Original Paper

Designing Positive Psychology Interventions for Social Media: Cross-Sectional Web-Based Experiment With Young Adults With Cancer

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Abstract

Background: Young adults (ages 18-39 years) with cancer face unique risks for negative psychosocial outcomes. These risks could be lessened with positive psychology interventions adapted for social media if intervention messages encourage intentions to do the activities and positive message reactions and if young adults with cancer perceive few downsides.

Objective: This study aimed to assess whether social media messages from evidence-based positive psychology interventions encouraged intentions to do the intervention activities and intended positive message reactions, overall and among sociodemographic or cancer characteristic subgroups. We also aimed to identify perceived downsides of the activity that would negatively impact the interventions' feasibility.

Methods: Young adults (ages 18-39 years, cancer diagnosis ages 15-39 years) were randomized to a between-persons web-based experiment. Participants viewed a social media message with social context cues (vs not) for 1 of 2 types of intervention (acts of kindness vs social connectedness). Participants reported intentions to do the activity, along with their perceived social presence in the message (how much they felt the sense of others) and forecasted positivity resonance (whether they would experience socially connected positive emotions when doing the activity), with 5-point items. Participants also reported their self-efficacy (how certain they can do the intervention activity) with a 0-100 item and potential downsides of the activity categorically.

Results: More than 4 out of 5 young adults with cancer (N=396) reported they "somewhat" (coded as 3) to "extremely" (5) intended to do the intervention activity (336/396, 84.8%; mean ranged from 3.4-3.6, SD 0.9-1.0), perceived social presence in the messages (350/396, 88.4%; mean 3.8, SD 0.7), and forecasted positivity resonance (349/396, 88.1%; mean 3.8-3.9, SD 0.8). Participants reported having self-efficacy to complete the activity (mean 70.7% of possible 100%, SD 15.4%-17.2%). Most (320/396, 80.8%) did not think of the downsides of the interventions. Messages with social context cues (vs not) and both intervention types were rated similarly (all $P>.05$). Black young adults reported lower intentions, perceived social presence, and forecasted positivity resonance than White young adults (all $P<.001$). Participants in active treatment (vs completed) reported greater intentions to do the activities ($P<.001$).

Conclusions: Positive psychology intervention messages adapted for social media were perceived as acceptable and feasible among young adults with cancer. The social media–based messages encouraged increasing one's social connectedness and performing acts of kindness. Young adults with cancer also predicted they would have feelings of positive social engagement (positivity resonance) when doing the interventions—the key ingredient for experiencing the health benefits of these activities. This study provides promising evidence for the development of age-appropriate, highly scalable interventions to improve psychosocial health among young adults with cancer.

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Keywords: young adult; cancer survivors; social media; positive psychology; acceptability; feasibility; youth; cancer; psychosocial; self-efficacy; social connection; positive emotion; emotion; social engagement

Introduction

Young adults (ages 18-39 years) with cancer need tailored interventions to improve their psychosocial health. Young adults who receive any cancer diagnosis often struggle with poor psychosocial health [1,2], more than non-cancer peers [3-5]. Young adults with cancer experience social isolation that is made worse by debilitating life disruptions (eg, extended school and work absences [6-9]) throughout the cancer experience and into survivorship [10,11]. Lack of social connectedness in this population is linked with poor psychological functioning, greater sensitivity to stressors, lower physical functioning, and worse quality of life [12]. Conversely, young adults with cancer who have frequent positive, in-person social interactions have better psychological and health outcomes [13].

The science of positive psychology offers a roadmap to meet the needs of young adults with cancer. Ample evidence demonstrates how behavioral interventions, collectively termed "positive psychology interventions," can increase people's day-to-day positive activities to improve their psychosocial health [14-18]. Among the most widely studied is an act of kindness intervention: a meta-analysis of 27 randomized controlled trials (combined N=4045) found people who increase their everyday kind acts show reliable increases in well-being [19].

Recent work identifies positive experiences of social connectedness as a key active ingredient in acts of kindness interventions [20], a result consistent with other large-scale studies showing that socially engaged pursuits predict increases in well-being [18]. Social connectedness interventions target this active ingredient directly, by assigning people to increase their positive connections with others, even brief ones with acquaintances and strangers encountered in person in daily life [21]. These interventions stem from recent theory and evidence that the collective emotional state of "positivity resonance" functions to build individual psychosocial health and caring communities [21-27]. In-person social connections vary in their positivity resonance, with high quality marked by a fusion of shared positive emotions, mutual kindness, and synchrony [25,28]. A recent randomized controlled trial of various social connectedness interventions produced increases in nightly reports of positivity resonance across 35 days and demonstrated links between this socially engaged state and altruism and other prosocial tendencies [21]. Despite the promise of positive psychology to meet the unique psychosocial needs of young adults with cancer, there are currently few age-appropriate resources available [29,30].

