Helping Peers to Promote Well-Being: A Randomized Controlled Trial Testing the Benefits of an Online Prosocial Intervention in Young Adult Cancer Survivors

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by

Marcie Dorethy Haydon

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ABSTRACT OF THE DISSERTATION

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Doctor of Philosophy in Psychology

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Professor Julienne E. Bower, Chair

Adolescent and young adult (AYA) cancer survivors are at risk for experiencing adverse psychological, social, and behavioral sequelae following treatment. Yet, research on developmentally-appropriate interventions for use with AYA cancer survivors is lacking. The current study sought to address this gap by testing two 4-week, online prosocial writing interventions with AYA cancer survivors. Participants were randomized to one of three conditions—peer helping, expressive writing + peer helping, or a cancer-specific fact-writing control—and completed four writing activities, once per week, each on a different topic. Assessments of the primary (hedonic, eudaimonic *social*, eudaimonic *psychological* well-being) and secondary (depressive symptoms, anxiety, physical and behavioral symptoms, social support, positive and negative affect, and fulfillment of psychological needs) outcomes were administered at baseline, weekly, post-intervention, and the 1-month follow-up. In total, 203 participants (M_{age} = 32.33 years; 76% female) enrolled in the study. Participants were, on average, 5.07 years since diagnosis, and the majority received a diagnosis of thyroid cancer (17%) or breast cancer (15%). Adherence to the intervention was high, and 89% of the sample was retained at post-intervention. Participants in the peer helping condition had significantly greater increases in eudaimonic *psychological* well-being ($b = 1.56$, $p = .04$) from pre- to post-intervention, relative to controls. Both the peer helping and expressive writing + peer helping conditions evidenced a trend towards greater increases in social support ($b = 3.47$, $p = .050$ and $b = 2.64$, $p = .077$, respectively) from pre- to post-intervention, relative to controls. Effects on well-being were not moderated by psychological distress or prosocial tendencies, two constructs identified by theoretical and empirical literature as potential moderators. Main effects of time were observed across groups for eudaimonic *social* well-being, depressive symptoms, anxiety, sleep disturbance, fatigue, positive and negative affect, and fulfillment of psychological needs, with all groups showing improvements. A main effect of time on hedonic well-being also emerged, with all three groups reporting declines across the intervention. Prosocial writing-based interventions are promising and warrant further study. Future studies should consider whether the three writing approaches used here are reliably distinct and who benefits most (e.g., moderated effects).

The dissertation of Marcie Dorethy Haydon is approved.

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Curriculum Vitae (abbreviated)

Education

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December 2011	Bachelor of Arts, Anthropology and Psychology California State University, Long Beach

Honors, Awards, & Fellowships

University of California, Los Angeles

2020	Bedari Kindness Institute Summer Graduate Fellowship
2020	Dissertation Year Fellowship
2019	Shepherd Ivory Franz Distinguished Teaching Award
2019	Graduate Summer Research Fellowship
2017	Diversity/Service Fund Stipend for Supporting Summer Research
2017	Graduate Summer Research Mentorship Fellowship
2017	John Fels and Sherri Abend-Fels Award
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2015	Distinguished University Fellowship

California State University, Long Beach

2016	CSULB Distinguished Graduate Student
2014	J. Robert Newman Scholar
2012	Outstanding Senior in Psychology, Class of 2011-2012
2011	Award for Academic Excellence in Anthropology

Research Positions

Mind-Body Research Laboratory, UCLA Graduate Student Researcher	Fall 2015 – Present
Teen Resilience Lab, UCLA & UCI Lead Clinician (*Teen Resilience Project*)	Summer 2017 – Spring 2021
Motivation and Social Identity Laboratory, CSULB Graduate Research Assistant	Summer 2014 – Spring 2015

Peer-Reviewed Publications

1. Radin, A. S., Kuhlman, K. R., Boyle, C. C., **Haydon, M. D.**, & Bower, J. E. (2021). Using the influenza vaccine as a mild, exogenous inflammatory challenge: When does

inflammation peak? *Brain, Behavior, and Immunity- Health*. 13. e100239. doi:10.1016/j.bbih.2021.100239

2. Kuhlman, K. R., Robles, T. F., **Haydon, M. D.**, Dooley, L. N., Boyle, C. C., & Bower, J. E. (2019). Early life stress sensitizes individuals to the behavioral correlates of mild fluctuations in inflammation. *Developmental Psychobiology*. *62*(3).400-408. doi:10.1002/dev.21908
3. Bower, J. E., Kuhlman, K. R., **Haydon, M. D.**, Boyle, C. B., & Radin, A. (2019). Cultivating a healthy neuro-immune network: A health psychology approach. *Social and Personality Psychology Compass*. *13*(9). e12498. doi:10.1111/spc3.12498
4. **Haydon, M. D.**, Stanton, A. L., Ganz, P. A., & Bower, J. E. (2019). Goal disturbance in early-stage breast cancer survivors. *Journal of Psychosocial Oncology*. *37*(4), 478-493. doi:10.1080/07347332.2018.1563265
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7. Kuhlman, K. R., Robles, T. F., Dooley, L. N., Boyle, C. C., **Haydon, M. D.**, & Bower, J. E. (2018). Within-subject associations between inflammation and features of depression: Using the flu vaccine as a mild inflammatory stimulus. *Brain, Behavior, and Immunity*. *69*, 540-547. doi:10.1016/j.bbi.2018.02.001

Oral Conference Presentations (abbreviated)

1. **Haydon, M. D.**, Kiyici, E., Eagan, I. R., Cross, Q. M, Hoyt, M. A., & Bower, J. E. (2021, August). Impact of COVID-19 on Adolescent and Young Adult (AYA) Cancer Survivors. Symposium presentation accepted at American Psychological Association 2021 Virtual Meeting
2. Carroll, J. E., **Haydon, M. D.**, Horvath, S., Sehl, M., Ganz, P.A., Bower, J. E. (2020, March). Healthy sleep quality protects from accelerated phenotypic epigenetic aging in breast cancer survivors. Oral presentation accepted at the 78th Annual Meeting of the American Psychosomatic Society, Long Beach, CA. (Meeting canceled due to COVID-19)
3. **Haydon, M. D.**, Walsh, L. C., Fritz, M. M., Lyubomirsky, S., & Bower, J. E. (2019, March). Kindness to others or to oneself: An online pilot randomized controlled trial to enhance well-being in breast cancer survivors. Oral presentation at the 77th Annual Meeting of the American Psychosomatic Society, Vancouver, BC.

Helping Peers to Promote Well-Being: A Randomized Controlled Trial Testing the Benefits of an Online Prosocial Intervention in Young Adult Cancer Survivors

Adolescent and young adult (AYA) cancer survivors (age 15 to 39 years at diagnosis) are an understudied group in the cancer community, historically included in research on either pediatric or adult-onset disease (National Cancer Institute [NCI], 2006). However, AYAs are developmentally distinct and have different needs than both children and adults with cancer (Zebrack & Isaacson, 2012). AYA cancer survivors report unmet health and psychosocial needs following treatment (Millar et al., 2010; Patterson et al., 2012; Zebrack & Isaacson, 2012); yet, research on interventions for use with AYA survivors is lacking. Moreover, existing interventions aim to reduce distress, and no studies, to date, have focused on promoting positive psychological processes, though these are relevant for health and well-being (Fredrickson, 2001; Pressman & Cohen, 2005). Prosocial behavior is of particular interest, given that helping others promotes well-being; may satisfy needs relevant for healthy psychosocial development, such as relatedness, competence, and autonomy (Fuligni, 2019; Martela & Ryan, 2016); and can be elicited through a short, online intervention. Interventions delivered via the internet are preferable for use with AYAs who report barriers to attending face-to-face groups (e.g., Malboeuf-Hurtubise et al., 2016; Treadgold & Kuperberg, 2010) and value the ability to connect with others online (Pew Research Center, 2010). Notably, online interventions designed to elicit prosocial behavior have been shown to increase well-being in healthy adults (Nelson et al., 2016) and feelings of social connection in breast cancer survivors (Haydon et al., 2019), though they have yet to be tested in AYAs with a history of cancer.

The aim of the current study was to develop and test a short, online prosocial intervention for use with AYA cancer survivors. Designing low-cost, easy-to-disseminate interventions for

AYA cancer survivors is critically important, given that survival rates are improving and AYA cancer survivors now represent a growing population (Lewis et al., 2014; Smith et al., 2014). Before outlining the study, I will first provide a brief overview of AYA cancer incidence, treatment, and prognosis; review the literature on the short- and long-term psychosocial and behavioral impacts of receiving a cancer diagnosis during adolescence or young adulthood; discuss existing interventions designed for use with AYA cancer patients and survivors; and highlight the importance of well-being as a target for intervention, with a focus on prosocial behavior.

AYA Cancer: Incidence, Treatment, and Prognosis

The National Cancer Institute (NCI) defines AYA cancer patients and survivors as those diagnosed between the ages of 15 to 39 years. Though broad, this range represents a unique (e.g., biologically, socially) and historically understudied group (NCI, 2006). Cancer that develops in adolescence and young adulthood is rare; in the United States, about 65,000 to 70,000 AYAs are diagnosed with cancer each year, which accounts for roughly 5% of new cancer cases (American Cancer Society (ACS), 2018a, 2018b; NCI, 2018a). However, cancer is the leading cause of disease-related death in AYAs and the fourth leading cause overall, behind accidents, homicide, and suicide. Cancer in AYAs occurs in the blood and bone marrow (i.e., leukemias and lymphomas), brain, spinal cord, thyroid, skin, breast, reproductive organs (e.g., testicular and ovarian germ cell tumors), and bone and soft tissue (i.e., sarcomas) (ACS, 2018a, 2018b; Barr et al., 2016). In adolescents and emerging adults (15-24 years old), the most common types of cancer are lymphomas, leukemia, testicular cancer (male), and thyroid cancer. In young adults (25-39 years), the most common types are breast (female) and skin cancer (NCI, 2018a).

Treatment regimens vary according to both cancer type and severity. For some diseases, such as acute blood-based cancers (e.g., acute myeloid and lymphoid leukemia), treatment is intensive and may last 2 to 3 years (ACS, 2018c). Early-stage, operable tumors of the soft tissue (e.g., testicular cancer) may require only one surgery with minimal follow-up care (NCI, 2018b). Surgery, chemotherapy, and radiation are among the most commonly used treatments, though some regimens may also include hormone and other targeted therapies (e.g., tyrosine kinase inhibitors) (Centers for Disease Control and Prevention, 2018; Mayo Clinic, 2018; NCI, 2019). Treatment course and length depend on the type, location, and severity of the cancer, as does follow-up care. Maintenance chemotherapy, for example, is often recommended for those diagnosed with acute blood-based cancers (ACS, 2018c), as is cognitive rehabilitation for AYAs who have received cranial radiation or surgery to resect a brain tumor (Mayo Clinic, 2018).

Survival rates also vary by cancer type and severity; while some AYA cancers, such as those occurring in the thyroid, breast, and skin, have a 5-year survival rate above 80%, others, such as acute myeloid and lymphoid leukemia and Ewing sarcoma, have a 5-year survival rate below 60% (Bleyer, 2011). Several studies suggest that survival rates in AYAs have remained relatively stable over the past 50 years, with the exception of certain cancers, such as breast carcinoma and acute leukemia (Bleyer, 2011; Bleyer et al., 2009; Bleyer et al., 2006). This is a stark contrast to improvements seen in both pediatric and adult-onset cancers (Bleyer et al., 2009). Data from the past 20 years, however, reveal a trend towards increased 5-year survival rates in AYAs (Desandes et al., 2013; Lewis et al., 2014; Smith et al., 2014), and a recent re-analysis of data from NCI's Surveillance, Epidemiology, and End Results (SEER) Program showed that survival rates are now better in AYAs than in those diagnosed with pediatric- or adult-onset disease (Liu et al., 2019). This shift is primarily due to the reduced incidence of

HIV/AIDS-related cancers (i.e., Kaposi sarcoma and lymphomas) which peaked among AYAs during the 1980s and 90s (Liu et al., 2019).

Effects of Receiving a Cancer Diagnosis in Adolescence or Young Adulthood

In AYAs, cancer diagnosis and treatment occur against a backdrop of biological, social, and psychological development and can have both immediate and long-term effects. These effects can occur at multiple points across the cancer continuum, which ranges from pre-diagnosis (e.g., screening) to palliative care or long-term survivorship (> 5 years after diagnosis). Periods of transition can be especially challenging to navigate, such as the time of diagnosis and the period of early survivorship when individuals complete primary treatment (i.e., “re-entry”). Throughout the paper, we refer to individuals undergoing treatment as *patients* and those who have completed treatment as *survivors*. This is consistent with the broader literature on AYA cancer treatment and survivorship but differs from the NCI’s definition, which defines survivor as anyone who has received a cancer diagnosis (NCI, n.d.; Ullman, 2014). We use the terms *patient* and *survivor* primarily for clarity to differentiate between individuals undergoing active treatment and those who have completed their primary treatment. Of note, research suggests that both terms can carry negative connotations (Bell & Ristovski-Slijepcevic, 2013; Surbone et al., 2013).

Impacts on Developmental Tasks and Milestones

AYAs progress through a variety of developmental tasks to achieve the social maturity necessary for adult independence. Beginning in adolescence, social orientation shifts away from one’s parents and towards same-aged peers (Spear, 2000), and youth begin to create and strengthen facets of their identity through social interactions and role exploration (Arnett, 2015; Cote, 2009). Adolescents also begin to initiate romantic relationships and explore components of their sexual identity (Arnett, 2015; van de Bongardt et al., 2015) while learning to manage their emotional experiences and exert cognitive control over their thoughts and feelings (Guyer et al., 2016). AYAs create and pursue long-term goals in efforts to establish a life structure, and young adults begin to carve out a niche within society pursuing opportunities outside of their family group, such as attending college, moving away from home, seeking employment, and starting a family (Levinson, 1986). Understandably, receiving a cancer diagnosis at this critical juncture may interact with a variety of developmental tasks and milestones (Suris et al., 2004), with both acute and long-term effects.

In one study of 523 AYA patients and survivors, the majority (80%) reported at least one negative impact of diagnosis and treatment, though these disturbances varied by age at diagnosis; older AYAs (age 21-39 years), for instance, endorsed more negative impacts on finances, whereas younger AYAs (age 15-20 years) reported more negative impacts on plans for education (Bellizzi et al., 2012). Indeed, missing out on school and leisure activities is a primary concern among adolescent cancer patients (Hedstrom et al., 2005; Hedström et al., 2004) and is associated with greater psychological distress across the year following treatment (Kwak et al., 2013). During survivorship, persistent treatment-related side effects, such as fatigue and cognitive complaints, may hamper reintegration with previous activities, such a school or work (Prasad et al., 2015; Vetsch et al., 2018), and taking time off may interfere with future-oriented goals (e.g., financial, educational, and/or vocational goals) (Bellizzi et al., 2012). In qualitative studies, patients and survivors report a loss of autonomy or independence due to these disruptions (Grinyer, 2007; Hokkanen et al., 2004; Patterson et al., 2012; Prasad et al., 2015; Warner et al., 2016). This is particularly distressing for AYAs diagnosed during young adulthood, as diagnosis can represent a threat or disruption to areas in which they have already achieved independence (e.g., living independently, being financially independent) (Patterson et al., 2012; Warner et al., 2016).

Diagnosis and treatment can also negatively impact peer and romantic relationships (Bellizzi et al., 2012; Hokkanen et al., 2004; Love et al., 2012), both integral to psychosocial development. Qualitative studies suggest that taking time away from normal activities, such as school or work, can create a sense of social isolation (Hedstrom et al., 2005) and that some survivors report difficulties re-establishing friendships following treatment (Choquette et al., 2016). Further, survivors report body image and sexual dysfunction concerns (Carpentier & Fortenberry, 2010; Pendley et al., 1997; Vetsch et al., 2018) and frustrations around receiving inadequate information about fertility preservation before treatment (Carpentier & Fortenberry, 2010; Murphy et al., 2013). Changes in physical appearance interfere with identity development and self-esteem (Bellizzi et al., 2012; Grinyer, 2007; Hedstrom et al., 2005; Zebrack, 2011) and can influence intimate partnerships (Larouche & Chin-Peuckert, 2006; Wettergren et al., 2017).

While some studies suggest that AYA survivors are less likely to reach developmental milestones (e.g., gaining independence from one's parents, graduating college, or starting a career) when compared to healthy controls, data are not always consistent (Warner et al., 2016). In a study of 2,589 long-term survivors of cancer diagnosed between the ages of 11 and 21 years, for example, survivors were less likely to be employed and have obtained post-high school education when compared to healthy sibling controls (Prasad et al., 2015). In another study of 4,054 AYAs diagnosed between the ages of 15 and 29, AYA survivors were more likely to report disruptions to employment when compared to healthy controls but not to educational attainment (Tai et al., 2012). Guy et al. (2014) similarly found that AYAs with a history of cancer (*N* = 1,464) reported greater loss of economic productivity, including more absences from work due to injury or illness, than healthy controls (*N* = 86,865). Seventy percent of those surveyed had received a cancer diagnosis more than 10 years prior, suggesting that impairments due to cancer and cancer-related treatment are long-lasting.

Experiencing cancer during adolescence or young adulthood can also produce positive impacts, occurring in tandem with more negative psychological and behavioral disturbances. Consistent with the literature on adult-onset disease (Stanton et al., 2006), the majority of AYA cancer patients and survivors report at least one positive impact (Bellizzi et al., 2012). These include favorable changes in family and romantic (for older AYAs) relationships, health competency, and spirituality/religion. In qualitative interviews, both patients and survivors report a shift in priorities (Patterson et al., 2012) and, though cancer can have a profoundly negative effect on goal processes, it may also elicit more positive shifts toward goals related to meaning and purpose (Vetsch et al., 2018). Further, evidence suggests that these positive impacts may increase over time; in a study comparing AYAs receiving oncological treatment to those who had completed it, for example, ratings of personal growth were higher in survivors—who were, on average, 4-years post-diagnosis—than in those still receiving treatment (Monteiro et al., 2013).

Psychological Distress

Cancer diagnosis and treatment represent a sudden, significant life-course disruption and can catalyze emotional distress. In newly diagnosed AYA cancer patients, estimates of depression range from 5 to 29% (Allen et al., 1997; Dyson et al., 2012; Hedstrom et al., 2005; Muffly et al., 2016; Rosenberg et al., 2018), and rates of anxiety range from 12 to 31% (Dyson et al., 2012; Hedstrom et al., 2005; Muffly et al., 2016; Rosenberg et al., 2018). Estimates vary widely, primarily due to differences in methods of assessment. In some studies, for example, prevalence estimates were reported based on cutoff scores on well-validated measures, such as the Beck Depression Inventory or the Hospital Anxiety and Depression Scale (e.g., Muffly et al., 2016); whereas in others, prevalence estimates were calculated based on deviations from population norms (e.g., Allen et al., 1997; Dyson et al., 2012). Of note, the majority of these studies were conducted among adolescent cancer patients (Allen et al., 1997; Hedstrom et al., 2005; Rosenberg et al., 2018).

Among AYA cancer survivors, estimates of depression range from 12 to 29% (Muffly et al., 2016; Prasad et al., 2015; Zeltzer et al., 2009), and rates of anxiety range from 7 to 24% (Geue et al., 2018; Muffly et al., 2016; Prasad et al., 2015; Zeltzer et al., 2009), with the highest estimates from a study on AYAs diagnosed with blood-based cancers who were within 2 years of treatment completion (Muffly et al., 2016). One study that utilized a structured clinical interview (*N* = 302) found that 47% of survivors met criteria for at least one psychological disorder; anxiety had the highest prevalence rate (24%), along with adjustment disorders (14%) (Geue et al., 2018). To date, there is a lack of studies that have used structured diagnostic interviews to assess the prevalence of clinical diagnoses in AYA cancer patients and survivors.

For reference, approximately 12% of adolescents and 21% of young adults meet criteria for a mood disorder (e.g., major depressive disorder or dysthymia), and about 14% of adolescents and 30% of young adults meet criteria for an anxiety disorder, based on structured clinical interviews (Kessler et al., 2009; Merikangas et al., 2010). Evidence suggesting that AYA cancer patients and survivors experience greater psychological distress than healthy controls is mixed, with several cross-sectional studies indicating elevated distress when compared to sibling controls (Prasad et al., 2015) and individuals without a history of cancer (Kaul et al., 2017; Tai et al., 2012), and others reporting comparable distress in comparison to age-matched healthy controls (Allen et al., 1997; Monteiro et al., 2013; Salsman et al., 2014). Notably, in one large study of 820 survivors diagnosed in adolescence, distress was elevated in female survivors, but not males, when compared to healthy controls (Seitz et al., 2010).

Of note, cross-sectional studies may not fully capture the experience of psychological distress across the cancer continuum. Distress may peak during certain periods, including diagnosis and in early survivorship (e.g., Kwak et al., 2013) or may persist at high levels in a subgroup of survivors. Indeed, trajectory studies suggest that about 30% of AYAs experience either an increase in or persistently high levels of distress during the first year after treatment (Zebrack et al., 2014). Risk factors for distress among AYA cancer patients and survivors include female gender (Allen et al., 1997; Hedstrom et al., 2005; Tebbi et al., 1988; Wu et al., 2007), experiencing more side effects (Collins et al., 2000; Hedstrom et al., 2005), and not attending work or school (Cheung, 2018; Kwak et al., 2013). However, results are inconsistent; for example, females do not always report more distress than males (e.g., Cheung, 2018; Dyson et al., 2012).

Physical and Behavioral Symptoms

Physical and behavioral side effects, such as pain, fatigue, and sleep disturbance, are common in newly diagnosed AYAs undergoing treatment. Prevalence estimates range from 25 to 95% for sleep disturbance (Ameringer et al., 2015; Corey et al., 2008; Erickson et al., 2010), 7 to 100% for fatigue (Nowe et al., 2017; Spathis et al., 2015), and 21 to 53% for pain (Ameringer et al., 2015; Corey et al., 2008; Enskär & von Essen, 2007). Prevalence estimates vary due to differences in sample characteristics (i.e., cancer type, treatment regimen, sample size) and type of measurement. In studies on fatigue, for example, some studies employed a single item to measure the presence of fatigue, whereas others relied on “case” scores on validated measures (e.g., Fatigue Scale-Adolescent). Other common symptoms include weight loss, nausea, lack of appetite, and hair loss (Ameringer et al., 2015; Atay et al., 2012; Enskär & von Essen, 2007). Reporting more physical symptoms is associated with both solid tumor diagnosis (e.g., those occurring in the bone, muscle, or organs) and treatment with chemotherapy (Collins et al., 2000; Erickson et al., 2010; Spathis et al., 2015). Much of the research on physical symptoms during treatment has focused on adolescent cancer patients (Ameringer et al., 2015; Atay et al., 2012; Collins et al., 2000; Edwards et al., 2003; Erickson et al., 2010; Hinds et al., 1992; Spathis et al., 2015; Wesley et al., 2013) and less is known about young adults.

