlled trial
RHLCCC: Robert H Lurie Comprehensive Cancer Center
WFBCCC: Wake Forest Baptist Comprehensive Cancer Center