Evidence-based positive psychology interventions should be adapted for young adults with cancer in their design and delivery. Young adults with cancer consistently report needing digital support and reducing social isolation as top priorities [31,32]. Most young adults in the United States (94%) own a smartphone [33], 85% are on the internet daily [34], and 71% use more than 1 social media platform [35]. Daily, millions of young adults turn to social media, to seek health information and lifestyle advice to improve their well-being [36], including those seeking cancer support [37-39]. Delivered via social media, positive psychology interventions designed for young adults with cancer can reach isolated populations where they are *online* to offer advice on how to foster meaningful, in-person social interactions [40].

Visuals and text about others (termed "social context cues") are important social media message elements to increase motivation to engage with digital interventions [41,42]. Social context cues that are visual (eg, peer photographs) and text-based (eg, personal stories) communicate psychosocial information about others' thinking and experiences [43]. Visuals of people are social context cues that provide rich peer information, which may be especially important for young adults with cancer who want to see images of peers' positive experiences or success stories (eg, enjoying life despite treatment or posttreatment) to feel hopeful [37,38]. Personal stories are text-based social context cues that provide salient cause-and-effect stories [44-47], which can include life advice young adults with cancer are looking for: managing negative mental health (eg, a reminder to stop doomscrolling and get out to connect in real life) or adjusting to a new "normal" of reconnecting and building community (eg, offer a sincere compliment to brighten someone's day) [37,38].

Social context cues increase young adults' perceived social presence in digital interventions [43,48]. Social presence is the feeling of being with others in mediated contexts. Social presence is driven by exposure to social context cues that signal information about peers and allow individuals to feel the personalness and human sensitivity of others through mediated channels. Social context cues increase motivation and use of web-based information for health behaviors because advice is perceived as more useful when it is from or endorsed by a community of peers [41,49], especially from young adults who "get it" because of a cancer diagnosis [42].

In this study, we adapted social media messages to include enhanced social context cues (ie, peer images, stories) for 2 different positive psychology interventions—acts of kindness and social connectedness—and assessed message reactions. This work is guided by our conceptual framework that our existing positive psychology interventions [21,50] can be optimized for young adults with cancer with the addition of attention-getting, relevant social context cues [41,43]. Social context cues are an important motivator for engagement with and intentions to do the behavior in intervention messages [41,51]. Following the advice to create more in-person social encounters allows for the emergence of positivity resonance [25,28], which in turn builds psychosocial health, a vital asset for young adults with cancer [52-54].

Our goal was to assess whether our social media messages encouraged intentions to do the intervention activities with the attendant positive reactions. We conducted a cross-sectional web-based experiment with 396 young adults with cancer (ages 18-39 years) viewing mock Instagram intervention messages. We hypothesized that enhanced social context cues (vs not) would lead to greater intentions to do the activity (hypothesis 1), greater perceived social presence in the messages (hypothesis 2), higher forecasted positivity resonance for the activity (hypothesis 3), and higher self-efficacy for the activity (hypothesis 4) across 2 different intervention types. We examined whether the type of intervention activity (acts of kindness vs social connectedness) impacted acceptability, asking (research question 1) whether intervention type impacted intentions. We also examined (research question 2) whether intervention type impacted perceived social presence, forecasted positivity resonance, or self-efficacy. We explored the feasibility of (research question 3) whether social cues or intervention type increased perceived downsides of the activity. Last, we explored whether intervention message reception (with enhanced cues vs not) differed by sociodemographic or cancer characteristics.

Methods

Participants

We recruited young adults with cancer, ages 18-39 years, to participate in a cross-sectional web-based experiment in December 2021. This experiment to assess reactions to evidence-based positive psychology interventions optimized for social media was part of a larger, unrelated study to better understand support needs of young adults with cancer. The sample size was calculated for the parent study where participants viewed a peer support app prototype and shared their social media use for cancer support (396 participants had 80% power to detect a small-to-medium effect, Cohen d=0.25, with a 2-tailed, independent samples t test and a critical α of 0.05) before participating in this experiment; results of those efforts will be reported elsewhere.

Young adults were eligible if they (1) were 18-39 years old and (2) had received any cancer diagnosis between 15-39 years. Participants had to report a cancer diagnosis from a multiselect list (see *Measures*) or select "other" and fill in their cancer type and select "yes" to receiving a cancer diagnosis between ages 15-39 years to be considered eligible. There were no eligibility restrictions for number of years since diagnosis or current treatment status (eg, completed treatment). There were no other exclusion criteria. Eligible participants were recruited by market research companies Opinions for Good and Slice MR [55]. Opinions for Good and Slice MR use their propriety web-based panels of survey respondents to reach a wide range of health care audiences and provide customized recruitment for each research study. Opinions for Good and Slice MR also use unique recruitment incentive methods to reach cancer populations through organization partnerships; participants can directly give back some of their incentive to benefit a nonprofit and advocacy organization of their choice, which encourages partnership among Opinions for Good and Slice MR with advocacy organizations to connect with individuals interested in participating in research.