Few studies have examined long-term or late physical side effects specifically in AYA cancer survivors, as AYAs are often included in research on either pediatric or adult-onset disease. From this small literature, we know that symptoms such as cognitive complaints, sleep disturbance, fatigue, and pain can, for some survivors, persist for months or years following treatment, interfere with normal functioning, and cause distress (Cheung, 2018; Daniel et al., 2017; Enskär & von Essen, 2007; Hamre et al., 2012; Prasad et al., 2015; Spathis et al., 2015; Vetsch et al., 2018). In a study of cognitive functioning among 2,589 AYA cancer survivors, roughly 25% reported memory impairments and 19% reported deficits in emotion regulation. When compared to AYA survivors without cognitive impairment, those endorsing symptoms were at greater risk for unemployment, low educational attainment, and reduced independence (Prasad et al., 2015). In another study of 61 AYA cancer survivors, almost half reported poor sleep 1 year after treatment completion (Daniel et al., 2017). Not surprisingly, those who indicated poor sleep also reported reduced quality of life.

Late Effects of Treatment: Morbidity and Mortality

Beyond physical and behavioral side effects, cancer diagnosis and treatment during adolescence or young adulthood can also generate more enduring effects on physical health. Late effects, or those that occur after treatment completion, are of particular concern for young survivors. A survivor diagnosed at the age of 20, for example, may live an additional 40 to 60 years following treatment; late effects, therefore, have the potential to exert a lasting and long-term impact. To date, only a few studies have examined late effects among AYA survivors (e.g., Prasad et al., 2012; Smitherman et al., 2018; Tai et al., 2012). Results of these studies are consistent with the literature from pediatric disease, suggesting that receipt of treatment at a young age can promote a frailty phenotype, which is associated with the development of disease, disability, and early mortality (Ness et al., 2015, 2018).

When compared to healthy controls, survivors of cancer diagnosed in childhood, adolescence, or young adulthood are at higher risk for developing a chronic health condition, such as cardiovascular disease, diabetes, or hypertension (Oeffinger et al., 2006; Tai et al., 2012). AYAs diagnosed with breast cancer, cervical cancer, testicular cancer, and Hodgkin's lymphoma are also at risk for the development of secondary cancers (Bright et al., 2019). Moreover, when compared to healthy controls, AYA cancer survivors report greater functional loss and disability (Tai et al., 2012) and have a higher mortality rate due to diseases of aging, such as cardiovascular and respiratory disease (Prasad et al., 2012). Receipt of certain types of cancer treatment (e.g., chest radiation plus abdominal or pelvic radiation) may contribute to an increased risk of late effects—demonstrated by the literature on pediatric disease (Oeffinger et al., 2006; Robison & Hudson, 2014)—and can lead to long-term impairments in organ functioning (Lipshultz et al., 2012) and physiological systems, such as the neuroendocrine system (Hudson et al., 2009). It is not yet known whether psychological and behavioral processes can alter the trajectory of late effects in AYAs, though current theory suggests the provision of tailored resources, particularly regarding health-promoting behaviors, may ameliorate loss of vitality and function (Ness et al., 2015).

Summary

Cancer can disrupt mastery of developmental tasks, such as gaining independence from one's parents, and AYAs with a history of cancer may be at risk for the delay of certain developmental milestones (Prasad et al., 2015; Tai et al., 2012; Warner et al., 2016). These risks increase for survivors who experience persistent side effects (Prasad et al., 2015; Vetsch et al., 2018). Many AYA cancer patients and survivors also experience psychological distress, with several studies showing increased prevalence of mood and anxiety disorders (e.g., Prasad et al., 2015) (though others report comparable rates; Allen et al., 1997; Larsson et al., 2010). Longitudinal research demonstrates that symptoms of depression and anxiety may peak during periods of transition, such as after diagnosis and in early survivorship (Kwak et al., 2013; Larsson et al., 2010), and that some AYAs are at risk for persistent distress. Literature also shows that physical symptoms are both prevalent and distressing among AYA cancer patients and survivors and that AYA cancer survivors report greater functional loss and disability than healthy controls (Prasad et al., 2012). Finally, studies of pediatric disease suggest that AYAs with a history of cancer will likely experience long-term health problems, such as chronic conditions of the cardiovascular and neuroendocrine systems (Oeffinger et al., 2006).

Interventions in AYA Cancer Patients and Survivors

Given the acute and longer-term challenges of receiving a cancer diagnosis during adolescence or young adulthood, designing interventions for use with AYA cancer patients and survivors is critically important. To date, however, few randomized controlled trials (RCTs) have been conducted with AYA cancer patients and survivors, and research on evidence-based therapies is lacking. A systematic review of existing RCTs, conducted in 2019, identified 15 trials designed specifically for use with AYA cancer patients and survivors (see Appendix A for a description of the search strategy and a table outlining the aims and results of each study). In subsequent years, several additional RCTs have been published or registered (Atkinson et al., 2021; Hoyt et al., 2020; Sansom-Daly et al., 2021; Valle et al., 2021; Victorson et al., 2020; Wurz & Brunet, 2019). These interventions targeted health-promoting behaviors (Atkinson et al., 2021; Beale et al., 2007; Bélanger et al., 2014; Kato et al., 2008; Valle et al., 2013; Valle et al., 2021; Wurz & Brunet, 2019), coping with treatment-related side effects and distress (Burns et al., 2009; Hinds et al., 2000; Robb et al., 2014; Rosenberg et al., 2018, 2019; Sansom-Daly et al., 2012; Victorson et al., 2020), and cancer-specific knowledge (Canada et al., 2007; Huyghe et al., 2009; Lyon et al., 2014), with limited success. In those that targeted psychological distress, for example, only one reported beneficial effects (Rosenberg et al., 2018).

Though a few of these RCTs addressed unmet needs identified by AYA cancer patients and survivors (e.g., fertility preservation, increased knowledge of one's cancer), several gaps remain. The majority of existing RCTs were designed for use with newly diagnosed AYA cancer patients (Hinds et al., 2000; Huyghe et al., 2009) or those undergoing current oncologic treatment (Beale et al., 2007; Burns et al., 2009; Kato et al., 2008; Lyon et al., 2014; Robb et al., 2014; Rosenberg et al., 2019, 2018). In recent years, several interventions have been developed specifically for use with AYA cancer survivors (e.g., Atkinson et al., 2021; Hoyt et al., 2020; Sansom-Daly et al., 2021; Valle et al., 2021). As outlined above, adjusting to life after cancer treatment comes with many challenges, such as persistent behavioral and psychological side effects (e.g., Kwak et al., 2013; Prasad et al., 2015). Thus, there is a critical need to develop interventions specifically for use with AYA survivors.

Notably, only a few interventions, to date, have been conducted online (Beale et al., 2007; Kato et al., 2008; Sansom-Daly et al., 2012; Valle et al., 2013). Though face-to-face interventions are both feasible and acceptable for use with cancer patients undergoing treatment, this method of delivery is less desirable for AYA cancer survivors who report barriers to attendance, such as living far from the trial site and competing demands due to work and/or school (Malboeuf-Hurtubise et al., 2016). The majority of AYA cancer patients report using the internet to gather information and seek support during their cancer experience (Zebrack, 2009) and AYAs, more so than children and adults, utilize the internet to connect with others (Pew Research Center, 2010, 2018). The use of online platforms to deliver psychosocial interventions, therefore, is a promising avenue for future research, particularly among AYA cancer survivors.

Further, though many survivors and patients report a desire to meet and connect with others who have experienced cancer (Millar et al., 2010; Patterson et al., 2012; Zebrack & Isaacson, 2012; Zebrack et al., 2007), few of the RCTs targeted or incorporated social processes (e.g., Lyon et al., 2014; Sansom-Daly et al., 2012; Valle et al., 2013). Indeed, the majority were implemented through individual meetings with healthcare professionals or trained research staff (Burns et al., 2009; Kato et al., 2008; Lyon et al., 2014; Robb et al., 2014; Rosenberg et al., 2019, 2018). The need to meet and interact with other survivors may be particularly salient during emerging adulthood; Kent et al. (2013), for example, found that survivors in their 20s reported a greater need to connect with other survivors compared to those diagnosed at a younger age, as did survivors reporting low quality of life and/or persistent side effects. Beyond *receiving* support, AYA survivors may also benefit from *giving* support, though this has yet to be tested. Among online peer support message boards, offering both informational (e.g., personal experiences with treatment, coping advice) and emotional (e.g., reframing, humor) support is common (Love et al., 2012; Suzuki & Beale, 2006).

Existing interventions have been designed mainly to help AYA cancer patients and survivors cope with distress (e.g., Burns et al., 2009; Canada et al., 2007; Hinds et al., 2000; Lyon et al., 2014; Robb et al., 2014), consistent with the broader literature on psychosocial interventions for adults with a history of cancer (Kalter et al., 2018; Sanjida et al., 2018; Stanton, 2006). However, in recent years, there has been a general movement to design interventions that promote and enhance psychological flourishing (Seligman, Steen, Park, & Peterson, 2005). These interventions have been conducted in healthy populations (e.g., Lyubomirsky & Dickerhoof, 2015; Otake et al., 2006) and among individuals diagnosed with a psychiatric disorder (Craske et al., 2016) or chronic physical illness (Huffman et al., 2011; Moskowitz et al., 2017). Only one study has targeted positive psychological processes in AYA cancer patients (Rosenberg et al., 2018) and, to date, no studies have been conducted with survivors. Rosenberg et al. (2018) randomized newly diagnosed AYAs to receive a brief skills training (*n* = 48) or usual care (control; *n* = 44). Those in the intervention group met with a trained research staff member four times over the course of several months to discuss stress management, active goal setting, cognitive reframing, and benefit finding. When compared to the usual care control, those in the intervention group had increased resilience and benefit finding (Rosenberg et al., 2019). Notably, this was also the only study conducted among AYAs to report reductions in psychological distress.

Promoting Positive Well-Being: Prosocial Behavior as a Novel Target for Intervention

Historically, adolescence and emerging adulthood have been seen as a period of increased vulnerability; however, researchers and policymakers have begun to view this period as a window of opportunity to instantiate positive habits and behaviors, with long-term implications for both health and well-being (Catalano et al., 2004; Dahl, 2004; Do et al., 2017; US Department of Health and Human Services, n.d.). Indeed, as with negative experiences, positive events and experiences during adolescence and emerging adulthood may become biologically "embedded" or catalyze the acquisition of personal resources, in turn altering how an individual responds to their environment (Fredrickson, 2001). Several studies, for example, suggest that experiencing positive events and emotions during adolescence is associated with engaging in more health-promoting behaviors during young adulthood (Hoyt et al., 2012; McDade et al., 2011), and new research demonstrates that a period of heightened hypothalamic-pituitary-adrenal (HPA) axis plasticity occurs during adolescence (Gunnar et al., 2009; Romeo et al., 2016) where positive social environments can remodel the HPA axis (DePasquale et al., 2018; Koss & Gunnar, 2018; Quevedo et al., 2012). Indeed, studies have shown that positive psychological states in emerging adulthood are associated with better health outcomes in adulthood, including links with lower mortality (Danner et al., 2001).

Social connection is a critical component of well-being. Though the benefits of *receiving* social support from close others are well-known (e.g., Uchino, 2009), growing evidence suggests that *giving* support may also be beneficial (e.g., Brown et al., 2003). Engaging in volunteering, for example, has beneficial effects on both mental and physical health among older adults (Anderson et al., 2014; Jenkinson et al., 2013; Kahana et al., 2013; Wheeler et al., 2005) and AYAs (Schreier et al., 2013; van Goethem et al., 2014). Giving to others may enhance well-being by fulfilling psychological needs, particularly for relatedness, competence, and autonomy

(Martela & Ryan, 2016; Weinstein & Ryan, 2010). Notably, these needs are relevant to the mastery of developmental tasks in adolescence and young adulthood, and engaging in prosocial behavior may contribute to healthy psychosocial development among AYAs (Fuligni, 2019). AYAs with a history of cancer are likely to experience threats to needs for relatedness, competence, and autonomy and may benefit greatly from engaging in prosocial behavior, though this has yet to be tested.

Prosocial Support Interventions

Interventions designed to elicit prosocial behavior among healthy populations, including studies in adolescence, have shown beneficial effects on health and well-being. High school students randomized to volunteer for 1 to 1.5 hours each week for 2 months (*n* = 52), for example, showed significant reductions in cardiovascular risk factors (i.e., inflammation [IL-6 but not CRP], cholesterol, and body mass index) when compared to those in a wait-list control group (*n* = 54). Further, even relatively minimal interventions have shown beneficial effects. Nelson et al. (2016), for example, conducted a 4-week online intervention with healthy adults comparing the effects of engaging in other-focused versus self-focused kindness. Participants randomized to perform acts of kindness for others (e.g., writing a note to a coworker, picking up trash) demonstrated greater increases in well-being than those assigned to do nice things for themselves (e.g., eating a favorite meal, spending time on a hobby) or to write about the factual details of their day. Similar studies reported increases in life satisfaction (Buchanan & Bardi, 2010) and reduced inflammatory potential of immune cells (Nelson-Coffey et al., 2017).

Moieni (2017) conducted a prosocial-writing intervention in older women, designed to target generativity—or care and concern for a younger generation (McAdams & de St. Aubin, 1992). Women were randomized to either (1) provide advice and support to a younger generation (i.e., middle-aged adults) on various topics related to healthy aging (e.g., lessons learned, suggestions for living a happy life) or (2) write about mundane topics (e.g., nightly bedtime routine), once per week for 6 weeks. At the end of the intervention, women who engaged in generativity writing had increased social integration and decreased psychological distress and pro-inflammatory gene expression when compared to controls. Though generativity is often associated with healthy development among older adults, emerging evidence suggests that this construct may be relevant throughout the lifespan, including among AYAs (e.g., Lawford et al., 2018; Lawford et al., 2005).

Thus far, the studies reviewed have all been conducted in healthy adolescents and adults; in patients with chronic illness, several studies have examined the effectiveness of peer mentoring interventions, though these studies are small, non-randomized, and lack a control group. In one study, Arnstein et al. (2002) enrolled eight patients interested in becoming a peer mentor following a 10-week pain management seminar. Peer mentors supported chronic pain patients who were receiving cognitive behavioral therapy by leading small group discussions and making weekly phone calls. After 6 months, peer mentors reported reduced depression and pain severity; though, due to the design of the study, it is unclear whether these differences were simply a function of time since treatment. In qualitative interviews, however, peer mentors reported a greater sense of meaning and purpose and increased feelings of social connection. This is consistent with other small, non-randomized trials conducted among patients with multiple sclerosis (N = 5) (Schwartz & Sendor, 1999) and coronary artery disease (sample size not reported) (Sullivan & Sullivan, 1997).

To date, few interventions have targeted prosocial behavior in individuals with a history of cancer, though both patients and survivors report a desire to “give back” (Allen et al., 2009;

Truong et al., 2011). Using methods adapted from Nelson et al. (2016), Haydon et al. (2019) conducted a 4-week, online study looking at the effects of other-focused versus self-focused kindness in a sample of early-stage breast cancer survivors. Women (*N* = 133) were randomized to one of four conditions: performing (1) acts of kindness for others, (2) acts of kindness for self, (3) self-compassion meditation, or (4) a daily-activity-tracking control. Though Nelson et al. reported no beneficial effects of engaging in *self-focused* kindness, recent research with breast cancer survivors highlights the role of self-compassion as an important emotion-regulation strategy (Boyle et al., 2017); thus, Haydon and colleagues included a self-compassion meditation condition to elucidate the influence of cultivating internal self-kindness (as opposed to performing tangible acts of kindness for oneself). Unlike Nelson et al., there were no effects of the intervention on ratings of well-being for any of the four conditions. Those randomized to perform acts of kindness for others, however, did report a greater increase in social support when compared to controls.

In another study, Rini et al. (2014) examined the effect of a 4-week, prosocial writing intervention among cancer survivors (*N* = 315) who had received a stem cell transplant (SCT). Notably, Rini et al. paired components of peer helping with expressive writing, a well-established intervention that typically involves writing your deepest thoughts and feelings regarding a stressful or traumatic experience (Pennebaker & Beall, 1986). Previous trials report benefits of expressive writing on mental and physical health among cancer patients and survivors (e.g., Henry et al., 2010; Jensen-Johansen et al., 2013; Rosenberg et al., 2002; Stanton et al., 2002), though results are not always consistent (see Merz, Fox, & Malcarne, 2014; Zachariae & O'Toole, 2015). Participants completed four 20-minute writing activities, each on a separate week, according to their assigned condition: (1) expressive writing (i.e., writing deepest thoughts and feelings about the process of receiving SCT), (2) peer helping (i.e., writing about the process of receiving SCT for the benefit of someone about to receive the treatment), (3) expressive helping (i.e., expressive writing for the first 3 essays, peer helping for the final essay), or (4) a factual-writing control (i.e., writing about the factual details of receiving SCT). The primary analysis revealed no significant differences between conditions following the intervention. However, those in the expressive helping condition who endorsed moderate to severe survivorship problems at baseline—defined as high distress, low purpose in life, and low health-related quality of life—demonstrated reductions in distress and physical symptoms when compared to the other three conditions. A follow-up study found that improvements were attributable to using more positive words when writing, though this was dependent on the frequency of negative word use (Williamson et al., 2017). In sum, Rini et al. found that peer helping paired with expressive writing was more beneficial than either expressive writing or peer helping alone, but only among survivors who endorsed elevated survivorship problems.

As a cautionary note, in another study among distressed breast cancer patients and survivors, those randomized to engage in peer helping in an online support group showed an *increase* in psychological distress when compared to those randomized to participate without an emphasis on helping (Lepore et al., 2014). The authors note that peer helpers may have refrained from expressing negative thoughts and feelings in pursuit of fulfilling their role as *helper* and, thus, experienced an increase in distress. Notably, Rini et al. (2014) reported *benefits* for survivors who exhibited baseline elevations in distress, but only when peer helping was paired with expressive writing. This suggests that individuals experiencing distress may need an opportunity to engage in emotional or cognitive processing (both components of expressive writing; Esterling et al., 2002) in order to reap the benefits of contributing to others.

The Present Study

Currently, there is a critical need to develop empirically-supported, developmentally-appropriate interventions for AYA cancer survivors (D'Agostino et al., 2011). Drawing from the literature on positive psychology and prosocial interventions, we developed a 4-week, online prosocial writing intervention designed to increase well-being among AYA cancer survivors. AYA cancer survivors report a desire to meet and connect with others who have experienced cancer (Millar et al., 2010; Patterson et al., 2012; Zebrack & Isaacson, 2012; Zebrack et al., 2007), yet may face barriers to attending in-person groups (e.g., location, school/work demands). Online peer support groups offer one solution; however, moderating these groups can be challenging (Treadgold & Kuperberg, 2010). Evidence suggests that *giving* support may be just as beneficial as *receiving* support (e.g., Brown et al., 2003) and, thus, prosocial support interventions provide a promising alternative. Because providing direct support to others can be logistically challenging and may contribute to increased feelings of distress in certain contexts (e.g., Lepore et al., 2014), we designed and conducted an online prosocial writing-based intervention.

The design of the current study was drawn from two previous prosocial writing-based interventions (Moieni, 2017; Rini et al., 2014). Both Moieni (2017) and Rini et al. (2014) used a peer mentoring approach; participants were instructed to write to someone about to undergo a similar circumstance—aging and cancer treatment, respectively. Here, a similar design was used; participants were asked to write about their cancer experience for the benefit of a newly diagnosed cancer patient. Given that Rini et al. found beneficial effects of engaging in expressive writing before offering advice or support (albeit among those who had high distress at baseline), we also included a similar condition in the present study. Both intervention groups—

peer helping and expressive writing + peer helping—were compared to a facts-only control condition, where participants were asked to write factual details about their cancer experience (Stanton et al., 2002).

The primary and secondary outcomes were chosen due to their relevance to emotional and physical health in AYA cancer survivors. Previous qualitative studies among individuals with a chronic disease suggest that peer mentoring may enhance feelings of social connection and meaning and purpose (Arnstein et al., 2002; Schwartz & Sendor, 1999; Sullivan & Sullivan, 1997), which are both components of our primary outcome, psychological well-being. Psychological well-being has been assessed in previous prosocial interventions (Nelson et al., 2016; O'Connell et al., 2016; Rini et al., 2014; Rowland & Curry, 2019), with several showing beneficial effects (Nelson et al., 2016; O'Connell et al., 2016; Rowland & Curry, 2019). Secondary outcomes included psychological distress (i.e., depressive symptoms, anxiety), physical and behavioral symptoms (i.e., cognitive complaints, sleep disturbance, fatigue, pain), social support, positive and negative affect, and fulfillment of psychological needs (i.e., relatedness, competence, autonomy). Psychological distress and physical and behavioral symptoms are of interest given elevated rates in some studies of AYA cancer survivors (e.g., Prasad et al., 2015; Spathis et al., 2015; Zebrack et al., 2014) and associations with poor outcomes, such as disruptions to school or work (Cheung, 2018) and low quality of life (Daniel et al., 2017). Notably, physical symptoms are also a common target for writing interventions in cancer survivors and may be responsive to writing-based intervention approaches (Merz et al., 2014), though the evidence is mixed (Zachariae & O'Toole, 2015). Prosocial interventions may increase feelings of social connection (Layous et al., 2012; O'Connell et al., 2016), including social support (Haydon et al., 2019); thus, a multi-dimensional measure of social support was included. Finally, we assessed positive affect and fulfillment of psychological needs based on previous research identifying these constructs as important mechanisms through which prosocial interventions may exert beneficial effects (Martela & Ryan, 2016; Nelson et al., 2016).