Ethical Considerations

This study was reviewed and determined exempted by the University of North Carolina Institutional Review Board (#19-2715). We preregistered the procedure and analyses on AsPredicted (#79697). After accessing the survey link, participants provided informed consent by reading the approved consent form. Participants then had to respond "Yes" to participate in the research study, and to confirm they had (1) read the consent form, (2) voluntarily agreed to participate, (3) were 18-39 years of age, and (4) had a previous cancer diagnosis. Participants received incentives based on the reward amount set by the Opinions for Good and Slice MR (eg, approximately US $20) with the opportunity to give a portion to a nonprofit of their choice. To protect the privacy and confidentiality of participants, all publicly available quantitative data are deidentified, and open-ended responses are not included in those public repositories.

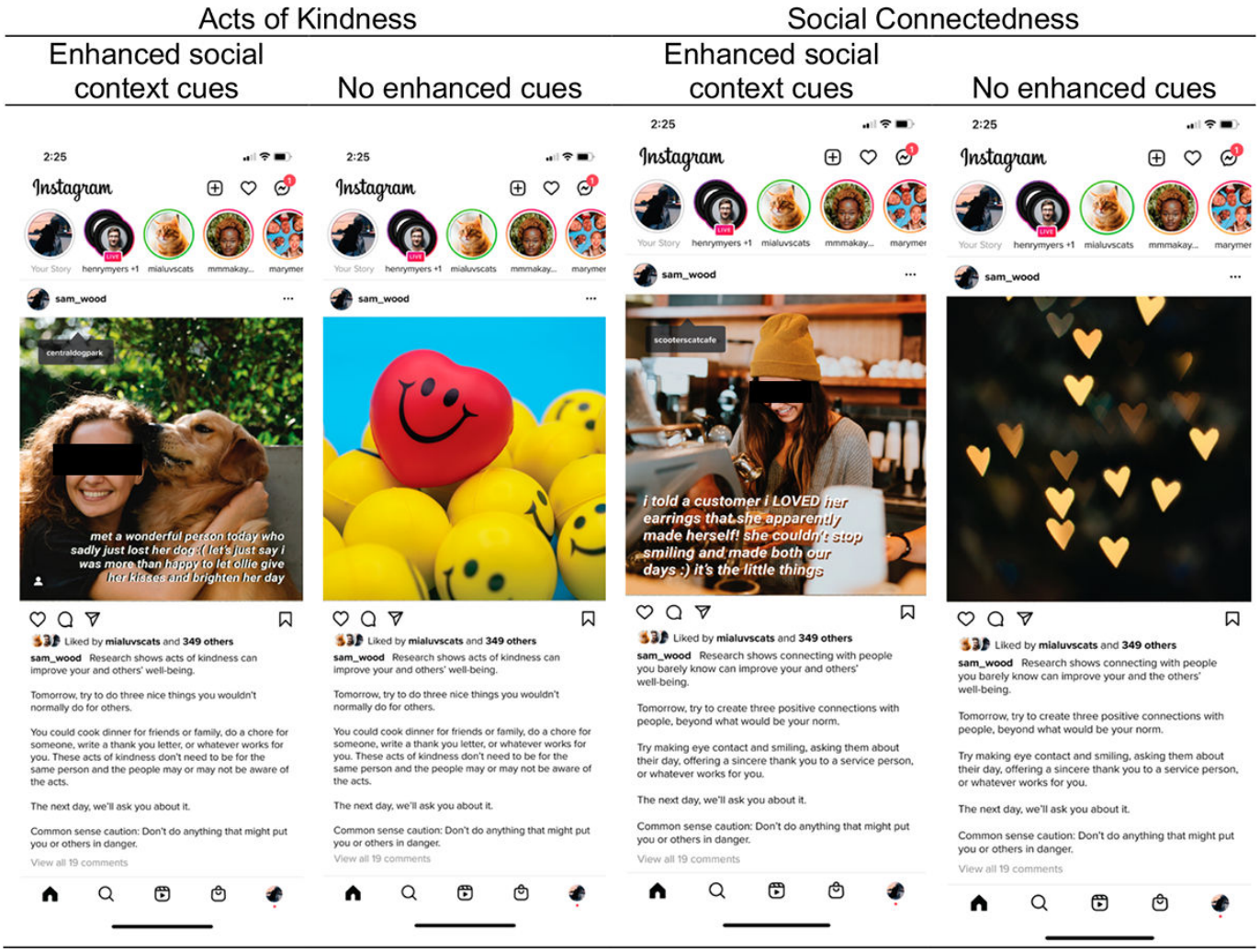
Stimuli

Four different posts were created using a mock Instagram interface and accounts created by the team (all shown in Figure 1 with black bars to anonymize the stimuli). To assess the impact of enhanced social context cues on social media posts, we paired the intervention instructions with different post images. In the social context cues conditions, each activity was paired with an image of a smiling young adult. In the image, we also added a personal story with specific examples of their positive experiences (eg, giving a compliment to make someone smile, or having a dog brighten someone's day). In the no cues conditions, positive activity instructions were paired with nonhuman imagery (eg, hearts) without any additional text (ie, no testimonial). All other elements of the mock Instagram posts were the same, including who posted, the number of interactions (eg, likes, comments), and the social media background.

The post message text was adapted from the emailed verbal instructions used in 2 types of evidence-based positive psychology interventions encouraging acts of kindness [50] or social connectedness [21]. All messages suggested that

young adults with cancer do 3 positive actions the following day. In the acts of kindness conditions, messages shared, "Research shows acts of kindness can improve your and others' well-being. Tomorrow, try to do three nice things you wouldn't normally do for others." In the social connectedness conditions, messages shared, "Research shows connecting with people you barely know can improve your and others' well-being. Tomorrow, try to create three positive connections with people, beyond what would be your norm." Each post then had a few examples, a statement about next-day follow-up (as would occur in an intervention), and a commonsense caution to not put oneself in danger.

Figure 1. Stimuli.



Procedure

After accessing the Qualtrics link from Opinions for Good and Slice MR invitations, participants answered eligibility questions (current age, diagnosis, age at diagnosis) and provided informed consent. Participants then completed items for the parent support app needs experiment (noted above) before beginning this study. Participants were given a transition prompt to set up this study: "In this next section, we want to show you a social media message for an activity and get your thoughts. Below is an example message for activities that involve social interaction. Please read the message and respond to the items below."

Young adults with cancer were then randomized to view an intervention message from 1 of 2 options for the first manipulation of social context cues (enhanced social context cues vs no enhanced cues) and for 1 of 2 options in the second manipulation of intervention types (acts of kindness vs social connectedness). Participants viewed one of the 4 messages from the respective social cue or intervention type conditions shown in Figure 1 (ie, acts of kindness message with and without social context cues, social connectedness message with and without social context cues). Participants were randomized to their study conditions, and which message they would view, with the randomization feature in the Qualtrics survey flow.

Participants were shown the intervention message at the top of the survey web page. With the stimuli shown, participants were asked to report (1) their intentions to do the activity, (2) perceived social presence in the message, (3) forecasted positivity resonance for emotions they would feel if they engaged in the activity, (4) their self-efficacy for undertaking the activity, and (5) any downsides for the activity. Items within scales were shown in a randomized order.

Measures

Intentions

We captured intentions to do the activity with an adapted single item [56]: "If this activity was assigned to you, how likely would you be to complete it tomorrow?" Response options were "not at all" (coded as 1), "a little" (2), "somewhat" (3), "quite a bit" (4), or "extremely" (5).

Perceived Social Presence

Participants rated the feelings of others in the message with 5 established items [57,58], including "There is a sense of personalness in the message." Response options were "not at all" (1), "a little" (2), "somewhat" (3), "quite a bit" (4), or "extremely" (5).

Forecasted Positivity Resonance

We assessed the degree to which participants anticipated socially engaged positive emotions by inquiring about forecasted personal enjoyment and adapting (for forecasted vs experienced affect) the Perceived Positivity Resonance Scale [23,27]. Items were "If you were to do this activity tomorrow, to what degree would you anticipate…," followed by 3 items: "…personally enjoying the activity?," "…experiencing a mutual sense of warmth and concern toward one another?," and "feeling 'in sync' with the other(s)?" Response options were "not at all" (1), "a little" (2), "somewhat" (3), "quite a bit" (4), or "extremely" (5).

Self-Efficacy

Participants reported their self-efficacy or confidence in their ability to complete the activity with the single item [59]: "Please indicate how certain you are that you can do the activity from the message." Responses were captured with a slider that was labeled with "cannot do at all" (0), "moderately can do" (50), and "highly certain can do" (100).

Potential Downsides

To better understand potential unintended consequences of the intervention messages we developed new items for this study. Specifically, we asked, "Do any downsides immediately come to mind when thinking about doing this activity?" Response options: "yes" (1), "no" (2), and "not sure" (3). If participants responded yes or not sure, they were asked to select from a multiselection item all the relevant downsides, including "would take too much time" (1), "would cost too much money" (2), "I already do these things and don't need this prompt" (3), and given a chance to "fill in any other downsides not listed" (4) in an open-ended text box.