As an exploratory aim, measures to assess potential moderators were included. Evidence suggests that interventions may be more effective among individuals with pre-existing vulnerabilities, such as elevated distress (Lengacher et al., 2016; Rini et al., 2014), and those likely to experience greater person-intervention fit (Lyubomirsky & Layous, 2013). In this study, an individual who already engages in and values prosocial behavior will likely reap greater benefits. Moderators assessed, therefore, included baseline psychological distress and prosocial tendencies.

Specific Aims and Hypotheses

The specific aims of the study were to:

(1) Develop and assess the feasibility of an online prosocial writing-based intervention for AYA cancer survivors.

(2) Determine the effect of the intervention on psychological well-being (primary outcome), as well as psychological distress, physical and behavioral symptoms, social support, affect, and fulfillment of psychological needs (secondary outcomes).

(3) Explore empirically- and conceptually-derived moderators (i.e., psychological distress, prosocial intentions) of the intervention effects on well-being.

To achieve these aims, AYA cancer survivors were randomized to three conditions—peer helping, expressive writing + peer helping, or a fact-writing control—and asked to complete four writing activities, once per week for 4 weeks. Primary and secondary outcomes were assessed using reliable and valid questionnaires before, during, directly after the intervention, and at the 1-month follow-up.

We hypothesized that:

(H1) Those randomly assigned to engage in peer helping or expressive writing + peer helping would show a greater increase in well-being when compared to those assigned to the fact-writing control condition.

(H2) Those randomly assigned to engage in peer helping or expressive writing + peer helping would show a greater reduction in psychological distress, physical and behavioral symptoms, and negative affect and an increase in perceived social support, positive affect, and fulfillment of psychological needs (i.e., relatedness, competence, autonomy) compared to the fact-writing control condition.

(H3) Exploratory: Intervention effects on well-being would be *moderated* by baseline ratings of psychological distress and prosocial tendencies, such that those with greater distress and higher ratings of prosocial tendencies would show a greater increase in well-being in response to peer helping or expressive writing + peer helping.

Method

Participants

Participants were recruited through the University of California, Los Angeles (UCLA) Cancer Registry, a database of patients who received a cancer diagnosis or cancer-related treatment at a UCLA medical facility. Inclusion criteria were: (1) a cancer diagnosis between the ages of 15 and 39 years; (2) completion of primary treatment and currently in partial or complete remission; (3) current age between 18 and 39 years old; (4) fluent in English; and (5) access to the internet and email. Exclusion criteria were: (1) currently receiving primary treatment for a cancer recurrence and (2) inability to commit to the intervention for 4 consecutive weeks.

Procedure

The study took place between August 2020 and April 2021. Recruitment emails were sent to 2,000 AYA cancer survivors identified through the registry. Emails included details about the study and an email address and phone number to contact for determination of eligibility. Of note, two additional individuals indicated interest over email after receiving information about the study from a friend. In total, 284 individuals contacted the study, yielding a 14% response rate. Two-hundred and seventeen interested individuals were screened over the phone, eight declined to participate, and six were determined ineligible (see CONSORT diagram in Figure 1). The final sample of 203 represented 10% of the 2,002 AYA identified cancer survivors. See Table 1 for distribution of recruitment across the study period.

After the phone screening, eligible individuals were asked to specify a day of the week (e.g., Monday) to complete the questionnaires and writing activities. An initial email containing a link to the consent form, baseline questionnaire, and first writing activity (T0) was then sent on the pre-specified day (see Appendix B for a study timeline). All study materials were housed on Qualtrics, an online survey platform. After completing the online informed consent and baseline questionnaire, participants were randomized to one of the three conditions via Qualtrics. A randomizer element was embedded at the end of the baseline questionnaire, and participants were randomly assigned to a condition using a fixed ratio (1:1:1). General instructions for completing the writing activities were then displayed, followed by the instructions and prompt corresponding to a participant's randomly assigned condition.

Instructions and writing prompts are included in Appendix C and D. Participants in all conditions were instructed to write for at least 20 minutes per session based on procedures reported by previous peer helping and expressive writing interventions in cancer patients and survivors (e.g., Low, Stanton, Bower, & Gyllenhammer, 2010; Mosher et al., 2012; Rini et al., 2014; Stanton et al., 2002). Participants were also instructed not to worry about grammar, spelling, or sentence structure and reminded that their responses would remain anonymous. Instructions specific to each condition contained information on why the study was being conducted and how participants should write about their cancer experience. A writing prompt was then displayed, followed by a free-response text box.

Instructions for completing the remaining three writing activities were sent via email every 7 days for the next 3 weeks (T1, T2, T3). This timeframe was based on recommendations for conducting and delivering positive psychology interventions (Lyubomirsky & Layous, 2013) and previous prosocial and expressive writing interventions in cancer survivors (Rini et al., 2014; Stanton et al., 2002). In total, participants were assigned four writing activities, each with a different theme (see *Interventions* below). Participants received a reminder email 48 and 72 hours after the initial email if the writing activity was not yet completed. Non-responsive participants then received a follow-up call from the study coordinator.

Weekly measures were assessed before each writing activity (see *Measures* below). At the end of the fourth week, participants completed the post-intervention questionnaire (T4). One month later, they were asked to complete a follow-up questionnaire (T5). In expressive writing interventions among cancer patients and survivors, follow-ups ranged from 1 week to 9 months (see Merz et al., 2014). In online prosocial interventions, follow-ups ranged from 2 weeks (Nelson et al., 2016) to 3 months (Rini et al., 2014). A 1-month follow-up was chosen here, as it is mid-range for those conducted using expressive writing. As a thank you for participating, participants received $35 after completing the post-intervention questionnaire and $15 after completing the 1-month follow-up questionnaire. The UCLA Jonsson Comprehensive Cancer Center and UCLA Institutional Review Board approved all study procedures. The ClinicalTrials.gov identifier for this trial is NCT04272346.

Interventions

The peer helping and expressive writing + peer helping conditions were designed based on previous prosocial writing interventions in cancer survivors (Rini et al., 2014) and older adults (Moieni, 2017). The cancer specific fact-writing control condition was designed based on peer helping and expressive writing interventions in cancer patients and survivors (Low et al., 2010; Rini et al., 2014; Stanton et al., 2002). Writing topics were drawn from studies conducted with AYA cancer patients and survivors that detail unmet psychosocial needs and highlight periods of difficult transition (e.g., re-entry after cancer treatment) (Hokkanen et al., 2004; Millar et al., 2010; Zebrack et al., 2006).

Topics were standardized across conditions, and participants were instructed to write about each topic in a different way based on condition assignment (see below for a description of each condition). In the first writing activity, participants wrote about receiving a cancer diagnosis. In the second writing activity, participants wrote about what it was like to undergo cancer treatment. In the third writing activity, participants wrote about the first year after treatment completion. In the fourth and final essay, participants in the peer helping and control conditions wrote about what their life is like now (of note, those in the peer helping condition were asked to provide advice or support to a newly diagnosed AYA cancer patient regarding this time in their lives), and those in the expressive writing + peer helping condition wrote advice or support to a newly diagnosed AYA cancer patient. Instructions and prompts are included in Appendix C and D.

Peer helping condition. For all four writing activities, participants in the peer helping condition were asked to write about their cancer experience with an emphasis on using the experience to benefit a newly diagnosed AYA cancer patient. Participants were informed that their writings would be used to create a resource guide—a compilation of writings and advice on various topics related to cancer diagnosis, treatment, and follow-up care for newly diagnosed AYAs. Based on feedback from a small focus group, we asked participants to write as if they were speaking to someone similar in terms of age, gender, type of cancer, and type of treatment received.

Expressive writing + peer helping condition. Participants in the expressive writing + peer helping condition were asked to write about their deepest thoughts and feelings regarding their cancer experience in the first three writing activities, then to provide advice or support to benefit a newly diagnosed AYA cancer patient in the fourth and final writing activity. Consistent with the peer helping condition, participants were asked to write as if they were speaking to someone similar in terms of age, gender, type of cancer, and type of treatment received for the final writing activity.

Fact-writing control condition. For all four writing activities, participants in the fact-writing condition were asked to provide factual details about their diagnosis, treatment, and daily lives, which could then be used as a personal resource. Participants were instructed to focus on the factual details rather than what they were thinking or feeling at the time. This condition controlled for time and attention spent completing the weekly writing activities and writing about one's cancer experience; it has been used in previous expressive writing interventions (e.g., Low et al., 2010; Rini et al., 2014; Stanton et al., 2002).

Measures

Reliable and valid self-report questionnaires were administered to assess primary and secondary outcomes, as well as demographic, cancer, and treatment-related variables. Self-report essay ratings were measured to evaluate feasibility and acceptability.

Primary outcome: **psychological well-being**. Psychological well-being was measured at baseline (T0), post-intervention (T4), and the 1-month follow-up (T5). To date, few interventions have targeted well-being among AYA cancer survivors—despite its relevance to physical health (Hernandez et al., 2018)—and mounting evidence suggests that prosocial interventions enhance well-being (Curry et al., 2018).

Psychological well-being was measured via the 14-item Mental Health Continuum-Short Form (MHC-SF; Keyes, 2002; Lamers et al., 2011). The MHC-SF measures three components of well-being: hedonic, eudaimonic *social*, and eudaimonic *psychological* well-being. Hedonic well-being relates to feelings of happiness and satisfaction in life and is assessed via 3 items (e.g., "During the past week, how often did you feel happy?"). Eudaimonic *social* well-being relates to feelings of social connectedness and belonging and is assessed via 5 items (e.g., "During the past week, how often did you feel that you belonged to a community or social group?"). Eudaimonic *psychological* well-being relates to feelings of autonomy, self-acceptance, and purpose in life and is assessed via 6 items (e.g., "During the past week, how often did you feel that your life had a sense of direction or meaning to it?"). Items are scored on a 5-point Likert scale (0 = *never,* 5 = *every day*) with higher scores indicating greater well-being. The 3-factor structure was confirmed in a sample of young adults (Robitschek & Keyes, 2009).

Secondary outcomes. Depressive symptoms, anxiety, physical and behavioral symptoms, and social support were assessed at baseline (T0), post-intervention (T4), and the 1-month follow-up (T5). Positive and negative affect and fulfillment of psychological needs (i.e., relatedness, competence, and autonomy) were assessed at baseline (T0), weekly during the intervention (T1, T2, T3), post-intervention (T4), and the 1-month follow-up (T5).

Psychological distress. Depressive symptoms and anxiety were assessed via widely-used and well-validated measures.

Depressive symptoms. Depressive symptoms were measured using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Participants rated the frequency with which they experienced a range of feelings and thoughts (e.g., "I felt depressed" and "I thought my life had been a failure") within the past week. Items were scored on a 4-point Likert scale (0 = *rarely or some of the time*, 3 = *most or all of the time*) with higher scores indicating greater depressive symptoms. A score of 16 or greater indicates risk for clinical depression. This measure has been shown to be reliable and valid for use with young adults (Radloff, 1991) and was previously used in a study of AYA cancer survivors (Muffly et al., 2016).

Anxiety. Anxiety symptoms were measured using the 7-item generalized anxiety disorder scale (GAD-7; Spitzer et al., 2006). Participants rated the intensity in which they felt emotions related to security, contentment, and confidence over the last 2 weeks using a 4-point Likert scale (0 = *not at all*, 4 = *nearly every day*). Higher scores indicate greater anxiety. Items include, "I feel nervous, anxious, or on edge" and "I worry too much about different things." A score of 10 or greater indicates risk for clinical anxiety. This measure has been shown to be both reliable and valid for use with young adults (Byrd-Bredbenner et al., 2021) and was used previously in a study with AYA cancer patients and survivors (Geue et al., 2018).

Physical and behavioral symptoms. Cognitive function, sleep disturbance, fatigue, and pain were assessed via brief measures from the National Institute of Health funded Patient-Reported Outcomes Measurement Information System (PROMIS). These scales were validated previously in a large, diverse sample of cancer patients (Jensen et al., 2015).

Cognitive function. Cognitive function over the past week was assessed using the 4-item PROMIS Cognitive Function-Short Form 4a (Lai et al., 2014). Items include, "My thinking has been slower" and "I have had to work harder than usual to keep track of what I was doing." Items are scored on a 5-point Likert scale (1 = *never,* 5 = very often/*several times a day*). Total raw scores were recoded into T-scores (with a mean of 50 and a standard deviation of 10) following standard PROMIS short form scoring guidelines. Higher scores indicate better cognitive function. The structure of the PROMIS Cognitive Function-Short Form 4a was validated in a sample of cancer patients (Lai et al., 2014). To our knowledge, it has yet to be used with AYA cancer patients or survivors.

Sleep disturbance. Sleep disturbance over the past week was measured via the 4-item PROMIS Sleep Disturbance-Short Form 4a (Buysse et al. 2010; Yu et al. 2011). Individuals reported on their sleep quality via 1 item, "My sleep quality was…," using a 5-point Likert scale (1 = *very good*, 5 = *very poor*). The remaining 3 items measured agreement with statements assessing sleep disturbance using a 5-point Likert scale (1 = *not at all*, 5 = *very much*). Items include, "I had a problem with my sleep" and "I had difficulty falling asleep." Total raw scores were recoded into T-scores (with a mean of 50 and a standard deviation of 10) following standard PROMIS short form scoring guidelines. Higher scores indicate greater sleep disturbance. This measure was used previously among AYA cancer patients (Erickson et al., 2014).

Fatigue. Fatigue over the past week was measured using the 4-item PROMIS Fatigue-Short Form 4a (Lai et al., 2011). Participants rated their level of fatigue on a 5-point Likert scale (1 = *not at all*, 5 = *very much*). Items include, "I feel fatigued" and "I have trouble starting things because I am tired." Total raw scores were recoded into T-scores (with a mean of 50 and a standard deviation of 10) following standard PROMIS short-form scoring guidelines. Higher scores indicate greater fatigue. This measure was used previously among AYA patients and survivors (Erickson et al., 2014; Withycombe et al., 2018).

Pain. Pain intensity over the past week was measured using the 1-item PROMIS Numeric Rating Scale, Pain Intensity 1a. The item read, "How would you rate your pain on average," and was scored on a 10-point numeric rating scale (0 = *no pain,* 10 = *worst imaginable pain*). A higher raw score indicates greater pain intensity. Pain interference over the past week was measured using the PROMIS Pain Interference-Short Form 4a (Amtmann et al., 2010). Items include, "How much did pain interfere with your day to day activities?" and "How much did pain interfere with your work around the house?" Questions are scored on a 5-point Likert scale (1 = *not at all*, 5 = *very much*). Total raw scores were recoded into T-scores (with a mean of 50 and a standard deviation of 10) following standard PROMIS short form scoring guidelines, with higher scores indicating greater fatigue. The pain interference measure was previously used among AYA cancer patients (Grossoehme et al., 2020).

Social support. Social support was measured using the 21-item 2-way Social Support Scale (2-Way SSS; Shakespeare-Finch & Obst, 2011). The 2-Way SSS is comprised of four subscales: Receiving Emotional Support (e.g., "I feel that I have a circle of people who value me”), Giving Emotional Support (e.g., “I am there to listen to other’s problems”), Receiving Instrumental Support (e.g., “If stranded somewhere there is someone who would get me”), and Giving Instrumental Support (e.g., “I am a person others turn to for help with tasks”). Statements are rated on a 6-point Likert scale (0 = *not at all*, 5 = *always*); higher scores indicate greater perceptions of giving and receiving social support. We focused here on total social support, a sum of the four subscales. This measure was validated in a sample of primarily young adults (Shakespeare-Finch & Obst, 2011). To our knowledge, this measure has yet to be used among AYA cancer patients or survivors.

Positive and negative affect. Affect was measured using subscales from the Positive and Negative Affect Schedule (PANAS-X; Watson & Clark, 1994). Two subscales were included: the 10-item positive affect subscale (e.g., alert, attentive, inspired) the 10-item negative affect subscale (e.g., irritable, guilty, upset). Participants rated the extent to which they experienced the corresponding emotion or feeling within the last week on a 5-point Likert scale (1 = *very slightly*, 6 = *extremely*). Higher scores indicate greater positive or negative affect, respectively. The PANAS-X has been validated for use with young adults (Watson & Clark, 1994), though, to our knowledge, this measure has yet to be used in a sample of AYA cancer patients or survivors.

Fulfillment of psychological needs. Fulfillment of psychological needs was measured using the 9-item Balanced Measure of Psychological Needs (BMPN; Sheldon & Hilpert, 2012), which is comprised of three 3-item subscales: relatedness, competence, and autonomy. Items designed to measure relatedness include: “I felt a strong sense of intimacy with the people I spent time with” and “I felt close and connected with other people who are important to me.” Items of competence include: “I felt very capable in what I did” and “I felt that I was taking on and mastering hard tasks.” Finally, items designed to measure autonomy include: “I felt free to do things my own way" and "I felt that my choices reflected my 'true self.'" Individuals rated their level of agreement within the last week on a 5-point Likert scale (1 = *no agreement* and 5 = *much agreement*). Higher scores indicate greater fulfillment of psychological needs. This measure has been used in studies with young adults (e.g., Fritz et al., 2019); though, to our knowledge, it has yet to be administered to AYA cancer patients or survivors.

Moderators. Moderators included baseline (T0) psychological distress, chosen primarily due to findings presented in Rini et al. (2014), and prosocial tendencies, based on an empirical study conducted among adolescents (Tashjian et al., 2021) and theoretical literature on person-intervention-fit (e.g., Lyubomirsky & Layous, 2013).

***Psychological distress*.** A composite score was computed using standardized and summed CES-D and GAD-7 scores at baseline to investigate psychological distress as a moderator of the intervention effects on well-being. Higher scores indicate greater overall distress.

***Prosocial tendencies*.** Prosocial tendencies were measured using the 20-item Self-Report Altruism Scale (Rushton et al., 1981). Participants indicated their frequency of engaging in a variety of altruistic behaviors (e.g., "I have given directions to a stranger" and "I helped a classmate who I did not know that well with a homework assignment"). Items are scored on a 5-point Likert scale (0 = *never, 5 = very often*). Higher scores indicate more prosocial tendencies. This measure was used previously in a longitudinal study among AYAs (Eisenberg et al., 2005).

Demographic, cancer, and treatment characteristics. Demographics, including age, gender, race/ethnicity, education, employment, income, and relationship status, were assessed at baseline. Cancer and treatment-related characteristics, including age at diagnosis, month and year of diagnosis, cancer type, cancer stage, type of treatment received, and recurrence status, were also assessed at baseline via self-report.

Essay ratings. Ratings of enjoyment were assessed after each writing activity. Specifically, participants were asked, “How enjoyable did you find writing in response to the prompt?” (0 = *not at all*, 4 = *very much so*). Ratings of helpfulness were assessed at the post-intervention assessment. Those in the peer helping and expressive writing + peer helping conditions were asked, “In this study, you were asked to provide advice to an AYA cancer patient. How helpful do you think this advice will be for an AYA cancer patient?” (0 = *not at all helpful*, 4 = *extremely helpful*). Those in the control condition were asked, “In this study, how helpful was it to write about your experience as a cancer survivor?” (0 = *not at all helpful*, 4 = *extremely helpful*).

Power Analysis

The study was designed to provide 80% power to detect differences in change in the primary outcome, psychological well-being. Because both the peer helping condition and the expressive writing + peer helping condition were considered active, viable interventions, we compared each to the control condition in an efficient trial design. As such, to test our hypotheses, two separate analyses were conducted for each outcome—one comparing peer helping to controls and one comparing expressive writing + peer helping to controls. The power analysis was, therefore, based on a two-group comparison with three measurement timepoints (i.e., baseline, post-intervention, follow-up). Though analyses were conducted in a multilevel framework, the power analysis was based on the ability to detect a time-by-condition interaction using a repeated-measures analysis of variance (ANOVA). Currently, well-established metrics for calculating power in a multilevel model are lacking. The approach used here represents a conservative estimate.

The design of the current study was based on previous procedures reported in Rini et al. (2014) and Moieni (2017); however, effect sizes for the latter were not reported. Calculations were, therefore, based on effect sizes derived from Rini et al.'s study and another prosocial intervention that was delivered online and reported effects using the MHC-SF (Nelson et al., 2016). Both of these studies reported small effect sizes on measures of well-being (*d*s = 0.23 and 0.31, respectively). Using G*Power and assuming a 0.5 correlation between repeated measurements, we calculated that $n = 186$, or 62 participants per condition, would provide 80% power to reject the null hypothesis. To account for 10% attrition, our target sample size was 68 participants per group or 204 total participants.

Analytic Strategy

Descriptive statistics were generated to depict the demographic, cancer, and treatment characteristics of the sample. χ^2, Fisher's exact, and one-way ANOVA tests were used to examine baseline differences in demographic, cancer, and treatment-related variables between groups. Baseline differences in the primary and secondary outcomes were assessed using one-way ANOVAs.

Intent-to-treat analyses were conducted using mixed models, allowing for inclusion of all available data. The primary outcome was psychological well-being. The secondary outcomes were psychological distress (i.e., depressive symptoms, anxiety), physical and behavioral symptoms (i.e., cognitive function, fatigue, sleep disturbance, pain), social support, positive and negative affect, and fulfillment of psychological needs (i.e., relatedness, competence, autonomy). Three analyses were conducted for each outcome using the mixed procedure in Stata with time as the within-subject repeated effect. First, main effects of time were assessed for all participants, across conditions. Only significant main effects are presented here. Next, primary analyses tested the group x time interaction. Here, we conducted two sets of analyses for each outcome—one comparing peer helping to controls and one comparing expressive writing + peer helping to controls. A significant interaction indicated that the difference between the corresponding active condition (i.e., peer helping, expressive writing + peer helping) and the control condition significantly differed across timepoints. For the weekly measures (i.e., affect and fulfillment of psychological needs), we assessed whether linear change significantly differed for each active condition relative to control using autoregressive multilevel models with time centered at baseline. For each significant interaction, post-hoc testing was conducted using simple contrasts, and effect sizes were generated using the process described in Selya et al. (2012). Finally, moderators were assessed by computing a three-way interaction term, time-by-condition-by-moderator. A significant three-way interaction indicated that differences between the groups over time differed as a function of both condition assignment (i.e., active condition versus control) and levels of the moderator.