Cancer Characteristics

Participants reported their cancer diagnosis with a multiselect item: "What cancer diagnosis have you received?" Response options included 15 cancers ("brain tumor," "breast," "cervical", "colon," "Hodgkin Lymphoma," "Leukemia," "lung," "non-Hodgkin Lymphoma," "ovarian," "rectal," "sarcoma," "testicular," "thyroid," "uterine/endometrial"), an "other" option with text entry, "prefer not to answer" (not eligible), or "I never had a cancer diagnosis" (not eligible). In addition to confirming eligibility ("yes"/"no") for a cancer diagnosis between ages 15-39 years, participants also reported their age of diagnosis for all cancer types selected. For each cancer selected, participants also reported their cancer stage, "If your [cancer] diagnosis was staged, with which stage were you diagnosed," and response options of "I," "II," "III," "IV," and "unknown/not applicable." For each cancer selected, participants reported their current treatment status, "Which of the following best describes your current treatment status with your [cancer] diagnosis?" Participants had either "completed treatment" or were considered in active treatment (ie, "in treatment," "ongoing therapies (hormonal, immunotherapy, etc)," "chronic disease (in/out of treatment)," or "not yet started treatment").

Data Analyses

We first ensured reliability via Cronbach α for the multi-item outcome scales was sufficient (>0.70). We also ensured our continuous variables were within normal distribution thresholds (skewness within SD 2, kurtosis within SD 7) [60]. We then inspected distributions to exclude extreme outliers (>3 SDs from the mean) and then computed descriptive statistics for all outcomes (ie, means, SDs, and proportions) by study condition. For all our predictions with continuous outcomes, we conducted ANOVAs, one for each outcome. The predictors were social context cues (present vs absent) and intervention type (acts of kindness vs social connectedness). We conducted chi-square tests for categorical outcomes (ie, downsides). We used a Bonferroni-corrected critical α of 0.005 and 2-tailed statistical tests for planned comparisons.

We next explored participant characteristics as moderators where sufficient subgroup sample sizes were allowed. This included age (18-24, 25-29, 30-34, and 35-39 years), race (Black vs White), gender (women vs men), and treatment status (completed vs active treatment). Each subgroup was included as a predictor, along with social context cues condition (present vs absent), in separate ANOVAs for intentions, social presence, forecasted affect, or self-efficacy. We omitted the intervention type and used a Bonferroni-corrected critical α of 0.002 and 2-tailed statistical tests for exploratory moderation. Per our preregistration, we conducted serial mediation analyses with PROCESS (SPSS macro) to examine mediated effects of social presence on our outcomes, but only reported in the web-based Multimedia Appendix 1, since we did not have main effects on our proposed mediator.

Results

Participant Characteristics

Young adult participants' (N=396) average age was 31 (SD 5.2) years, with an average age of 27 (SD 5.1) years at diagnosis (Table 1). Participants mostly identified as male (251/396, 63.4%), White (246/396, 62.1%), or Black or African American (95/396, 24%). Young adults were from all 50 United States (392/396, 99%) and Canada. Cancer diagnoses included lung cancer (85/396, 21.5%), brain tumors

(62/396, 15.7%), leukemia (37/396, 9.3%), breast cancer (32/396, 8.1%), testicular cancer (32/396, 8.1%), colon cancer (30/396, 7.6%), cervical cancer (30/396, 7.6%), rectal cancer (28/396, 7.1%), and thyroid cancer (20/396, 5.1%), among others. Participants had either completed treatment (73/396, 18.4%) or were in active treatment, including reporting they were in treatment (160/396, 40.4%), ongoing therapies (139/396, 35.1%), in and out of treatment (15/396, 3.8%), and not yet started treatment (11/396, 2.8%). Participants did not differ by age, race and ethnicity, gender, or treatment status across experimental conditions.

Table 1. Participant demographics (N=396).

Demographics	Values
Current age (in years), mean (SD)	31.1 (5.2)
18-24, n (%)	45 (11.4)
25-29, n (%)	90 (22.7)
30-34, n (%)	121 (30.6)
35-39, n (%)	132 (33.3)
Age at diagnosis (years), mean (SD)	26.8 (5.1)
Gender, n (%)	
Women	131 (33.1)
Men	251 (63.4)
Nonbinary, gender queer, or questioning	2 (0.6)
Transgender, n (%)	
Yes, transgender	38 (9.6)
No, not transgender	345 (87.1)
Race and ethnicity, n (%)	
White	246 (62.1)
Black or African American	95 (24.0)
Hispanic, Latino, or Spanish	26 (6.6)
Asian	9 (2.3)
American Indian or Alaska Native	8 (2.0)
Some other race or ethnicity	2 (0.5)
Multiracial	10 (2.5)
Diagnosis[a], n (%)	
Brain tumor	62 (15.7)
Breast cancer	32 (8.1)
Cervical cancer	30 (7.6)
Colon cancer	30 (7.6)
Hodgkin lymphoma	18 (4.5)
Leukemia	37 (9.3)
Lung cancer	85 (21.5)
Non-Hodgkin lymphoma	2 (0.5)
Ovarian cancer	15 (3.8)
Rectal cancer	28 (7.1)
Sarcoma	6 (1.5)
Testicular cancer	32 (8.1)
Thyroid cancer	20 (5.1)
Uterine/endometrial cancer	14 (3.5)
Other cancers	9 (2.3)
Stage[a], n (%)	
I	140 (35.4)
II	188 (47.5)
III	54 (13.6)

Demographics	Values
IV	16 (4.1)
Treatment status, n (%)	
Active (in treatment, ongoing therapies, in/out of treatment, or not yet started)	322 (81.3)
Completed	73 (18.4)

[a]Most (95%) participants reported one diagnosis; 20 participants reported between 2 and 4 diagnoses.

Most Young Adults With Cancer Reported Intending to Do the Intervention Activity (Hypothesis 1, Research Question 1a)

Most young adults with cancer (336/396, 84.8%) reported that they were "somewhat" (3) to "extremely" (5) likely to carry out the recommended intervention activity with means ranging from 3.4 to 3.6 on a 5-point scale. See Table 2 for condition means, SDs, and results from ANOVAs. Messages with social context cues (peer images, personal stories) and those without cues encouraged young adults to intend to enact the intervention behavior similarly. Although the highest means were observed when cues were shown, this condition difference was not significant, P=.05 (hypothesis 1 unsupported). Young adult participants were similarly encouraged to engage in the activity regardless of intervention type; there were no differences in intentions between acts of kindness activity (eg, do a chore for someone, write a thank you letter) and a social connectedness activity (eg, making eye contact and smiling, offering a sincere thank you), P=.36 (research question 1a).

Participants' race and treatment status influenced intentions to do any of the intervention activities, with main effects for these subgroups (Table 3). Overall, Black participants had lower intentions to engage in any of the activities from the messages compared with White participants, $F_{1,333}$=18.8, P<.001. Participants in active treatment, including in treatment, ongoing therapies, in/out of treatment, or not yet started, had greater intentions to do any of the activities shown compared with participants who completed treatment, $F_{1,387}$=20.2, P<.001.

Table 2. Effects of social context cues and type of intervention (N=396).

	Social context cue condition		*F* test (*df*)	Chi-square (*df*)	*P* value	Intervention type condition		*F* test (*df*)	Chi-square (*df*)	*P* value
	With enhanced cues	No enhanced cues				Acts of kindness	Social connected-ness			
Intentions, mean (SD)	3.6 (0.9)	3.4 (0.9)	3.8 (1,388)	—[a]	.05	3.6 (0.9)	3.5 (1.0)	0.8 (1,388)	—	.36
Social presence, mean (SD)	3.8 (0.7)	3.8 (0.7)	0.1 (1,392)	—	.75	3.8 (0.7)	3.8 (0.7)	0.1 (1,392)	—	.72
Forecasted positivity resonance, mean (SD)	3.9 (0.8)	3.8 (0.8)	1.0 (1,392)	—	.32	3.9 (0.8)	3.8 (0.8)	0.4 (1,392)	—	.51
Self-efficacy, mean (SD)	72.0 (15.9)	69.5 (16.6)	2.3 (1,369)	—	.13	70.5 (15.4)	71.0 (17.2)	0.1 (1,369)	—	.75
Downsides, n (%)				2.6 (2)	.27				3.3 (2)	.19
Yes	11.6 (23)	31 (15.8)	—			28 (14.3)	26 (13.1)	—		
No	167 (84.3)	153 (78.1)	—			162 (82.7)	158 (79.8)	—		
Not sure	8 (4.0)	12 (6.1)	—			6 (3.1)	14 (7.1)	—		

[a]Not applicable.

Table 3. Outcomes by participant characteristic subgroups.

	Intentions, mean (SD)	Social presence, mean (SD)	Forecasted positivity resonance, mean (SD)	Self-efficacy, mean (SD)
Age (years)				
18-24	3.4 (0.9)	3.8 (0.7)	3.8 (0.9)	70.0 (16.6)
25-29	3.4 (1.0)	3.7 (0.7)	3.7 (0.9)	68.1 (17.1)
30-34	3.5 (0.9)	3.7 (0.7)	3.8 (0.8)	70.3 (17.0)
35-39	3.7 (0.9)	4.0 (0.6)	4.0 (0.6)	73.1 (14.4)
Race				
Black or African American	3.2 (0.8)	3.6 (0.6)	3.7 (0.7)	68.3 (15.5)
White	3.6 (0.9)	4.0 (0.6)	4.0 (0.8)	72.1 (16.3)
Gender				
Women	3.6 (1.0)	3.7 (0.8)	3.8 (0.9)	69.7 (17.3)
Men	3.5 (0.9)	3.9 (0.6)	3.9 (0.7)	71.8 (15.4)
Treatment status				
Active treatment	3.6 (0.9)	3.8 (0.7)	3.9 (0.8)	70.6 (16.2)
Completed treatment	3.1 (0.9)	3.7 (0.8)	3.7 (0.8)	70.7 (16.3)

Alongside these significant subgroup differences, we note that mean intention ratings remained above 3 (on our 1-5 scale) for Black participants (mean 3.2) and those who had completed treatment (mean 3.1). There were no main effects for age or gender. There were no interactions for social context cues and any subgroups for intentions to do the activity.