Results

Participants

Two hundred and three AYA cancer survivors completed the informed consent and were enrolled in the trial. Of those, 201 were randomized to one of three conditions: peer helping (*n* = 67), expressive writing + peer helping (*n* = 66), or the fact-writing control (*n* = 68) (CONSORT diagram included in Figure 1). Two participants failed to complete the baseline questionnaire and were, thus, not randomized to a condition. Groups did not differ on demographic, cancer, or treatment characteristics at baseline (reported in Table 2) (all *p*s > .05), with the exception of cancer stage at diagnosis (see Table 2) (Fisher's exact test, *p* = .036). However, cancer stage was not included as a covariate in our analyses, given that some cancers commonly diagnosed among AYAs (e.g., leukemia, Ewing's sarcoma) are not classified using a traditional numbered staging system. Notably, 39% of the sample (*n* = 79) indicated a cancer stage of "other" or "do not recall." Groups did not differ significantly on primary or secondary outcomes at baseline (see Table 3 for means and standard deviations).

As shown in Table 2, participants were, on average, 32.33 years of age (*SD* = 5.23; age range: 18-39 years). The majority were female (76%), White (72%), college educated (74%), and employed (66%). About half of the sample were married (49%) and earned more than $100,000 in yearly household income (48%). On average, participants were diagnosed at 27.38 years of age (*SD* = 5.91, range: 15-39 years) and were 5.06 years (*SD* = 3.65, range: 0.85-19.97) after cancer diagnosis. The most commonly reported diagnoses were thyroid cancer (17%), breast cancer (15%), lymphoma (13%), and leukemia (12%). Surgery was the most commonly reported treatment (76%), followed by chemotherapy (61%) and radiation (44%). Sixteen percent of the sample indicated a cancer recurrence.

The percentage of participants who endorsed clinically significant depressive symptoms at baseline (as indicated by scores greater than or equal to 16 on the CES-D) was 56%. This is higher than results from a previous study of AYA survivors within 2 years of treatment for blood-based cancers (*N* = 61), where 29% of the sample met criteria for clinically significant depressive symptoms using the CES-D (Muffly et al., 2016). The percentage of participants who endorsed clinically significant anxiety symptoms at baseline (as indicated by scores greater than or equal to 10 on the GAD-7) was 35%. In a sample of German AYAs within 5 years of diagnosis (*N* = 368), Geue et al. (2018) reported that 20.8% of the sample met criteria for clinically significant anxiety using the GAD-7.

Of the 203 participants enrolled in the study, 180 completed the post-intervention assessment, yielding an 89% retention rate. Those who withdrew from the intervention did not differ from completers on demographic, cancer, or treatment-related variables (*p*s ≥ .08). They did, however, endorse lower total well-being (completers: *M* = 44.46, *SD* = 12.23; non-completers: *M* = 38.91, *SD* = 14.74; *t*(200) = -1.99, *p* = 0.047), greater anxiety symptoms (completers: *M* = 7.50, *SD* = 5.21; non-completers: *M* = 10.09, *SD* = 6.07; *t*(198) = 2.19, *p* = 0.029), and less social support (completers: *M* = 88.46, *SD* = 13.01; non-completers: *M* = 81.75, *SD* = 17.39; *t*(191) = -2.10, *p* = 0.037) at baseline.

Adherence to the intervention was high; the majority of participants retained at post-intervention completed all four writing activities (*n* = 166; 92%) (*M* =3.65, *SD* = 0.92). This did not differ significantly across the three groups: peer helping (*M* = 3.89, *SD* = 0.37), expressive writing + peer helping (*M* =3.88, *SD* = 0.38), or the fact-writing control (*M* =3.97, *SD* = 0.18). On average, the 180 participants who completed the intervention found the weekly writing activities enjoyable, with no differences between groups (peer helping: *M* = 2.51, *SD* = 0.86; expressive writing + peer helping: *M* = 2.37, *SD* = 0.93; control: *M* = 2.13, *SD* = 0.75; *F*(2,166) = 2.94, *p* = .056). At the post-intervention assessment, participants in the peer helping (*M* = 2.47, *SD* = 1.02) and expressive writing + peer helping (*M* = 2.56, *SD* = 0.93) conditions, on average, felt that their advice would be helpful to a newly-diagnosed AYA cancer patient. Participants in the control condition, on average, reported it helpful to write about their cancer experience (*M* = 2.32, *SD* = 0.95).

Primary Outcome

Well-being. Means and standard deviations are presented in Table 3. Bivariate correlations between primary and secondary outcomes at baseline are presented in Table 4. Coefficients, standard errors, *p*-values, and confidence intervals for the time-by-condition interactions are presented in Table 5. Confidence intervals (CI) reported are 95%. Graphs depicting the adjusted means for total, hedonic, eudaimonic *social*, and eudaimonic *psychological* well-being in each condition are presented in Figure 2.

Main effects. From baseline to post-intervention, there was a main effect of time on hedonic (b = -0.36, SE = 0.15, *p* = .015, CI [-0.66, -0.07]) and eudaimonic *social* well-being (*b* = 0.89, *SE* = 0.29, *p* = .002, CI [0.33, 1.45]). All three groups had decreases in hedonic well-being (peer helping: M_{Δ} = -0.27, SD_{Δ} = 2.02; expressive writing + peer helping: M_{Δ} = -0.34, SD_{Δ} = 1.82; control: M_{Δ} = -0.60, SD_{Δ} = 2.33) and increases in eudaimonic *social* well-being (peer helping: M_{Δ} = 1.24, SD_{Δ} = 3.62; expressive writing + peer helping: M_{Δ} = 0.85, SD_{Δ} = 4.34; control: M_{Δ} = 0.38, SD_{Δ} = 3.37).

From baseline to the 1-month follow-up, there was a main effect of time on total (*b* = 2.16, *SE* = 0.67, *p* = .001, CI [0.85, 3.47]) and eudaimonic *social* well-being (*b* = 1.84, *SE* = 0.64, *p* < .001, CI [1.26, 2.42]). All three conditions evidenced increases in total (peer helping: M_{Δ} = 1.91, SD_{Δ} = 8.31; expressive writing + peer helping: M_{Δ} = 2.74, SD_{Δ} = 9.95; control: M_{Δ} = 1.33, SD_{Δ} = 8.57) and eudaimonic *social* well-being (peer helping: M_{Δ} = 1.83, SD_{Δ} = 3.72; expressive writing + peer helping: M_{Δ} = 1.86, SD_{Δ} = 4.57; control: M_{Δ} = 1.63, SD_{Δ} = 4.22). Change in total well-being was driven by increases in eudaimonic *social* well-being.

Interactions: peer helping versus control. When comparing the peer helping and control conditions, there were no significant time-by-condition interactions for total (*p*s ≥ .065), hedonic (*p*s ≥ .40), or eudaimonic *social* well-being (*p*s ≥ .17). The effect of time on eudaimonic *psychological* well-being from baseline to post-intervention did, however, differ across the two groups, $b = 1.56$, $SE = 0.76$, $p = .040$, CI [0.07, 3.05], $f^2 = 0.03$. This difference accounted for 3% of the total variance, from baseline to post-intervention, in eudaimonic *psychological* well-being. Simple contrasts suggested an increase in psychological well-being in the peer helping condition and a decrease in controls; however, neither change was statistically significant (peer helping: $b = 0.64$, $SE = 0.56$, $p = .25$, CI [-0.45, 1.73]; control: $b = -0.92$, $SE = 0.56$, $p = .10$, CI [-2.01, 0.18]).

Interactions: expressive writing + peer helping versus control. When comparing those in the expressive writing + peer helping condition to controls, there were no significant time-by-condition interactions for total (ps ≥ .21), hedonic (ps ≥ .48), eudaimonic *social* (ps ≥ .46), or eudaimonic *psychological* well-being (ps ≥ .098).

Secondary Outcomes

Means and standard deviations for depressive symptoms, anxiety, physical and behavioral symptoms, and social support are presented in Table 3. Bivariate correlations between primary and secondary outcomes at baseline are presented in Table 4. Coefficients, standard errors, *p*-values, and CIs for the time-by-condition interactions are presented in Table 5. CIs reported are 95%. Means and standard deviations for the weekly measures—affect and fulfillment of psychological needs—are presented in Table 6. Graphs depicting the adjusted means for psychological distress (i.e., depressive symptoms, anxiety) in each condition are presented in Figure 3. Graphs for each additional outcome—physical and behavioral symptoms, social support, affect, and fulfillment of psychological needs—are presented in Figures 4 through 7.

Depressive symptoms. There was a main effect of time on depressive symptoms from baseline to post-intervention ($b = -2.11$, $SE = 0.63$, $p = .001$, CI [-3.35, -0.88]) and baseline to the 1-month follow-up ($b = -3.38$, $SE = 0.64$, $p < .001$, CI [-4.64, -2.13]). Depressive symptoms decreased for all three groups from baseline to post-intervention (peer helping: $M_{\Delta} = -2.86$, $SD_{\Delta} = 9.57$; expressive writing + peer helping: $M_{\Delta} = -1.71$, $SD_{\Delta} = 7.99$; control: $M_{\Delta} = -1.45$, $SD_{\Delta} = 6.61$) and baseline to the 1-month follow-up (peer helping: $M_{\Delta} = -3.05$, $SD_{\Delta} = 10.33$; expressive writing + peer helping: $M_{\Delta} = -3.39$, $SD_{\Delta} = 8.83$; control: $M_{\Delta} = -2.87$, $SD_{\Delta} = 6.91$).

There were no significant time-by-condition interactions for depressive symptoms when comparing: the peer helping condition to controls (ps $\geq .41$) or the expressive writing + peer helping condition to controls (ps $\geq .64$).

Anxiety. There was a main effect of time on anxiety symptoms from baseline to post-intervention ($b = -0.94$, $SE = 0.31$, $p = .003$, CI [-1.55, -0.32]) and baseline to the 1-month follow-up ($b = -1.62$, $SE = 0.33$, $p < .001$, CI [-2.26, -0.99]). Anxiety symptoms decreased for all three groups from baseline to post-intervention (peer helping: $M_{\Delta} = -1.05$, $SD_{\Delta} = 3.66$; expressive writing + peer helping: $M_{\Delta} = -0.63$, $SD_{\Delta} = 4.76$; control: $M_{\Delta} = -0.73$, $SD_{\Delta} = 3.27$) and baseline to the 1-month follow-up (peer helping: $M_{\Delta} = -1.80$, $SD_{\Delta} = 5.52$; expressive writing + peer helping: $M_{\Delta} = -1.61$, $SD_{\Delta} = 5.34$; control: $M_{\Delta} = -1.11$, $SD_{\Delta} = 2.87$).

There were no significant time-by-condition interactions for anxiety when comparing: the peer helping condition to controls (ps $\geq .40$) or the expressive writing + peer helping condition to controls (ps $\geq .48$).

Physical and behavioral symptoms. From baseline to the 1-month follow-up, there was a main effect of time on both sleep disturbance ($b = -2.54$, $SE = 0.63$, $p < .001$, CI [-3.78, -1.31]) and fatigue ($b = -1.83$, $SE = 0.67$, $p = .006$, CI [-3.14, -0.51]). For all three groups, sleep disturbance (peer helping: $M_{\Delta} = -1.71$, $SD_{\Delta} = 10.36$; expressive writing + peer helping: $M_{\Delta} = -2.55$, $SD_{\Delta} = 9.00$; control: $M_{\Delta} = -3.05$, $SD_{\Delta} = 6.13$) and fatigue (peer helping: $M_{\Delta} = -0.21$, $SD_{\Delta} = 7.36$; expressive writing + peer helping: $M_{\Delta} = -1.17$, $SD_{\Delta} = 10.17$; control: $M_{\Delta} = -3.27$, $SD_{\Delta} = 8.94$) decreased. Notably, decreases were greatest among those in the control condition.

When comparing the peer helping and control conditions, there were no significant time-by-condition interactions for cognitive function (ps $\geq .14$), sleep disturbance (ps $\geq .48$), fatigue (ps $\geq .080$), pain intensity (ps $\geq .74$), or pain interference (ps $\geq .68$). Similarly, there were no significant time-by-condition interactions for cognitive function (ps $\geq .81$), sleep disturbance (ps $\geq .81$), fatigue (ps $\geq .41$), pain intensity (ps $\geq .21$), or pain interference (ps $\geq .39$) when comparing the expressive writing + peer helping and control conditions.

Social support. There were no significant main effects of time on total social support (ps $\leq .084$). Several marginally significant interactions emerged.

Interactions: peer helping versus control. When comparing the peer helping and control conditions, the difference in the effect of time on total social support from baseline to post-intervention was marginally significant, $b = 3.47$, $SE = 1.77$, $p = .050$, CI [-0.00, 6.94], $f^2 = 0.04$. Simple contrasts indicated an increase in social support in the peer helping condition and a decrease in the control condition, although neither change was statistically significant (peer helping: $b = 2.02$, $SE = 1.17$, $p = .084$, CI [-0.27, 4.31]; control: $b = -1.44$, $SE = 1.18$, $p = .22$, CI [-3.76, 0.88]). Similarly, the difference in the effect of time on total social support from baseline to the 1-month follow-up was marginally significant, $b = 1.04$, $SE = 1.85$, $p = .057$, CI [-2.58, 4.66], $f^2 = 0.002$. Simple contrasts indicated an increase in social support in both the peer helping and control conditions, although neither change was statistically significant (peer helping: $b = 1.47$, $SE = 1.21$, $p = .22$, CI [-0.90, 3.83]; control: $b = 0.43$, $SE = 1.24$, $p = .73$, CI [-

2.00, 2.86]). For the control condition, this change was driven by a return to baseline ratings from post-intervention to the 1-month follow-up.

Interactions: expressive writing + peer helping versus control. When comparing the expressive writing + peer helping condition to the control condition, the overall trend from baseline to post-intervention was similar to that observed for the peer helping condition, $b = 2.64$, $SE = 1.49$, $p = .077$, CI [-0.29, 5.56], $f^2 = 0.04$. Simple contrasts indicated an increase in social support in the expressive writing + peer helping condition and a decrease in the control condition, although neither change was statistically significant (peer helping: $b = 1.26$, $SE = 1.15$, $p = .28$, CI [-1.01, 5.52]; control: statistics reported above). When comparing baseline to the 1-month follow-up, there were no statistically significant interactions (ps $\geq .42$).

Affect. For positive and negative affect, several main effects of time emerged. Linear change was not significantly different when comparing the intervention conditions to controls.

Positive affect. For positive affect, there was a main effect of time from baseline to post-intervention ($b = 1.46$, $SE = 0.52$, $p = 0.005$, CI [0.44, 2.49]) and baseline to the 1-month follow-up ($b = 1.82$, $SE = 0.55$, $p = 0.001$, CI [0.74, 2.89]). All three conditions had an increase in positive affect from baseline to post-intervention (peer helping: $M_{\Delta} = 0.84$, $SD_{\Delta} = 7.28$; expressive writing + peer helping: $M_{\Delta} = 2.29$, $SD_{\Delta} = 7.09$; control: $M_{\Delta} = 0.90$, $SD_{\Delta} = 6.86$) and baseline to the 1-month follow-up (peer helping: $M_{\Delta} = 0.29$, $SD_{\Delta} = 8.80$; expressive writing + peer helping: $M_{\Delta} = 2.92$, $SD_{\Delta} = 6.90$; control: $M_{\Delta} = 2.62$, $SD_{\Delta} = 6.46$).

Linear change in positive affect was not significant different when comparing: the peer helping condition to controls ($b = -0.36$, $SE = 0.24$, $p = 0.13$, CI [-0.82, 0.11]) or the expressive writing + peer helping condition to controls ($b = 0.11$, $SE = 0.23$, $p = 0.65$, CI [-0.34, 0.55]).

Negative affect. For negative affect, there was a main effect of time at all 5 timepoints (i.e., T1, T2, T3, T4, T5) (*p*s < .001). All three conditions evidenced a decline in negative affect during the first week of the intervention (*b* = -3.38, *SE* = 0.47, *p* < 0.001, CI [-4.30, -2.45]; peer helping: M_{Δ} = -3.52, SD_{Δ} = 8.20; expressive writing + peer helping: M_{Δ} = -3.16, SD_{Δ} = 5.86; control: M_{Δ} = -3.44, SD_{Δ} = 5.66). This decrease remained statistically significant throughout the intervention, at the post-intervention assessment (*b* = -2.28, *SE* = 0.51, *p* < 0.001, CI [-3.28, 1.27]; peer helping: M_{Δ} = -1.86, SD_{Δ} = 7.92; expressive writing + peer helping: M_{Δ} = -2.66, SD_{Δ} = 7.68; control: M_{Δ} = -1.68, SD_{Δ} = 5.81), and the 1-month follow-up (*b* = -3.21, *SE* = 0.53, *p* < 0.001, CI [-4.26, -2.16]; peer helping: M_{Δ} = -2.16, SD_{Δ} = 9.09; expressive writing + peer helping: M_{Δ} = -3.93, SD_{Δ} = 6.55; control: M_{Δ} = -2.74, SD_{Δ} = 6.15).

Linear change in negative affect was not significantly different when comparing: the peer helping condition to controls (*b* = 0.20, *SE* = 0.24, *p* = 0.40, CI [-0.27, 0.67]) or the expressive writing + peer helping condition to controls (*b* = -0.16, *SE* = 0.22, *p* = 0.46, CI [-0.59, 0.27]).

Fulfillment of psychological needs. For relatedness, competence, and autonomy, several main effects of time emerged. Linear change was not significantly different when comparing the intervention conditions to controls.

Relatedness. There was a main effect of time on relatedness from baseline to the T1 assessment (*b* = -0.19, *SE* = 0.06, *p* = 0.004, CI [-0.31, 0.06]), baseline to post-intervention (*b* = 0.22, *SE* = 0.07, *p* = 0.001, CI [0.87, 0.34]), and baseline to the 1-month follow-up (*b* = 0.25, *SE* = 0.07, *p* < 0.001, CI [-0.12, 0.38]). For all three groups, relatedness declined during the first week of the intervention (peer helping: M_{Δ} = -0.22, SD_{Δ} = 0.84; expressive writing + peer helping: M_{Δ} = -0.23, SD_{Δ} = 0.87; control: M_{Δ} = -0.16, SD_{Δ} = 0.99). However, by the post-intervention assessment, all three groups evidenced an increase in relatedness (peer helping: M_{Δ}

= 0.29, $SD_{\Delta} = 0.92$; expressive writing + peer helping: $M_{\Delta} = 0.20$, $SD_{\Delta} = 0.75$; control: $M_{\Delta} = 0.19$, $SD_{\Delta} = 0.88$). Increases remained statistically significant at the 1-month follow-up (peer helping: $M_{\Delta} = 0.18$, $SD_{\Delta} = 0.98$; expressive writing + peer helping: $M_{\Delta} = 0.22$, $SD_{\Delta} = 1.00$; control: $M_{\Delta} = 0.40$, $SD_{\Delta} = 0.78$).

Linear change in relatedness was not significantly different when comparing: the peer helping condition to controls ($b = -0.02$, $SE = 0.03$, $p = 0.51$, CI [-0.07, 0.04]) or the expressive writing + peer helping condition to controls ($b = -0.03$, $SE = 0.03$, $p = 0.34$, CI [-0.08, 0.03]).

Competence. There was a main effect of time on competence from baseline to the T2 assessment ($b = 0.15$, $SE = 0.07$, $p = 0.029$, CI [0.16, 0.28]), baseline to post-intervention ($b = 0.08$, $SE = 0.07$, $p = 0.002$, CI [0.08, 0.37]), and baseline to the 1-month follow-up ($b = 0.30$, $SE = 0.08$, $p < 0.001$, CI [0.15, 0.45]). For all three groups, competence increased during the second week of the intervention (peer helping: $M_{\Delta} = 0.18$, $SD_{\Delta} = 0.93$; expressive writing + peer helping: $M_{\Delta} = 0.18$, $SD_{\Delta} = 0.98$; control: $M_{\Delta} = 0.04$, $SD_{\Delta} = 0.86$). Similarly, all three groups evidenced increases in competence at post-intervention (peer helping: $M_{\Delta} = -0.24$, $SD_{\Delta} = 1.07$; expressive writing + peer helping: $M_{\Delta} = 0.28$, $SD_{\Delta} = 1.01$; control: $M_{\Delta} = 0.16$, $SD_{\Delta} = 0.92$) and the 1-month follow-up (peer helping: $M_{\Delta} = 0.14$, $SD_{\Delta} = 1.12$; expressive writing + peer helping: $M_{\Delta} = 0.45$, $SD_{\Delta} = 1.03$; control: $M_{\Delta} = 0.29$, $SD_{\Delta} = 1.07$).

Linear change in competence was not significantly different when comparing: the peer helping condition to controls ($b = -0.02$, $SE = 0.04$, $p = 0.60$, CI [-0.09, 0.05]) or the expressive writing + peer helping condition to controls ($b = 0.03$, $SE = 0.03$, $p = 0.39$, CI [-0.04, 0.09]).

Autonomy. There was a main effect of time on autonomy from baseline to the T1 assessment ($b = -0.14$, $SE = 0.06$, $p = 0.026$, CI [-0.25, -0.02]), baseline to post-intervention ($b =$

0.22, $SE = 0.07$, $p = 0.001$, CI [0.09, 0.35]), and baseline to the 1-month follow-up ($b = 0.24$, $SE = 0.07$, $p = 0.001$, CI [0.11, 0.38]). For all three groups, autonomy declined during the first week of the intervention (peer helping: $M_{\Delta} = -0.09$, $SD_{\Delta} = 0.79$; expressive writing + peer helping: $M_{\Delta} = -0.32$, $SD_{\Delta} = 0.72$; control: $M_{\Delta} = -0.02$, $SD_{\Delta} = 0.84$). However, by the post-intervention assessment, all three groups evidenced an increase in autonomy (peer helping: $M_{\Delta} = 0.40$, $SD_{\Delta} = 1.09$; expressive writing + peer helping: $M_{\Delta} = 0.12$, $SD_{\Delta} = 0.83$; control: $M_{\Delta} = 0.11$, $SD_{\Delta} = 1.02$). Increases remained statistically significant at the 1-month follow-up (peer helping: $M_{\Delta} = 0.21$, $SD_{\Delta} = 0.95$; expressive writing + peer helping: $M_{\Delta} = 0.21$, $SD_{\Delta} = 0.84$; control: $M_{\Delta} = 0.29$, $SD_{\Delta} = 0.89$).