Most Young Adults With Cancer Reported Perceived Social Presence, Forecasted Positivity Resonance, and Self-Efficacy for the Intervention Messages (Hypotheses 2-4, Research Question 2)

Over 4 of 5 young adults with cancer (350/396, 88.4%) reported "somewhat" (3) to "extremely" (5) feeling the presence of someone in the messages (perceived social presence) with a mean of 3.8 across all conditions and reliability of α=.8 across items. There were no differences for perceived social presence with the enhanced social context cues (vs no cues), P=.75 (hypothesis 2 unsupported). Perceived social presence was also similar across intervention type, P=.72 (research question 1b). There was a main effect and interaction by race for perceived social presence in the messages. Black participants had lower perceived social presence across all messages than White participants, $F_{1,337}$=28.7, P<.001; when decomposing the interaction we find that whereas White participants reported higher social presence with enhanced social context cues (vs not), P=.02, no effect for cues emerged for Black participants, P=.33. There were no main effects of age, gender, nor treatment status, as well as no interactions with age, gender, nor treatment status for social presence.

Most young adults with cancer (349/396, 88.1%) also forecasted they would be "somewhat" (3) to "extremely" (5) likely to experience feeling states linked to positivity resonance, that is, enjoying the activity, feeling mutual warmth, and feeling "in sync" with others, with reliability of α=.7 across items. Means for forecasted positivity resonance ranged from 3.8 to 3.9, on our 1-5 response scale. Messages were rated similarly with (vs without) social context cues, P=.32 (hypothesis 3 unsupported), and for both intervention types, P=.51 (research question 1c). There was a main effect for race on forecasted positivity resonance, with Black participants forecasting lower positivity resonance (mean 3.7) across all messages than White participants (mean 4.0), $F_{1,337}$=10.9, P=.001. There were no main effects for age, gender, or treatment status on forecasted positivity resonance, nor were there interactions among any subgroups.

Young adults with cancer, on average, reported having self-efficacy to complete the intervention activity, with a mean of 70.7% on a 0-100 scale (excluding 3 outliers of >3 SDs). There were no differences in self-efficacy with the enhanced social context cues (vs no cues), P=.13 (hypothesis 4 unsupported) nor intervention type, P=.75 (research question 1d). There were no main effects nor interaction by age, race, gender, or treatment status for self-efficacy.

Few Young Adults With Cancer Reported Downsides to the Intervention Activities (Research Question 3)

Most young adults with cancer (320/396, 80.8%) did not report downsides to doing the intervention activity. Potential downsides did not differ with the enhanced social context cues (vs no cues), P=.27, nor for intervention type, P=.19 (research question 2). Among participants who thought of downsides (n=54) or were not sure (n=20), reasons included the following: would cost too much money (n=41), would take too much time (n=38), and not needing prompt because already doing these things (n=24).

Discussion

Overview

Young adults with cancer are an underserved population with few age-appropriate support resources for their unique psychosocial health needs [29,30]. To address this need, we adapted evidence-based positive psychology interventions for presentation to young adults with cancer via social media. We found intervention messages adapted for social media were well received among young adults with cancer. More than 80% of young adults with cancer reported they would do the intervention activity if prompted (intentions), reported intended message reactions (perceived social presence, forecasted positivity resonance, self-efficacy), and did not think of downsides.

Principal Findings for Positive Psychology Interventions as Social Media Messages

Young adults were largely willing to engage in both intervention activities—to carry out acts of kindness or increase their social connectedness. Evidence for the positive reception of 2 interventions is valuable because positive activity assignments are known to be most effective when they involve variety and good "person-activity fit" [16]. Young adults in cancer treatment, inclusive of those in-and-out of treatment, not yet having started treatment, and in ongoing therapies, had greater intentions to do the intervention activity compared with those who had completed treatment. This promisingly signals these positive psychology interventions could be adapted for people at all stages of the cancer experience. With highly scalable distribution through social media, the interventions would not need to be "saved" or held for a later date when young adults have completed their cancer treatment. Given the unmet needs of young adults with cancer for interventions to improve psychosocial health, our initial evidence for 2 low-cost, age-appropriate interventions is encouraging. Both intervention types provide researchers, clinicians, and practitioners with valuable options to disseminate through their organization's presence on the web.

Most young adults with cancer also thought the messages signaled peers (perceived social presence), which increases trust and motivation to use web-based health interventions [41,42]. We did not find differences in perceived social presence between intervention messages with enhanced social context cues and those without. This could be because, with messages designed to mimic Instagram posts, the control condition included many standard social context cues (eg, profile pictures, post likes) known to signal others and peer communities among young adults [41,49].

Most young adults with cancer expected to enjoy the recommended activities and anticipated that doing them would bring feelings of mutual warmth and of being "in sync" with others, core facets of the uplifting, socially connected state of positivity resonance. Growing evidence shows that the frequency of people's daily experiences of positivity resonance promotes health and well-being [26] and is linked to better mental health, increased resilience, and a greater sense of meaning [22-24].

Most young adults with cancer were confident they could do these intervention activities with few perceived downsides. Their reported self-efficacy to do the activities is encouraging with the COVID-19 pandemic and related psychological pressure contributing to poor psychosocial outcomes in young adults with cancer [61]. Fewer than one in seven participants thought of any downsides. The few downsides reported were resource concerns—money or time—that could be alleviated by revising intervention activity prompts (eg, shorter activities) and providing financial support for costs incurred (eg, coffee or meal gift cards).

Moderation by Race for Positive Psychology Interventions as Social Media Messages

Although the positive psychology interventions developed for young adults with cancer, broadly, were well received, these messages did not work equally well for all. We should prioritize critical frameworks in intervention development to reach health disparity populations who may receive great benefit [62], such as Black young adults who face a disproportionate burden of disease compared with White young adults [63]. All too often, evaluations of interventions do not disaggregate data to address inequalities by race—a critical step to reduce health disparities. Looking at differences by race in this study, Black young adults had lower intentions and forecasted positivity resonance for the activities in the messages compared with White young adults. Moreover, our interaction for perceived social presence indicates social context cues only had an impact among White participants when images of individuals who appeared White were shown. These findings highlight a need to prioritize optimizing intervention messages for Black young adults. Literature supports the development of culturally tailored messages across the cancer continuum [64-66]. Culturally tailored messages should be designed with visuals and text that incorporate shared beliefs, language, and representation of the cancer experience as a Black young adult. A failure to account for cultural context may lead to ineffective health communication messages for some of the most vulnerable youth, further exacerbating existing cancer disparities. Enhancing the effectiveness of positive psychology interventions requires intentional efforts to ensure Black young adults and members of other disparate subgroups, not examined here due to subgroup size, can "see" themselves in the messages, to increase relevance and potential impact.

Strengths and Limitations

Our recruitment methods allowed us to reach a large, diverse sample of participants willing to engage in research about web-based cancer support, including those with cancers that have disproportionately poor outcomes (eg, lung cancer). However, our recruitment had limitations. First, this is a convenience sample that should not be interpreted as representative of young adults with cancer in the United

States. Second, research with young adults with other demographics, cancer characteristics, or more variability in their willingness to use social media for cancer support may yield different results. Third, while we used measures from previous research, when possible, the adapted versions of these items for our specific study context were not pre-tested among young adults with cancer. Fourth, for our study design, a limited number of social context cues (ie, peer images, personal stories) were used in these messages; other message content with more culturally or age-relevant behavioral tips, stories, and peer images could have greater or different effects. Future research should include young adults with cancer in the image selection and personal story generation process to identify effective content with a human-centered process for intervention message optimization. Specifically, Black young adults with cancer and other disparate groups should be directly involved in the content creation, refinement, and selection of message images and text to ensure the message images and text are optimized to reach and have the intended impact among our most vulnerable populations.

Conclusion

This study provides promising evidence that positive psychology intervention messages adapted for social media were perceived as acceptable and feasible among young adults. More than 4 in 5 participants thought they would do the activity, with confidence in their ability to do so, and did not perceive downsides. Moreover, young adults with cancer thought the interventions delivered on social media would improve their psychosocial health. Most participants anticipated doing these intervention activities would raise their positive emotions and feelings of social connection. As the need for age-appropriate resources for young adults with cancer continues, this encouraging evidence for 2 low-cost, highly scalable interventions provides options to address their unique needs and improve psychosocial health.

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Data Availability

The datasets generated or analyzed during this study are available in the Carolina Digital Repository [67].

Authors' Contributions

AJL, HBN, CS, ND, and BLF contributed to the conceptualization of the study. Data curation and formal analysis were conducted by AJL, who also secured funding for the project. The investigation was carried out by AJL, RNV, and MP. The methodology was developed by AJL, JZ, and BLF. Project administration was managed by MP, with supervision provided by AJL and BLF. AJL and RNV wrote the original draft, and the manuscript was reviewed and edited by AJL, RNV, JZ, HBN, MP, CS, ND, and BLF.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Preregistered mediation analyses.
[DOCX File (Microsoft Word File), 37 KB-Multimedia Appendix 1]

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Abbreviations

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