Linear change in autonomy was not significantly different when comparing: the peer helping condition to controls ($b = 0.03$, $SE = 0.03$, $p = 0.40$, CI [-0.04, 0.09]) or the expressive writing + peer helping condition to controls ($b = 0.01$, $SE = 0.03$, $p = 0.68$, CI [-0.04, 0.07]).

Moderators

Moderators included baseline psychological distress—comprised of depressive symptoms and anxiety—and prosocial tendencies. We hypothesized that those reporting more distress and higher ratings of prosocial tendencies at baseline would show a greater increase in well-being in response to peer helping or expressive writing + peer helping.

Psychological distress. When comparing the peer helping and control conditions, there were no significant three-way interactions for total (ps $\geq .72$), hedonic (ps $\geq .61$), eudaimonic *social* (ps $\geq .20$), or eudaimonic *psychological* well-being (ps $\geq .67$). Similarly, when comparing the expressive writing + peer helping and control conditions, there were no significant three-way interactions for total (ps $\geq .18$), hedonic (ps $\geq .42$), eudaimonic *social* (ps $\geq .32$), or eudaimonic *psychological* well-being (ps $\geq .23$).

Prosocial tendencies. When comparing the peer helping and control conditions, there were no significant three-way interactions for total (ps ≥ .49), hedonic (ps ≥ .34), eudaimonic *social* (ps ≥ .43), or eudaimonic *psychological* well-being (ps ≥ .12). Similarly, when comparing the expressive writing + peer helping and control conditions, there were no significant three-way interactions for total (ps ≥ .74), hedonic (ps ≥ .92), eudaimonic *social* (ps ≥ .46), or eudaimonic *psychological* well-being (ps ≥ .31).

Discussion

Developing and testing low-cost, easy-to-disseminate interventions for AYA cancer survivors is critically important. Though many AYA cancer survivors report unmet health and psychosocial needs following treatment (Millar et al., 2010; Patterson et al., 2012; Zebrack & Isaacson, 2012), few interventions, to date, have been developed specifically for use among this population. The overall goal of the current study was to test two brief, online prosocial interventions—peer helping and expressive writing + peer helping—for use with AYA cancer survivors.

Recruitment and retention data and self-report essay ratings demonstrate the feasibility of conducting an online prosocial writing intervention among AYA cancer survivors. Results also supported the efficacy of peer helping for one of the primary outcomes, eudaimonic *psychological* well-being. Participants randomized to the peer helping condition, who were instructed to write about their cancer experience with an emphasis on using the experience to benefit a newly diagnosed AYA cancer patient, demonstrated an increase in eudaimonic *psychological* well-being from baseline to post-intervention, whereas participants assigned to the control condition reported a decrease. Additionally, both intervention conditions (i.e., peer helping and expressive writing + peer helping) evidenced a trend towards a significant increase in total social support from baseline to post-intervention, relative to controls. On average, those in the intervention conditions had an increase, and those in the control condition had a decrease.

Several main effects of time emerged across groups. All three conditions evidenced improvements in eudaimonic *social* well-being, depressive symptoms, anxiety, sleep disturbance, fatigue, positive and negative affect, and fulfillment of psychological needs. This suggests that individuals, regardless of condition, benefited from participation on those variables. In contrast, all three groups had declines in hedonic well-being across the intervention. A detailed discussion of these results is included below. Notably, this study was conducted during an extraordinary year in American history, particularly amidst a global pandemic, a divisive presidential election, and heightened national attention to discrimination and racial injustice. Findings should, therefore, be interpreted against the broader historical context during which the study was conducted.

Feasibility

The first aim of the study was to evaluate the feasibility of conducting an online prosocial intervention with AYA cancer survivors, a population that is notoriously difficult to recruit and retain (e.g., Harlan et al., 2011; Sansom-Daly et al., 2019; Victorson et al., 2020). Recruiting from a local hospital-based registry, we identified and contacted 2,000 eligible individuals. This approach yielded a 14% response rate; two-hundred and eighty-four AYAs responded to the recruitment email. For comparison, a previous prosocial intervention conducted among breast cancer survivors using the same hospital-based registry yielded a 9% response rate (Haydon et al., 2019). Among AYA cancer survivors, response rates are highly variable; one study using a hospital-based registry reported a 2% response rate (Rabin, Horowitz, & Marcus, 2013), and others using national or province-based registries reported rates of 16 (Harlan et al., 2011) to 43% (Bélanger et al., 2014).

Of the 284 AYAs that contacted the study, 217 were screened for eligibility, and 203 were enrolled in the trial. Both current age and age at diagnosis spanned the entire range specified by the inclusion criteria (i.e., 18-39 years and 15-39 years, respectively). Participants reported various cancer diagnoses and variability in cancer severity at diagnosis and type of treatment received, which is typical among AYA cancer research. Compared to other studies (Geue et al., 2018; Muffly et al., 2016), participants reported high rates of clinically significant psychological distress—depressive symptoms and anxiety—at baseline. However, given the historical events that occurred in 2020 and early 2021, this was not entirely surprising. Encouragingly, 89% of enrolled participants were retained at the post-intervention assessment, and overall adherence to the intervention was high.

Primary Outcome

The primary outcome was psychological well-being, and we hypothesized that those assigned to engage in either peer helping or expressive writing + peer helping would show a greater increase in well-being than those assigned to the fact-writing control condition. Well-being, as conceptualized by the MHC-SF, was comprised of three domains: hedonic well-being, which reflects happiness and life satisfaction; eudaimonic *social* well-being, which includes feelings of social connectedness and belonging; and eudaimonic *psychological* well-being, which relates to feelings of autonomy, self-acceptance, and purpose in life. Results showed a significant time-by-condition interaction for eudaimonic *psychological* well-being when comparing the peer helping and control conditions. Those in the peer helping condition evidenced an increase in eudaimonic *psychological* well-being from baseline to post-intervention, while those in the control condition had a decrease. Change in total, hedonic, and eudaimonic *social* well-being was not statistically significant when comparing the intervention conditions to controls.

This finding is novel and partially supports the primary hypothesis of the study. Previous prosocial interventions conducted among cancer survivors reported null effects on measures of well-being (Haydon et al., 2019; Rini et al., 2014), though only one of these trials tested a prosocial writing intervention (Rini et al., 2014). Providing advice or support to peers may promote personal growth and enhance feelings of purpose in life (Arnstein et al., 2002; Schwartz & Sendor, 1999), two components of eudaimonic *psychological* well-being. Autonomy, another element of eudaimonic *psychological* well-being, may be particularly receptive to prosocial interventions that provide a rationale, emphasize personal choice, and acknowledge negative feelings (e.g., Nelson et al., 2015), several of which were included in the instructions for the peer helping condition. Our results underscore the importance of assessing eudaimonic *psychological* well-being in future prosocial interventions conducted among cancer survivors.

Analyses also revealed a main effect of time on eudaimonic *social* and hedonic well-being. All three groups evidenced increases in eudaimonic *social* well-being from baseline to post-intervention, which were maintained at the 1-month follow-up. Due to the rarity of experiencing cancer as an adolescent or young adult, AYA cancer survivors may struggle to cultivate a sense of community following treatment. It is plausible that simply participating in a study designed specifically for AYA cancer survivors catalyzed feelings of belongingness. In contrast, there was a decline in hedonic well-being across the intervention, with those in the control condition reporting the greatest reductions. This result was surprising, given that we found beneficial main effects of time on positive affect, depressive symptoms, and anxiety.

Items measuring hedonic well-being on the MHC-SF include both happiness and life satisfaction, the latter of which may be particularly difficult to increase during a global pandemic. Regardless, additional research is needed to understand these effects.

Secondary Outcomes

Secondary outcomes included psychological distress, physical and behavioral symptoms, and social support, all of which are highly relevant for AYA cancer survivors. On a weekly basis, we also assessed affect and fulfillment of psychological needs, two constructs that have emerged from empirical and theoretical literature as drivers of prosocial intervention effects on well-being (Martela & Ryan, 2016; Nelson et al., 2016). We hypothesized that those randomly assigned to engage in peer helping or expressive writing + peer helping would show a greater reduction in psychological distress, physical and behavioral symptoms, and negative affect and increases in perceived social support, positive affect, and fulfillment of psychological needs (i.e., relatedness, competence, autonomy) when compared to the fact-writing control condition.

Several time-by-condition interactions emerged for total social support at the trend level (*ps* ≤ 0.077). Both intervention groups had increased social support from pre- to post-intervention, while those in the control condition evidenced a decrease. Notably, though social support is relevant for both physical and emotional health (Uchino, 2009; Wang et al., 2018), only one RCT conducted with AYA cancer patients and survivors has included social support as an outcome (Robb et al., 2014). Our finding is consistent with a previous prosocial intervention conducted among early-stage breast cancer survivors; those randomized to perform kind acts for others had significantly greater increases in total social support when compared to controls (Haydon et al., 2019). Several other expressive writing and prosocial interventions also report effects on a range of social processes, including peer acceptance (Layous et al., 2012), social support (Gellaitry et al., 2010), relationship satisfaction (O'Connell et al., 2016), and social network size (Fritz et al., 2021). Future RCTs should both measure and target social support and related interpersonal constructs (e.g., social integration, social network size). Enhancing social support among AYA cancer survivors is essential, given that AYA cancer survivors report lower rates of social support than age-matched controls (Tremolada et al., 2016) and may experience adverse impacts to family, peer, and romantic relationships as a result of cancer diagnosis and treatment (Warner et al., 2016).

Main effects of time were observed for several secondary outcomes—specifically, psychological distress, sleep disturbance, fatigue, positive and negative affect, and fulfillment of psychological needs. Across groups, participants reported improvements in all of these domains. Most of the effects emerged at post-intervention and were maintained at the 1-month follow-up, except for sleep disturbance and fatigue. Effects on sleep disturbance and fatigue emerged at the 1-month follow-up, consistent with the expressive writing literature where delayed effects on somatic symptoms are commonly reported (see Merz et al., 2014; Smyth et al., 1998). Intriguingly, declines in relatedness and autonomy were observed during the first week of the intervention for all three conditions. These declines may be, in part, due to the process of writing about one's cancer diagnosis during the first writing activity. As one participant noted, "Getting a diagnosis stops time and there is a lot that happens in what feels like an eternity. It is the most painful moment in all of it, in my experience."

That we saw beneficial effects for all three conditions, and particularly among controls, was unexpected. Previous expressive writing and prosocial intervention trials report mixed effects on psychological distress (Lepore et al., 2014; Merz et al., 2014; Zhou et al., 2015), physical symptoms (Merz et al., 2014; Zhou et al., 2015), and positive and negative affect

(Nelson et al., 2016). Further, in previous studies that utilized a cancer-specific fact-writing control, no benefits were observed in the control condition (e.g., Low et al., 2010; Rini et al., 2014; Stanton et al., 2002), except for Lu et al. (2016). Examination of writing content may help to contextualize these findings. For example, preliminary evaluation of the essays revealed that participants in the peer helping condition seldom used advice words, such as "recommend" or "helpful," and participants in the control condition often included details about their feelings (e.g., "I felt so ugly," "I was always depressed, tired, frustrated, angry," "I remember not being happy with my life"). Further, in the final writing activity, participants in both the peer helping and control conditions wrote about what their life is like now, and many discussed the impacts of the COVID-19 pandemic. Writing about the pandemic may have been therapeutic in and of itself; indeed, some evidence suggests that writing about recent traumatic experiences leads to greater benefits (e.g., Low et al., 2010). Analysis of the qualitative data should illuminate whether patterns of writing were distinct across the three conditions and, in particular, why the control group benefited.

Moderators

Both psychological distress and prosocial tendencies were assessed as moderators based on theoretical and empirical literature (Lyubomirsky & Layous, 2013, Rini et al., 2014, Tashjian et al., 2021). However, neither significantly moderated the effects of engaging in peer helping or expressive writing + peer helping on well-being. Our hypotheses were exploratory and based on single studies showing moderated effects. Rini et al. (2014), for instance, found that expressive writing + peer helping was more effective among those who had greater distress at baseline, and Tashjian et al. (2021) found that acts of kindness lead to greater well-being, but only for those who had high levels of altruistic behavior at baseline. Our ability to detect moderated effects may have been limited due to sample size and attrition among those with high distress at baseline. It is also possible that other constructs, including those identified in the expressive writing literature (e.g., gender, time since diagnosis, coping style, social support; Low et al., 2010; Smyth et al., 1998; Stanton et al., 2002), moderate intervention effects on well-being. Notably, few prosocial interventions, to date, have tested and/or reported moderated effects (e.g., Tashjian et al., 2021). In the current study, there was considerable variability among participants in whether, and by how much, the primary and secondary outcomes changed across the intervention. Thus, examining individual-level characteristics—beyond psychological distress and prosocial tendencies—is an important direction for future research.

Limitations and Future Directions

Enrollment occurred during a difficult and stressful time for many, coinciding with a global pandemic, a heated presidential election, and increased national focus on racial inequality. These events likely influenced the study in a number of ways. First, stay-at-home orders—issued in response to the global COVID-19 pandemic—and associated changes in commute times and work responsibilities may have benefited our ability to recruit and retain a relatively large sample of AYA cancer survivors. Resultant isolation, loneliness, and psychological distress and the repeated barrage of stressful stimuli, on the other hand, may have hampered our ability to detect the small effects that are characteristic of positive psychology and prosocial interventions (Bolier et al., 2013; Curry et al., 2018). Participants may have derived greater benefit from a more intensive intervention, particularly those who had high distress at baseline and, consequently, were more likely to drop out of the study. Conversely, it is also possible that social isolation may have magnified changes in social well-being (e.g., eudaimonic *social* well-being, relatedness), as the need for social connection during this time was heightened. It is difficult to disentangle whether these effects were driven by the passing of time. Evidence suggests that loneliness and psychological distress increased due to the COVID-19 pandemic (Jia et al., 2020), including for individuals with a history of cancer (Rentscher et al., 2021). Thus, given the historical context, the likelihood of positive changes to social well-being spontaneously emerging during this time is low.

Several other limitations are worthy of note. First, the demographic characteristics of our sample may limit generalizability. For instance, 75% of participants reported a current age between 30 and 39 years, most identified as non-Hispanic White, and 48% reported an annual household income greater than $100,000. Thus, future studies should replicate these findings in a younger more diverse population of AYAs. Second, though we asked participants to write for 20 minutes following established procedures from the expressive writing literature, a time clock was not included in the online survey. It is likely that some participants spent more or less time completing the activities; whether this affected the primary and secondary outcomes in a meaningful way is unknown. Third, though a handful of online expressive writing interventions have been conducted (e.g., Hirai et al., 2020; Possemato et al., 2010), comparative effectiveness trials have yet to compare online approaches to more traditional paper-and-pen writing sessions. Fourth, the follow-up period used here (i.e., 1 month) was in the mid-range for those reported in previous expressive writing interventions (see Merz et al., 2014). Given that we found sustained main effects for many of the outcomes assessed, limiting the follow-up period to 1-month may have inhibited our ability to detect more delayed and/or long-term effects. Finally, receiving social feedback is an important component of prosocial giving (e.g., Chancellor et al., 2018). Embedding social feedback within the intervention may have bolstered the effectiveness of the trial, and this approach should be considered in future studies (see Moieni, 2017 for an example).

Summary and Conclusions

Should online prosocial interventions be conducted among AYA cancer survivors? Based on our findings, these approaches are promising and warrant future study. Cancer survivors report a desire to help others with a history of cancer (Allen et al., 2009; Truong et al., 2011), and AYA cancer survivors, in particular, report a desire to connect with others who have experienced cancer (Millar et al., 2010; Patterson et al., 2012; Zebrack & Isaacson, 2012; Zebrack et al., 2007). Online prosocial interventions make the act of giving accessible to AYA cancer survivors, who may lack the opportunity to help other AYAs with a history of cancer. Moreover, data from the current trial, including high adherence and positive essay ratings, suggest that these approaches are favorable. Indeed, feedback from participants in the current study was overwhelmingly positive. One participant in the expressive writing + peer helping condition wrote,

> This writing project really helped me to express my thoughts and share my experience and journey without being judged, and I felt heard even if no one responded on the other end. I think this should be offered to people who have cancer as a way of coping and learning more about how they feel and see themselves. It's therapy for sure. Thank you for this experience. I hope it helps someone else who might be going through cancer.

AYAs also value the ability to connect with others using the internet (Pew Research Center, 2010, 2018; Zebrack, 2009) and often face barriers to attending in-person groups (Malboeuf-Hurtubise et al., 2016). Online prosocial interventions require a minimal time commitment, are easy to disseminate, and have the potential to be self-administered, enhancing their utility among AYA cancer survivors.

Of the two intervention conditions tested, results indicated that peer helping had beneficial effects on eudaimonic *psychological* well-being (primary outcome) relative to controls. Both the peer helping and expressive writing + peer helping conditions had trend effects on total social support (secondary outcome) relative to controls. Both eudaimonic *psychological* well-being and social support are important contributors to health (Fredrickson et al., 2013; Ryff et al., 2004; Uchino, 2009); thus, evidence that peer helping and expressive writing + peer helping may enhance these processes is encouraging. Further, main effects of time emerged for eudaimonic *social* well-being, depressive symptoms, anxiety, sleep disturbance, fatigue, positive and negative affect, and fulfillment of psychological needs. These findings were unexpected and suggest that participants benefited from writing about their cancer experience, regardless of condition assignment, or simply benefited from participating in a study focusing on AYA cancer survivors.

Future research should capitalize on AYAs' desire to connect with and help others with a history of cancer. As noted before, integrating social feedback—by either having AYAs directly deliver their writings or providing a written response from a beneficiary—should be considered in future trials to magnify the effects of the intervention (e.g., Moieni, 2017). Further, larger trials are needed to both replicate these findings and understand individual-level characteristics (i.e., moderators) that may influence effects on well-being, psychological distress, social support, and physical and behavioral symptoms. Indeed, our data showed that change scores—capturing the difference in a given outcome from pre- to post-intervention—varied widely among individuals. Finally, adding a didactic component may enhance the effectiveness of prosocial writing interventions (e.g., Nelson et al., 2015) and should be included in future studies.

Due to early detection and advancements in treatment, survival rates are increasing, and there are now a growing number of AYAs living beyond cancer diagnosis and treatment (Lewis et al., 2014; Smith et al., 2014). Improving well-being among these survivors has important health implications, as many will experience persistent or delayed effects due to diagnosis and treatment (e.g., Kwak et al., 2013; Prasad et al., 2015). Online writing-based interventions are a promising approach, and future research on the utility of prosocial writing for this population is needed. Our findings underscore the importance of designing developmentally-appropriate, accessible interventions for use with AYA cancer survivors and highlight avenues for future study. This is one of the first RCTs, to our knowledge, to target positive psychological processes among AYA cancer survivors. Furthering this line of research has the potential to contribute to the long-term health and well-being of this vulnerable, understudied group.

Table 1

Participants Enrolled By Month

	2020					2021	
	August	September	October	November	December	January	February
Participants Enrolled	4	68	49	23	14	40	5

Table 2

Demographic, Cancer, and Treatment Characteristics According to Condition

		Condition			
	All (*N* = 203)	PH (*n* = 67)	EPH (*n* = 66)	Control (*n* = 68)	*p*-value
Demographics					
Age: mean (*SD*), range[a]	32.33 (5.23), 18-39	31.99 (5.51), 18-39	32.17 (5.39), 18-39	32.87 (4.78), 21-39	.59
Female, *n* (%)[b]	154 (76)	49 (73)	49 (74)	54 (79)	.57
Ethnicity, *n* (%)[c]					.53
Black	6 (3)	3 (5)	3 (5)	0 (0)	
Asian	23 (12)	7 (11)	6 (9)	10 (15)	
White	143 (72)	44 (70)	47 (71)	50 (75)	
Other	26 (13)	9 (14)	10 (15)	7 (10)	
Latina (Yes), *n* (%)%[b]	44 (22)	14 (21)	18 (27)	11 (16)	.29
Education, *n* (%)% [b]					.27
< College	52 (26)	16 (24)	19 (29)	16 (23)	
College graduate	81 (40)	33 (49)	24 (36)	23 (34)	
> College	70 (34)	18 (27)	23 (35)	29 (43)	
Employed (full- or part-time), *n* (%)[b]	133 (66)	44 (66)	42 (63)	47 (70)	.49
Income > $100,000, *n* (%)[b]	95 (48)	37 (56)	24 (38)	34 (51)	.61
Married, *n* (%)[b]	89 (44)	29 (43)	30 (45)	30 (44)	.50
Cancer Characteristics					
Age at Diagnosis: mean (*SD*), range[a]	27.38 (5.91), 15-39	27.41 (5.85), 15-39	27.74 (6.26), 15-38	27.01 (5.64), 15-38	.78
Years Since Diagnosis: mean (*SD*)[a]	5.06 (3.65)	4.68 (3.17)	4.58 (3.73)	5.89 (3.95)	.07
Cancer Type, *n* (%)[c]					.56
Brain & CNS Tumors	8 (4)	2 (3)	1 (2)	5 (7)	
Breast	30 (15)	10 (15)	10 (15)	10 (15)	
Leukemia	24 (12)	11 (16)	10 (15)	3 (4)	
Lymphoma	26 (13)	9 (13)	7 (11)	10 (15)	
Melanoma	10 (5)	5 (7)	1 (2)	4 (6)	
Sarcoma	17 (9)	4 (6)	6 (9)	7 (10)	
Testicular	7 (3)	2 (3)	2 (3)	3 (4)	
Thyroid	34 (17)	13 (19)	12 (18)	9 (13)	
Other	45 (22)	11 (16)	17 (26)	17 (25)	
Cancer Stage, *n* (%)[c]					0.04*
0	10 (5)	4 (6)	5 (8)	1 (1)	
I	41 (20)	11 (16)	17 (16)	13 (19)	

II	39 (20)	12 (18)	9 (14)	18 (26)	
III	21 (10)	13 (19)	3 (5)	5 (7)	
IV	11 (5)	2 (3)	3 (5)	6 (9)	
Other/Do Not Recall	79 (39)	25 (37)	29 (44)	25 (37)	
Treatment Characteristics					
Type of Treatment, *n* (%)^{b}					
Surgery	154 (76)	49 (76)	50 (81)	55 (81)	.56
Chemotherapy	121 (61)	38 (57)	39 (59)	44 (65)	.62
Radiation	87 (44)	30 (45)	26 (40)	31 (46)	.74
Bone Marrow Transplant	26 (13)	11 (16)	8 (12)	7 (10)	.55
Cancer Recurrence, *n* (%)^{b}	31 (16)	12 (18)	12 (18)	7 (10)	.34

Note. PH = peer helping, EPH = expressive writing + peer helping, *SD* = standard deviation, CNS = central nervous system, ^{a} = analysis of variance, ^{b} = chi-square test, ^{c} = Fisher’s exact test, **p* < .05.

Table 3

Means and Standard Deviations for Psychological Outcomes and Physical and Behavioral Symptoms

	Baseline (*N* = 201)			Post-intervention (*n* = 180)			Follow-up (*n* = 168)		
	PH	EPH	Control	PH	EPH	Control	PH	EPH	Control
Well-being (MHC-SF)									
Total	42.91 (13.66)	44.92 (11.85)	43.50 (12.50)	44.08 (13.52)	46.81 (10.83)	43.08 (13.39)	44.71 (12.81)	49.17 (10.47)	45.87 (12.26)
Hedonic	10.82 (2.82)	11.17 (2.50)	10.85 (3.16)	10.50 (2.93)	11.08 (2.19)	10.50 (2.96)	10.71 (2.91)	11.53 (2.01)	11.11 (2.57)
Eudaimonic Social	11.64 (6.33)	11.98 (5.47)	11.29 (5.60)	12.86 (5.51)	13.27 (4.94)	11.83 (5.41)	13.68 (5.68)	14.33 (5.12)	13.30 (5.56)
Eudaimonic Psychological	20.34 (5.95)	21.77 (5.59)	21.35 (5.51)	20.95 (6.35)	22.61 (4.98)	20.61 (6.04)	20.52 (5.50)	23.19 (4.77)	21.75 (5.48)
Depressive Symptoms (CES-D)	19.58 (10.90)	17.52 (9.41)	17.54 (11.78)	16.53 (9.81)	15.07 (9.82)	15.68 (11.19)	15.54 (11.06)	13.22 (8.30)	13.71 (11.33)
Anxiety (GAD-7)	8.69 (5.63)	7.32 (7.33)	7.46 (5.30)	7.52 (5.24)	6.05 (5.04)	6.35 (4.61)	6.67 (5.63)	5.14 (4.21)	5.89 (5.13)
Cognitive Function (PROMIS)	44.11 (10.21)	44.97 (10.03)	45.80 (9.67)	43.77 (9.78)	46.29 (9.69)	46.78 (9.10)	43.66 (9.91)	46.71 (9.57)	47.83 (8.41)
Sleep Disturbance (PROMIS)	52.89 (10.13)	53.48 (9.23)	53.40 (10.03)	52.77 (9.01)	52.79 (9.65)	53.05 (9.41)	50.74 (9.26)	50.60 (8.50)	50.24 (8.12)
Fatigue (PROMIS)	55.36 (10.48)	52.88 (10.29)	55.62 (10.92)	54.45 (10.18)	52.99 (11.10)	54.27 (9.78)	54.14 (9.83)	51.12 (10.91)	51.56 (9.33)
Pain Intensity (PROMIS)	1.58 (2.10)	1.68 (2.00)	1.90 (2.06)	1.70 (2.07)	1.58 (1.94)	2.17 (2.24)	1.77 (2.32)	1.57 (2.03)	2.16 (2.34)
Pain Interference (PROMIS)	47.61 (8.48)	48.02 (7.79)	48.48 (8.13)	47.11 (7.85)	47.44 (7.93)	48.52 (8.18)	48.02 (9.48)	47.11 (7.95)	48.23 (7.52)
Social Support (2-Way SSS)	85.21 (15.57)	89.09 (12.55)	88.78 (12.51)	88.24 (12.71)	90.86 (10.77)	87.61 (14.46)	88.49 (15.79)	91.04 (11.62)	89.42 (13.42)

Note. PH = peer helping, EPH = expressive writing + peer helping

Table 4

Bivariate Correlations Between Primary and Secondary Outcomes at Baseline

	1	2	3	4	5	6	7	8	9	10	11
1. Total WB (MHC-SF)	-										
2. Hedonic WB (MHC-SF)	.83***	-									
3. Eudaimonic Social WB (MHC-SF)	.88***	.60***	-								
4. Eudaimonic Psychological WB (MHC-SF)	.91***	.74***	.65***	-							
5. Depressive Symptoms (CES-D)	-.66***	-.71***	-.52***	-.59***	-						
6. Anxiety (GAD-7)	-.43***	-.50***	-.34***	-.36***	.70***	-					
7. Cognitive Function (PROMIS)	.35***	.39***	.24***	.33***	-.55***	-.49***	-				
8. Sleep Disturbance (PROMIS)	-.32***	-.33***	-.29***	-.26***	.45***	.37***	-.27***	-			
9. Fatigue (PROMIS)	-.41***	-.44***	-.34***	-.35***	.58***	.51***	-.54***	.47***	-		
10. Pain Intensity (PROMIS)	-.18**	-.20*	-.18**	-.11	.24***	.15*	-.20**	.26***	.33***	-	
11 Pain Interference (PROMIS)	-.23***	-.25***	-.21**	-.16*	.28***	.12	-.21**	.26***	.31***	.85***	-
12. Social Support (2-Way SSS)	.48***	.38***	.36***	.49***	-.40***	-.17*	.27***	-.10	-.25***	-.15*	-.18**

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

Table 5

Time-by-Condition Interaction Coefficients for the Primary and Secondary Outcomes

		Baseline to Post-Intervention				Baseline to Follow-up			
		b	*SE*	*p*	95% CI	*b*	*SE*	*p*	95% CI
Primary Outcome									
Well-Being (MHC-SF)									
Total	PH vs. Control	2.70	1.46	.065	-0.17, 5.57	0.25	1.54	.87	-2.78, 3.27
	EPH vs. Control	1.99	1.59	.21	-1.13, 5.11	1.37	1.69	.42	-1.94, 4.69
Hedonic									
	PH vs. Control	0.28	0.37	.45	-0.44, 1.00	-0.06	0.40	.88	-0.83, 0.72
	EPH vs. Control	0.26	0.37	.48	-0.46, 0.99	0.24	0.39	.53	-0.51, 1.00
Eudaimonic Social									
	PH vs. Control	0.90	0.65	.17	-0.38, 2.18	0.16	0.68	.82	-1.18, 1.49
	EPH vs. Control	0.54	0.72	.46	-0.88, 1.95	0.26	0.76	.73	-1.22, 1.74
Eudaimonic Psychological									
	PH vs. Control	1.56	0.76	0.040*	0.07, 3.05	0.11	0.80	.89	-1.46, 1.68
	EPH vs. Control	1.36	0.82	0.098	-0.25, 2.96	0.84	0.86	.33	-0.85, 2.54
Secondary Outcomes									
Depressive Symptoms (CES-D)									
	PH vs. Control	-1.26	1.52	.41	-4.23, 1.72	-0.33	1.59	.84	-3.43, 2.78
	EPH vs. Control	-0.34	1.40	.81	-3.09, 2.41	-0.68	1.43	.64	-3.47, 2.12
Anxiety (GAD-7)									
	PH vs. Control	-0.27	0.71	.71	-1.66, 1.13	-0.63	0.74	.40	-2.08, 0.83
	EPH vs. Control	-0.01	0.74	.99	-1.46, 1.44	-0.54	0.76	.48	-2.04, 0.95
Cognitive Function (PROMIS Short Form 4a)									
	PH vs. Control	-1.31	1.39	.35	-4.04, 1.41	-2.16	1.45	.14	-5.01, 0.69
	EPH vs. Control	0.36	1.45	.81	-2.48, 3.20	0.21	1.49	.89	-2.70, 3.13
Sleep Disturbance (PROMIS Short Form 4a)									
	PH vs. Control	0.16	1.50	.92	-2.78, 3.10	1.09	1.53	.48	-1.91, 4.09
	EPH vs. Control	-0.27	1.44	.85	-3.10, 2.56	0.35	1.46	.81	-2.51, 3.22
Fatigue (PROMIS Short Form 4a)									
	PH vs. Control	0.58	1.49	.70	-2.34, 3.51	2.67	1.52	.080	-0.32, 5.66
	EPH vs. Control	1.37	1.64	.41	-1.86, 4.59	2.06	1.70	.23	-1.28, 5.39
Pain									
Pain Intensity (PROMIS 1a)									
	PH vs. Control	-0.08	0.25	.74	-0.58, 0.41	0.00	0.27	.99	-0.52, 0.53
	EPH vs. Control	-0.32	0.25	.21	-0.81, 0.18	-0.32	0.27	.22	-0.84, 0.20

Pain Interference (PROMIS Short Form 4a)								
PH vs. Control	-0.46	1.10	.68	-2.63, 1.70	0.19	1.12	.86	-2.00. 2.39
EPH vs. Control	-0.81	1.12	.47	-3.00, 1.38	-0.99	1.15	.39	-3.24, 1.26
Social Support (2-Way SSS)								
PH vs. Control	3.47	1.77	.050*	-0.00, 6.94	1.04	1.85	.057	-2.58, 4.66
EPH vs. Control	2.64	1.49	.077	-0.29, 5.56	1.29	1.61	.42	-1.87, 4.45

Note. PH = peer helping, EPH = expressive writing + peer helping, CI = confidence interval, *$p \leq .05$.

Table 6

Means and Standard Deviations for Affect and Fulfillment of Psychological Needs

	Condition		
	PH (*n* = 67)	EPH (*n* = 66)	Control (*n* = 68)
Positive Affect			
Baseline	32.09 (8.63)	31.67 (8.19)	31.26 (8.03)
Week 1	31.22 (7.26)	31.23 (8.23)	30.97 (7.65)
Week 2	31.84 (7.04)	32.58 (7.60)	31.16 (7.56)
Week 3	30.76 (7.56)	32.76 (8.26)	30.60 (8.16)
Post-intervention	33.21 (8.56)	33.95 (8.62)	32.83 (8.27)
Follow-up	32.47 (8.41)	34.58 (8.39)	34.38 (7.71)
Negative Affect			
Baseline	23.43 (8.83)	22.06 (7.66)	22.65 (8.28)
Week 1	20.02 (7.68)	19.16 (7.28)	18.69 (6.31)
Week 2	19.22 (7.44)	16.75 (5.94)	18.98 (7.32)
Week 3	19.05 (7.58)	18.00 (7.38)	18.25 (8.25)
Post-intervention	21.46 (8.37)	18.86 (8.21)	20.38 (9.43)
Follow-up	21.24 (9.07)	17.63 (6.75)	18.83 (8.57)
Relatedness			
Baseline	3.97 (1.04)	4.10 (0.90)	3.96 (0.95)
Week 1	3.81 (1.06)	3.83 (1.06)	3.86 (1.00)
Week 2	3.89 (0.88)	4.03 (1.02)	3.97 (1.00)
Week 3	3.93 (0.96)	3.87 (1.10)	3.94 (0.91)
Post-intervention	4.27 (0.86)	4.29 (0.79)	4.16 (0.86)
Follow-up	4.16 (0.89)	4.33 (0.84)	4.39 (0.82)
Competence			
Baseline	3.37 (1.06)	3.47 (1.04)	3.45 (0.99)
Week 1	3.46 (0.90)	3.43 (1.00)	3.41 (1.05)
Week 2	3.60 (1.08)	3.67 (0.99)	3.57 (0.99)
Week 3	3.64 (0.89)	3.60 (1.10)	3.39 (1.03)
Post-intervention	3.64 (1.08)	3.76 (0.97)	3.64 (1.02)
Follow-up	3.57 (1.12)	3.94 (0.96)	3.80 (1.02)
Autonomy			
Baseline	3.67 (1.11)	4.04 (0.88)	3.73 (0.82)
Week 1	3.63 (1.04)	3.70 (1.03)	3.71 (0.99)
Week 2	3.61 (0.96)	3.94 (0.96)	3.66 (0.83)
Week 3	3.79 (0.88)	3.92 (0.98)	3.59 (0.97)
Post-intervention	4.08 (0.98)	4.19 (0.83)	3.84 (0.93)
Follow-up	3.92 (1.12)	4.28 (0.80)	4.06 (0.71)

note. PH = peer helping, EPH = expressive writing + peer helping.

Figure 1

CONSORT Diagram

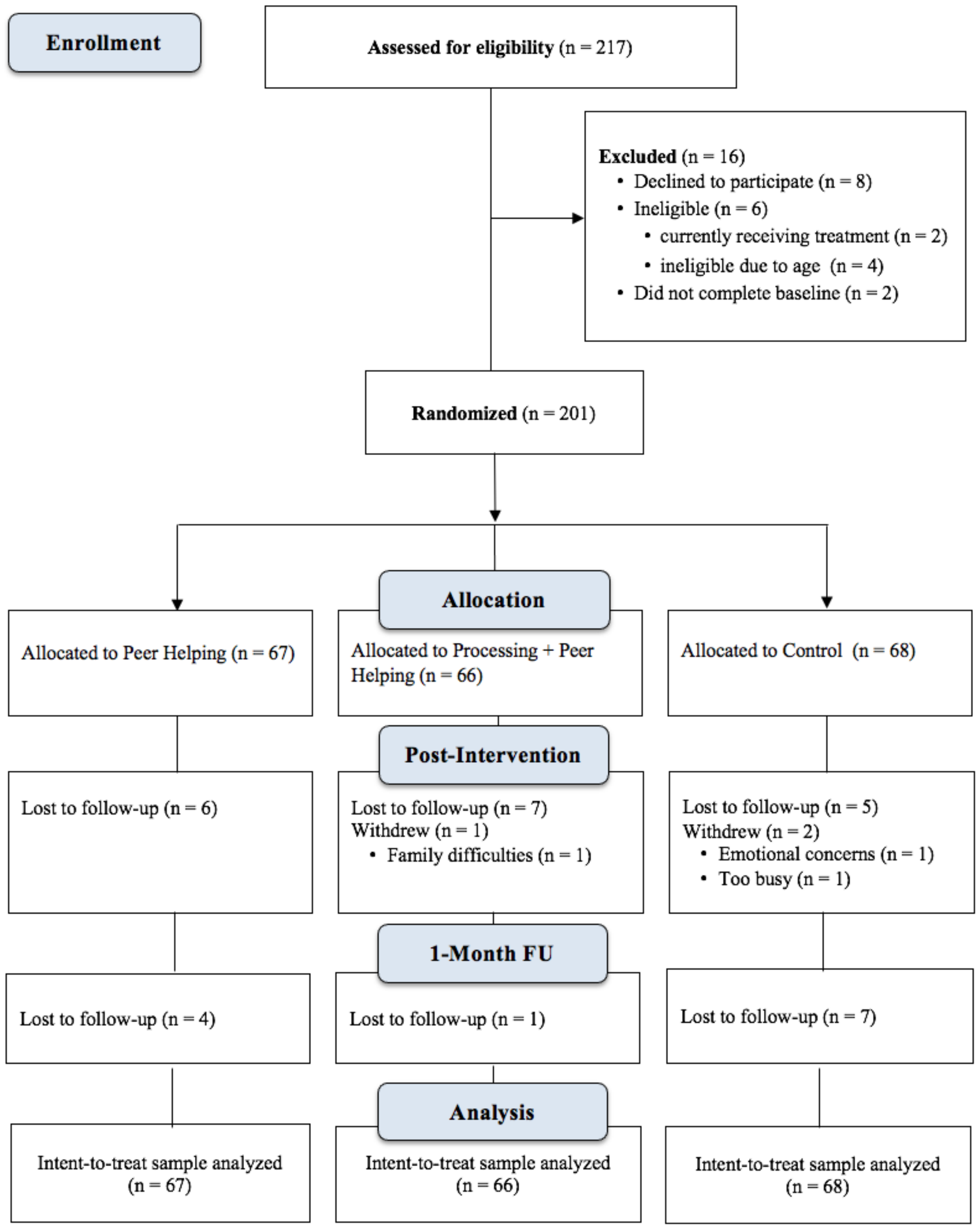
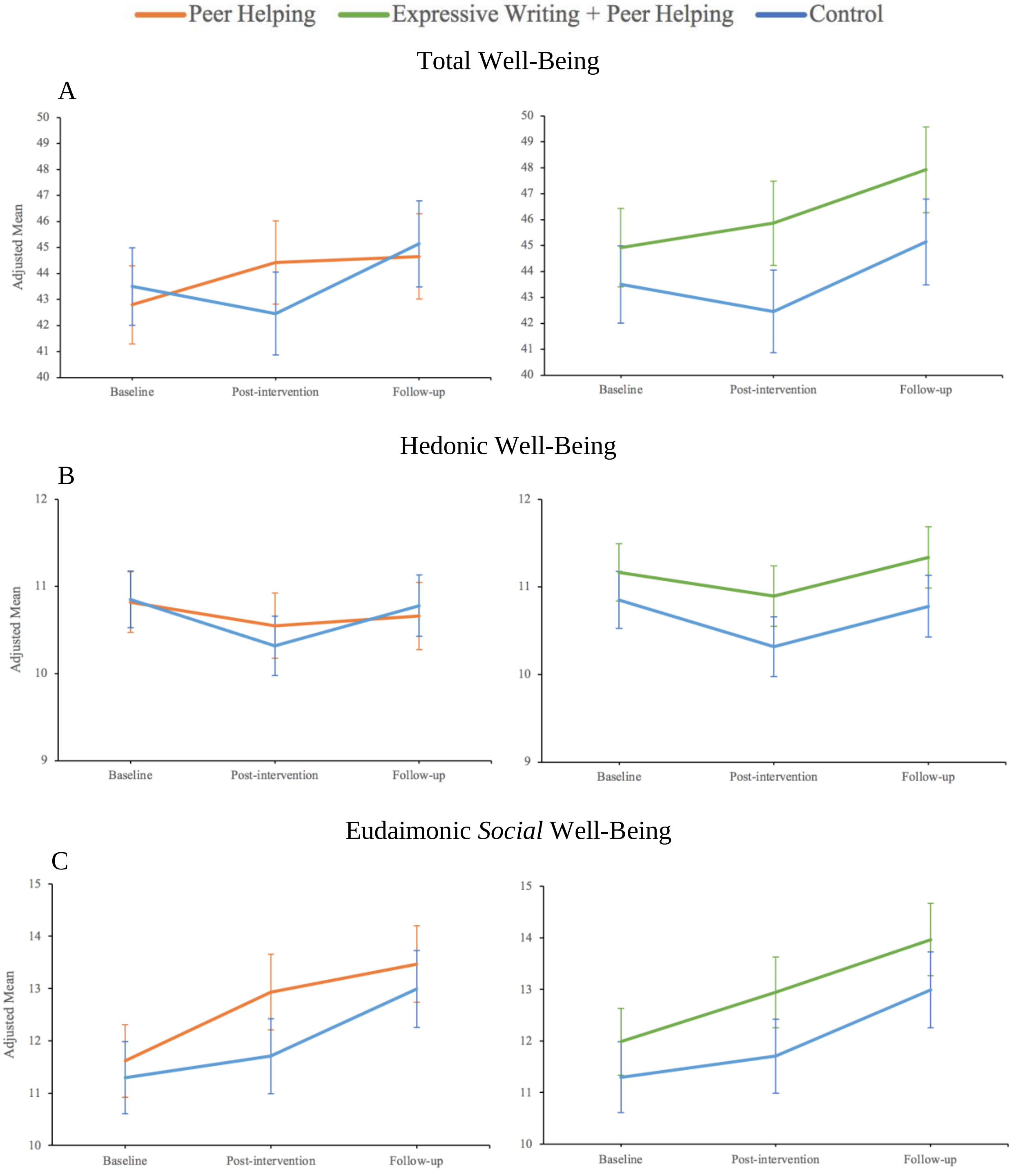
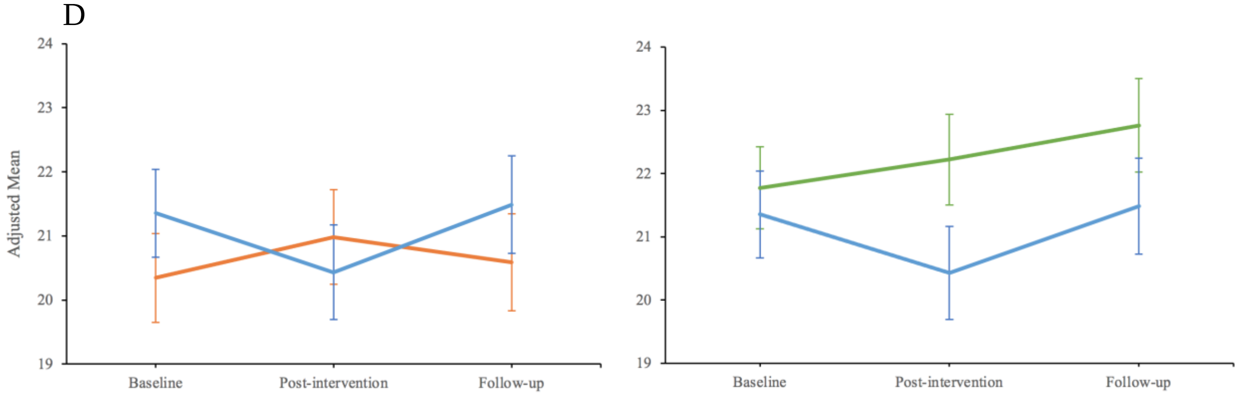


Figure 2

Adjusted Means for Total, Hedonic, Eudaimonic Social, and Eudaimonic Psychological Well-Being up by Condition



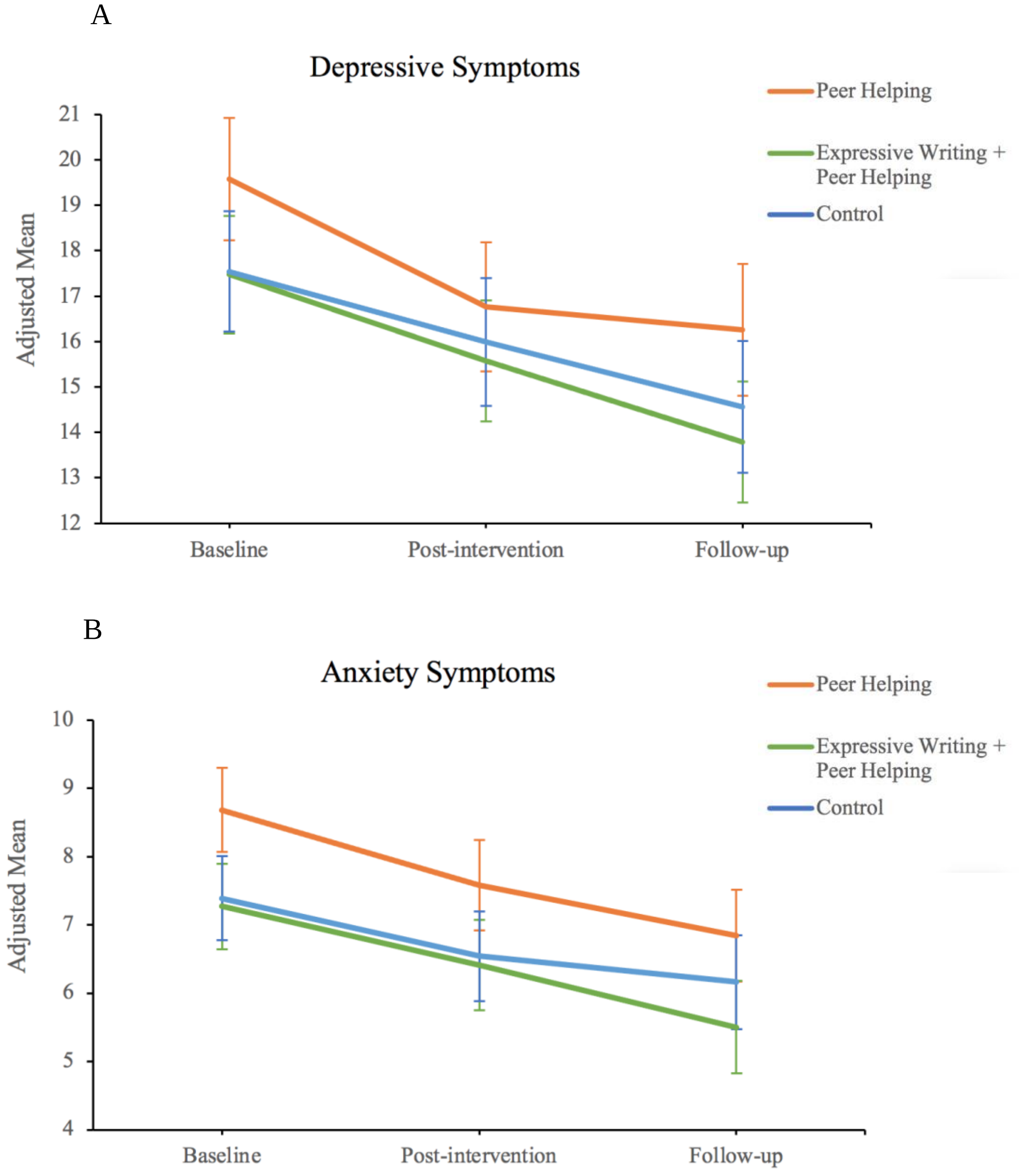
Eudaimonic *Psychological* Well-Being



Adjusted means for (A) total, (B) hedonic, (C) eudaimonic *social*, and (D) eudaimonic *psychological* well-being. Graphs on the left depict means in the peer helping and control conditions. Graphs on the right depict means in the expressive writing + peer helping and control conditions. (D) The effect of time on eudaimonic *psychological* well-being from baseline to post-intervention differed when comparing the peer helping and control conditions. Simple contrasts suggested an increase in eudaimonic *psychological* well-being in the peer helping condition and a decrease in the control condition, although neither change was statistically significant. Error bars represent one standard error.

Figure 3

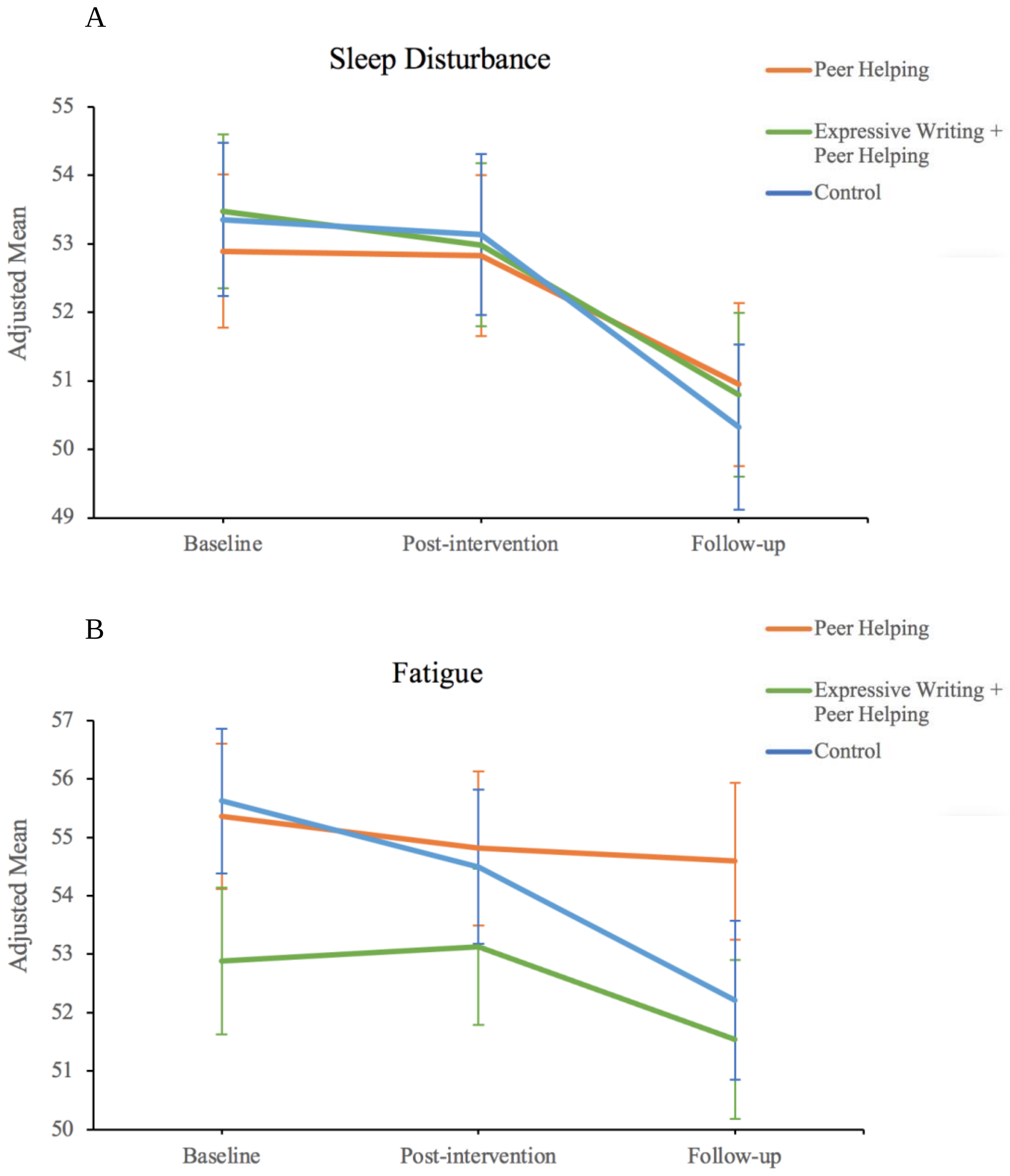
Adjusted Means for Depressive Symptoms and Anxiety by Condition



Adjusted means for (A) depressive symptoms and (B) anxiety in all three conditions. There was a main effect of time on both depressive symptoms and anxiety from baseline to post-intervention and baseline to the 1-month follow-up, such that all conditions decreased over time. Error bars represent one standard error.

Figure 4

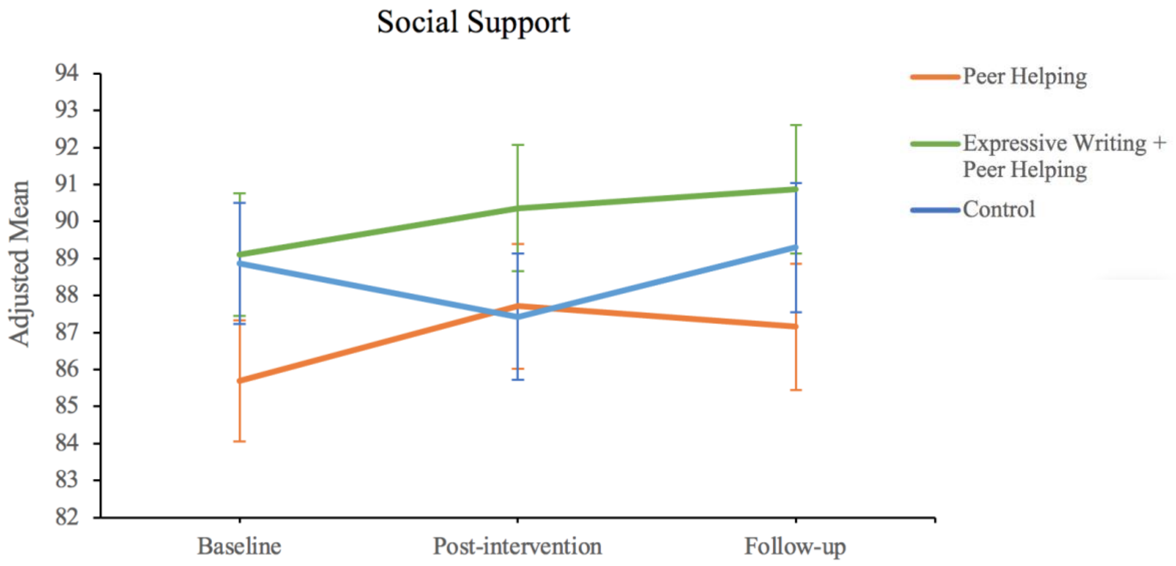
Adjusted Means for Sleep Disturbance and Fatigue by Condition



Adjusted means for (A) sleep disturbance and (B) fatigue in all three conditions. There was a main effect of time on both sleep disturbance and fatigue from baseline to the 1-month follow-up. Though ratings for all three conditions decreased over time, change was the greatest among the control condition. Error bars represent one standard error.

Figure 5

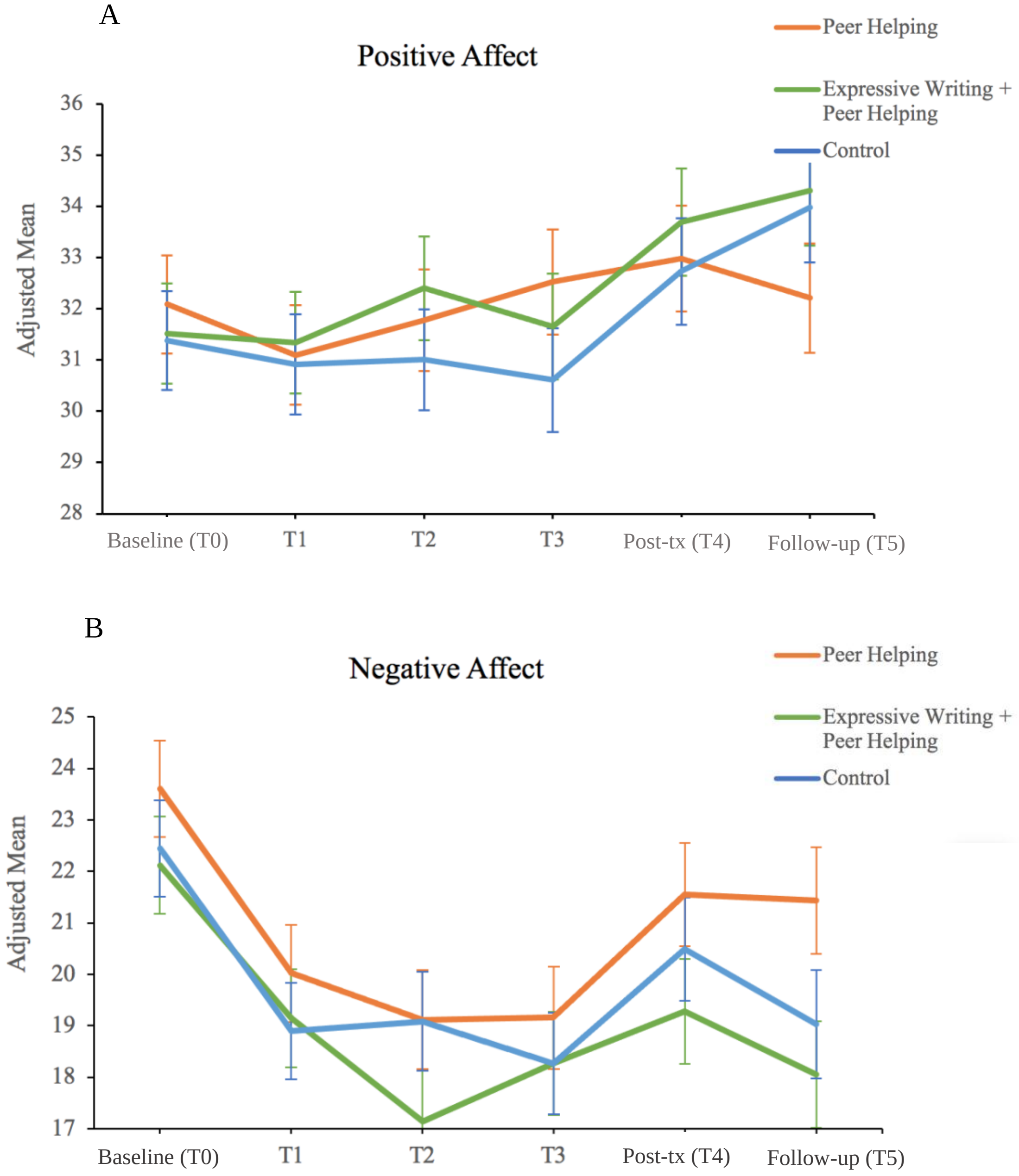
Adjusted Means for Total Social Support by Condition



Adjusted means for total social support in all three conditions. When comparing the peer helping and control conditions, the effect of time on total social support from baseline to post-intervention differed between the two groups. Simple contrasts indicated an increase in social support in the peer helping condition and a decrease in the control condition, although neither change was statistically significant. Error bars represent one standard error.

Figure 6

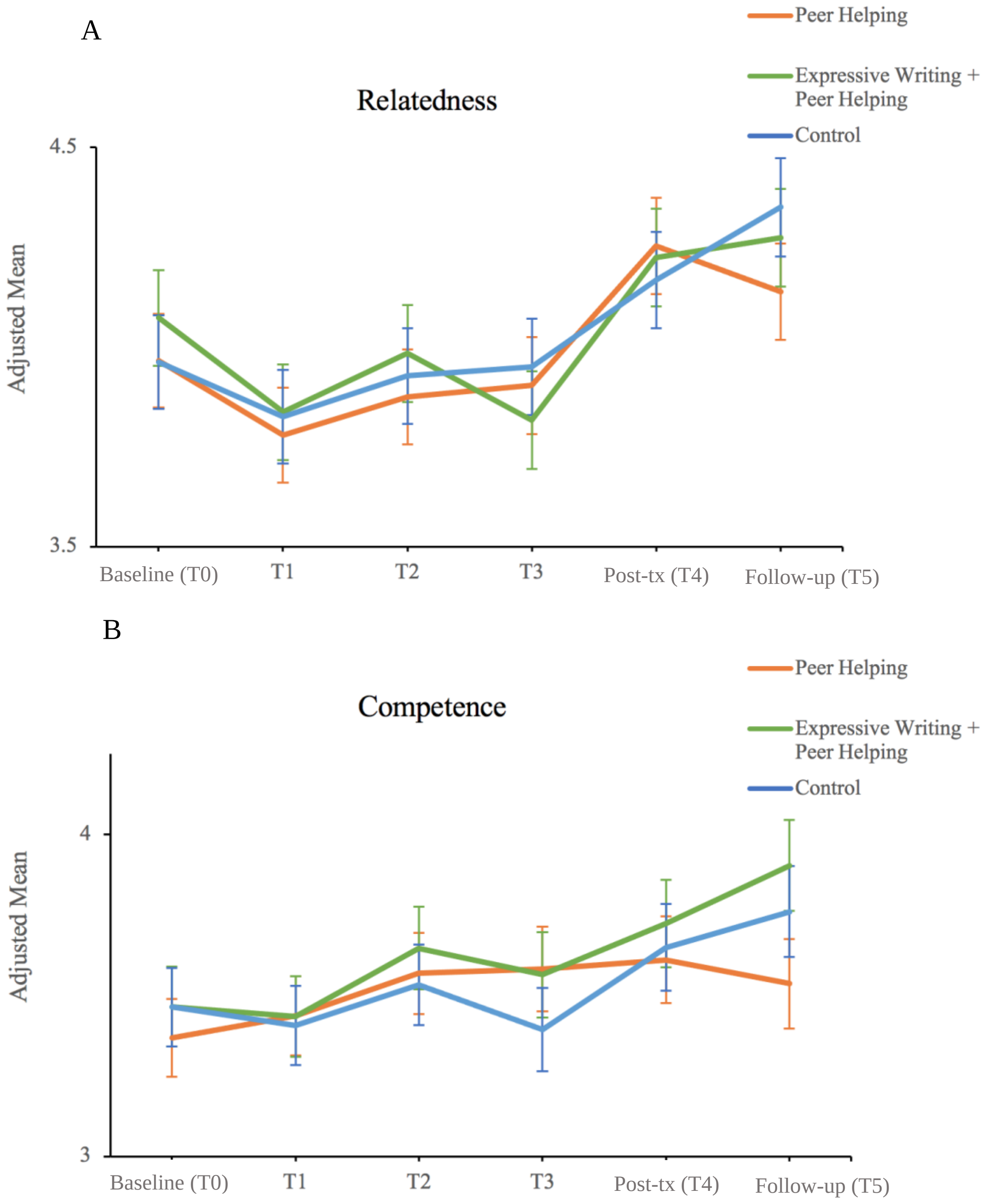
Adjusted Means for Positive and Negative Affect by Condition

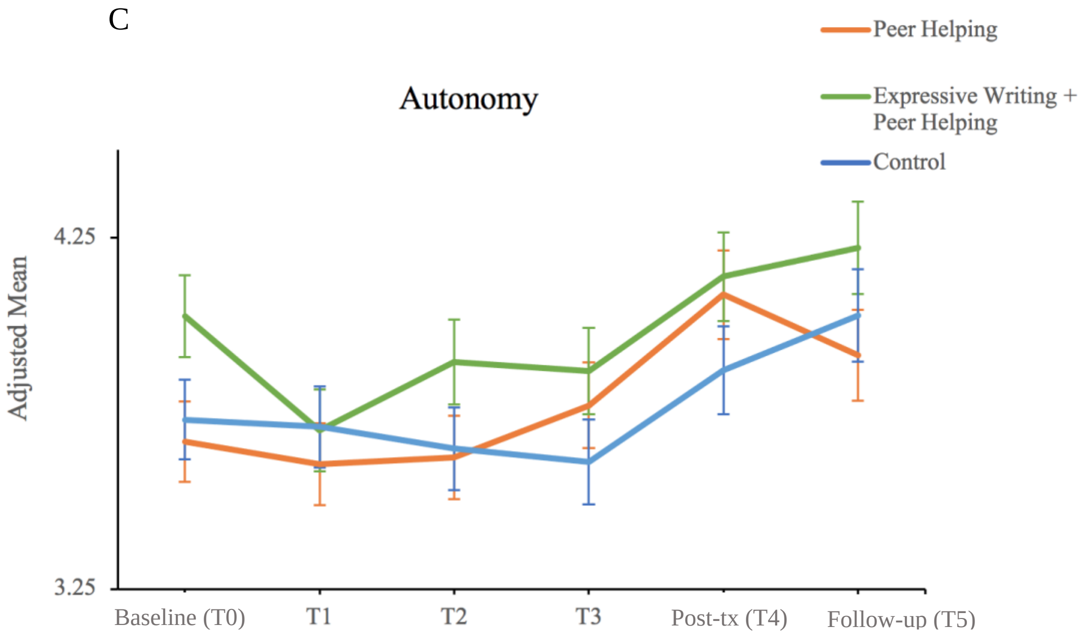


Adjusted means for (A) positive affect and (B) negative affect in all three conditions. There was a main effect of time on positive affect from baseline to post-intervention and baseline to follow-up. All three conditions evidenced an increase in positive affect. There was also a main effect of time on negative affect at all 5 timepoints. For all three conditions, negative affect decreased during the first week and remained statistically different across the intervention and at follow-up. Error bars represent one standard error.

Figure 7

Adjusted Means for Fulfillment of Psychological Needs (i.e., Relatedness, Competence, Autonomy) by Condition





Adjusted means for fulfillment of psychological needs: (A) relatedness, (B) competence, and (C) autonomy. There was a main effect of time on relatedness from baseline to the T1 assessment, baseline to post-intervention, and baseline to the 1-month follow-up. All three groups evidenced a decline in relatedness during the first week of the intervention, then an increase at the post-intervention and follow-up assessments. There was a main effect of time on competence from baseline to the T2 assessment, baseline to post-intervention, and baseline to the 1-month follow-up. All three groups evidenced an increase in competence at T2, post-intervention, and follow-up. There was a main effect of time on autonomy from baseline to the T1 assessment, baseline to post-intervention, and baseline to the 1-month follow-up. Similar to relatedness, all three groups evidenced a decline in autonomy during the first week of the intervention, then an increase at the post-intervention and follow-up assessments. Error bars represent one standard error.

Appendix A

Randomized Controlled Trials Conducted Among AYA Cancer Patients and Survivors

Search Strategy. Studies were identified by a combination of terms: (intervention, randomized controlled trial, RCT) AND (cancer, cancer survivor, cancer patient, oncology) AND (adolescent, young adult, AYA, adolescent and young adult, youth). Databases searched included: Google Scholar, PubMed, and PsycINFO. Databases were searched up to February 2019, and included articles were restricted to the English language. Studies were excluded if the sample included primarily pediatric or adult cancer survivors (e.g., several of those included by Bradford & Chan, 2017).

Author	**Intervention Aims**	**N**	**Mean Age (SD); Range**	**Type of Cancer**	**Treatment Stage**	**Study Design**	**Results**
Beale et al. (2007) Kato et al. (2008)	determine the efficacy of a video game intervention on adherence and health-promoting behaviors	371	NR; 13-29	mixed	patients receiving treatment	game play for at least 1 hour per week for 3 months control group played a commercial video game assessments pre-intervention, 1 month later, and post-intervention	• the intervention enhanced cancer-related knowledge relative to the control group • no differences in general self-reported adherence, though the intervention group had greater adherence to prescribed antibiotics • the intervention group maintained greater adherence to oral chemotherapy across time, as measured by blood metabolites • the intervention group had greater cancer-related knowledge and cancer-specific self-efficacy; increases in these mediated the effect of the intervention on objective adherence (metabolite from one of the oral chemotherapies assessed)

Bélanger, Mummery, Clark, & Courneya (2014)	evaluate the impact of print-based physical activity (PA) materials on subsequent exercise habits and quality of life	212	NR 16% age 18-29 74% age 30-39	mixed	patients and survivors (no more than 5-years post treatment)	mailed a targeted 58-page PA guidebook, with content based on the theory of planned behavior control group received 1-page handout on government guidelines assessments at pre-intervention, and 1 and 3 months later	• no differences between groups in self-reported PA • for those who initially preformed less than 300 mins/week of PA, those in the intervention group evidenced more PA than controls at the 3-month follow up • also at the 3-month follow-up, the intervention group evidenced a greater reduction in the mental component subscale of the SF-36 (i.e., vitality [RC], social functioning [RC], emotional role dysfunction, and mental health complaints)
Burns et al. (2009)	assess the feasibility of a therapeutic music video intervention in patients undergoing stem-cell transplant (SCT)	12	17.5 (3.6); 11-24	mixed	patients undergoing SCT	six one-on-one sessions, twice a week for 3 weeks audio-book control assessments pre- and post-intervention, after weeks 1 and 2, and 100-days post-transplant	• due to attrition, group differences were not analyzed
Canada, Schover, & Li (2007)	evaluate reproductive-health counseling as a means to enhance psychosexual functioning	21	21.3 (2.7); 15-25	mixed	patients & survivors	two 90-minute individual counseling sessions waitlist control assessments pre- and 3 mos. post-intervention	• intervention group had greater knowledge of treatment-related effects on fertility and sexuality, higher confidence in romantic relationships, and less emotional distress than the control

Hinds et al. (2000)	implement a short intervention to improve behavioral and emotional coping	78	16.0 (2.1); 12-21	mixed	newly diagnosed patients (within 1-12 days of diagnosis)	one 40-minute individual session (included consult with medical professional, peer advice via video, and rehearsal of self-care) control group met with medical professional for 40 minutes longitudinal: assessments pre- and post-intervention; follow-ups at 3- and 6-months post-diagnosis	• no statistically significant differences in coping between the treatment and control groups
Huyghe et al. (2009)	to determine the efficacy of a short computerized educational tool, *Banking on Fatherhood*, on decisional conflict about banking sperm	20	32.7 (9.5); 14-45	mixed	newly diagnosed patients	patients either viewed the educational tool before filling out questionnaires about banking sperm or after (control) assessment was conducted directly after the intervention	• the interventions did not improve knowledge scores, but men in the experimental condition reported less decisional conflict than those in the control group

Author	Intervention Aims	N	Mean Age (SD); Range	Type of Cancer	Treatment Stage	Study Design	Results
Jones et al. (2010)	development of an informational CD-ROM to promote self-efficacy, coping, cancer-related knowledge, and quality of life	71	14.8 (1.2); 12-18	solid tumors	patients and survivors (no more than 5 years post-treatment)	receipt of a CD-ROM control condition received a print handbook with the same information assessments pre-intervention and 3 mos. later	• at the 3-month follow-up, teens in the intervention group had greater feelings of control
Lyon et al. (2014)	assess the impacts of a family-centered advanced care planning intervention for AYA cancer patients	30	16.3 (NR); 14-20	mixed	patients in either active or long-term care	three weekly 60-minute sessions with a trained facilitator (includes teen and their family member) treatment as usual control assessments at pre-intervention, each session, and 3-months post intervention	• teens in both groups had a decrease in anxiety • whereas family members in the intervention group had an increase when compared to controls • family members in the intervention group also had improved quality of life in the school domain at follow-up when compared to controls, whereas teens did not

Author	Intervention Aims	N	Mean Age (SD); Range	Type of Cancer	Treatment Stage	Study Design	Results
Robb et al. (2014)	determine the effectiveness of a therapeutic music video intervention in patients undergoing SCT	113	17.3 (3.8); 11-24	mixed (46% leukemia, 25% lymphoma)	patients undergoing SCT	six one-on-one sessions, twice a week for 3 weeks audio-book control assessments pre- and post-intervention and 100-days post-transplant	• At post-intervention, the intervention group evidenced greater courageous coping—a composite of confrontive, optimistic, and supportant coping (via the Jalowiec Coping Scale-Revised)—relative to control • At 100-days post-transplant, the intervention group evidenced greater perceived social support (from friends, family, and health care providers) and better family environment (cohesion, communication, adaptability) than the control
Rosenberg et al. (2018) Rosenberg et al. (2019)	design and evaluate a brief skills training to enhance coping, stress management, and resilience	92	NR; 12-25 73% age 12-17 27% age 18-25	mixed	patients, either at first onset (1-10 weeks post diagnosis) or with chronic or remittent disease	four (30-50 min) individual meetings, every 2 weeks; weekly homework; and an optional 5th session for participants, family, and friends topics included: mindfulness, goal setting, benefit finding, and cognitive reappraisal usual care control assessments pre-intervention and at 6 months post-enrollment	• at 6 months post-enrollment, the intervention group had greater resilience and cancer-specific quality of life and lower distress (measured by the Kessler-6 Psychological Distress Scale) relative to the control • no significant effects for anxiety symptoms, though a trend towards lower depressive symptoms • at 6 months post-enrollment, those in the intervention group evidenced greater increases in hopefulness and benefit finding

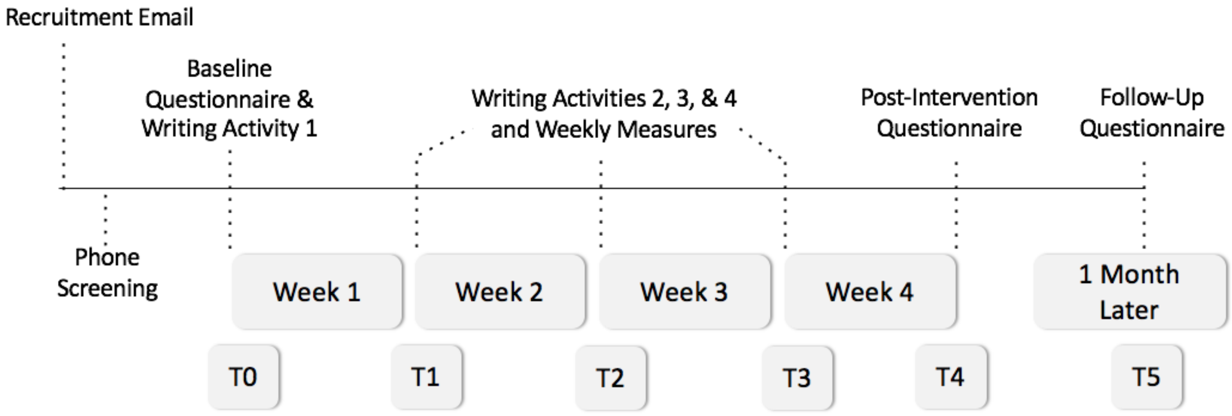
Sansom-Daly et al. (2012)	outline of the study protocol for an online group-based cognitive-behavioral therapy (CBT) intervention	--	---; 15-25	mixed	survivors (1-6 mos. post treatment)	six 90-min weekly CBT groups, plus a booster session 6-weeks later both wait-list and peer-support group controls assessments at pre- and post-intervention and 12 mos. later	• no results presented
Sansom-Daly et al. (2019)	report on the feasibility and acceptability of the intervention	42	20.6 (2.91); NR	47% blood cancers			• recruitment was challenging and participants had to wait about 40 days to be placed in a treatment group following completion of baseline questionnaire. Technological issues were common in the trial. • attrition rate was 47%, though AYAs who completed the intervention reported finding it beneficial. • the intervention was relatively safe, with patients that did experience distress reporting improvements within a week, on average
Valle et al. (2013)	develop and conduct an online intervention to enhance PA	86	31.7 (5.1); NR	mixed	survivors (on average, 58.2-mos. post diagnosis)	12-week Facebook-based intervention; weekly lesson plans which encouraged goal setting and tracking, social support, and behavioral strategies to enhance PA; Facebook group interaction was also encouraged self-care control; both groups instructed to get	• self-reported PA increased significantly in both groups; only the increase in light PA was greater in the intervention group than in the controls •

						150 minutes of PA each week assessments at pre- and post-intervention	

Note. NR = Not Reported, RC = Reverse Coded

Appendix B

Study Timeline



Appendix C

Activity Instructions

General Instructions (adapted from Moieni et al., 2017 and Stanton et al., 2002):

"In this study, you will be asked to complete a writing activity once per week for the next 4 weeks. Each session will take 20 minutes to complete. You will be asked to write on a variety of different topics, and detailed instructions will be provided before each session.

Before you begin each week, we would like you to find a quiet, uninterrupted time to complete the writing. There is no need to worry about grammar, spelling, or sentence structure. **The only rule is that you write continuously for the entire 20 minutes**. If you run out of things to say, you can simply repeat the things you have already written. Your responses will remain anonymous (i.e., not linked to your name or any personally identifiable information), so feel free to write openly and honestly about your experience."

Condition Specific Instructions (adapted from Moieni et al., 2017):

Peer Helping	"For some newly diagnosed cancer patients, learning about others' experiences with cancer can be helpful. Though everyone's experience is different, there are many benefits to learning about other's experiences. Newly diagnosed patients may, for example, learn more about common side effects or be introduced to practical tips for coping with cancer diagnosis and treatment. They may also find it helpful to realize that others share their thoughts and feelings regarding diagnosis and treatment and that these thoughts and feelings are both understandable and normal. **We are putting together a collection of writings and advice that can be used as a resource for newly diagnosed adolescent and young adult (AYA) cancer patients**. To help with this project, we would like you to share your experiences and advice on a range of different topics related to your cancer diagnosis, treatment, and follow-up care. <u>These activities were designed to help you communicate your experiences and provide advice and support to a newly diagnosed AYA patient</u>. You can provide as much or as little detail as you would like. We do ask, however, that you share all aspects of your experience, including the difficulties and challenges. <u>We encourage you to write about your experience as if you were speaking to someone similar to you in terms of age, gender, type of cancer, and type of treatment received</u>. Anonymized responses from this study will be compiled into a booklet, grouped by age, gender, and type of cancer to be used by newly diagnosed AYA cancer patients. At the end of the study, you will also have the option to receive a copy of your written responses for your records."

Expressive Writing + Peer Helping	"For some newly diagnosed cancer patients, learning about others' experiences with cancer can be helpful. Though everyone's experience is different, there are many benefits to learning about other's experiences. Newly diagnosed patients may, for example, learn more about common side effects or be introduced to practical tips for coping with cancer diagnosis and treatment. They may also find it helpful to realize that others share their thoughts and feelings regarding diagnosis and treatment and that these thoughts and feelings are both understandable and normal. **We are putting together a collection of writings and advice that can be used as a resource for newly diagnosed adolescent and young adult (AYA) cancer patients**. The first three writing activities were designed to help you organize and communicate your experience receiving a cancer diagnosis and undergoing treatment and follow-up care. They will NOT be shared with an AYA cancer patient. In the final writing activity, you will be asked to provide advice and support to a newly diagnosed AYA cancer patient. You can provide as much or as little detail as you would like. We do ask, however, that you share all aspects of your experience, including the difficulties and challenges. In the final writing activity, we encourage you to write about your experience as if you were speaking to someone similar to you in terms of age, gender, type of cancer, and type of treatment received. Responses from this writing activity will be compiled into a booklet, grouped by age, gender, and type of cancer to be used by newly diagnosed AYA cancer patients. At the end of the study, you will have the option to receive a copy of your written responses for your records."
Fact-Writing Control	"For some cancer survivors, writing about the experience of having cancer may be beneficial. Research shows that many types of people benefit from writing, regardless of whether they have written about their experiences before or consider themselves good at writing. Writing may, for example, help people to organize their thoughts, which can be helpful when planning for the future. For cancer survivors, in particular, writing factual details about the experience of receiving a cancer diagnosis and undergoing treatment may help when planning for long-term care. **We are asking adolescent and young adult (AYA) cancer survivors to document their experiences through a series of writing activities, which can then be used as a personal resource**. To help with this project, you will be asked to provide factual details about your experiences receiving a cancer diagnosis, undergoing treatment, and your life after treatment. These responses will NOT be shared with anyone other than the research team and are designed to help you organize and document your experiences. You can provide as much or as little detail as you would like, but we do ask that you

	share all aspects of your experience, including both the good and bad parts. We encourage you to write about your experience as if you were writing for only yourself. There is no need to explain any of your responses. Again, the goal of these activities is to help you document your own experience. At the end of the study, you will have the option to receive a copy of your written responses for your records."

Appendix D

Writing Prompts

Peer Helping:

1.) **Today, I would like you to write about what it was like for you when you received a cancer diagnosis, including how you felt and how it impacted your life at the time**. Remember as you write that your story will be a resource to help newly diagnosed AYAs. Please include details about things you think newly diagnosed AYAs would benefit from knowing, including both the good and bad parts of your experience. Overall, it might help to think about what you wish you had known at the time.

Here are some questions to get you started: What emotions did you experience during this time? What were some of the changes that occurred to your day-to-day life during this time? How did you cope with these changes? What concerns or hopes did you have? How did those around you deal with the diagnosis? In what ways did receiving a cancer diagnosis impact your relationships with your family, friends, classmates, romantic partner, and/or coworkers?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

2.) Today, I would like you to **write about the experience of receiving cancer treatment, including how you felt and how it impacted your life at the time**. This may also include details about the type of treatment you received, how long it lasted, and any side effects you had. Remember as you write that your story will be a resource to help newly diagnosed AYAs. Please include details about things you think newly diagnosed AYAs would benefit from knowing, including both the good and bad parts of your experience. Overall, it might help to think about what you wish you had known at the time.

Here are some questions to get you started: What type of treatment did you receive? Did you experience any physical side effects during or after treatment? If so, how did you (or do you) cope with these side effects? What did you find the most helpful during this time? Did anything during this time surprise or frighten you? How did cancer treatment impact your life? This may include both negative (e.g., taking time off of work) and positive (e.g., making new friends) impacts.

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

3.) Today, I would like you to **write about your experiences in the first year after treatment ended**. This may include details about your return to work and/or school, who you interacted with on a daily basis, and whether your plans for the future were impacted by diagnosis and treatment. Remember as you write that your story will be a resource to help newly diagnosed AYAs. Please include details about things you think newly diagnosed AYAs would benefit from knowing, including both the good and bad parts of your experience. Overall, it might help to think about what you wish you had known at the time.

Here are some questions to get you started: When were you able to return to some of your normal roles and activities and how did that feel? What was it like to go back to work or school after treatment? Did you have any concerns about completing treatment? What were some of the good and bad things that happened during this first year? How did you cope with any changes that occurred because of your diagnosis and treatment? How did cancer diagnosis and treatment impact your social relationships during this time?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

4.) Today, I would like you to **write about how your cancer diagnosis and treatment has influenced your life now, in both good and bad ways**. <u>Remember as you write that your story will be a resource to help newly diagnosed AYAs</u>. Please include details about things you think newly diagnosed AYAs would benefit from knowing, including both the good and bad parts of your experience. Overall, it might help to think about what you wish you had known.

Here are some questions to get you started: Looking back on your diagnosis and treatment, how do you view that time in your life now? How has this experience shaped who you are now? Did your experience change your plans for the future and, if so, how? What are some of the difficulties that you face in managing your follow-up care? What are some of the ways that you cope with persistent side effects or difficult thoughts and emotions regarding your experience? What benefits have you received because of your cancer diagnosis and treatment?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

Expressive Writing + Peer Helping Condition:

1.) **Today, I would like you to write about your deepest thoughts and feelings regarding the time when you received a cancer diagnosis, including how you felt, what thoughts you had, and how it impacted your life at the time**. Please include details about what you went through, including both the good and bad parts of your experience. <u>Remember, today's writing activity was designed to help you organize and communicate your experience and will NOT be shared</u>. In the 4th and final writing activity, you will be asked to provide advice and support to a newly diagnosed AYA cancer patient.

Here are some questions to get you started: What emotions did you experience during this time? What were some of the changes that occurred to your day-to-day life during this time? How did you cope with these changes? What concerns or hopes did you have? How did those around you deal with the diagnosis? What do you wish someone had told you about receiving a cancer diagnosis? In what ways did receiving a cancer diagnosis impact your relationships with your family, friends, classmates, romantic partner, and/or coworkers?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

2.) Today, I would like you to **write about your deepest thoughts and feelings regarding the time when you received cancer treatment, including how you felt, what thoughts you had, and how it impacted your life at the time**. This may also include details about the type of treatment you received, how long it lasted, and any side effects you experienced. Remember, today's writing activity was designed to help you organize and communicate your experience and will NOT be shared. In the 4th and final writing activity, you will be asked to provide advice and support to a newly diagnosed AYA cancer patient.

Here are some questions to get you started: What type of treatment did you receive? Did you experience any physical side effects during or after treatment? If so, how did you (or do you) cope with these side effects? What did you find the most helpful during this time? Did anything during this time surprise or frighten you? How did cancer treatment impact your life? This may include both negative (e.g., taking time off of work) and positive (e.g., making new friends) impacts.

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

3.) Today, I would like you to **write about your deepest thoughts and feelings regarding your experiences in the first year after treatment ended**. This may include details about your return to work and/or school, who you interacted with on a daily basis, and whether your plans for the future were impacted by diagnosis and treatment. Remember, today's writing activity was designed to help you organize and communicate your experience and will NOT be shared. In the 4th and final writing activity, you will be asked to provide advice and support to a newly diagnosed AYA cancer patient.

Here are some questions to get you started: When were you able to return to some of your normal roles and activities and how did that feel? What was it like to go back to work or school after treatment? Did you have any concerns about completing treatment? What were some of the good and bad things that happened during this first year? How did you cope with any changes that occurred because of your diagnosis and treatment? How did cancer diagnosis and treatment impact your social relationships during this time?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

4.) Today, I would like you to **provide advice and support to a newly diagnosed AYA cancer patient**. Feel free to write about any aspect of your experience and include details about things you think newly diagnosed AYAs would benefit from knowing, including both the good and bad parts of your experience. Remember as you write that your story will be a resource to help newly diagnosed AYAs. Overall, it might help to think about what you wish you had known.

Here are some questions to get you started: Looking back on your diagnosis and treatment, how do you view that time in your life now? How has this experience shaped who you are now? Did your experience change your plans for the future and, if so, how? What are some of the difficulties that you face in managing your follow-up care? What are some of the ways that you cope with persistent side effects or difficult thoughts and emotions regarding your experience? What benefits have you received because of your cancer diagnosis and treatment?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

Fact-Writing Control Condition:

1.) **Today, I would like you to write factual details about your cancer diagnosis, what it was like to receive a cancer diagnosis, and what your life was like at the time**. Please include only <u>factual details</u> about this time frame. There is no need to write about what you were thinking or how you were feeling at the time. <u>Remember, today's writing activity will NOT be shared with anyone other than the research team and is meant to help you organize and document your experience</u>. We encourage you to write about your experience as if you were writing only for yourself.

Here are some questions to get you started: When were you diagnosed? What was a typical day like for you at this time? What were the steps that led up to your diagnosis? Where did you receive your diagnosis? What are some of the factual details that you remember about this conversation? What type of cancer were you diagnosed with? What details do you remember about the setting and the person who conveyed the news? What changes did you make to your schedule immediately following diagnosis?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

2.) Today, I would like you to **write factual details about your cancer treatment, including what type of treatment you received, how long it lasted, and what your life was like at the time**. Please include only factual details about this timeframe. There is no need to write about what you were thinking or how you were feeling at the time. <u>Remember, today's writing activity will NOT be shared with anyone other than the research team and is meant to help you organize and document your experience</u>. We encourage you to write about your experience as if you were writing only for yourself.

Here are some questions to get you started: What type of treatment did you receive? Describe a typical day while you were receiving treatment. For how long did you receive treatment? Where did you receive treatment? Who administered the treatment? Describe the people you interacted with during treatment sessions. Describe the room where you received treatment. How often did you follow-up with your doctor during this time? Did you experience any physical side effects during or after treatment? If so, what were they and how long did they last?

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

3.) Today, I would like you to **write factual details about the first year after treatment ended**. Please include only factual details about this timeframe. This may include details about your return to work and/or school and who you interacted with on a daily basis. There is no need to write about what you were thinking or how you were feeling at the time. Remember, today's writing activity will NOT be shared with anyone other than the research team and is meant to help you organize and document your experience. We encourage you to write about your experience as if you were writing only for yourself.

Here are some questions to get you started: What was a typical day like for you during the first few months after completing treatment? What was a typical day like for you 6 or 9 months after completing treatment? What types of activities (e.g., work, school, social activities) were you engaged in during this time? Describe your follow-up care, which may include doctor's visits, medication, exercise and/or nutrition, and attendance at support groups. Describe your social network at this time, including what friends and family members you had contact with.

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

4.) Today, I would like you to **write factual details about what your life is like now**. Please include only factual details about this timeframe. There is no need to write about what you are thinking or how you are feeling. Remember, today's writing activity will NOT be shared with anyone other than the research team and is meant to help you organize and document your experience. We encourage you to write about your experience as if you were writing only for yourself.

Here are some questions to get you started: Describe a typical workday and a typical day on the weekend. What types of activities (e.g., work, school, social activities) are you engaged in during this time? Describe your follow-up care, which may include doctor's visits, medication, exercise and/or nutrition, and attendance at support groups. Describe your social network at this time, including what friends and family members you have contact with. Describe your plans for the future, including both short-term and long-term goals.

Remember, please write continuously for the next 20 minutes. When you are done, please click through to the next screen to answer a few questions.

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